

Risks of Elective Caesarean Delivery

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Outline

- The controversy
- Maternal morbidity
- Neonatal morbidity
- Costs
- Long term outcomes and costs
- Future work

The Controversy

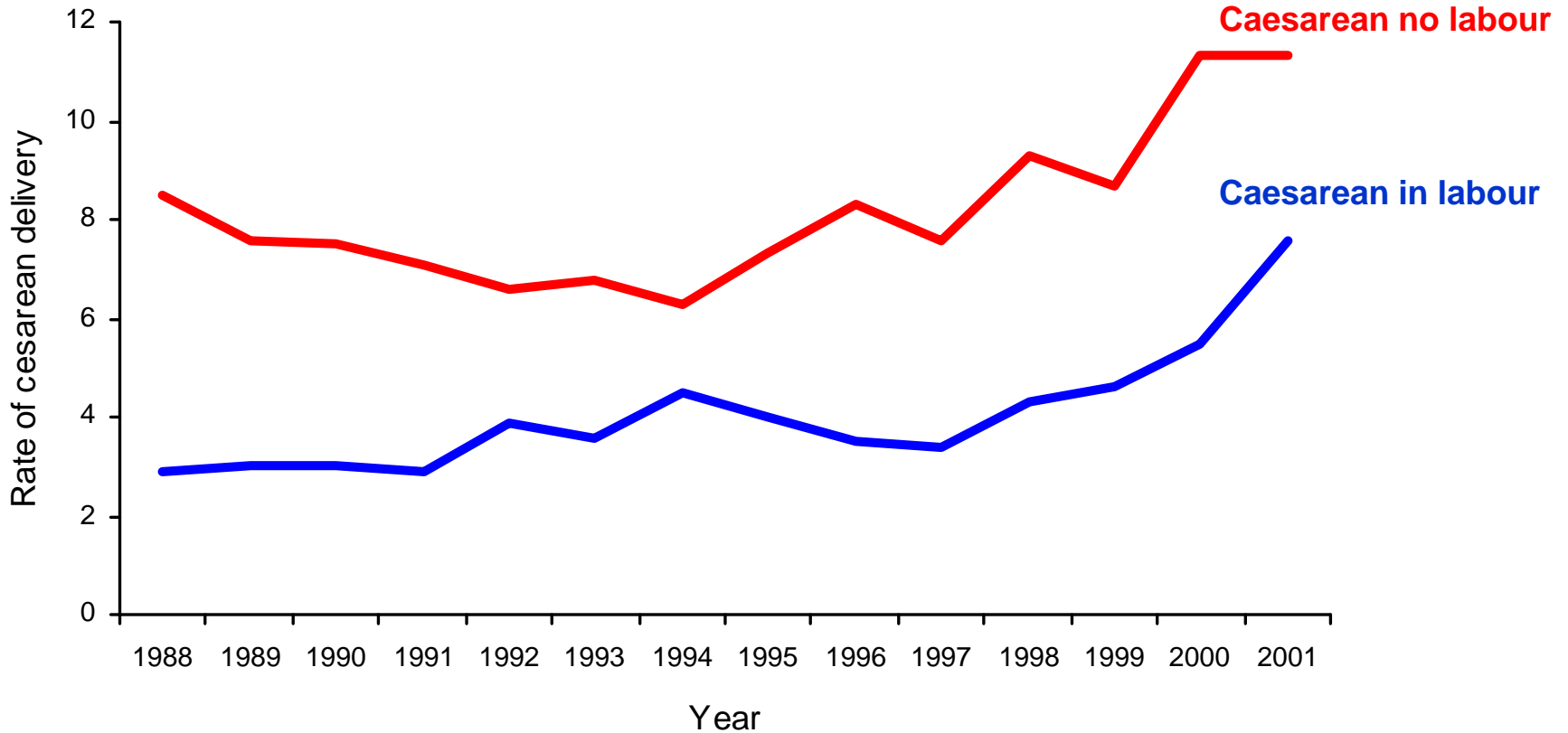
- Growing body of literature addressing the issue of elective caesarean delivery in the absence of a medical indication
- Safety for both mother and infant with caesarean delivery without labour compared with spontaneous labour and planned vaginal delivery remains unresolved

Trends in 1° Caesarean Delivery in Canada



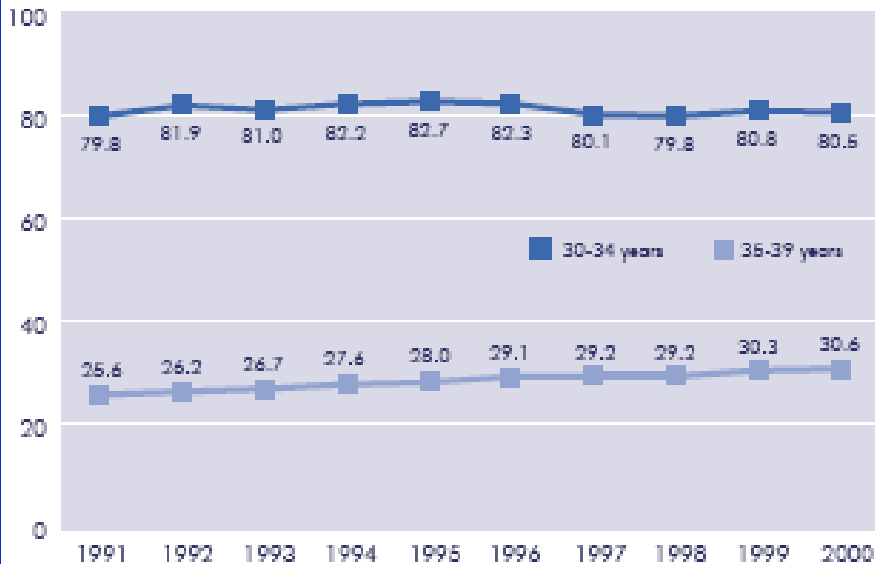
Trends in 1° Caesarean Delivery in Nova Scotia

Rate of caesarean delivery by year



1.18 Age-specific live birth rate, females 30-39 years, Canada (excluding Ontario),* 1991-2000

Live births per 1,000 females



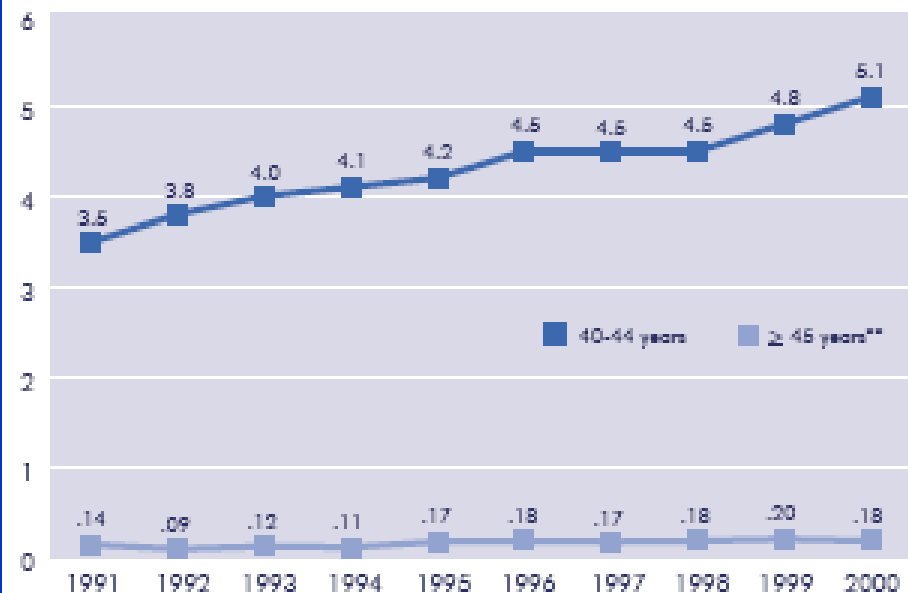
≥ 40 years
3.5 → 5.1/1000 live births

35-39 years

25.6 → 30.6/1000 live births

19 Age-specific live birth rate, females ≥ 40 years, Canada (excluding Ontario),* 1991-2000

Live births per 1,000 females



- Rising C/S rates can be attributed to changing maternal characteristics and obstetric practice factors
 - Maternal age, parity, prepregnancy weight, weight gain, term and post-term induction, forceps

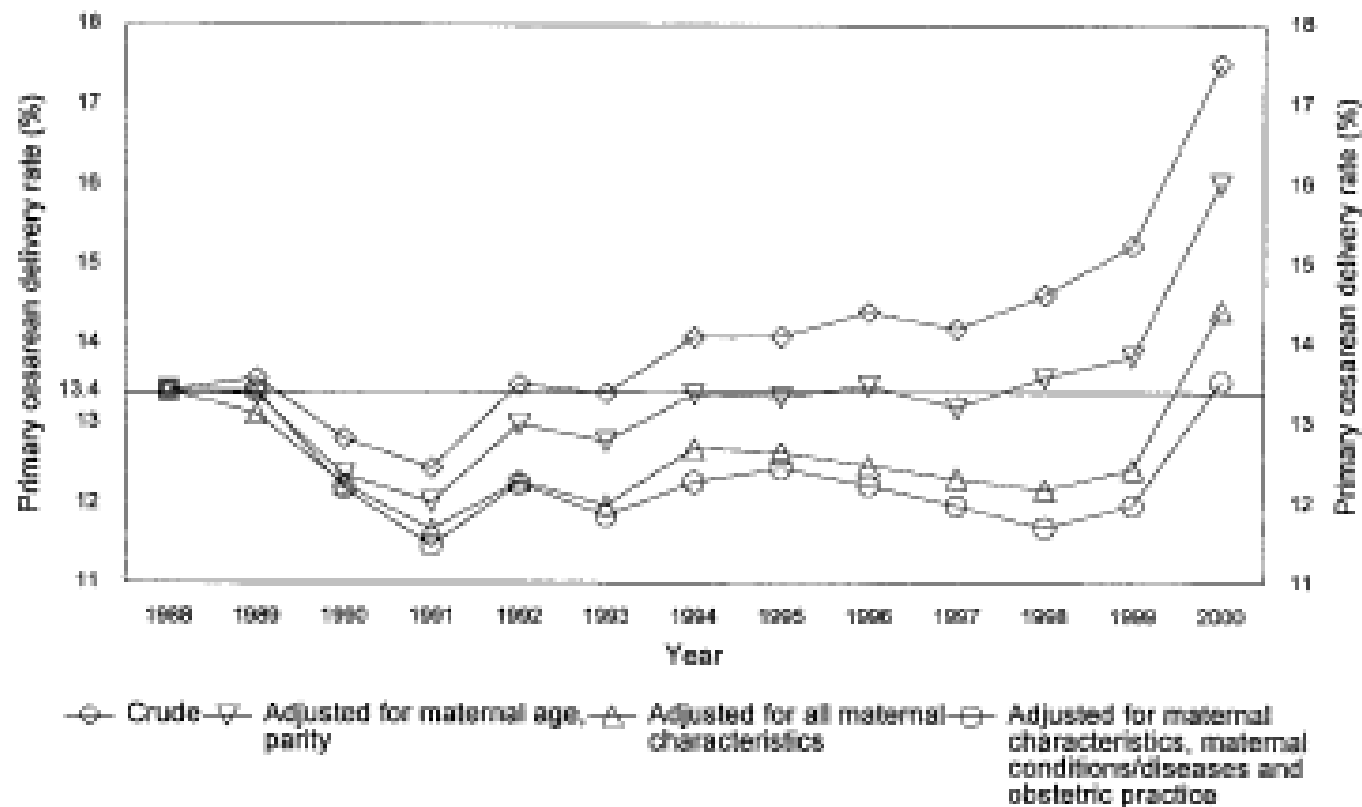
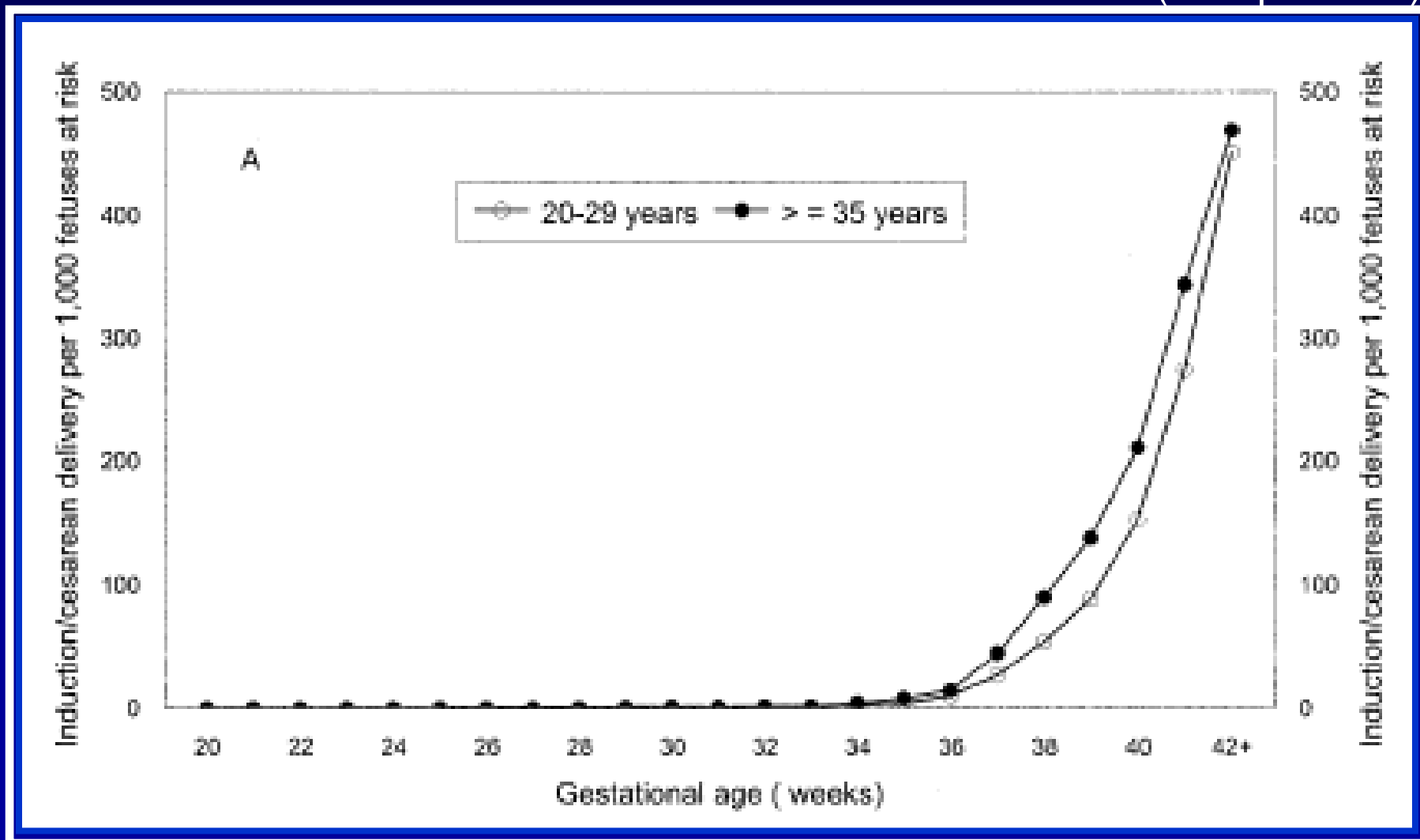


Figure 2. Observed rates of primary cesarean delivery in Nova Scotia, 1988–2000, and rates adjusted sequentially for changes in maternal characteristics, maternal conditions or diseases, and obstetric practice.

Joseph. Primary Cesarean Section. Obstet Gynecol 2003.

- Older women also more likely to require labour induction and caesarean delivery, deliver preterm, have small for gestational age infants, and increased perinatal mortality/morbidity

(Joseph 2005)



The Controversy

- Safety of C/S has improved dramatically over the last 50 years
- Maternal mortality or morbidity from C/S is highest for C/S in labour (UK Confidential Enquiries)
- Increasing information on long term health consequences of C/S and vaginal delivery
- Increasing maternal request for elective C/S

The Controversy

- Reasons for elective caesarean delivery
 - Fear of pain in labour
 - Uncertainty of outcome and fear of emergency intervention such as forceps
 - Fear of fetal distress in labour
 - Fear of future sexual dysfunction, stress incontinence or pelvic prolapse
 - Convenience

The Controversy

- Different perspectives among physicians and professional organizations
 - Professional responsibility
 - Reproductive autonomy

The Controversy

- Unethical to perform a caesarean section without a medical indication because of inadequate evidence to support a net benefit

FIGO Committee for the Ethical Aspects of Human Reproduction and Women's Health 1999

- If the physician believes that caesarean delivery promotes health and welfare of woman and fetus, caesarean delivery is ethically justified
- If C/S detrimental to overall health and welfare then ethically obliged to refrain from C/S

ACOG Committee Opinion 2003

The Controversy

- SOGC does not promote caesarean sections on demand
- Caesarean section in labour based on medical indications
- Resources required to promote an elective procedure
- Final decision between the woman and her health care provider

SOGC Advisory March 10, 2004

Maternal and Neonatal Morbidity

Maternal morbidity

- Maternal outcomes with the Term Breech Trial
- During the first 6 weeks postpartum
 - Death
 - Hemorrhage
 - Trauma
 - Infection
- No differences between groups in terms of maternal mortality or serious maternal morbidity (RR1.2, 95% CI 0.8-1.2)

Maternal morbidity

- Maternal outcomes with the Term Breech Trial
- Secondary analysis
- 3-fold increase in maternal morbidity following caesarean delivery during active labour
- 76% reduction in maternal morbidity with a short active phase of the 2nd stage of labour (<30 min)

Nova Scotia Atlee Perinatal Database

- Several hundred, well-defined variables on maternal and newborn information on every pregnancy and birth in NS since 1988
 - Demographic variables, procedures, interventions, maternal and newborn diagnoses, morbidity and mortality
 - Data quality verified by re-abstraction studies

Maternal morbidity

- Nulliparous women at term with singleton, cephalic presentation
 - “planned vaginal delivery”
- Nulliparous women delivering by caesarean section without labour
 - “planned caesarean delivery”
- Excluded congenital anomalies, pre-existing illness and gestational diabetes and hypertension.

Maternal morbidity

- Postpartum haemorrhage
- Blood transfusions
- Hysterectomy
- Intraoperative trauma
- Wound infection

Maternal morbidity – spontaneous labour

- 721 elective C/S, 17,714 spontaneous labour
- No difference in:
 - Blood transfusions, wound infection, intraoperative trauma
- Caesarean delivery without labour:
 - 2x more likely to have puerperal febrile morbidity
 - 40% less likely to PPH
- Maternal morbidity increased after assisted vaginal delivery and caesarean in labour compared to caesarean without labour

Allen, O'Connell, Liston, Baskett. Obstet Gynecol 2003

Maternal morbidity – induced labour

- 879 elective C/S, 4,900 induced labour
- No difference in:
 - Blood transfusions, wound infection, puerperal febrile morbidity
- Caesarean delivery without labour:
 - 40% less likely to PPH
 - 30% less likely to have composite outcome
- Maternal traumatic morbidity highest after assisted vaginal delivery and caesarean in labour compared to caesarean without labour

Allen, O'Connell, Liston, Baskett Obstet Gynecol 2006

Maternal and neonatal morbidity – full dilatation

- 549 caesarean at full dilatation, 1,074 caesarean at less than full dilatation
- No difference in
 - Blood transfusions, wound infection, febrile morbidity
 - neonatal trauma, low 5-minute Apgar, neonatal sepsis
- Caesarean delivery at full dilatation:
 - 3x increased risk of intraoperative trauma
 - 1.5x increased risk of perinatal asphyxia

Allen, O'Connell, Liston, Baskett BJOG 2005

Maternal morbidity

RESEARCH

Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term

Shiliang Liu, Robert M. Liston, K. S. Joseph, Maureen Heaman, Reg Sauve, Michael S. Kramer
for the Maternal Health Study Group of the Canadian Perinatal Surveillance System

Maternal morbidity

- Used CIHI Discharge Abstract Data
- 1991-2005
 - Healthy pregnant women with singletons at term
 - Canada (excluding Quebec and Manitoba)
 - Caesarean for breech surrogate for planned caesarean group (n=46,766)
 - Compared to similar group with planned vaginal delivery (n=2,292,420)

Maternal morbidity

- Planned caesarean group:
 - Increased postpartum risks of:
 - Cardiac arrest and wound hematoma - 5x
 - Major puerperal infection - 3x
 - Anesthetic complications, hysterectomy, longer hospital stay - 2x
- Difference in rate of in-hospital maternal mortality was not significant

Maternal morbidity

- Absolute risks for severe morbidity low
- Emergency caesarean delivery was associated with the highest in-hospital mortality and most severe morbidity rates

Liu CMAJ 2007

Maternal morbidity

- Strengths
 - Canadian National Database
 - Large numbers
- Limitations
 - Limitations of CIHI
 - No code for labour
 - Only coded when length of hospital stay is affected
 - Validated with the Nova Scotia Atlee Perinatal Database
 - Estimate that 16-17% in the caesarean delivery group may have laboured

Neonatal morbidity and mortality

- Term Breech Trial
- Multicentre randomized control trial
- Planned caesarean delivery showed a 70% reduction in perinatal mortality, neonatal mortality or serious neonatal morbidity

Hannah Lancet 2000

Neonatal morbidity

- 1988 - 2002
- Evaluated neonatal outcomes in term newborns born by:
 - spontaneous and assisted vaginal delivery
 - Caesarean delivery with and without labour

Liston F, Allen, O'Connell, Jangaard JOGC 2005

Neonatal morbidity

- 61% of caesarean deliveries were performed in labour
- Caesarean in labour – increased risks for depression at birth and neonatal respiratory conditions
- Caesarean with and without labour – 66-96% reduction in major birth trauma

Economic implications of method of delivery

Economic implications

- Direct
 - Fixed
 - Overheads, building, equipment
 - Variable
 - Physician fees, nursing fees, consumables, readmission
- Indirect
 - Lost income for patient and family
- Intangible/psychosocial

Economic implications

- Estimated costs of C/S suggest C/S more costly than vaginal delivery
- Estimated using hospital charges or C/S as a group
- Have not accounted for:
 - Intermittent or continuous nursing support in labour
 - Actual maternal and neonatal length of stay
 - Neonatal intensive care costs

Economic implications

- Attempted vaginal delivery cheaper than elective caesarean delivery by 15% for nulliparous women and 20% for multiparous women but only if no oxytocin and no epidural in attempted vaginal birth
- With both oxytocin and epidural the costs were 10% more than elective caesarean delivery
- Actual costs approximately equal
- Highest actual cost with failed attempted vaginal delivery

Economic implications

Costs:

- Physician fees
- Nursing hours in the labour and delivery, postpartum and neonatal intensive care units
- Anesthesia technician hours
- Epidural use
- Induction of labour agents
- Consumables

Allen, O'Connell, Baskett. Am J Obstet Gynecol 2005

Economic implications

Spontaneous vaginal delivery	\$1,340
Assisted vaginal delivery	\$1,594
Caesarean in labour	\$2,137
Caesarean without labour	\$1,532
Spontaneous onset of labour	\$1,474
Induction of labour	\$1,715
Caesarean without labour	\$1,532

Economic implications

- Cost analysis of the Term Breech Trial
- Used a third-party payer perspective
- Included for both the mother and infant:
 - All costs for physician services
 - All hospital-related costs
 - Utilization data from countries with rates of low perinatal mortality
- Estimated mean cost of planned caesarean (\$7,165) significantly lower than planned vaginal delivery (\$8,042)

Long-term outcomes and costs

Long-term morbidities

- Obstetrical risks of:
 - Placenta praevia/accreta (Ananth 1997)
 - Uterine dehiscence/rupture
 - Trial of labour vs. elective caesarean delivery (McMahon NEJM 1996)
 - Stillbirth (Smith Lancet 2003)

Long-term morbidities

- Risks of pelvic floor disorders by method of delivery:
 - Contradictory data
 - Cohort
 - Sibling/Twin/Nun studies
- Limitations
 - Questionnaire studies
 - Span many years
 - Small sample sizes
 - Selection bias
 - Recall bias

Long-term morbidities

- Risks of pelvic floor disorders by method of delivery:
 - Prospective studies
 - 6 week and 6 month follow-up questionnaire
 - 3-fold increase in risk of urinary incontinence with vaginal delivery compared to caesarean
 - 1.5-fold increase in risk of urinary incontinence with forceps compared to spontaneous vaginal delivery

Farrell/Allen/Baskett Obstet Gynecol 2001

Long-term morbidities

- Risks of pelvic floor disorders by method of delivery:
 - Prospective studies
 - 6 week and 6 month follow-up questionnaire
 - 2.6-fold increase in risk of flatal and 3.6-fold increase in risk of fecal incontinence with forceps delivery compared to caesarean
 - 2.6-fold increase in risk of flatal incontinence with forceps compared to spontaneous vaginal delivery

Long-term morbidities

- Risks of pelvic floor disorders by method of delivery:
 - Prospective studies
 - 5 and 9 month, and 5 and 10 year follow-up questionnaire in Sweden
 - Included vaginal delivery as index delivery
 - Vaginal delivery was independently associated with a significant long-term increase in stress urinary incontinence regardless of maternal age or parity
- Altman Obstet Gynecol 2006

Long-term maternal morbidity

- Maternal outcomes with the Term Breech Trial
- 3 month follow-up study
- Planned caesarean group 40% less likely to report urinary incontinence
- No significant difference in flatal or fecal incontinence

Long-term maternal morbidity

- Maternal outcomes with the Term Breech Trial
- 2 year follow-up study
- No significant difference in incontinence with planned caesarean versus planned vaginal delivery for breech presentation at term

Cumulative maternal morbidity

- To determine the cumulative maternal morbidity in subsequent pregnancies related to method of delivery in the first pregnancy
- 1985 - 2002
- Nulliparous women at term with spontaneous or induced labour for planned vaginal delivery with singleton, cephalic presentation
- Nulliparous women delivering by caesarean without labour

Cumulative maternal morbidity

- Postpartum haemorrhage
- Blood transfusion
- Placenta praevia
- Placenta praevia accreta
- Accreta (no praevia)
- Abruptio placentae
- Sepsis (wound infection, endometritis)
- Venous thromboembolism
- Uterine rupture
- Hysterectomy
- Need for intensive care

Cumulative maternal morbidity

- Cumulative frequency of individual morbidities is low
- Where statistical differences were found the prevalence was higher in caesarean delivery
- The exception was haemorrhage in which spontaneous or assisted vaginal delivery both had higher prevalence than caesarean delivery

Cumulative maternal morbidity

- Cumulative maternal morbidity was highest for women who had caesarean delivery in their first labour and lowest with spontaneous vaginal delivery
- Cumulative morbidity was similar for those who delivered by assisted vaginal delivery and caesarean without labour in their first pregnancy

Baskett, Allen, O'Connell JOGC 2007

Cumulative maternal morbidity

- For both two and three pregnancies, cumulative morbidity was significantly lower with spontaneous delivery and highest with caesarean in labour
- For two pregnancies, caesarean without labour had significantly less morbidity than assisted vaginal delivery or caesarean in labour

Baskett, Allen, O'Connell JOGCM 2007

Long-term infant outcomes

- Infant outcomes with the Term Breech Trial
- 2 year follow-up study
- Evaluated neurodevelopmental delay ≥ 2 years of age
- No difference in death or neurodevelopmental delay (RR 1.1, 95% CI 0.5-2.3)

Cumulative economic implications

- Minimal literature
- Classified by initial method of delivery in nulliparous women
- 1985-2002
- Examined cumulative costs of hospital care in the first and subsequent pregnancies

Cumulative economic implications

Costs:

- Physician fees
- Nursing hours in the **antepartum**, labour and delivery, postpartum and neonatal intensive care units
- Anesthesia technician hours
- Epidural use
- Induction of labour agents
- Consumables
- **Hysterectomy, D&C, T/L**

Cumulative economic implications

Spontaneous vaginal delivery	\$6,425
Assisted vaginal delivery	\$7,288
Caesarean in labour	\$9,524
Caesarean without labour	\$7,213
Spontaneous onset of labour	\$6,919
Induction of labour	\$7,220
Caesarean without labour	\$7,213

Conclusions

In these studies:

- Primary reason for C/S without labour was breech presentation at term
- Caesarean delivery without labour and without maternal disease was used as a surrogate for primary C/S by choice to provide insight into risks

Conclusions

- Caesarean delivery in labour, both in the initial delivery and in subsequent deliveries, appears associated with the highest maternal morbidity and costs
 - Costs of nursing care in labour and delivery accounted for the increased costs associated with caesarean delivery in labour
 - Long-term maternal outcomes remain unclear

Conclusions

- Caesarean in labour is associated with increased risks for depression at birth and neonatal respiratory conditions but decreased risks of major birth trauma

Conclusions

- Goal of optimizing management of the second stage of labour to minimize maternal and neonatal/infant short- and long-term adverse outcomes
- The rate of emergency or urgent caesarean delivery in any group planning vaginal delivery will dictate how valid elective caesarean delivery might be, and the cost benefits may also become more evident, for other selected populations, such as mature, nulliparous women

Future work

- WHO/CIHR Collaborative project on caesarean delivery (Lee/Armson)
- CIHR Twin Birth Study (Barrett)
- Outcomes associated with prolonged second stage of labour (Allen/Baskett/Allen)
- NSHRF Long-term gynecological morbidity by method of delivery using linked databases (Amir /Allen/Farrell)
- CIHR Creation of prognostic models and simple scoring systems to evaluate the probability of maternal and perinatal outcomes (Allen/Baskett/Joseph)



Influenza immunization is now recommended for all pregnant women.

For more information consult the
National Advisory Committee on Immunization
Statement on Influenza Vaccination
for the 2007-2008 Season
available in PDF at
www.phac-aspc.gc.ca/naci-ccni/index.html

A message from the
Canadian Coalition for
Immunization Awareness & Promotion
www.immunizecphac.ca

