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Reducing caesarean section rates – no easy task

Short title: Priorities for reducing caesarean deliveries

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ABSTRACT

To identify the greatest potential for reducing overall caesarean delivery rates, we used longitudinally-linked data for women with consecutive births 2001-2009 to examine the likely impact of hypothetical risk-based scenarios. Among women with a first-birth, singleton, vertex-presenting fetus at term, increasing the vaginal birth rate following induction of labour by 20% potentially has greatest impact, with a 12.1% relative decrease in the overall caesarean rate. The potential relative decrease of other scenarios ranged from 0.8% to 6.4%.

INTRODUCTION

There is such international concern about rising caesarean delivery rates, that when the US caesarean rate was reported to decrease from 32.9% in 2009 to 32.8% in 2010 it was international news.[1,2] It is unclear why this plateau in the US rates occurred and it has not been attributed to any particular strategy aimed at reducing caesarean rates.[1] In Australia, caesarean rates have continued to increase without any plateau.[3]

Strategies to reduce the overall rate of caesarean delivery can target primary caesarean rates and/or repeat caesarean rates. Increasing the number of women who chose a trial of labour after caesarean (TOLAC) helped reduce the overall caesarean rate in the 1990s although concern about the risk of uterine rupture has since led to decreasing rates of TOLAC.[4,5] Encouraging TOLAC remains a pathway to reducing caesarean rates, albeit with careful assessment for eligibility. As individual components of practice change, they can have a ripple effect on overall practice. The most obvious example is how the increase in women birthing by caesarean sections in their first pregnancy has led to an ongoing increase in repeat caesarean births.[6] An analysis which models the contingent effects of particular changes in practice has not been undertaken. Hence, it is unclear where the greatest achievable potential lies for reducing the caesarean delivery rates. To help clinicians frame the potential benefits of practice change, we pre-specified a number of hypothetical clinical scenarios (eg reducing the rates of induction and term breech) and determined which of these scenarios would have the greatest potential impact on the overall caesarean rate.

MATERIALS AND METHODS

As the base case, we used population-level data for a cohort of women with sequential (1st and 2nd) births in NSW between 2001 and 2009 whose obstetric pathways (labour onset, and

mode of delivery for 1st and 2nd births) have been described in detail elsewhere.[6] Briefly, data were obtained from longitudinally-linked records of the NSW Perinatal Data Collection (PDC). Record linkage was undertaken by the Centre for Health Record Linkage, and was approved by the NSW Population and Health Services Research Ethics Committee. Data were provided to researchers as de-identified records by the NSW Ministry of Health.

We estimated the relative reduction in overall caesarean delivery rates if various clinical practices were successfully changed (Table 1). Global reductions in pre-labour caesareans and inductions were considered impractical as choices around preterm labour and delivery management are constrained. Thus we identified women with singleton pregnancies with a vertex-presenting infant at term as the population for whom attempts at reducing the caesarean rate are most likely to be adopted.[7] We also pre-specified changes in breech presentation at term, and in mode of delivery for multiple pregnancies (Table 1). The proposed changes in delivery management were pragmatic, similar to or less than the observed increases since 2000.[8,9]

When applying these proposed scenarios to population data, it was *not* assumed that the hypothesised changes would automatically result in a vaginal birth. For example, where fewer inductions were the target, the proportion of avoided inductions were redistributed according to the rates of vaginal and caesarean delivery among women who were not induced. We applied the hypothetical targets (Table 1) to the study population and calculated the potential relative reduction in the overall caesarean delivery rate.

RESULTS

There were 85,859 women who had a first birth in 2001-2004 and a second birth within 5 years. Over both deliveries, 47,122 (27.4%) were by caesarean section. For the 1st births,

22,433 (26.1%) women had a caesarean (7,579 prelabour and 14,854 intrapartum). For the 2nd births, there were 61,170 vaginal births (including 3,508 VBAC) and 24,689 caesareans (including 15,098 repeat prelabour and 3,827 repeat intrapartum).

Of the 1st -births, 73,663 (85.8%) women had singleton pregnancies with vertex-presenting fetuses at term including 3,588 (4.9%) who had prelabour caesarean deliveries, and 21,803 (2~~7~~9.~~2~~6%) who had labour inductions. Of the 48,272 women with spontaneous labour, 86.8% were delivered vaginally. Of the inductions, 15,903 (72.9% of inductions) women were delivered vaginally and 5900 (27.1%) resulted in intrapartum caesarean. There were also 3,477 (4.0%) women with a singleton breech presentations at term (98% delivered by caesarean) and 655 (0.8%) with multiple pregnancies (63% delivered by caesarean).

Table 1 illustrates the relative reduction in the total caesarean rate that would result ~~if the~~based upon hypothesised target reductions. Base case rates were taken from the term vertex cohort (i.e. 27.1% intrapartum casesarean after first birth induction, above). Second birth assumptions included 5.5% planned casesarean and 3.4% intrapartum caesarean among women who had a first birth vaginal delivery.~~were achieved, and how these targeted reductions would impact the observed caesarean delivery rate of 27.4%. For example, h~~Hypothetically reducing 1st birth inductions among women with singleton pregnancies with vertex-presenting infants at term by 10% would result in a relative reduction in the total caesarean rate of 0.8% for an absolute reduction in the overall rate from 27.4% to 27.2% (Table 1).

Application of the hypothetical scenarios indicates that the single greatest potential impact on overall caesarean rates would be achieved by increasing the *success* rate for labour inductions by 20% among women who have first birth singleton pregnancies with vertex-presenting infant at term (Table 1). The latter could decrease the overall caesarean rate from 27.4% to

24.1%, a slightly greater overall impact than could be achieved by a 20% reduction in all first-birth intrapartum caesareans (to 24.9%). The other first-birth interventions we examined have a lesser impact either because the target group is small (e.g., women with breech presentation at term, or multiple pregnancies), or because planned deliveries which are avoided (labour inductions and prelabour caesareans) remain exposed to high intrapartum caesarean delivery rates. A return to TOLAC and VBAC rates extant in 1994-1997 could reduce the total caesarean delivery rate to 25.7%. The potential impact of increased TOLAC/VBAC at 2nd births can be added to the individual first birth intervention reductions. For example adding the proposed 20% increase in induction success rates to the proposed TOLAC/VBAC rates could together decrease the overall caesarean rate by 18.4% to 22.4%.

DISCUSSION

Our study illustrates the challenges involved in attempting to reduce caesarean rates. The estimated effects on caesarean rates are intended as an aid to prioritisation of efforts to reduce the caesarean section rates at a population level. The hypothesised changes to first-birth management are pragmatic and consistent with current or recent international rates.[10-14] With the possible exception of increasing induction success rates, any single achievable change in the management of first-births is likely to produce only modest relative and absolute reductions in the overall caesarean rates.

The strength of this study lies in the use of population data with validated labour and delivery information facilitating whole population-level estimates of the potential impact of management changes on overall caesarean section rates.[15] The approach is risk-based (parity, plurality, onset of labour), rather than by indication for caesarean section. The decision to perform a caesarean can closely follow the manifestation of an indication for delivery, which presents practical difficulties for identifying target groups for management/practice change.[7]

Importantly, although the estimated relative reductions for 1st and 2nd births can be summed, most first birth scenarios are not independent and thus the first-birth reductions are not simply additive. For example, a successful ECV becomes a vertex-presenting infant, and although a high probability of prelabour caesarean for breech presentation is avoided, the avoided caesarean for breech presentation were still considered to be at risk of prelabour or intrapartum caesarean at the same rates as those for women with a vertex presentation.

Increasing the success of labour inductions should be achievable. In this cohort, only 73% of labour inductions at term among singleton first pregnancies with a vertex-presenting fetus resulted in a vaginal birth; this rate has declined to 70% in more recent years.[8] This is in contrast to international reports. If the induction success rates in NSW were increased by 20%, this would equate to a vaginal birth rate of 84-86%, rates that are currently reported among high risk pregnancies in the Netherlands and nulliparae in the US, Canada and Ireland.[10-14] Issues relating to variations in practice with respect to oxytocin administration, dosage, infusion protocols and maximal dose administered have been identified as key to maximising vaginal birth rates and minimising adverse maternal and fetal effects of the drug.[16,17]

In contrast to increasing the success of labour inductions, global reduction in intrapartum caesareans and increases in TOLAC/VBAC rates are less likely to be feasible. Successful obstetric litigation based on a determination that an adverse outcome could have been avoided if a timely caesarean section had been performed, suggests that intrapartum caesareans are more likely to increase rather than decline.[18] Similarly, a change in the declining TOLAC/VBAC rate seems unlikely with a recent prospective study reporting a higher risk of infant morbidity and mortality following planned TOLAC (compared with elective repeat caesarean) adding to existing concerns about uterine rupture.[19]

Finally, our study suggests that even a 20% reduction in prelabour caesareans among women with singleton first births at term would have a negligible effect on overall caesarean rates due to the relatively small size of this subgroup, and that the women would still face the possibility of an intrapartum caesarean. Nevertheless, given the impact of 1st birth management on subsequent pregnancies, these rates should be closely monitored with a strong commitment to avoiding the first caesarean.[20]

In conclusion, turning the tide on caesarean rates is not easy. If caesarean reduction is a worthwhile goal, this risk-based approach suggests that increasing the rate of vaginal birth following labour induction would be a good place to start.

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Table 1 The potential impact of prespecified hypothetical risk-based clinical scenarios aimed at reducing caesarean rates

Population	**Pre-specified scenario and % change**	**Relative % reduction in total caesarean rate**	**Potential impact on 27.4% caesarean rate**
First-births			
Singleton pregnancies with vertex-presenting infant at term (37-41 weeks)	*Decrease* induction rate by 10%*	0.8	27.2
	Decrease induction rate by 20%*	1.6	27.0
	Decrease prelabour caesarean delivery by 10%*	1.0	27.1
	Decrease prelabour caesarean delivery by 20%*	2.1	26.8
	Decrease intrapartum caesarean delivery by 10%*	4.6	26.2
	Decrease intrapartum caesarean delivery by 20%*	9.2	24.9
	Increase induction success rate by 10%*	6.0	25.8
	Increase induction success rate by 20%*	12.1	24.1
Singleton pregnancies with breech presentation at term (37-41 weeks)	*Decrease* breech presentation by 30%*	2.7	26.7
Multiple pregnancies	*Decrease* prelabour caesarean delivery by 30%	0.1	27.4
Second-births			
1st birth caesarean delivery	*Increase* TOLAC/VBAC equal to rates in 1994-1997 TOLAC 46% and VBAC 61% of all primary CS*	6.4	25.7

TOL Trial of labour; VBAC vaginal birth after caesarean; CS caesarean section

* **Note** that the relative reductions in these groups are not independent and are thus not simply additive