Pessaries for the prevention of preterm birth in multiple pregnancies
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CHAPTER 8
The effect of duration of twin-to-twin interval on neonatal outcome of the second twin

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Submitted
Abstract

Objective In vaginal delivery of twins, the optimal time interval between the delivery of the first and second child is controversial. We studied the influence of duration of the twin-to-twin delivery interval on neonatal outcome of the second twin.

Study design We performed a secondary analysis of delivery data of women included in the AMPHIA trial (ISRCTN 40512715) and ProTWIN trial (NTR 1858). Women who delivered the first twin vaginally after 34 weeks of gestation were included. The association between the twin-to-twin delivery interval, defined as the time interval between the delivery of the first twin and the second twin, and umbilical cord pH was evaluated by linear regression. Logistic regression was used to determine the association between delivery interval (categorized as <15 min, 15-30 min, >30 min) and poor neonatal outcome, defined as arterial umbilical cord pH below 7.10, 5-minute Apgar score below 7 and NICU admission.

Results We used data on 628 twin deliveries. An increasing twin-to-twin interval was correlated with a decline in arterial pH (difference -0.04 (95% CI;-0.05 to -0.03)) on the transformed natural log scale. Second twins born after 15 minutes more frequently had an arterial pH <7.10 (15-30 min: odds ratio (OR) 5.1; 95% confidence interval (CI) 2.4 to 11) and >30 min: OR 6.1; 95% CI 2.8 to 13)). After 30 minutes there were significantly more neonates that had low Apgar scores (OR 3.0; 95% CI 1.3 to 6.9) or were admitted to NICU (OR 3.1; 95% CI 1.4 to 6.9).

Conclusions The risk of neonatal acidosis, low Apgar scores and NICU admission increases when the twin-to-twin interval exceeds 15 minutes. These data justify further evaluation of active management of delivery of the second twin in randomized controlled trials.
Introduction

Twin pregnancies are associated with an eight to tenfold increase in perinatal morbidity and mortality rate as compared to singleton pregnancies; a substantial part of this increased risk occurs during delivery.\(^1\)\(^2\) Until recently, it was unclear whether an intended vaginal delivery or a planned caesarean section (CS) was the best option. The results of the Twin Birth Study indicate that a planned CS does not substantially improve perinatal outcome versus a planned vaginal birth when the first twin is in cephalic position.\(^3\)

The optimal time interval between the delivery of the first and second twin (twin-to-twin delivery interval) remains unclear. Some studies demonstrate a fivefold increased risk of acidosis (pH <7.1)\(^4\)\(^5\) and a threefold increased risk of an Apgar score (AS) <7 at 5 minutes in the second twin when the delivery interval exceeded 30 minutes.\(^4\)\(^6\) Another study demonstrated a significant difference in venous pH (7.31 versus 7.26, \(p\)-value 0.01), but not in arterial pH (7.24 versus 7.21, \(p\)-value 0.14) when the twin delivery interval exceeded 30 minutes.\(^7\)

On the other side there are also studies reporting that the twin-to-twin delivery interval has little impact on the outcome of the second twin and a time restriction for the delivery interval between the first and second infants is not necessary when there is continuous fetal and uterine monitoring. In a study by Rayburn et al. 115 twins were included. There was no statistically significant increased risk of an AS <7 at 5 minutes or admission to intensive care nursery when the delivery interval exceeds 15 minutes.\(^8\) Sneuber et al. included 207 twins and divided the study population in two groups based on the mode of delivery: (1) vaginal delivery of both twins in vertex position and (2) vaginal or vaginal operative delivery of first twin in vertex position combined with breech or transverse presentation and vaginal breech delivery or CS of the second twin. For both groups there were no statistically significant correlations between the twin-to-twin delivery interval and arterial pH or Apgar scores at 5 minutes.\(^9\)

In view of these conflicting results, we assessed the twin-to-twin delivery interval and neonatal outcome of the second twin in a study with a large sample size. In this way, the rate of deterioration in cord blood gas status, Apgar scores and admissions to the neonatal intensive care unit (NICU) may provide important information on whether a time restriction for the twin-to-twin delivery interval should be considered. This is of clinical importance, as an elective CS might not or only marginally reduce poor perinatal outcome as compared to intended vaginal delivery.\(^3\)

Methods

We performed a secondary analysis of twin deliveries between 2007 and 2012 in The Netherlands of the AMPHIA trial and the ProTWIN trial. The AMPHIA trial was a multicentre, double-blind, placebo-controlled randomized trial in which 671 women with a multiple pregnancy were randomized to weekly injections of either 17α-hydroxyprogesterone caproate or placebo to prevent preterm birth (ISRCTN 40512715).\(^10\) The ProTWIN trial investigated whether the prophylactic use of a cervical pessary could prevent preterm birth in women with a multiple pregnancy. In this multicenter randomized controlled
trial 813 women were assigned to a cervical pessary or no intervention (NTR 1858). In the present study, we selected women who reached at least 34 weeks of gestation and who delivered the first twin vaginally in cephalic or breech presentation. Both twins had to be alive before the onset of labor without signs of twin-twin transfusion or suspicion of fetal malformations. During labor and delivery, both twins were monitored with continuous cardiotocography, using fetal scalp electrode for the first twin and external transducer for the second twin. The twin-to-twin delivery interval was defined as the time interval between the delivery of the first twin and the second twin. To investigate trends over time, the birth intervals were stratified into periods of 15 minutes (<15 minutes, 15-30 minutes, >30 minutes).

The association between the twin-to-twin delivery interval and umbilical cord pH was evaluated by linear regression. When the relation between pH and delivery interval was not linear a natural log transformation was applied. Subsequently, logistic regression was used to determine the association between delivery interval (categorized as <15 min, 15-30 min, >30 min) and neonatal outcome (arterial umbilical cord pH below 7.10, 5-minute Apgar score below 7, NICU admission, perinatal death, birthweight and cephalic presentation and mode of delivery (vaginal assisted delivery, CS or breech extraction)). Furthermore, we did multivariable analyses in which we calculated an adjusted odds ratio with 95% confidence intervals, taking into account differences in gestational age, maternal age, BMI or parity.

When evaluating an effect of the twin-to-twin delivery interval, we considered that the following characteristics could play a role: maternal age, gestational age, parity, obesity, fetal presentation and chorionicity on combined short-term neonatal outcome (arterial umbilical cord pH below 7.10, 5-minute Apgar score below 7, NICU admission and perinatal death) for different twin-to-twin delivery intervals. We performed univariable regression analysis to determine whether these factors affected the relationship between twin-to-twin delivery interval and neonatal outcome. We subsequently investigated whether there was an association between a vaginal operative delivery and arterial umbilical cord pH below 7.10 for each delivery interval.

Various women had missing values for some of the variables. Hence, as widely acknowledged, a complete case analysis would yield biased results. Therefore we used multiple imputation (ten imputed datasets) following the original trial analyses. As imputed data sets differ from each other, variables were selected in each imputation set separately. For inclusion in the analysis, we used the majority method, i.e. variables were included if selected in at least five out of ten imputed data sets. The regression coefficients and standard errors of these final variables were combined from the ten data sets using Rubin’s rules to come to the two final prediction models. All statistical analyses were conducted in R for Windows, version 2.15.2 (The R Foundation for Statistical Computing) and statistical significance was considered if the p-value was <0.05.
Results

From August 2006 to September 2012, 671 women participated in the AMPHIA trial and 813 in the ProTWIN trial. We excluded 857 (58%) women due to the following reasons: 595 (69%) delivery before <34 weeks, 142 (17%) first twin not delivered vaginally, 43 women (5%) in whom one or both children were not alive before the onset of labor, 15 (2%) women with twin-twin transfusion, and 62 (7%) with fetal malformations. We therefore included 628 twins in the present analysis of whom 310 (49%) participated in the AMPHIA trial and 318 (51%) in the ProTWIN trial. (Figure 1) The median twin-to-twin delivery interval was 16 minutes (IQR 6-29 min) with a range varying from 1 minute to 164 minutes.

Figure 1: flowchart

Table 1 shows the maternal demographic and clinical characteristics of all women, as well as categorized in three twin-to-twin delivery intervals: <15 minutes, 15-30 minutes and > 30 minutes. There were 302 (48%) second twins born within 15 minutes after delivery of the first twin, 181 (29%) within 15-30 minutes and 145 (23%) after > 30 minutes. There were more nulliparous women in the delivery interval >30 min (<15 min: 36%, 15-30 min: 43% and >30 min: 47%, p-value 0.04) and more monochorionics in the delivery interval <15 min (<15 min: 26%, 15-30 min: 14% and >30 min: 15%, p-value 0.003).
Among the 628 included women, 484 (77%) had a spontaneous vaginal delivery of the second child, 88 (14%) a vaginal instrumental delivery, 42 (7%) a caesarean and 14 (2%) a breech extraction. Indications for the 88 (14%) vaginal assisted deliveries for the second twin were: fetal distress (n=57 (65%)), failure to progress (n=27 (31%)) and both fetal distress and failure to progress (n=4 (1%)). In total 42 (7%) caesarean sections for delivery of the second twin were performed for the indications: failed instrumental delivery (n=2 (1%)), fetal distress (n=14 (33%)), failure to progress (n=7 (17%)), both fetal distress and failure to progress (n=4 (10%)), maternal complication (n=2 (5%)) and other (n=13 (31%)) (Table 2).

There were significantly more vaginal assisted deliveries and caesarean sections for second twin compared to spontaneous deliveries when the twin-to-twin delivery was >15 minutes compared to <15 min (vaginal assisted: 15-30 min: 9% versus 20% (OR 2.5; 95% CI 1.5-4.3) and >30 min: 9% versus 17% (OR 2.9; 95% CI 1.6-5.2), caesarean section for second twin: 15-30 min: <1% versus 4% (OR 15; 95% CI 1.9-123) and >30 min: <1% versus 23% (OR 103; 95% CI 13-764)). These OR’s demonstrated similar results.

**Table 1:** characteristics in relation to twin-twin delivery by 15-minute time interval

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>&lt;15 minutes</th>
<th>15-30 minutes</th>
<th>&gt;30 minutes</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=628</td>
<td></td>
<td>N=302 (48%)</td>
<td>N=181 (29%)</td>
<td>N=145 (23%)</td>
<td></td>
</tr>
<tr>
<td>Maternal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestational age (weeks)</td>
<td>37.1 (1.3)</td>
<td>37.1 (1.3)</td>
<td>37.0 (1.2)</td>
<td>37.3 (1.3)</td>
<td>0.12</td>
</tr>
<tr>
<td>Maternal age (years)</td>
<td>33.0 (4.3)</td>
<td>33.1 (4.2)</td>
<td>32.5 (4.4)</td>
<td>33.2 (4.3)</td>
<td>0.31</td>
</tr>
<tr>
<td>BMI</td>
<td>23.1 (21.0-26.1)</td>
<td>22.9 (21.0-25.5)</td>
<td>23.7 (21.0-25.7)</td>
<td>22.9 (21.5-27.4)</td>
<td>0.36</td>
</tr>
<tr>
<td>Nulliparous</td>
<td>253 (40)</td>
<td>108 (36)</td>
<td>77 (43)</td>
<td>68 (47)</td>
<td>0.04</td>
</tr>
<tr>
<td>Multiparous with previous vaginal delivery</td>
<td>351 (56)</td>
<td>185 (61)</td>
<td>98 (54)</td>
<td>68 (47)</td>
<td>x</td>
</tr>
<tr>
<td>Multiparous with previous caesarean delivery</td>
<td>24 (4)</td>
<td>9 (3)</td>
<td>6 (3)</td>
<td>9 (6)</td>
<td>x</td>
</tr>
<tr>
<td>Monochorionicity</td>
<td>125 (20)</td>
<td>78 (26)</td>
<td>25 (14)</td>
<td>22 (15)</td>
<td>0.003</td>
</tr>
<tr>
<td>Spontaneous delivery first twin</td>
<td>534 (85)</td>
<td>264 (87)</td>
<td>153 (85)</td>
<td>117 (81)</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Data are presented as mean (SD), median (IQR) or no. (%)

* The body-mass index is the weight in kilograms divided by the square of the height in meters.
### Table 2: mode of delivery of the second twin and neonatal outcome per twin-to-twin delivery interval

<table>
<thead>
<tr>
<th>Neonatal outcome</th>
<th>Overall N=628</th>
<th>&lt;15 minutes N=302</th>
<th>OR (95% CI) Adjusted OR</th>
<th>15-30 minutes N=181</th>
<th>OR (95% CI) Adjusted OR</th>
<th>&gt;30 minutes N=145</th>
<th>OR (95% CI) Adjusted OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial pH &lt;7.1</td>
<td>75 (12)</td>
<td>13 (4)</td>
<td>ref (1.0)</td>
<td>32 (18)</td>
<td>30 (21)</td>
<td>6.1 (2.8-13)</td>
<td>5.5 (2.4-12)</td>
</tr>
<tr>
<td>AS 5 min &lt;7</td>
<td>35 (6)</td>
<td>11 (3)</td>
<td>ref (1.0)</td>
<td>10 (6)</td>
<td>14 (10)</td>
<td>3.0 (1.3-6.9)</td>
<td>3.6 (1.1-6.0)</td>
</tr>
<tr>
<td>Admission NICU</td>
<td>36 (6)</td>
<td>11 (4)</td>
<td>ref (1.0)</td>
<td>10 (6)</td>
<td>15 (10)</td>
<td>3.1 (1.4-6.9)</td>
<td>3.0 (1.3-6.8)</td>
</tr>
<tr>
<td>Perinatal death</td>
<td>2 (&lt;1)</td>
<td>0 (0)</td>
<td>ref (1.0)</td>
<td>1 (1)</td>
<td>NA</td>
<td>1 (1)</td>
<td>NA</td>
</tr>
<tr>
<td>Cephalic presentation second twin</td>
<td>438 (70)</td>
<td>226 (75)</td>
<td>ref (1.0)</td>
<td>126 (70)</td>
<td>86 (59)</td>
<td>0.49 (0.32-0.75)</td>
<td>0.47 (0.30-0.72)</td>
</tr>
<tr>
<td>Birthweight second twin (g)</td>
<td>2586 (451)</td>
<td>2515 (448)</td>
<td>ref (1.0)</td>
<td>2601 (413)</td>
<td>2717 (471)</td>
<td>228 (141-315)</td>
<td>228 (141-315)</td>
</tr>
<tr>
<td><strong>Mode of delivery</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spontaneous delivery second twin</td>
<td>484 (77)</td>
<td>269 (89)</td>
<td>ref (1.0)</td>
<td>134 (74)</td>
<td>81 (56)</td>
<td>ref (1.0)</td>
<td>ref (1.0)</td>
</tr>
<tr>
<td>Vaginal assisted delivery second twin</td>
<td>88 (14)</td>
<td>29 (9)</td>
<td>ref (1.0)</td>
<td>35 (20)</td>
<td>24 (17)</td>
<td>2.9 (1.6-5.2)</td>
<td>2.5 (1.3-4.6)</td>
</tr>
<tr>
<td>Fetal distress</td>
<td>57 (65)</td>
<td>22 (7)</td>
<td>x</td>
<td>21 (12)</td>
<td>x</td>
<td>14 (10)</td>
<td>x</td>
</tr>
<tr>
<td>Failure to progress</td>
<td>27 (31)</td>
<td>3 (1)</td>
<td>x</td>
<td>14 (8)</td>
<td>x</td>
<td>10 (7)</td>
<td>x</td>
</tr>
<tr>
<td>Both</td>
<td>4 (1)</td>
<td>4 (1)</td>
<td>x</td>
<td>0 (0)</td>
<td>x</td>
<td>0 (0)</td>
<td>x</td>
</tr>
<tr>
<td>Caesarean section second twin</td>
<td>42 (7)</td>
<td>1 (&lt;1)</td>
<td>ref (1.0)</td>
<td>8 (4)</td>
<td>33 (23)</td>
<td>103 (13-764)</td>
<td>107 (14-800)</td>
</tr>
<tr>
<td>Failed instrumental delivery</td>
<td>2 (1)</td>
<td>0 (0)</td>
<td>x</td>
<td>0 (0)</td>
<td>x</td>
<td>2 (1)</td>
<td>x</td>
</tr>
<tr>
<td>Fetal distress</td>
<td>14 (33)</td>
<td>0 (0)</td>
<td>x</td>
<td>4 (2)</td>
<td>x</td>
<td>10 (7)</td>
<td>x</td>
</tr>
<tr>
<td>Failure to progress</td>
<td>7 (17)</td>
<td>1 (0)</td>
<td>x</td>
<td>0 (0)</td>
<td>x</td>
<td>6 (4)</td>
<td>x</td>
</tr>
<tr>
<td>Both</td>
<td>4 (10)</td>
<td>0 (0)</td>
<td>x</td>
<td>0 (0)</td>
<td>x</td>
<td>4 (3)</td>
<td>x</td>
</tr>
<tr>
<td>Maternal complication</td>
<td>2 (5)</td>
<td>0 (0)</td>
<td>x</td>
<td>1 (1)</td>
<td>x</td>
<td>1 (1)</td>
<td>x</td>
</tr>
<tr>
<td>Other</td>
<td>13 (31)</td>
<td>0 (0)</td>
<td>x</td>
<td>3 (2)</td>
<td>x</td>
<td>10 (7)</td>
<td>x</td>
</tr>
<tr>
<td>Breech extraction</td>
<td>14 (2)</td>
<td>3 (1)</td>
<td>ref (1.0)</td>
<td>4 (2)</td>
<td>7 (5)</td>
<td>7.6 (1.9-30)</td>
<td>6.7 (1.7-27)</td>
</tr>
</tbody>
</table>

Adjusted for parity and chorionicity
Figure 2 demonstrates that an increase of the log (twin-to-twin interval) by 1 was associated with a decline in arterial pH (-0.04; 95% CI -0.05 to -0.03, p-value < 0.0001). The decline in pH is strongest shortly after birth of the first child and slowly levels thereafter, with a decline of 0.04 for each interval between 1-3, 3-7, 7-20, 20-55 and 55-148 minutes.

Table 2 shows the association between the twin-to-twin delivery interval and short-term neonatal outcome (arterial cord pH <7.1, 5-minute Apgar score <7, NICU admissions, perinatal death, cephalic presentation second twin and birth weight) as well as its association with mode of delivery of the second twin (vaginal assisted delivery, CS or breech extraction). Second twins born after 15 minutes had more frequently an arterial pH <7.10 compared to those born within 15 minutes (15-30 min: 4% versus 18% (OR 5.1; 95% CI 2.4-11) and after 30 min: 4% versus 21% (OR 6.1; 95% CI 2.8-13)), an Apgar score below 7 at 5 minutes (15-30 min: 3% versus 6% (OR 1.7; 95% CI 0.64-4.2) and >30 min: 3% versus 10% (OR 3.0; 95% CI 1.3-6.9)) and were more often admitted to the NICU (15-30 min: 4% versus 6% (OR 1.6; 95% CI 0.65-3.7) and >30 min: 4% versus 10% (OR 3.1; 95% CI 1.4-6.9)).

Univariable regression analysis showed that the relation between delivery interval and poor perinatal outcome (defined as at least one of the following: arterial pH <7.1, 5-minute Apgar score <7, NICU admission or perinatal death) was not affected by maternal age, gestational age, parity, obesity, parity, fetal presentation, chorionicity or cephalic presentation. We found no significant association between vaginal operative delivery and arterial umbilical cord pH <7.10 for increasing twin-to-twin delivery interval (OR 2.9; 95% CI 0.65-12).

**Figure 2:** Linear plots of the relationship of umbilical cord arterial pH (n= 202) of second twins as a function of twin-to-twin time interval in minutes on a transformed log scale
The effect of duration of twin-to-twin interval on neonatal outcome of the second twin

Discussion

In this secondary analysis of two randomized clinical trials, we found that the risk of neonatal acidosis for the second twin seems to increase when the twin-to-twin interval exceeds 15 minutes. The results remained similar after adjusting for parity and chorionicity. We demonstrated that there were significantly more vaginal assisted deliveries and caesarean sections for second twins compared to spontaneous deliveries when the twin-to-twin delivery was longer than 15 minutes.

Limitations and strengths

Strengths of our study are the fact that we restricted our study to women who delivered after 34 weeks of gestation with the first twin delivered vaginally, and without malformation or signs of twin-twin transfusion syndrome. Although it has been shown in previous studies that a breech delivery is associated with a higher risk of poor short-term neonatal outcome, we decided to include these twins since this reflects clinical practice.17

It has long been established that birthweight discordance, defined as a percentage difference in birthweight, is an important contributor to neonatal morbidity and mortality especially when the birthweight discordance is 25% or more, we decided to include twins with discordant birthweights.18

However, a repeat of our analysis after exclusion of twin pregnancies with a birthweight discordance and after exclusion of first twins in breech presentation, similar results were seen (data not shown). Furthermore, emergency caesarean delivery has been reported in 10 to 30 percent of pregnancies in which vaginal births of twins had been planned, and may be necessary for delivery of the second twin after vaginal birth of the first twin.20;21 In The Netherlands it is current practice to deliver twins in the delivery room while in the United States all twin pregnancies are delivered in an operating theatre. Therefore, our results might be more reliable compared to countries where delivery of twin is in the operation theatre where caesarean delivery can be performed directly.

Furthermore, we investigated whether there was an association between vaginal assisted delivery and a low arterial pH. An association could indicate lower arterial pH due to the need to perform a vaginal assisted delivery promptly because of fetal distress. We did not find this association in our data indicating a true effect of the delivery interval only (OR 2.9; 95% CI 0.65-12).

A limitation of our study is that information on arterial pH was not available for all twins, as this is not standard care in The Netherlands. However, omitting such a variable with missing values would result in bias, and hence is not recommended. Multiple imputations is generally considered the preferred method of handling missing predictor data.19

Hence, there were more caesarean sections for second twins when the twin-to-twin delivery exceeds 15 minutes (15-30 min <1% versus 4% (OR 15; 95% CI 1.9-123) and >30 min: <1% versus 23% (OR 103; 95% CI 13-764)). Nevertheless, the 95% confidence interval that we found was large due to small numbers.
Other studies and clinical impact

Our findings are in line with the results of studies that demonstrated an increased risk of acidosis when the delivery interval increases. It is suggested that the decline in the second twin’s condition results from the sudden decrease in uterine volume, which might cause reduction of uterine perfusion and placental circulation. Apart from such mechanisms, obviously the increased time interval increases the risk of asphyxia of the second child, as being in the uterus for the second twin is more risky than being outside the uterus. It is important to realize that we found the first period of the interval to be associated with the highest risk.

According to the results of our study, the twin-to-twin delivery interval seems to be an independent risk factor and prolonged intervals are associated with poor perinatal outcome. Apgar scores alone might not accurately reflect fetal damage or hypoxia. Perinatal asphyxia is preceded by fetal acidemia, determined by umbilical arterial cord pH at birth. Meta-analysis showed that low arterial cord pH was significantly associated with neonatal mortality and morbidity (composite of hypoxic ischaemic encephalopathy, intraventricular haemorrhage or periventricular leucomalacia) and long-term outcome (cerebral palsy). As neonates with 5-min Apgar scores less than 7 have an increased risk for neonatal, infant, and childhood (ages 1–8 years) death, cerebral palsy, mental retardation, and other neurological disabilities as compared to neonates with 5-minute Apgar scores above 7, this is an important surrogate marker. Consequently, it is important to minimize the number of neonates with low Apgar scores. Our study suggests that active management for delivery of the second twin might accomplish this.

Our data are insufficient to guide clinical practice in such a way, that immediate delivery of the second neonate should be recommended once the first neonate has been born. Obviously, since we found an increased risk of asphyxia once the delivery interval increases, obstetrical interventions that reduce this time might potentially improve outcome for the second twin. This however, should preferably be assessed in future randomized studies comparing immediate delivery of the second twin versus a wait and see policy. In view of the outcomes of the Twin Birth Study that excludes a large benefit from elective caesarean section in women with a twin pregnancy, women might opt for vaginal delivery, making the question of extreme relevance. To show a reduction from the 20% poor outcome rate that we observed after 30 minutes, to the 5% poor outcome that was present in neonates where the delivery interval was within 15 minutes, a study with 90% power and a 5% alpha-error would require two groups of 110 patients.

In summary, we found that in vaginal delivery of a woman with a twin pregnancy, a short twin-to-twin interval reduces the risk of neonatal acidosis, low Apgar scores and NICU admissions. However, the question whether active management of the second twin improves outcome has not been answered. Our data therefore justify evaluation of active management in the delivery of the second twin in a randomized controlled trial.
The effect of duration of twin-to-twin interval on neonatal outcome of the second twin

Reference List

22. Leung TY, Lok IH, Tam WH, Leung TN, Lau TK. Deterioration in cord blood gas status during the second stage of labour is more rapid in the second twin than in the first twin. BJOG 2004;111:546-549.