



PREGNANCY *beyond* 40

A clinical backgrounder for midwives

Due to a variety of socioeconomic and cultural factors, the average age of bearing a child and becoming a parent is rising across high-income countries. (1) As part of this shift, the rate of live births to those aged 40 and older has increased steadily in Canada since 2001. (2) Research and commentary on pregnancy outcomes in older people has raised concerns about the higher risk of stillbirth in term pregnancies among those aged 40 and older. However, questions about the effects of early elective induction of labour in this population remain unanswered.

Community standards regarding antenatal surveillance and the timing of induction of labour for those aged 40 and older have changed, without a clear evidence base to support this practice. This document is intended to help midwives assess and interpret the growing body of clinical research on pregnancy outcomes for those aged 40 and older. Focusing primarily on perinatal mortality and the timing of induction of labour, this backgrounder aims to help midwives provide informed choice and high-quality care to this group of clients.

BACKGROUND

In 2011-2012, 22% of births in Ontario were to women ≥ 35 years of age. Figure 1 charts the increase in live births per females ≥ 35 years old between 2006 and 2010. (3) Overall trends suggest that these numbers will continue to rise. (4) The increase in the proportion of all births occurring in clients age ≥ 35 has been accompanied by an increase in the average age at first pregnancy. In 2010, 26% of Canadian women age 40 to 44 who gave birth were primiparous. For women 45 to 49, the rate was 29%. (4)

Some recent research describes the population of women who give birth at age 35 and older as more likely to be

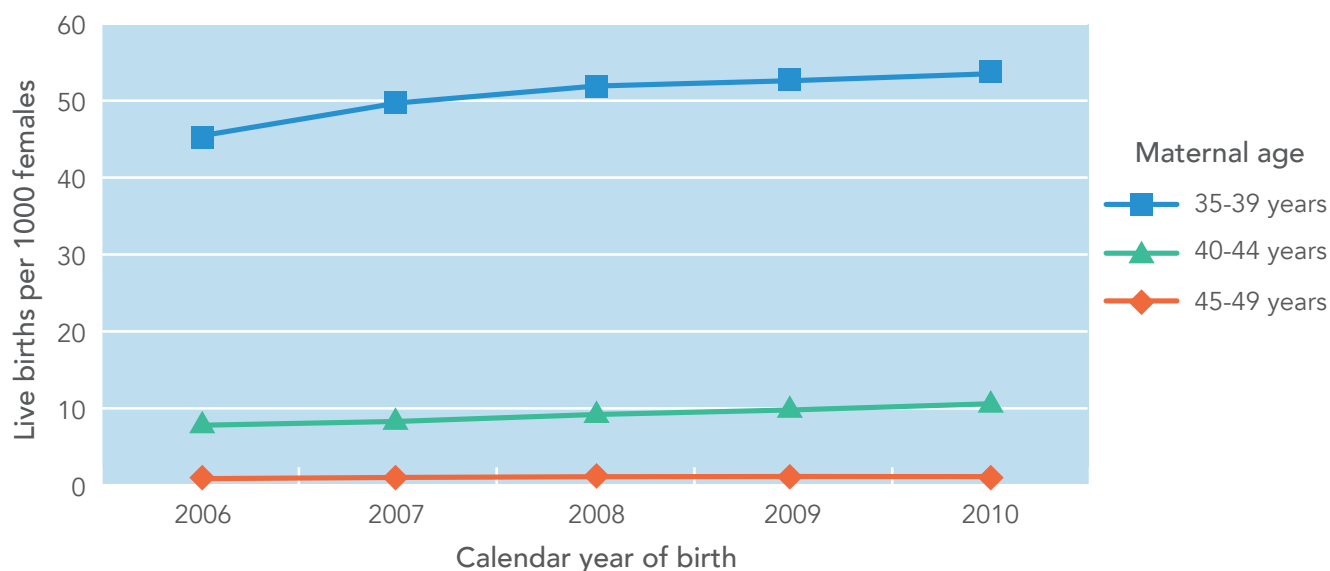
Implementation Tip

This document provides a summary and discussion of select evidence related to key outcomes of interest to midwives caring for clients of what may be referred to as “advanced” or “late” maternal age. This population is variably defined as women who are ≥ 35 years or ≥ 40 years. Relative and absolute risks are presented for women ≥ 40 years where possible. Special focus is on the risk of perinatal mortality and associated management considerations for the term pregnancy including induction of labour.

This document does not discuss the use of assisted reproductive technologies (ART) and the potential impact on maternal and neonatal outcomes. This document does not discuss the risk of chromosomal difference or the use of prenatal genetic testing.

This document is intended to help midwives interpret consensus opinions on this topic offered by the Society of Obstetricians and Gynaecologists of Canada and the Royal College of Obstetricians and Gynaecologists. Unlike a clinical practice guideline (CPG), this document does not offer recommendations for care. Instead, it is meant as a reference to help midwives interpret evidence and to incorporate clinical research into informed choice discussions with clients, as appropriate. This document considers available research from a midwifery perspective, interpreting the evidence to support birth, pregnancy and the postpartum period as a normal physiologic process. This difference in perspective may produce a different analysis than the analysis offered by medical bodies.

FIGURE 1: AGE-SPECIFIC LIVE BIRTH RATES, FEMALES AGED 35-39, 40-44 AND 45-49 YEARS ONTARIO, 2006-2010 (8)



primiparous, better educated, intentionally pregnant, and have a higher socioeconomic status than their peers in the past. (5) However, other research points to heterogeneity among this population, finding that lower levels of education, higher rates of unemployment, unsatisfactory relationships with a partner and unplanned pregnancies are over-represented among older primiparous women. (6)

Primary or secondary infertility and the use of assisted reproductive technologies (ART) may also influence outcomes, but the effect of ART on outcomes and management is beyond the scope of this paper. (7)

New evidence on maternal and neonatal outcomes, the influence of comorbidities, and determining if or when it is appropriate to offer induction of labour are emerging issues for midwives caring for clients who are 40 years of age or older.

What maternal complications are associated with pregnancy beyond 40?

Clients over the age of 40 are more likely to have comorbid conditions. Table 1 summarizes the risk of selected pregnancy complications and the rate

TABLE 1: SELECTED MATERNAL AND PERINATAL OUTCOMES FOR ADVANCED MATERNAL AGE CANADA, 2006-2009 (8)

		<i>Rate of outcome¹, by age group</i>	
Age:		20-34	≥ 40
Gestational diabetes		1/24	1/8
Placenta previa		1/208	1/65
Gestational hypertension		1/26	1/18
Preeclampsia / eclampsia		1/83	1/ 62
Caesarean section	Primipara:	1/4	1/2
	Multipara:	1/4	1/3

¹From 2006-2009, based on more than one million maternal/birth records from Canadian hospital live births (Ontario excluded due to data quality concerns). (8)

of caesarean section (CS) for women age 20 to 34 versus those ≥ 40 , based on records from live births in Canadian hospitals (excluding Ontario) from 2006-2009. One out of two primiparous and one out of three multiparous women over age 40 gave birth by CS. (8) Midwives should note that these are population averages and the presence of other factors (BMI, previous obstetric history, social determinants, etc.) have not been controlled for and each client's particular history should inform an individualized plan of care.

MATERNAL AGE, STILLBIRTH AND INDUCTION OF LABOUR

This paper focuses on the interpretation of recent research on perinatal mortality, particularly antepartum stillbirth.

Documents from other organizations

Documents from two obstetrical organizations may particularly influence Canadian community standards and management approaches related to induction of labour in clients over the age of 40. These are the Society of Obstetricians and Gynaecologists of Canada (SOGC) Committee Opinion No. 271: *Delayed Child-bearing* (9) and the Royal College of Obstetricians and Gynaecologists (RCOG) (U.K.) Scientific Impact Paper No. 34: *Induction of Labour at Term in Older Mothers* (1). While these documents are not CPGs, they offer opinions on clinical management that have the potential to alter management options offered to clients in this age group. Examining the research regarding induction of labour cited in these opinion documents can help midwives understand, consider and discuss the choices relevant to clients in their communities.

Reddy study

The SOGC committee opinion cites Reddy et al.'s study based on a large U.S. population-based data set of linked birth and death certificate records from more than five million pregnancies from 2001-2002. (10) This study included singleton gestations without congenital anomalies where stillbirth was defined as fetal death at ≥ 20 weeks' gestation. The authors acknowledge the limitations of their data source: birth and death certificate data is not able to distinguish between antepartum and intrapartum fetal death and maternal medical conditions and perinatal risk factors for stillbirth tend to be under-

SOGC COMMITTEE OPINION: DELAYED CHILD-BEARING (9)

Recommendation

"Delayed child-bearing is associated with increased obstetrical and perinatal complications. Care providers need to be aware of these complications and adjust obstetrical management protocols to ensure optimal maternal and perinatal outcomes. (II-2A)"

Practice points

"The cumulative risk of stillbirth in women of 40 to 44 years of age at 39 weeks' gestation is nearly identical to the risk in those of 25 to 29 years of age at 42 weeks' gestation. Therefore, a strategy of antenatal testing beginning at 38 gestational weeks with delivery by the completion of the 39th week for women > 40 years of age should be considered."

reported. (11,12) The SOGC committee opinion cites Reddy's data to establish an overall risk of stillbirth as: 3.73, 6.41, and 8.65 per 1000 for ongoing pregnancies 37 weeks or longer in women aged < 35, 35 to 39 and ≥ 40 respectively. However, the SOGC's text does not specify that these rates were for primiparous women only. This is problematic because in the Reddy et al. study primiparous women experienced an increased risk of stillbirth regardless of age. Table 2 gives the absolute and relative risks of stillbirth for both primiparous and multiparous women stratified by age. Table 3 gives the absolute and relative risk of stillbirth by maternal age in the Reddy study for all parities. Although the relative risks are similar when comparing differing age groups of women when divided by parity, the absolute risk of stillbirth for a primiparous woman ≥ 40 is 2.63 times that of a multiparous woman of the same age. (10)

TABLE 2: ABSOLUTE AND RELATIVE RISK OF STILLBIRTH BY MATERNAL AGE AND PARITY (10)

		Absolute risk of stillbirth 37 weeks or longer per 1000 ongoing pregnancies	Relative risk (95% CI)
Primipara			
Maternal age	< 35	3.73	1.0
	35-39	6.41	1.72 (1.54-1.92)
	≥ 40	8.65	2.32 (1.89-2.86)
Multipara			
Maternal age	< 35	1.29	1.0
	35-39	1.99	1.54 (1.38-1.72)
	≥ 40	3.29	2.54 (2.14-3.03)

TABLE 3: RISK OF STILLBIRTH BY GESTATIONAL AGE FOR WOMEN < 35 AND ≥ 40 YEARS, ANY PARITY (10)

		Absolute risk of stillbirth per 1000 ongoing pregnancies		Relative risk of stillbirth (95% CI)	
Maternal age		< 35 years	≥ 40 years	< 35 years	≥ 40 years
Gestational age	37-41 weeks	N/A	N/A	1.0	1.88 (1.64-2.16)
	37-38 weeks	0.61	1.12	1.0	1.82 (1.49-2.23)
	39-40 weeks	0.98	1.99	1.0	2.04 (1.64-2.54)
	41 weeks	0.75	2.48	1.0	3.30 (2.24-4.87)

Bahtiyar study

The second study appraised in the SOGC committee opinion also relies on data from linked U.S. birth and death certificates but from an earlier time period, 1995-1997. (13) Bahtiyar et al. compared risk of stillbirth among women in different age intervals at different weeks of gestation, concluding that stillbirth risk significantly increased with maternal age. Bahtiyar et al. found the risk of stillbirth (not stratified by parity) for women age 40 to 44 years at 39 weeks' gestation was numerically very similar to the risk of stillbirth among women age 25 to 29 (the lowest-risk age group) at 42 weeks. Risk of stillbirth in the lowest-risk age cohort was approximately 5 or 6 per 1000 live births at 41

weeks' gestation, and 8 or 9 per 1000 live births at 42 weeks' gestation. (13) Risks based on parity were not included in the study. The authors point out that if the small but increased risk of stillbirth for pregnancies at 41 completed weeks and beyond is thought to justify increased antenatal testing and/or intervention (14-16). The authors suggest that because this risk threshold is crossed earlier in women ≥ 40 (at 38 weeks), it follows that testing and/or intervention be considered at an earlier point. (13)

RCOG's Scientific Impact Paper *Induction of Labour at Term in Older Mothers* offers a similar perspective as the SOGC committee opinion on the management of the term pregnancy in women ≥ 40 years. The RCOG

paper explores differential management of older mothers based on data that suggests that a woman age ≥ 40 years has a similar stillbirth risk at 39 weeks as a woman 25 to 29 years old at 41 completed weeks' gestation. (10,17) Research shows that these effects persist even after controlling for medical disease, parity, race and ethnicity. RCOG uses the Reddy study to cite the risks of stillbirth at 39 to 40 weeks for women ≥ 40 as 2/1000. (10)

RCOG's assertion that induction of labour at 39 weeks is not likely to increase rates of CS is supported to some extent by the most recent Cochrane review of studies examining induction of labour in women with normal pregnancies at or beyond term. It found that in women of all ages, induction of labour ≥ 41 weeks' gestation resulted in lower rates of CS than expectant management and similar rates of perinatal morbidity and mortality. (16) Randomized control trials (RCTs) to evaluate induction versus expectant management are not able to blind care providers, so known prolonged pregnancies might receive different clinical care. Based on the RCTs analyzed in the Cochrane review, inductions would need to be planned for 410 women at or beyond term (95% CI 322-1492) in order to prevent one perinatal death. (16)

The data used in the Cochrane analysis relied heavily on the large Hannah trial (1992), an RCT that compared policies of induction of labour at 41 weeks to expectant management. (18) The validity of the results of this trial have been questioned, as participants randomized to the induction group received more effective cervical ripening than those who were randomized to the expectant management group but subsequently underwent induction of labour. Also, more participants in the expectant management group had a CS for fetal distress. (16) This may have been due to the lack of blinding of the attending physician.

RCOG also refers to a large Scottish retrospective population-based cohort study based on a data from deliveries occurring from 1981-2007. This study observed no significant differences in mode of delivery between women (of all ages) who experienced elective induction of labour and expectant management at 37 to 39 weeks' gestation. This study also suggests that at 40 and 41 weeks, induction is associated with reduced odds of CS and assisted vaginal delivery. (19)

RCOG SCIENTIFIC IMPACT PAPER: INDUCTION OF LABOUR AT TERM IN OLDER MOTHERS (1)

- *"Risk of stillbirth at 39-40 weeks for all ages is 1/1000"*
- *"Risk of stillbirth at 39-40 weeks for age ≥ 40 is 2/1000"*
- *"Women ≥ 40 years of age [have] a similar stillbirth risk at 39 weeks of gestation to women in their mid 20s at 41 weeks of gestation, at which stage the consensus is that induction of labour should be offered to prevent late stillbirth...However, at present there are insufficient data available on the effect such a policy would have on surgical deliveries and perinatal mortality specifically in older mothers. There is growing evidence that such a policy would not increase the number of operative vaginal deliveries or emergency caesarean sections. Such issues should be discussed with women who are older and pregnant."*

As the authors of the RCOG opinion note, there is little data that specifically addresses the outcomes of induced and expectantly managed labours for those aged 40 and older. The studies described above were not designed to study the outcomes of earlier induction for older women specifically, so their results may not be applicable to this population.

The RCOG opinion cites a handful of studies to support the case that parturients age 40 to 44 are still likely to have a vaginal birth, even if induced: an Australian study had a vaginal delivery rate following induction of about 60% in primiparas 40 to 44, and a U.S. study observed a vaginal delivery rates of 67% in that same age cohort. (20,21)

Upon their review of the evidence, RCOG presents the opinion that the case for induction of labour at 39 to 40 weeks in those ≥ 40 is strengthened when risk of stillbirth is already increased due to the presence of comorbid conditions and/or nulliparity. (1) The overall risk of stillbirth at about 39 to 40 weeks is low but increased in older parturients: approximately 2 per 1000 for women ≥ 40 years, versus 1 per 1000 for women < 25 years. (10)

WHAT DOES OTHER RESEARCH SAY ABOUT MATERNAL AGE, STILLBIRTH AND INDUCTION OF LABOUR?

Most relevant to clients over the age of 40 is the rise in risk of stillbirth (see appendix for definitions related to perinatal mortality) for term pregnancy. Research describes the risk of stillbirth doubling at 39 to 40 weeks' gestation in women age ≥ 40 compared to a younger pregnant population. (1,10) A Canadian meta-analysis from 2008 included research that varied widely in study designs (cohort, case-control), measures of association (odds ratios, relative risks), age group comparisons and risk adjustments. Overall, an association between pregnancy beyond age 35 to 40 and risk of stillbirth appeared to persist even after controlling for maternal medical conditions and/or fetal congenital abnormalities. (22)

A retrospective cohort study using data from the North Western Perinatal Survey (U.K.) collected maternal, infant and obstetrical records from 21 hospitals. This study looked at the relationship between maternal age and pregnancy outcomes using records from live-born and stillborn pregnancies between 2004 and 2008. (5) These records are more detailed and contain more reliable data than what is in U.S. birth and death certificate databases as used in Reddy et al. and Bahtiyar et al. (10,13) Compared to women age 20 to 29 at delivery, older maternal age was associated with a significant increased risk of stillbirth (RR 1.83 (95%CI 1.37-2.43)). (5)

Another study used data from the 2002-2006 New South Wales Midwives Data Collection records and perinatal death databases in Australia, including > 300 000 singleton births. (23) The researchers set out to investigate risk factors for antepartum stillbirth and looked at maternal age among other variables, calculating the ongoing risk of antepartum stillbirth at each week of gestation. This study found that maternal age, smoking, nulliparity, pre-existing hypertension, pre-existing diabetes, location and country of birth were all significantly associated with antepartum stillbirth. The absolute risk of stillbirth at ≥ 40 weeks' gestation was 2.2 per 1000 for women age ≥ 40 compared with 0.85 per 1000 women < 40 years. Nulliparous women ≥ 40 years were at highest risk, with an antepartum stillbirth rate of 4 per 1000 at ≥ 40 weeks' gestation. (23)

What are the potential risks of early term induction?

If antenatal monitoring is initiated at 38 weeks for clients aged ≥ 40 , it is possible that the number of inductions occurring before or at 39 weeks may increase. Eliminating “non-medically indicated” elective deliveries < 39 weeks has become a major focus of quality improvement efforts in the U.S., including campaigns led by large non-governmental organizations and a statement from the American Congress of Obstetricians and Gynecologists (ACOG) issued in April 2013. (24) Delivery between 37 and 39 weeks is associated with increased risk of select adverse perinatal and maternal outcomes (see Table 3). (25,26) Liu et al have calculated that compared to

TABLE 4: ADVERSE OUTCOMES ASSOCIATED WITH DELIVERY AT 37 TO 39 WEEKS' GESTATION

Perinatal (25)	Maternal (26)
<ul style="list-style-type: none"> Respiratory problems (respiratory distress syndrome, transient tachypnea of the newborn, respiratory failure) Ventilator use and/or NICU admission Infection Hypoglycemia 5 minute Apgar < 7 Neonatal mortality 	<ul style="list-style-type: none"> Postpartum hemorrhage Puerperal sepsis Venous thromboembolism

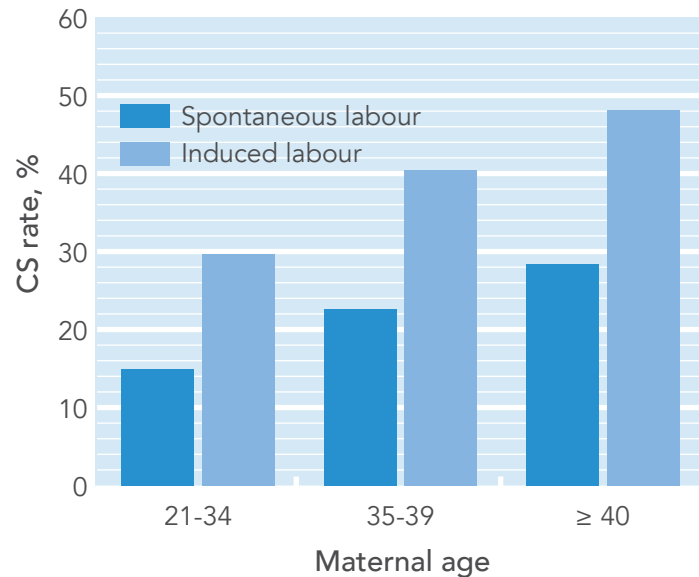
expectant management, induction of labour for 1270 (95% CI 730-3217) women of all ages reaching 38 weeks' gestation leads to one additional case of postpartum hemorrhage (PPH) requiring blood transfusion. (26)

WHAT ARE THE POTENTIAL IMPLICATIONS OF MORE WIDESPREAD INDUCTION OF LABOUR?

As described and critiqued earlier, the most recent Cochrane review of RCTs comparing strategies of induction of labour and expectant management at term found lower rates of CS with induction compared to expectant management among women ≥ 41 weeks' gestation. However, no benefit was observed in most trials comparing induction and expectant management before 41 weeks. (16) These findings differ from a number of retrospective studies that have found that induction is associated with an increase in CS. (14) However, authors of reviews comparing induction of labour to expectant management urge caution in extrapolating these findings to non-study settings. (16,22,27) RCTs such as those informing the Cochrane meta-analyses provide information about efficacy, rather than effectiveness, since they compare outcomes in the context of a research study in which care is provided to a selected population according to circumscribed study protocols. The benefits and harms of induction of labour may be different when the intervention is provided in a real-life setting.

RCT findings that suggest similar or reduced risks of CS with induction of labour are also challenged by findings that are directly applicable to the Ontario context. Data obtained from Ontario's Better Outcomes and Registry Network (BORN) suggests a strong, consistent relationship between induction of labour and CS for primiparas, increasing with maternal age. Figure 2 shows CS rates from 2011-2012 for Robson group 1 (nulliparous, singleton, cephalic pregnancy at term, spontaneous labour) versus Robson group 2a (nulliparous, singleton, cephalic pregnancy at term, induced labour). Increasing maternal age was significantly associated with a rise in CS rate ($p < 0.0001$). BORN data also demonstrates a clear association between induction of labour and CS, with rates of CS 15% to 20% higher in primiparas

FIGURE 2: CAESAREAN SECTION RATES (%) (NULLIPAROUS, SINGLETON, CEPHALIC TERM PREGNANCIES, HOSPITAL BIRTHS ONLY) ONTARIO, 2011-2012



TRENDS IN MIDWIFERY OUTCOMES BASED ON MATERNAL AGE

BORN data specific to midwifery clients demonstrates that rates of induction of labour are now higher in clients ≥ 40 than clients in younger age groups (≤ 34 or 35-39) (Figure 3). This divergence in rate began in fiscal year 2011-2012, following a three-year period during which induction rates were stable across age groups. (9) Rates of CS have also increased in clients ≥ 40 , following a period during which rates of CS varied less significantly by age group (Figure 4). Differences in rates of induction and CS may be partly attributable to the higher incidence of conditions such as gestational diabetes, hypertensive disorders of pregnancy and abnormal placentation in clients over ≥ 40 .

While it is difficult to draw conclusions from population-level data, the trends described above suggest that clients ≥ 40 may indeed be managed differently than their younger counterparts. Differential management of clients ≥ 40 could in part be based on the SOGC's Committee Opinion *Delayed Child-bearing*, which was published in January 2012.

FIGURE 3: RATES OF INDUCTION, BY MATERNAL AGE AND FISCAL YEAR, CLIENTS UNDER THE CARE OF A MIDWIFE (LIVE BIRTH OR STILLBIRTH), BORN

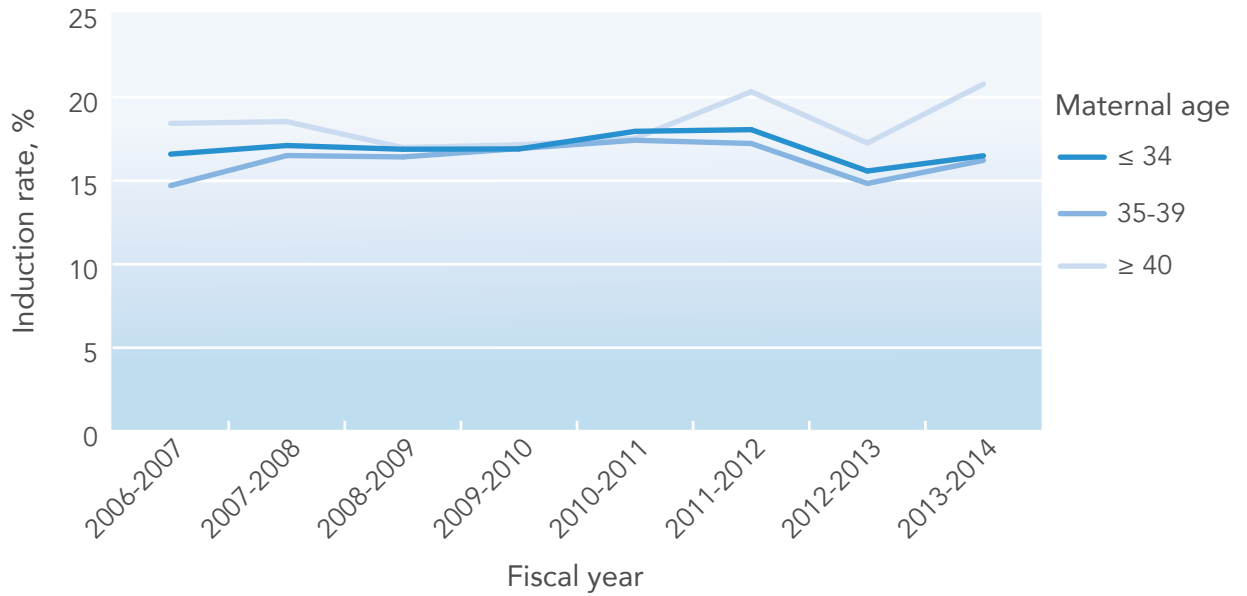
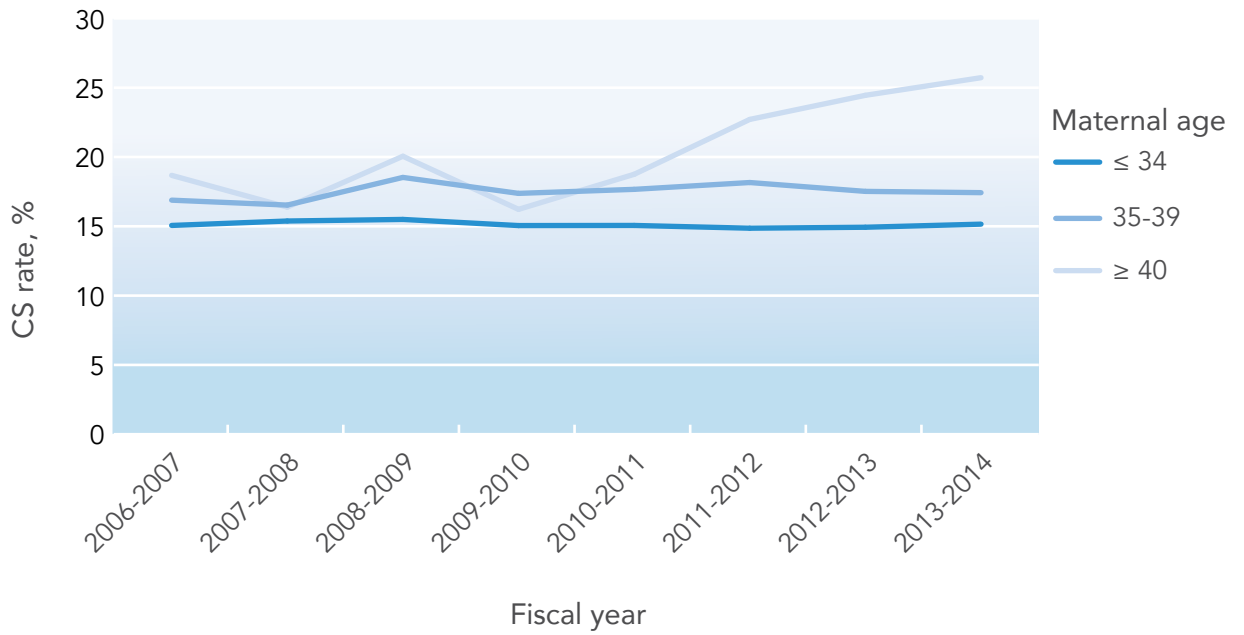


FIGURE 4: RATES OF CS, BY MATERNAL AGE AND FISCAL YEAR, CLIENTS UNDER THE CARE OF A MIDWIFE (LIVE BIRTH OR STILLBIRTH), BORN



IS THERE A ROLE FOR EARLIER ANTEPARTUM SURVEILLANCE AND/OR INDUCTION OF LABOUR TO REDUCE THE RISK OF STILLBIRTH?

The SOGC opinion states that because the cumulative risk of stillbirth for women age 40 to 44 years at 39 weeks' gestation is very similar to the risk in those age 25 to 29 years at 42 weeks' gestation, a strategy of starting antenatal testing at 38 weeks' gestation with birth by 39+6 for women > 40 years should be "considered." (9) Although systematic reviews are finding reduced rates of

CS for induction of labour versus expectant management at ≥ 41 weeks' gestation in the RCT setting, it is unknown how a policy of early delivery at 39 weeks for those age ≥ 40 , who are already most at risk for CS in Ontario, would affect rates of surgical delivery and/or perinatal mortality in this population. One of the concerns expressed is that stillbirths potentially averted by earlier induction of labour in older clients could be offset by an increased risk of neonatal morbidity and/or death. (1) However, it remains that there is little known about the risks and benefits of antenatal testing and/or induction of labour in older clients with no other complications.

KEY POINTS

- Evidence is consistent that risk of stillbirth increases with increasing maternal age, but absolute risk remains low.
- The association between maternal age and risk of stillbirth appears to persist even after controlling for maternal medical conditions and/or fetal congenital abnormalities.
- The age-related risk of stillbirth varies among studies and comparison groups. The Reddy study is quoted by both the SOGC and RCOG opinions and calculates that the risk of stillbirth at 39 to 40 weeks is approximately 2 per 1000 for women ≥ 40 years, versus 1 per 1000 for women < 35 years (RR 2.04, 95% CI 1.64-2.54). The risk of stillbirth at 41 weeks is approximately 2.48 per 1000 for women ≥ 40 years, versus 0.7 per 1000 for women < 35 years (RR 3.30, 95% CI 2.24-4.87). The absolute risk of stillbirth for women in any age group at 42 weeks' gestational age is not included in this study.(10)
- The risk of stillbirth in primiparas ≥ 40 is 2.63 fold greater than the risk for multiparas ≥ 40 years. (10)
- In the Bahtiyar study, the risk of stillbirth for women ≥ 40 years at 39 weeks' gestation is similar to the risk of stillbirth for women 25 to 29 years (lowest risk age group) at 42 weeks' gestation. The authors of this study suggest that women ≥ 40 years should therefore be offered fetal surveillance and induction of labour two weeks earlier than those interventions are offered to women < 40 years. (13) The SOGC interprets this data to suggest that women ≥ 40 years be considered "biologically postterm" (i.e., having equivalent risk to being 42 weeks' gestation) at 39 weeks (when their risk of stillbirth is 2/1000). (9)
- The etiology of stillbirth in older pregnant people is not clear.
- It is unknown whether results from RCTs comparing expectant management and induction of labour strategies for postdates pregnancies are reproducible in the non-trial environment and whether they can be extrapolated to the prevention of stillbirth in women of older parturients at earlier gestations.

- BORN data demonstrates a strong, consistent relationship between induction of labour and CS for primiparas, increasing with maternal age.
- The effects of initiating fetal surveillance at 38 weeks and offering induction of labour at 39 weeks' gestation for those age ≥ 40 have not been studied.
- Stillbirths potentially prevented by earlier induction could be offset by increased risk of maternal, neonatal or infant morbidity and mortality.
- Midwives can support informed choice by being aware of changing practice in their community and understanding the limitations of what the research evidence currently offers.

APPENDIX

The following notes provide more detailed information about some of the methodological challenges and information gaps encountered when considering research on maternal age and stillbirth.

Defining and quantifying stillbirth

Fetal mortality in Canada is defined as the number of fetal deaths per 1000 total births (live and stillborn). In most of Canada, the definition of stillbirth includes all fetal deaths with a gestational age of ≥ 20 weeks at delivery or a birth weight of at least 500 g. Canada's perinatal surveillance system calculates three rates: mortality among fetuses of all birth weights meeting provincial/territorial registration requirements (not directly comparable between jurisdictions); mortality among fetuses with a birth weight of ≥ 500 g; and mortality in fetuses of ≥ 1000 g or ≥ 28 weeks (criteria

suggested by the World Health Organization for international comparisons). (2)

Calculations of stillbirth risk sometimes incorporate live births as the denominator (or live births at a specific gestational age). However, the population truly at risk of stillbirth are not infants born at a particular gestational age, but pregnancies that reach and continue beyond that point. Consequently, calculations of stillbirth that use ongoing pregnancies are generally preferred; this is particularly important when considering stillbirth risk at particular gestational ages because the live birth denominator and ongoing pregnancy denominator can be very different depending on the gestational age (see Table 4). (28) Calculations of stillbirth risk that incorporate ongoing pregnancies are also thought to be a more clinically meaningful.

TABLE 4: A COMPARISON OF STILLBIRTH RATES CALCULATED BASED ON LIVE BIRTHS VS ONGOING PREGNANCIES (DATA FROM (29))

GA (weeks)	37	38	39	40	41	42
Stillbirths	807	957	951	691	411	182
Births	336,640	730,908	1,099,469	977,101	508,438	168,270
Ongoing pregnancies	3,144,118	3,315,916	2,753,278	1,653,809	676,708	/
Rate of stillbirth/10,000 births	23.97	13.09	8.65	7.07	8.08	/
Rate of stillbirth/10,000 ongoing pregnancies	2.57	2.89	3.45	4.18	6.07	/

Capturing reason for IOL using BORN

It is difficult to quantify the impact of changing community standards regarding maternal age and induction of labour using available methods of data collection. Primary indication for induction of labour is entered into the BORN database as free text rather than a 'pick list' – there is no circumscribed list of options from which the provider may choose and so any number of terms could be used to classify inductions chosen based on age-related considerations. While the SOGC Committee Opinion Delayed Child-bearing suggests that “women \geq 40 years of age should be considered biologically 'postterm' at 39 weeks' gestation” (9), a labour induction due to maternal age will not technically meet criteria for a postterm induction before 42 weeks' gestation. The option chosen by the midwife entering data into BORN may or may not capture maternal age as an indication.

Incorporating clearer criteria into the BORN data dictionary (or configuring the variable that describes the primary indication for induction as a pick list that includes maternal age as an indication) would enable more consistent data entry. This would make it easier to identify clients for whom maternal age constitutes the primary indication for induction of labour and track patterns on a broader scale.

Maternal age and place of birth

Little is known about how maternal age influences decision-making about place of birth or whether maternal age affects the relationship between place of birth and labour outcomes.

Research examining the perception of pregnancy risk hypothesizes that maternal age is a key factor influencing risk perception, which may then influence decisions surrounding place of birth. Researchers in Winnipeg, Manitoba compared perceptions of pregnancy risk between primiparas aged 20 to 29 and primiparas aged 35 and older. The older participants in this study had higher perceptions of risk than younger participants, even those whose pregnancies were considered low-risk. The authors suggest that these perceptions can affect decisions about place of birth, but do not draw any conclusions about whether or not they do. (30)

Few studies have reported labour outcomes by maternal age and place of birth. A secondary analysis based on the Birthplace in England study included data from over 63 000 low-risk participants who planned to give birth in non-obstetric units (midwife-led units and at home) and obstetric units (staffed by midwives but led by obstetricians). This cohort study found that across all ages, low-risk nulliparas and multiparas who planned to give birth in non-obstetric unit settings had lower rates of intervention and adverse maternal outcome than those who planned to give birth in obstetric units. (31) In both settings, likelihood of intervention or adverse maternal or perinatal outcome increased with age.

Among the approximately 1700 participants over 40 who were included in the study, incidence of the maternal composite outcome (augmentation, instrumental delivery, intrapartum CS, general anesthesia, blood transfusion, third or fourth degree tear or admission to intensive care) was 72% (primiparas) and 24% (multiparas) among those planning to give birth in obstetric units, compared to 45% and 7% among those planning to give birth in non-obstetric units. The composite perinatal outcome (admission to NICU, stillbirth or early neonatal death) occurred in 7.5% (primiparas) and 2.1% (multiparas) of planned obstetric unit births and 3.9% (primiparas) and 2.3% of planned non-obstetric unit births. Because only a small number of participants over 40 were included in this large study, it was limited in its ability to look at how age affects outcomes in different settings. The non-obstetric unit category used in this study combined births at freestanding birth centers, birth centers adjacent to hospitals and home births, which makes it hard to separate results for any one of these locations. (31)

Another publication based on data from the Birthplace in England study found that likelihood of intrapartum transfer from midwifery unit to obstetric unit increased with maternal age only in primiparas. Approximately half of primiparas over 40 transferred to obstetric units for reasons other than neonatal concerns, compared to 35% to 42% of primiparas aged 25 to 29. Transfer rates for multiparas were relatively stable across age groups, ranging from 12% to 15%. (32)

REFERENCES

1. RCOG. Induction of Labour at Term in Older Mothers. Scientific Impact Paper No. 34. 2013 p. 8.
2. Canadian Perinatal Surveillance System. PERINATAL HEALTH INDICATORS FOR CANADA 2013. 2014.
3. Better Outcomes Registry & Network (BORN) Ontario. Perinatal Health Indicators for Ontario 2012. Ottawa, ON; 2012.
4. Statistics Canada. Table 102-4508 - Live births, by age and parity of mother, Canada [Internet]. CANSIM (database). 2014 [cited 2014 Mar 12]. Available from: <http://www5.statcan.gc.ca/cansim/a47>
5. Kenny LC, Lavender T, McNamee R, O'Neill SM, Mills T, Khashan AS. Advanced maternal age and adverse pregnancy outcome: evidence from a large contemporary cohort. *PLoS One*. 2013 Jan;8(2):e56583.
6. Nilsen ABV, Waldenström U, Hjelmstedt A, Hjelmsted A, Rasmussen S, Schytt E. Characteristics of women who are pregnant with their first baby at an advanced age. *Acta Obstet Gynecol Scand*. 2012 Mar;91(3):353–362x.
7. Guedes M, Canavarro MC. Characteristics of primiparous women of advanced age and their partners: a homogenous or heterogenous group? *Birth*. 2014 Mar;41(1):46–55.
8. Canadian Institute for Health Information (CIHI). In Due Time: Why Maternal Age Matters. Canadian Institute for Health Information (CIHI); 2011.
9. Johnson J-A, Tough S. Delayed child-bearing. *J Obstet Gynaecol Can*. 2012 Jan;34(1):80–93.
10. Reddy UM, Ko C-W, Willinger M. Maternal age and the risk of stillbirth throughout pregnancy in the United States. *Am J Obstet Gynecol*. 2006 Sep;195(3):764–70.
11. Lydon-Rochelle MT, Holt VL, Cárdenas V, Nelson JC, Easterling TR, Gardella C, et al. The reporting of pre-existing maternal medical conditions and complications of pregnancy on birth certificates and in hospital discharge data. *Am J Obstet Gynecol*. 2005 Jul;193(1):125–34.
12. Lydon-Rochelle MT, Cárdenas V, Nelson JL, Tomashek KM, Mueller B a, Easterling TR. Validity of maternal and perinatal risk factors reported on fetal death certificates. *Am J Public Health*. 2005 Nov;95(11):1948–51.
13. Bahtiyar MO, Funai EF, Rosenberg V, Norwitz E, Lipkind H, Buhimschi C, et al. Stillbirth at term in women of advanced maternal age in the United States: when could the antenatal testing be initiated? *Am J Perinatol*. 2008 May;25(5):301–4.
14. Corey J, Macdonald T. AOM CPG No. 10: Management of the Uncomplicated Pregnancy Beyond 41+0 weeks' Gestation. *Assoc Ontario Midwives*. 2010;(10).
15. Delaney M, Roggensack A, Leduc DC, Ballermann C, Biringer A, Dontigny L, et al. Guidelines for the management of pregnancy at 41+0 to 42+0 weeks. *J Obstet Gynaecol Can*. 2008 Sep;30(9):800–23.
16. Gülmezoglu AM, Crowther CA, Middleton P, Heatley E. Induction of labour for improving birth outcomes for women at or beyond term. *Cochrane database Syst Rev*. 2012 Jan;6(6):CD004945.
17. Wyatt PR, Owolabi T, Meier C, Huang T. Age-specific risk of fetal loss observed in a second trimester serum screening population. *Am J Obstet Gynecol*. 2005 Jan;192(1):240–6.
18. Hannah ME, Hannah WJ, Hellmann J, Hewson S, Milner R, Willan A. Induction of labor as compared with serial antenatal monitoring in post-term pregnancy. A randomized controlled trial. The Canadian Multicenter Post-term Pregnancy Trial Group. *N Engl J Med*. 1992 Jun 11;326(24):1587–92.

19. Stock SJ, Ferguson E, Duffy A, Ford I, Chalmers J, Norman JE. Outcomes of elective induction of labour compared with expectant management: population based study. *BMJ*. 2012 Jan;344:e2838.
20. Carolan M, Davey M-A, Biro MA, Kealy M. Older maternal age and intervention in labor: a population-based study comparing older and younger first-time mothers in Victoria, Australia. *Birth*. 2011 Mar;38(1):24–9.
21. Ecker JL, Chen KT, Cohen AP, Riley LE, Lieberman ES. Increased risk of cesarean delivery with advancing maternal age: indications and associated factors in nulliparous women. *Am J Obstet Gynecol*. 2001 Oct;185(4):883–7.
22. Huang L, Sauve R, Birkett N, Fergusson D, van Walraven C. Maternal age and risk of stillbirth: a systematic review. *CMAJ*. 2008 Jan 15;178(2):165–72.
23. Gordon A, Raynes-Greenow C, McGeechan K, Morris J, Jeffery H. Risk factors for antepartum stillbirth and the influence of maternal age in New South Wales Australia: a population based study. *BMC Pregnancy Childbirth*. 2013 Jan;13:12.
24. American College of Obstetricians and Gynecologists. Nonmedically indicated early-term deliveries. Committee opinion no. 561. *Obstet Gynecol*. 2013 Apr;121(4):911–5.
25. Cheng YW, Nicholson JM, Nakagawa S, Bruckner TA, Washington AE, Caughey AB. Perinatal outcomes in low-risk term pregnancies: do they differ by week of gestation? *Am J Obstet Gynecol*. 2008 Oct;199(4):370.e1–7.
26. Liu S, Joseph KS, Hutcheon JA, Bartholomew S, León JA, Walker M, et al. Gestational age-specific severe maternal morbidity associated with labor induction. *Am J Obstet Gynecol*. 2013 Sep;209(3):209.e1–8.
27. Caughey AB, Sundaram V, Kaimal AJ, Gienger A, Cheng YW, McDonald KM, et al. Systematic review: elective induction of labor versus expectant management of pregnancy. *Ann Intern Med*. 2009 Aug 18;151(4):252–63, W53–63.
28. Caughey AB. Measuring perinatal complications: methodologic issues related to gestational age. *BMC Pregnancy Childbirth*. 2007 Jan;7:18.
29. Rosenstein MG, Cheng YW, Snowden JM, Nicholson JM, Caughey AB. Risk of stillbirth and infant death stratified by gestational age. *Obstet Gynecol*. 2012 Jul;120(1):76–82.
30. Bayrampour H, Heaman M, Duncan KA, Tough S. Comparison of perception of pregnancy risk of nulliparous women of advanced maternal age and younger age. *J Midwifery Womens Health*. 2012;57(5):445–53.
31. Li Y, Townend J, Rowe R, Knight M, Brocklehurst P, Hollowell J. The effect of maternal age and planned place of birth on intrapartum outcomes in healthy women with straightforward pregnancies: secondary analysis of the Birthplace national prospective cohort study. *BMJ Open*. 2014 Jan 17;4(1):e004026.
32. Rowe RE, Fitzpatrick R, Hollowell J, Kurinczuk JJ. Transfers of women planning birth in midwifery units: data from the birthplace prospective cohort study. *BJOG*. 2012 Aug;119(9):1081–90.