Elective Repeat Cesarean Section: The London Health Sciences Centre Experience

BORN Ontario Provincial Rounds
September 19 2013

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Objectives

1. To present medical evidence for timing of elective repeat cesarean section > 39 weeks based on maternal and fetal outcomes.

2. To show the utility of the BORN dashboard to measure and provide ongoing audit of the timing of elective repeat cesarean section.

3. To discuss strategies to improve the percentage of elective repeat cesarean section performed > 39 weeks.
Cesarean Section: The Context

Rate of cesarean section by province, 2010-2011

Exceeds the WHO recommendation of 15% C/S rate for all deliveries
Repeat Caesarean Section Rate in Canada, 2010–2011

Bars represent the percentage of repeat C-section rates for various provinces and territories in Canada. The bars show the range of percentages with error bars indicating variability. The graph compares the rates between provinces and territories such as N.L., P.E.I., N.S., N.B., Que., Ont., Man., Sask., Alta., B.C., Y.T., N.W.T., and Nun. The variation in the rates across these regions is evident from the bar graph.
Repeat Caesarean Section Rate in Ontario 2010–2011

Ontario, 2010-2011
By Health Region

70.2%

www.cihi.ca
Figure 4.16 Proportion of women with a cesarean delivery performed prior to 39 weeks’ gestation among low-risk women having an elective repeat cesarean delivery at term, by LHIN of birth

_Erie St. Clair and South West (ESC-SW) LHIN Region, 2009–2010_

<table>
<thead>
<tr>
<th>LHIN of birth</th>
<th>Percent (%) of low-risk women between 37-42 weeks having a repeat cesarean delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erie St. Clair</td>
<td>1.7</td>
</tr>
<tr>
<td>South West</td>
<td>2.8</td>
</tr>
<tr>
<td>ESC-SW Region</td>
<td>2.1</td>
</tr>
<tr>
<td>ONTARIO</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Data source: BORN Ontario (Niday Perinatal Database), 2009–2010

Local Health Integration Network (LHIN) based on hospital of birth
Overall caesarean section rate at SJHC (level III) and LHSC-VH (level II), 2000-2010.

- Level III: $25.35\%$
- Level II: $21.38\%$
Caesarean section rate among low-risk nulliparas and multiparas at SJHC (level III) and LHSC–VH (level II), 2000–2010
The Robson Caesarean Section Classification System

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Nulliparous women with a singleton cephalic pregnancy ≥37 weeks gestation; spontaneous labour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 2</td>
<td>Nulliparous women with a single cephalic pregnancy ≥37 weeks gestation; induced labour or C/S delivery before labour</td>
</tr>
<tr>
<td>Group 3</td>
<td>Multiparous women without a previous uterine scar, with a single cephalic pregnancy ≥37 weeks gestation; spontaneous labour</td>
</tr>
<tr>
<td>Group 4</td>
<td>Multiparous women without a previous uterine scar, with a single cephalic pregnancy ≥37 weeks gestation; induced labour or C/S delivery before labour</td>
</tr>
<tr>
<td>Group 5</td>
<td>All multiparous women, with at least one previous uterine scar and single cephalic pregnancy ≥37 weeks gestation</td>
</tr>
<tr>
<td>Group 6</td>
<td>All nulliparous women with a single breech pregnancy</td>
</tr>
<tr>
<td>Group 7</td>
<td>All multiparous women with a single breech pregnancy including, women with previous uterine scars</td>
</tr>
<tr>
<td>Group 8</td>
<td>All women with multiple pregnancies, including women with previous uterine scars</td>
</tr>
<tr>
<td>Group 9</td>
<td>All women with a single pregnancy with transverse or oblique lie, including women with previous uterine scars</td>
</tr>
<tr>
<td>Group 10</td>
<td>All women with a single cephalic pregnancy ≤36 weeks gestation, including women with previous scars</td>
</tr>
</tbody>
</table>
Caesarean section rates at SJHC (level III) and LHSC-VH (level II) stratified by Robson criteria, 2000-2010.
Contribution of caesarean sections among single cephalic pregnancies ≥37 weeks with at least one previous uterine scar (Group 5) to the overall caesarean section rate, SJHC (level III) and LHSC-VH (level II), 2000-2010.
Contribution of caesarean sections in single cephalic pregnancies ≥37 weeks with at least one previous uterine scar (Group 5) by labour onset type, SJHC and LHSC-VH, 2000-2010.
EXISTING GUIDELINES
2007 Guidelines state:
- Caesarean delivery on maternal request should not be performed before gestational age of 39 weeks has been accurately determined
  - Exception for documented lung maturity

2013 Recommendation:
- Caesarean delivery on maternal request should not be performed before a gestational age of 39 weeks
National Institute for Clinical Excellence (NICE)

- April 2004
  - The risk of respiratory morbidity is increased in babies born by CS before labour, but this risk decreases significantly after 39 weeks. Therefore, planned CS should not routinely be carried out before 39 weeks.
2009 Recommendation:

- Elective caesarean section in women without additional risks should be carried out at “approximately” 39 weeks gestation
  - breech presentation and uncomplicated repeat caesarean section
No Canadian Guidelines for ERCS

Bottom Line:
All clinical management guidelines recommend delaying ERCS to 39 weeks when possible.
Are we compliant?

Tita et al, 2009 – US multicenter cohort study
35.8% of pre-labour ERSC were performed prior to 39 weeks
6.3% at 37 weeks, 29.5% at 38 weeks

Wilmink et al, 2010 – cohort study/Netherlands
56.6% of ECS were performed prior to 39 weeks gestation
8.3% at 37 weeks, 48.3% at 38 weeks.

Ertugrul et al, Jan 2013 – cohort study/Turkey
64.6% of ECS were performed prior to 39 weeks gestation
10% at 37 weeks, 54.6% at 38 weeks
BORN–Ontario

- BORN: Dashboard indicates that we are not compliant with elective repeat C/S after 39 weeks in women with no maternal or fetal risk factors
<table>
<thead>
<tr>
<th>Quarter</th>
<th>N</th>
<th>n</th>
<th>%</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>40</td>
<td>23</td>
<td>57.5</td>
<td>(40.9 - 73.0)</td>
</tr>
<tr>
<td>Apr 2012</td>
<td>12</td>
<td>&lt;6</td>
<td>8.3</td>
<td>(15.2 - 72.3)</td>
</tr>
<tr>
<td>May 2012</td>
<td>18</td>
<td>11</td>
<td>61.1</td>
<td>(35.7 - 82.7)</td>
</tr>
<tr>
<td>Jun 2012</td>
<td>10</td>
<td>7</td>
<td>70.0</td>
<td>(34.8 - 93.3)</td>
</tr>
<tr>
<td>Q2</td>
<td>45</td>
<td>23</td>
<td>51.1</td>
<td>(35.8 - 66.3)</td>
</tr>
<tr>
<td>Jul 2012</td>
<td>21</td>
<td>11</td>
<td>52.4</td>
<td>(29.8 - 74.3)</td>
</tr>
<tr>
<td>Aug 2012</td>
<td>13</td>
<td>9</td>
<td>69.2</td>
<td>(38.6 - 90.9)</td>
</tr>
<tr>
<td>Sep 2012</td>
<td>11</td>
<td>&lt;6</td>
<td>9.1</td>
<td>(6.0 - 61.0)</td>
</tr>
<tr>
<td>Q3</td>
<td>34</td>
<td>26</td>
<td>76.5</td>
<td>(58.8 - 89.3)</td>
</tr>
<tr>
<td>Oct 2012</td>
<td>9</td>
<td>8</td>
<td>88.9</td>
<td>(51.8 - 99.7)</td>
</tr>
<tr>
<td>Nov 2012</td>
<td>14</td>
<td>11</td>
<td>78.6</td>
<td>(49.2 - 95.3)</td>
</tr>
<tr>
<td>Dec 2012</td>
<td>11</td>
<td>7</td>
<td>63.6</td>
<td>(30.8 - 89.1)</td>
</tr>
<tr>
<td>Q4</td>
<td>13</td>
<td>6</td>
<td>46.2</td>
<td>(19.2 - 74.9)</td>
</tr>
<tr>
<td>Jan 2013</td>
<td>13</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data source: BORN Ontario, 2012-2013
<table>
<thead>
<tr>
<th>Location</th>
<th>37 to &lt; 39 weeks</th>
<th>37 weeks</th>
<th>38 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>London Health Sciences Centre - Victoria Hospital</td>
<td>58.8</td>
<td>6.1</td>
<td>52.7</td>
</tr>
<tr>
<td>Other &gt;4000 birth volume hospitals</td>
<td>52.8</td>
<td>4.7</td>
<td>48.1</td>
</tr>
<tr>
<td>Ontario</td>
<td>52.1</td>
<td>5.8</td>
<td>46.3</td>
</tr>
</tbody>
</table>

**Benchmark rates (%)**

<table>
<thead>
<tr>
<th>Target</th>
<th>Warning</th>
<th>Alert</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;11.0</td>
<td>11.0-15.0</td>
<td>&gt;15.0</td>
</tr>
</tbody>
</table>
Why aren’t we compliant?

Some reasons suggested in literature include:

- Convenience for surgeon and patient;
- Lack of awareness around the risks of carrying out a “slightly early” delivery;
- To ensure the patient’s own doctor performs the procedure;
- Patient’s unwillingness to prolong pregnancy;
- To avoid the onset of labour and maternal morbidity associated with emergency CS.
TIMING OF ERCS AND NEONATAL OUTCOMES
Objective
Assess associations between elective cesarean delivery at term (37 weeks of gestation or longer) but before 39 weeks of gestation and neonatal outcomes.
Timing of Elective Repeat Cesarean Delivery at Term and Neonatal Outcomes

Patients

- cohort of consecutive patients undergoing repeat caesarean sections performed at 19 centers
- 13,258 patients had ERCS at term with singletons
  - Absence of labor or other recognized medical or obstetrical indications for delivery
  - 6.3% were performed at 37 completed weeks
  - 29.5% were performed at 38 completed weeks
  - 49.1% were performed at 39 completed weeks

Timing of Elective Repeat Cesarean Delivery at Term and Neonatal Outcomes

Primary Outcome – Composite
- death
- adverse respiratory outcomes (RDS, TTN)
- hypoglycemia
- newborn sepsis
- confirmed seizures
- necrotizing enterocolitis
- cardiopulmonary resuscitation or ventilator support within 24 hours after birth,
- hypoxic–ischemic encephalopathy
- umbilical–cord–blood arterial pH below 7.0,
- a 5–minute Apgar score of 3 or below,
- admission to the NICU
- prolonged hospitalization (5 days or longer).

– followed up until discharge from the hospital or 120 days after birth
Timing of Elective Repeat Cesarean Delivery at Term and Neonatal Outcomes

Figure 2. Timing of Elective Repeat Cesarean Delivery and the Incidence of the Primary Outcome According to the Number of Completed Weeks of Gestation.
Figure 6: Complication Rates in Infants of Scheduled Repeat Cesarean Birth by Gestational Age (Weeks)
Figure 7: Odds Ratios for Complications in Infants of Scheduled Repeat Cesarean Birth by Gestational Age (Weeks)

Additional analysis:

Risk of primary outcome in 38+4 days to 38+6 days gestational age (51.9% of deliveries before 39 weeks) remained higher than the risk at 39 completed weeks (relative risk, 1.21; 95% CI, 1.04 to 1.40; P=0.01).

Postponing ECS to 39 weeks might have prevented 48% of cases of the primary outcome at 37 weeks and 27% at 38 weeks of gestation.
Stillbirth rates fell by >50% for each gestational week past 37 weeks.
Neonatal outcomes for ERCS prior to 39 completed weeks of gestational age in a low risk population

Increased NICU admissions
Increased TTN
Increased RDS
Increased ventilator support
Increased suspected or proven sepsis
TIMING OF ERCs AND MATERNAL OUTCOMES
Objective:

to test the hypothesis that delivery at 37 or 38 weeks of gestation, as compared to delivery at 39 completed weeks, is associated with a reduction in adverse maternal outcomes.
Cohort study of consecutive repeat cesarean deliveries performed at 19 U.S. academic centers from 1999 to 2002

11,255 patients had ERCS at term with singletons
- Absence of labor or other recognized medical or obstetrical indications for delivery

Primary Outcome – composite

Alternative composite of severe outcome including only death, hysterectomy and uterine rupture
<table>
<thead>
<tr>
<th>Maternal outcomes **</th>
<th>37 weeks (n=834)</th>
<th>38 weeks (n=3909)</th>
<th>39 weeks (n=6512)</th>
<th>p-value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary composite adverse outcome</td>
<td>7.43 (62)</td>
<td>7.47 (292)</td>
<td>6.56 (427)</td>
<td>0.09</td>
</tr>
<tr>
<td>Composite severe outcomes **</td>
<td>0.48 (4)</td>
<td>0.23 (9)</td>
<td>0.15 (10)</td>
<td>0.07</td>
</tr>
<tr>
<td>Maternal Death</td>
<td>0 (0)</td>
<td>0.03 (1)</td>
<td>0.02 (1)</td>
<td>&gt;0.99</td>
</tr>
<tr>
<td>Hysterectomy</td>
<td>0.48 (4)</td>
<td>0.20 (8)</td>
<td>0.15 (10)</td>
<td>0.09</td>
</tr>
<tr>
<td>Blood transfusion (intra- or postpartum)</td>
<td>2.04 (17)</td>
<td>0.77 (30)</td>
<td>0.74 (48)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Uterine atony</td>
<td>2.64 (22)</td>
<td>2.71 (106)</td>
<td>2.18 (142)</td>
<td>0.12</td>
</tr>
<tr>
<td>Uterine dehiscence</td>
<td>0.60 (5)</td>
<td>0.61 (24)</td>
<td>0.46 (30)</td>
<td>0.35</td>
</tr>
<tr>
<td>Thromboembolism</td>
<td>0.12 (1)</td>
<td>0.13 (5)</td>
<td>0.03 (2)</td>
<td>0.10</td>
</tr>
<tr>
<td>Endometritis</td>
<td>0.96 (8)</td>
<td>1.28 (50)</td>
<td>1.61 (105)</td>
<td>0.07</td>
</tr>
<tr>
<td>Wound complication</td>
<td>0.84 (7)</td>
<td>1.31 (51)</td>
<td>1.04 (68)</td>
<td>0.72</td>
</tr>
<tr>
<td>Uterine artery ligation</td>
<td>0.48 (4)</td>
<td>0.44 (17)</td>
<td>0.34 (22)</td>
<td>0.40</td>
</tr>
<tr>
<td>Broad ligament hematoma</td>
<td>0.24 (2)</td>
<td>0.10 (4)</td>
<td>0.09 (6)</td>
<td>0.36</td>
</tr>
<tr>
<td>Cystotomy</td>
<td>0.12 (1)</td>
<td>0.15 (6)</td>
<td>0.15 (10)</td>
<td>&gt;0.99</td>
</tr>
<tr>
<td>Ileus</td>
<td>0.36 (3)</td>
<td>0.28 (11)</td>
<td>0.32 (21)</td>
<td>&gt;0.99</td>
</tr>
<tr>
<td>ICU admission</td>
<td>0.24 (2)</td>
<td>0.13 (5)</td>
<td>0.15 (10)</td>
<td>0.85</td>
</tr>
<tr>
<td>Maternal hospitalization ≥ 5 days</td>
<td>4.68 (39)</td>
<td>3.17 (124)</td>
<td>1.92 (125)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

* P-value for Exact Cochran-Armitage trend test from 37 to 39 weeks

** Composite of death, uterine rupture and hysterectomy only

2 fold increase
Objective: Comparing the risk of an elective caesarean section delivery at a specific gestational age to the risk of delivering at a later time.

Database: prospectively collected information on consecutive repeat caesarean deliveries performed at 19 U.S. academic centers from 1999 to 2002.
14,993 were delivered by caesarean before labor and in the absence of any medical or obstetric indications.
Composite maternal outcome included death, pulmonary edema, cesarean hysterectomy, pelvic or abdominal abscess, confirmed deep vein thrombosis or pulmonary embolism, pneumonia, and blood transfusions.
Of statistical significance:

**Blood Transfusion:**
incidence was significantly higher among women delivered at 37 weeks of gestation as opposed to the ones expectantly managed (P = .016).

**Pneumonia:**
incidence was more frequent with elective deliveries at 37 weeks of gestation (P = .042).

**Cesarean Hysterectomy:**
incidence was more commonly encountered in those who were still pregnant after 39 weeks of gestation (P = .035).
Slight decrease in postpartum anemia and number of cesarean deliveries performed due to fetal distress.

Slight increase in mild preeclampsia.

No differences in infectious morbidity.
Neonatal Morbidity significantly decreases when ERCS are delayed to after 39 weeks gestation.
- NICU admissions
- Transient tachypnea of the newborn (TTN)
- Respiratory distress syndrome (RDS)
- Ventilator support
- Suspected or proven sepsis

Maternal Morbidity is not overall significantly increased if ERCS are delayed to 39 weeks.

RCTs are needed to answer all risk:benefit questions as to the best timing of scheduled elective caesarean sections.
IMPLEMENTING THE GUIDELINES: EXPERIENCE AT OTHER INSTITUTIONS
Decreasing Elective Deliveries Before 39 Weeks of Gestation in an Integrated Health Care System

Bryan T. Oshiro, MD, Erick Henry, MPH, Janie Wilson, RN, D. Ware Branch, MD, and Michael W. Varner, MD, for the Women and Newborn Clinical Integration Program

= Intermountain Healthcare Quality Improvement Study (2009)

- Multidisciplinary team of physicians, nurse leaders, statisticians, data managers and administrative leaders
- Developed and implemented a program to decrease the number of early term elective deliveries
- 2001–2006
- Participation by 9 urban facilities in Utah
Fig. 3. Percent of elective deliveries before 39 weeks of gestation. Data from Intermountain Healthcare. Oshiro. Decreasing Elective Deliveries Before 39 Weeks. Obstet Gynecol 2009.
Retrospective cohort study (27 US hospitals)

Objective:
1) to examine the effectiveness of different approaches in reducing elective early term deliveries
2) To examine the effect of such policies on NICU admissions and stillbirth rates
ECS

27 hospitals

Policy #1
“hard stop”
7 hospitals

Policy #2
“soft stop”
9 hospitals

Policy #3
education
11 hospitals

2007 (May/June/July) vs 2009 (May/June/July)
17,221 delv vs 17,794 delv
FIGURE 1
Reduction in elective delivery by group, 2007-2009

Elective deliveries <39 weeks (% of total elective deliveries)

<table>
<thead>
<tr>
<th>Year</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
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</tbody>
</table>

Conclusion:

- The rate of elective delivery between 37 and 39 weeks of gestation fell from 9.6% of all deliveries in 2007 to 4.3% of deliveries in 2009
  - 55% reduction in elective early term delivery rate
- NICU admission rate: 8.9 to 7.5%
  - 16% decline in overall term newborn intensive care unit admissions
- Stillbirth rate: no change
LHSC Strategic Initiative: “Soft Stop”

Objective: To reduce the incidence of elective repeat CS < 39 weeks

- Education
  - LHSC BORN data and our comparators
    - Maternal /Newborn Quality of Care Committee
    - Obstetrical Clinical Meeting
    - OB/GYN/Anesthesia/Pediatric Grand Rounds
    - Physician specific data
LHSC Strategic Initiative: “Soft Stop”

- Process Improvements
  - Electronic booking
  - Booking “Form”
    - Identification of maternal and fetal risk factors
    - Gestational age at date of CS – ?? Flag if no risk factors
  - Real time data entry into BORN
LHSC Strategic Initiative : “Soft Stop”

- Evaluation, Audits and Feedback

  - Real time entry – real time feedback
  - LHSC monthly data – Patient safety/Quality of Care Agenda – OB/Gyn Clinical Meeting
  - Physician specific data – quarterly audit and feedback
LHSC Strategic Initiative: “Soft Stop”

Objective: To reduce the incidence of elective repeat CS < 39 weeks

Anticipated outcome: