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Full length article

The continuous audit of events and outcomes of labour and birth using the Ten Group Classification System and its role in quality improvement

Per Kempe[a,b,*], Marie Vikström-Bolin[a]

[a] Department of Obstetrics and Gynaecology, Sundsvall Hospital, Sundsvall, Sweden
[b] Department of Obstetrics and Gynaecology, Palmerston North Hospital, Palmerston North, New Zealand

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ABSTRACT

Objective: The knowledge of a labour and birth unit's rates of events and outcomes is essential to design any quality improvement initiative. It is in the same way important to have a system to analyse results of the ongoing changes within the unit. The Ten Group Classification System is the framework for doing this in a systematic and clinically relevant way. We aimed to use this classification system as a quality improvement tool.

Study design: All labours and births during four years at a secondary level Hospital were included in a continuous analysis and of events and outcomes based on the Ten Group Classification System. From the results of the audit, policies and guidelines were designed and updated to improve outcomes.

Results: The normal vaginal birth rate in Group 1 increased during the four-year-period and the Caesarean Section rate in Group 2 A dropped after the introduction of a new induction method. The overall Caesarean Section rate decreased. The experience of giving birth improved in Groups 1, 2 A and 3.

Conclusion: The use of a continuous audit of events and outcomes based on a clinically significant classification for all women makes it possible to improve quality. Other labour and birth units are encouraged to collect and present data in a way that allows comparisons between units and over time.

Introduction

Although the Scandinavian Caesarean section (CS) rates are still low compared to other western countries [1], they have increased from the 1990′s and onwards [2]. The same development occured at Sundsvall County Hospital, a secondary level Swedish Hospital where 1500–1700 women give birth each year. In 2010, the overall CS rate was 20,1% and CS rate in the Ten Groups Classification System (TGCS) Group 1 (nulliparous women in spontaneous labour at term with a fetus in a cephalic presentation) [3] was 9,8%. At the same time, an increasing number of women coming to our unit asked for a CS in their subsequent pregnancies due to a traumatic experience at the time of their previous labour and birth resulting in a gradually larger proportion of women in TGCS group 4B (Multiparous women without a previous CS having a pre-labour CS at term). With the aim to address the rising CS rate, we sent a group of obstetricians and midwives to the National Maternity Hospital (NMH) in Dublin and the Active Management of Labour Course in 2012. However, what they brought with them home was not primarily a new way to manage labour, since the main principles of active management of labour were already used, but the understanding of the potential effects of a continuous audit of all labours and births, with events and outcomes analysed separately for the groups of the TGCS.

To most women, children, midwives and obstetricians, the primary aspect of labor and birth is good outcomes. However, the definition of good outcomes may vary between one woman and another and, possibly even more, between professionals. At the same time, management of labour and birth is supposed to be evidence based and guidelines and policies are usually based on existing evidence with the common understanding that randomized control trials are the best form of evidence. Change initiatives often take place without any understanding or knowledge of the local outcomes before or after changes in practice and how the characteristics of the local population may affect them. So, in many cases, no one knows if outcomes improve or not when guidelines are changed. For the woman who comes to a

* Corresponding author at: Department of Obstetrics and Gynaecology, Palmerston North Hospital, 50 Ruahine Street, Palmerston North, 4442, New Zealand.
E-mail address: per.kempe@midcentraldhb.govt.nz (P. Kempe).

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specific unit to give birth, it is probably important that the actual outcomes of the unit are good, perhaps even more important than knowing that the guidelines used are in accordance with the latest randomized controlled trial. As midwives and obstetricians, we have a responsibility to practice evidence-based medicine but also to know the outcomes of our own practice and how our unit is performing in comparison with other units. To be able to do that comparison it has to be done in an objective and replicable way.

The Ten Group Classification System (TGCS) shown in Fig. 1, was introduced in 2001 to classify perinatal outcome but was first popularized for analyzing caesarean section (CS) rates [3]. The main idea of the system is to prospectively classify women into clinically relevant groups based on category of pregnancy (single cephalic, single breech, single oblique or transverse lie, multiple pregnancy), previous obstetric record (nulliparous, multiparous, multiparous with a previous CS), course of labour and delivery (spontaneous labour, induced labour, CS before labour) and gestational age (preterm or term). TGCS is now widely used, especially in Europe for analysing caesarean section rates and is, according to a systematic review, the most appropriate classification system for analyzing CS rates [4]. In 2015, the World Health Organisation (WHO), proposed the TGCS as a global standard for assessing Caesarean Section rates at health care facilities [5]. A recent study used the TGCS to analyse CS rates in the US nationwide cohort between 2005 and 2014 [6]. To every midwife and obstetrician, it is obvious that parity, lie of the baby, onset of labour and gestational age affect the outcome of the labour and delivery and since the TGCS is based on these factors it is a clinically relevant classification system which could be used to analyze other outcomes than CS rates [7,8]. Overall rates of outcomes are of limited value since one unit may have a higher proportion of multipara women or a lower proportion of premature births than others. Using the TGCS gives an important initial overview to ascertain the validity of the obstetric population before ensuring that as homogeneous groups as possible are compared whatever the size or the location of the unit.

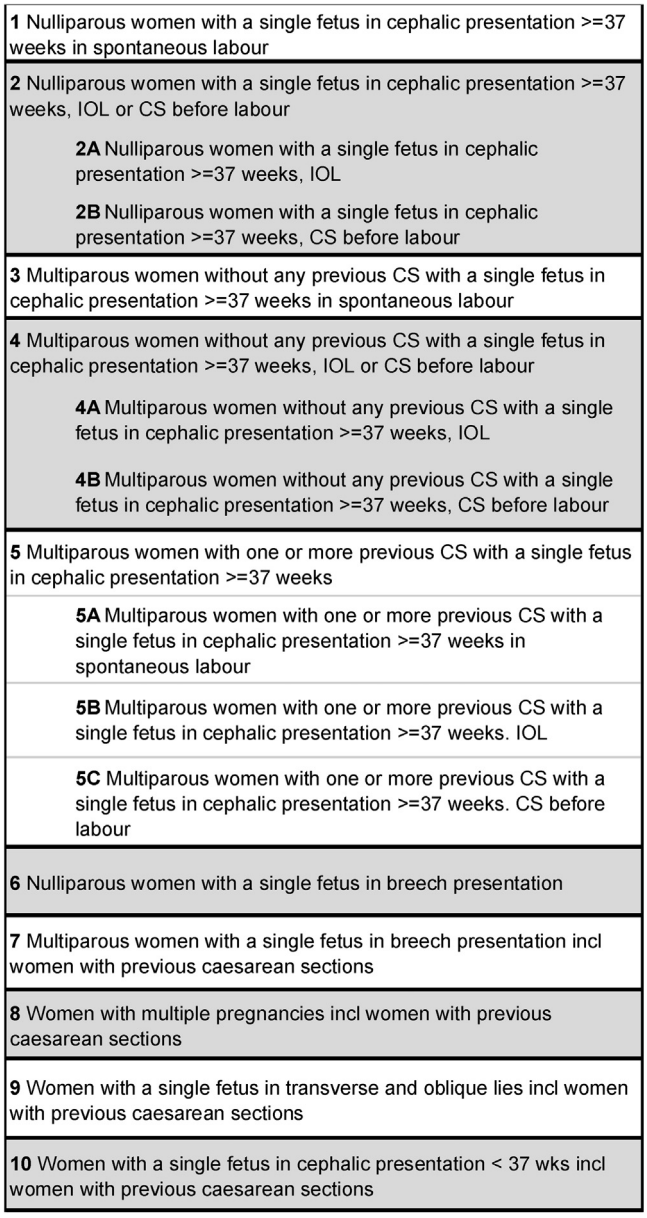

Fig. 1. The Ten Group Classification System.

Our study aims to show how the continuous audit of labour and birth events and outcomes based on the TGCS can be used as a tool to improve quality.

Method

Audit by collection, analysis and presentation of background data, events, and outcomes

On January 1 st, 2013, we started to collect outcome data of all labours and births in the unit in a database using the TGCS groups. To be able to register data for each patient individually in correct TGCS groups we needed to have a midwife collecting the data manually from our medical records since the statistical report module of the software is not able to produce this but inly CS rates of the Ten Groups. Since one of the problems of the unit was the bad experiences at the first birth we wanted to measure women's satisfaction with their care. To evaluate this, every woman was asked to rate the overall experience of giving birth on a Visual Analog Scale (VAS) from 0 to 10, where 10 was the best possible experience and 0 was the worst. This evaluation was done within 5 days after the delivery either when leaving the maternity ward or when attending a postnatal outpatient visit. The midwife asking the woman of her experience was not to be the one who looked after her during her labour. All data was analysed quarterly for Groups 1 and 3 and yearly for the smaller groups. The results were presented to all staff at meetings and as tables and graphs in the staff room of the labour ward. The results were also presented to patients as graphs on the walls of the labour ward and publicly in the annual report. We also decided to collect data on the staff's compliance to guidelines as, for example, documentation of cardiotocography (CTG) interpretation and diagnosis of labour. The data were presented as rates of the events and outcomes for each of the TGCS groups. In January 2014, when we had the complete results of the first year and invited an obstetrician and two midwives from NMH to visit and give us feedback on our work so far and make comparisons with the results from their unit. In this study we present data from 2013 to 2016 but the continuous audit is ongoing. Data were analysed in SPSS 23.0 (IBM Corporation 2015).

Continuous audit as a part of the daily routines

For every labour and delivery, the partogram was printed from the medical notes software and audited by a consultant obstetrician the following morning. The management and decisions that were made were discussed with the charge

midwife, registrar and obstetrician on call and other staff involved to learn from every case and to make sure the management was compliant with the policies. At every change of staff, three times daily, the midwives discussed the deliveries of the last shift. Once a week a meeting was held for all doctors and midwives of the unit and cases of importance for both midwives and obstetricians were reviewed.

Ethics

The publication of these data was approved by the Regional Ethics Committee of Umeå University.

Results

6398 women gave birth between January 1, 2013 and December 31, 2016. The yearly total number of deliveries, overall CS rate, number of deliveries and CS's in each group, CS rate of each group and contribution of each group to the overall CS rate are shown in Table 1 while Table 2–6 shows background data, events and outcomes in Groups 1, 2 A, 3, 4 A and 5 respectively.

The CS overall CS rate went from was 18,3% in 2013 and showed a falling trend down to 16,4% in 2016 (Table 1). The CS rate in Group 1 stayed on a low level while the Operative Vaginal Delivery (OVD)

Table 1
The total number of deliveries, the overall CS rate, the number of deliveries and CSs in each Robson group, the CS rate of each group and the contribution of each group to the overall CS rate.2013–2016.

Group	2013 280/1528 18,3%	Size of group	C/S rate	Contr of each gp
1	25/417	27,2%	6,0%	1,6%
2	51/130	8,5%	39,2%	3,3%
2A	35/114	7,5%	31,6%	2,3%
2B	16/16	1,0%	100,0%	1,0%
3	7/563	36,8%	1,2%	0,5%
4	28/120	7,9%	23,3%	1,8%
4A	1/93	6,1%	1,1%	0,1%
4B	27/27	1,8%	100,0%	1,8%
5	88/153	10,0%	57,5%	5,8%
5A	14/75	4,9%	18,7%	0,9%
5B	11/15	0,9%	73,3%	0,7%
5C	63/63	4,1%	100,0%	4,1%
6	26/28	1,8%	92,9%	1,7%
7	17/17	1,2%	100,0%	1,2%
8	12/21	1,4%	57,1%	0,8%
9	3/3	0,1%	100,0%	0,1%
10	23/76	5,0%	30,3%	1,5%
Group	2014 288/1525 18,9%	Size of group	C/S rate	Contr of each gp
1	37/405	26,6%	9,1%	2,4%
2	55/142	9,3%	38,7%	3,6%
2A	35/122	8,0%	28,7%	2,3%
2B	20/20	1,3%	100,0%	1,3%
3	10/582	38,2%	1,7%	0,7%
4	20/102	6,7%	19,6%	1,3%
4A	3/85	5,6%	3,5%	0,2%
4B	17/17	1,1%	100,0%	1,1%
5	95/163	10,7%	58,3%	6,2%
5A	15/76	5,0%	19,7%	1,6%
5B	5/12	0,8%	41,7%	0,3%
5C	75/75	4,9%	100,0%	4,9%
6	18/18	1,2%	100,0%	1,2%
7	14/18	1,2%	77,8%	0,9%
8	17/23	1,5%	73,9%	1,1%
9	1/1	0,1%	100,0%	0,1%
10	21/73	4,8%	28,8%	1,4%
Group	2015 253/1616 15,7%	Size of group	C/S rate	Contr of each gp
1	21/470	29,1%	4,5%	1,3%
2	55/167	10,3%	32,9%	3,4%
2A	31/143	8,8%	21,7%	1,9%
2B	24/24	1,5%	100,0%	1,5%
3	5/568	35,1%	0,9%	0,3%
4	25/128	7,9%	19,5%	1,6%
4A	7/110	6,8%	6,4%	0,4%
4B	18/18	1,1%	100,0%	1,1%
5	76/149	9,2%	51,0%	4,7%
5A	17/73	4,5%	23,3%	1,1%
5B	7/24	1,5%	29,2%	0,4%
5C	52/52	3,2%	100,0%	3,2%
6	23/23	1,4%	100,0%	1,4%
7	14/14	0,9%	100,0%	0,9%
8	11/22	1,4%	50,0%	0,7%
9	2/2	0,1%	100,0%	0,1%
10	21/73	4,5%	28,8%	1,3%
Group	2016 283/1729 16,4%	Size of group	C/S rate	Contr of each gp

Table 1 (*Continued*)

Group	2016 283/1729 16,4%	Size of group	C/S rate	Contr of each gp
1	26/488	28,2%	5,3%	1,5%
2	43/156	9,0%	27,5%	2,5%
2A	24/137	7,9%	17,5%	1,4%
2B	19/19	1,1%	100,0%	1,1%
3	7/608	35,2%	1,2%	0,4%
4	27/149	8,6%	18,1%	1,6%
4A	6/128	7,4%	4,7%	0,3%
4B	21/21	1,2%	100,0%	1,2%
5	93/183	10,6%	50,8%	5,4%
5A	15/80	4,6%	18,8%	0,9%
5B	9/34	2,0%	26,4%	0,5%
5C	69/69	4,0%	100,0%	4,0%
6	30/31	1,8%	96,8%	1,7%
7	13/15	0,9%	86,7%	0,8%
8	18/31	1,8%	58,1%	1,0%
9	4/4	0,2%	100,0%	0,2%
10	22/64	3,7%	34,4%	1,3%

Table 2
Base data, events and outcomes for women in Robson Group 1, 2013–2016. p-values are from x^2-test 2013 vs 2016.

Group 1	2013	2014	2015	2016	p
Nr of deliveries	417	405	470	488	
BMI (Median)		23,1	23,5	23,4	
Age ≥ 35 years	7,7%	7,4%	6,6%	8,4%	ns
ARM	44,8%	42,2%	47,2%	43,9%	ns
Oxytocin	56,8%	58,8%	56,2%	57,2%	ns
Epidural	49,9%	46,2%	47,4%	53,5%	ns
FBS	23,3%	19,1%	6,5%	2,5%	<.001
NVD	74,1%	74,9%	82,3%	81,6%	<.01
OVD	19,9%	16,0%	13,2%	13,1%	<.01
CS	6,0%	9,1%	4,5%	5,3%	ns
CS second stage		3,2%	1,1%	2,0%	
Apgar < 7 at 5 min	1,0%	0,7%	1,0%	1,0%	ns
pH < 7,00	2,1%	1,4%	1,8%	4,7%	<.05
Perinatal mortality	0,0%	0,0%	0,0%	0,2%	ns
Episiotomy	28,0%	26,9%	25,3%	17,6%	<.001
OASIS	5,5%	4,6%	4,2%	3,7%	ns
Labour > 12 hours	16,1%	7,4%	7,4%	10,6%	<.05
Fetal weight > 4000g	12,2%	16,8%	15,3%	17,4%	<.05
PPH > 1000 ml	3,1%	3,7%	4,5%	4,7%	ns
Door test classified according to guideline	97,6%	98,0%	95,3%	98,0%	ns
Risk classification according to guideline	77,5%	84,2%	80,9%	79,1%	ns
Diagnosis of labour according to guideline		80,2%	76,4%	78,1%	
Experience of labour/delivery (median)	8	8	8	8	ns
Experience of labour/delivery < 5	7,6%	8,8%	4,7%	4,4%	ns
Experience of labour/delivery > 6	76,3%	74,5%	83,9%	83,8%	<.01

rate decreased significantly causing the Normal Vaginal Delivery (NVD) rate to increase significantly from 74,1 to over 81,6% in 2016 (Table 2). The CS rates for women with induced labour was higher than for women in spontaneous labour during the four-year period (Table 1). In 2014, we changed our primary method for induction of labour in women with an unfavourable cervix from balloon catheter or vaginal Dinoprostone to low-dose oral Misoprostol and following this, the CS rate in Group 2 A decreased from 29,8%–17,5% while the rate of normal vaginal delivery increased from 50,9%–68,6% (Table 3). The already low CS rate in induced multiparous women, Group 4 A, did not change significantly (Table 5). In the largest group of women with a previous CS, Group 5, the rate of normal vaginal delivery increased significantly from 35,3%–45,4%, while the decreased rates of CS and OVD were not statistically significant (Table 6).

The rates of Artificial Rupture of Membranes (ARM), Oxytocin augmentation and Epidural anesthesia in Group 1 were stable over the four years and while the CS rate in this group stayed on a low level, the rate of assisted vaginal delivery decreased, resulting in an increased rate of normal vaginal delivery (Table 2). The ratio of women in Group 1 with a labour lasting longer than 12 h also decreased from 2013 to 2016.

In 2013, soon after the introduction of the continuous audit, we understood we had a relatively high rate of perineal tears grade 3 and 4, especially in nulliparous group 1 and we decided to try to address this. Firstly, we arranged a workshop in perineal protection for all midwives and obstetricians and secondly, we introduced the routine that two midwives should attend any vaginal birth, one who delivers the baby and one who protects the perineum from tearing. Subsequently, there was a decreasing trend of the rate of grade 3 and 4 tears in this group over the four years, although not statistically significant (Table 2). We also identified a high rate of episiotomies (Tables 2,3 and 5) and decided that the indication for each episiotomy had to be documented in the woman's notes and we started to audit the rate of this documentation. As shown in the tables, the episiotomy rates in groups 1, 2 A and 4 A decreased significantly after this intervention.

Following the introduction of the FIGO consensus guideline in intrapartum fetal monitoring [9] in 2015, the use of fetal blood

Table 3
Base data, events and outcomes for women in Robson Group 2 A, 2013-2016. p-values are from x^2-test 2013 vs 2016.

Group 2A	2013	2014	2015	2016	p
Nr of deliveries	114	122	143	137	
BMI (Median)		24,9	25,7		
Age ≥ 35 years	11,4%	20,5%	14,0%	19,0%	ns
ARM	62,3%	64,8%	46,2%	35,8%	<.001
Oxytocin	76,3%	70,5%	68,5%	66,4%	ns
Epidural	63,2%	73,8%	69,9%	66,4%	ns
FBS	34,2%	38,5%	7,0%	8,0%	<.001
NVD	50,9%	52,4%	66,4%	68,6%	<.05
OVD	17,5%	18,9%	11,9%	13,9%	ns
CS	29,8%	28,7%	21,7%	17,5%	<.05
CS second stage		4,1%	2,1%	2,2%	
Apgar < 7 at 5 min	4,4%	0,0%	1,4%	0,7%	ns
pH < 7,00	2,9%	1,9%	3,5%	4,6%	ns
Perinatal mortality incl IUFD	0,0%	0,0%	0,7%	0,0%	ns
Episiotomy	24,6%	24,6%	23,8%	16,1%	<.001
OASIS	7,9%	3,3%	5,6%	6,6%	ns
Labour > 12 hours	6,2%	6,6%	5,6%	5,9%	ns
Fetal weight > 4000g	27,4%	19,7%	13,3%	23,4%	ns
PPH > 1000 ml	8,8%	7,4%	4,9%	6,6%	ns
Door test classified acoording to guideline	98,2%	95,1%	99,3%	97,8%	ns
Experience of labour/delivery (median)	7	7	8	8	ns
Experience of labour/delivery < 5	14,5%	8,7%	11,1%	9,3%	ns
Experience of labour/delivery > 6	54,2%	67,4%	77,8%	72,0%	<.01

Table 4
Base data, events and outcomes for women in Robson Group 3, 2013–2016. p-values are from x^2-test 2013 vs 2016.

Group 3	2013	2014	2015	2016	p
Nr of deliveries	563	582	568	608	
BMI (Median)		24,2	24,2	24,3	
Age ≥ 35 years	20,1%	17,0%	21,8%	22,9%	ns
ARM	40,7%	38,5%	39,4%	34,5%	<.01
Oxytocin	9,8%	16,0%	14,8%	10,9%	ns
Epidural	11,0%	14,1%	13,4%	14,1%	ns
FBS	5,9%	4,1%	1,9%	1,0%	<.001
NVD	95,9%	96,4%	97,3%	97,2%	ns
OVD	1,8%	1,9%	1,8%	1,6%	ns
CS	1,2%	1,7%	0,9%	1,2%	ns
CS second stage		0,5%	0,2%	0,3%	
Apgar < 7 at 5 min	0,2%	0,5%	0,7%	0,2%	ns
pH < 7,00	1,1%	0,4%	0,6%	1,0%	ns
Perinatal mortlity incl IUFD	0,0%	0,0%	0,0%	0,0%	ns
Episiotomy	4,4%	4,6%	4,4%	3,8%	ns
OASIS	1,1%	1,7%	1,1%	0,7%	ns
Labour > 12 hours	0,4%	0,0%	0,6%	0,3%	ns
Fetal weight > 4000g	22,5%	26,5%	25,0%	23,7%	ns
PPH > 1000 ml	2,8%	3,1%	3,4%	2,6%	ns
Door test classified according to guideline	91,5%	92,8%	88,6%	92,3%	<.01
Risk classification according to guideline	71,2%	77,7%	70,2%	77,8%	
Diagnosis of labour according to guideline		72,7%	65,8%	73,0%	
Experience of labour/delivery (median)	9	8	9	9	
Experience of labour/delivery < 5	3,0%	4,1%	2,1%	3.3%	ns
Experience of labour/delivery > 6	85,2%	84,8%	91,5%	90,1%	<.05

sampling (FBS) decreased significantly in all presented groups. The percentage of babies born with an arterial cord pH below 700 has increased significantly in group 1 but not in any other group while the rate of Apgar below 7 at 5 min has not changed in any group, neither has the perinatal mortality rate including intrauterine fetal death (IUFD) (Tables 2–6). There was no intrapartal death during the four years.

Over the four years the rates of compliance to policies and guidelines has been stable with rates of door test CTG done according to the guideline above 90% and rates of risk classifying and diagnosing labour between 70 and 85% for all groups (Tables 2–5).

The reported experience of labour and birth improved significantly in groups 1,2 A, 3 and 5 with a higher proportion of women with a high rating of their experience in 2016 compared to 2013 while the experience did not change significantly in group 4 A (Tables 2–6).

Comment

Good quality in maternity care, apart from a healthy mother and child, may be defined differently due to social and cultural settings. For some it may mean the possibility to choose the date for a pre-labour cesarean section, for others, to have the

Table 5
Base data, events and outcomes for women in Robson Group 4 A, 2013–2016. p-values are from x^2-test 2013 vs 2016.

Group 4A	2013	2014	2015	2016	p
Nr of deliveries	93	84	110	128	
BMI (Median)		26,2	27,1	26,8	
Age ≥ 35 years	29,8%	27,1%	28,3%	33,6%	ns
ARM	73,4%	70,6%	56,4%	53,1%	<.05
Oxytocin	57,4%	43,5%	42,7%	35,9%	<.05
Epidural	29,8%	32,9%	32,7%	25,0%	ns
FBS	11,7%	10,6%	6,4%	3,1%	<.05
NVD	93,6%	94,1%	85,4%	93,0%	ns
OVD	4,3%	2,4%	8,2%	2.3%	ns
CS	2,1%	3,5%	6,4%	4.7%	ns
CS Second stage		1,2%	1,8%	0,0%	
Apgar < 7 at 5 min	0,0%	3,5%	3,6%	0,0%	ns
pH < 7,00	0,0%	0,0%	0,9%	1,9%	ns
Perinatal mortality incl IUFD	1,1%	3,6%	2,7%	0,8%	ns
Episiotomy	6,5%	7,1%	5,5%	0,8%	<.001
OASIS	3,2%	1,2%	0,9%	2,3%	ns
Labour > 12 hours	0,0%	0,0%	0,0%	0,0%	ns
Fetal weight > 4000g	34,0%	38,1%	30,9%	28,1%	ns
PPH > 1000 ml	3,2%	3,5%	6,3%	3,9%	ns
Door test classified acoording to guideline	96,8%	95,3%	96,4%	96,1%	ns
Experience of labour/delivery (median)	8	9	9	9	
Experience of labour/delivery < 5	4,5%	6,3%	8,7%	6,0%	ns
Experience of labour/delivery > 6	81,8%	84,1%	82,6%	88,0%	ns

Table 6
Base data, events and outcomes for women in Robson Group 5, 2013–2016. p-values are from x^2-test 2013 vs 2016.

Group 5	2013	2014	2015	2016	p
Nr of deliveries	153	163	149	183	
BMI (Median)		25,9	25,0	25,5	
Age ≥ 35 years	35,9%	33,1%	26,8%	36,1%	ns
ARM	22,9%	25,2%	29,5%	21,3%	ns
Oxytocin	26,1%	28,2%	27,5%	21,9%	ns
Epidural	22,9%	27,6%	28,2%	28,4%	ns
FBS	16,4%	12,2%	3,4%	1,1%	<.05
NVD	35,3%	34,4%	43,0%	45,4%	<.05
OVD	7,2%	7,3%	6,0%	3,8%	ns
CS	57,5%	58,3%	51,0%	50,8%	ns
CS Second stage		2,5%	1,3%	0,5%	
Apgar < 7 at 5 min	2,5%	2,8%	1,4%	2,2%	ns
pH < 7,00	1,4%	1,2%	1,4%	3,3%	ns
Perinatal mortality incl IUFD	0,0%	0,0%	0,0%	0,0%	ns
Episiotomy	9,3%	12,9%	9,4%	7,7%	ns
OASIS	2,7%	2,5%	2,0%	3,1%	ns
Labour > 12 hours	6,0%	4,2%	3,7%	1,1%	ns
Fetal weight > 4000g	22,2%	24,9%	22,1%	18,0%	ns
PPH > 1000 ml	5,6%	3,7%	5,4%	6,0%	ns
Experience of labour/delivery (median)	8	8	9	9	
Experience of labour/delivery < 5	5,2%	5,0%	5,3%	2,4%	ns
Experience of labour/delivery > 6	75,0%	89,1%	83,3%	87,8%	<.05

same midwife during antenatal care and in labour or the possibility to have a midwife attending a home delivery. In our unit, we define good obstetric quality as a high rate of healthy mothers and babies, a high rate of spontaneous vaginal deliveries with a low rate of anal sphincter tears and a positive overall experience. We try to provide one-to-one care for all women in active labour.

The main aim of the quality improvement project was to establish an ongoing audit of events and outcomes of all labours and deliveries based on the TGCS and to use this information to guide management and improve quality. With the knowledge of our own results comes the possibility to continuously change guidelines based on the outcomes you have in combination with contemporaneous evidence [10]. For example, we realised after the first year that we had a high rate of cesarean section in the second stage of labour. This lead to changes of our guideline on the management of the second stage. Another example is the introduction of oral misoprostol for induction of labour (IOL) in 2014. In group 2 A and 4 A, we thereafter saw a lower CS rate and a higher NVD rate while the rate of babies with Apgar < 7 at 5 min did not change (Tables 3 and 5).

We also wanted to raise the normal vaginal delivery rate and give women a good experience of giving birth. In four years the rate of NVD increased, particularly in Group 1, 2 A and 4 A. During this time, the women's experience of giving birth in our unit improved. This has been achieved by the introduction and use of strict

guidelines, a higher grade of independency in decision-making for midwives, supported by a charge midwife, the responsibilities of senior obstetricians, regular follow-up of outcomes and auditing on different levels. The rate of Oxytocin augmentation in group 3 was higher in our unit than in an Irish and a Norwegian unit but lower than in a Slovenian national cohort with no major differences in mode of delivery [8].

The OASIS rate in nulliparous women with a baby in cephalic presentation at term (Groups 1 and 2) has decreased during the studied time period but is still higher than in some other European reports [7,8,11], although lower than the mean Swedish rate [12]. The rate of episiotomy has traditionally been high in our unit compared to other Swedish units but low in comparison to units in other countries [8,11]. The encouragement of a less frequent use and the introduction of a routine to document the indication for each episiotomy and to audit the rate of documentation is an example of how just the continuous audit in itself is a tool to improve outcomes since it has made the episiotomy rate decrease over the four year period. In the light of the large Finish study showed which showed that episiotomy reduces the risk of OASIS at first vaginal birth [11], we have not seen an increased OASIS rate in groups 1 and 2 A as a result of fewer episiotomies.

The dramatic decrease in the use of FBS (Tables 2–5) is the result of updated guidelines for CTG interpretation based on the new FIGO guidelines [9]. This may be a part of the explanation of the lower rates of CS and OVD in 2016. Although the rates of low Apgars at 5 min have not increased, we did see a higher rate of umbilical artery pH under 7 in group 1 in 2016 (Table 2). The perinatal mortality including IUFD, did not increase significantly in any group (Tables 2–6). This points out the importance of the continuous analysis of multiple outcomes for mothers and babies, but there are a number of other events and outcomes which would be interesting to follow over time and to compare with other units. We did, for example, not collect data on hypoxic-ischaemic encephalopathy, admissions to the Neonatal Intensive Care Unit (NICU) or the rate of blood transfusion to women during the four years. There is a risk that we have unknown outcomes which would be useful to know to improve management and quality. However, having set up the framework for the continuous audit is the first step and various parameters could be added over time.

Our way of measuring the women's experience of giving birth could also be criticized. There are other, more sophisticated, ways of investigating this subject [13,14] and the main drawback with our measurement is probably that the women rate their experience too soon after giving birth. On the other hand, we have a very high response rate with 80% of all women having rated their birthing experience in 2016. We believe this gives strength to our data. The method has also been shown to predict more complex childbirth experience scores at a later stage [15].

We have been deeply inspired by the work done by the team at National Maternity Hospital in Dublin, Ireland and have chosen a way of management which in many ways resembles their way of handling labour and delivery [16,17]. The maternity unit at Linköping University Hospital, Linköping, Sweden has also made great impact on our unit, especially in management of the labour ward with focus on the team and audits [18]. However, we don't believe there is a single way to manage labour and delivery to achieve good outcomes and high quality. There are many possible methods to reach a high standard care in labour and delivery and others may have better results than we do using other guidelines. We are convinced though, that every unit should have a system to collect and analyze outcome data in a way that allows comparisons to the outcomes of other units. In this way, we will all be able to learn from each other, no matter how large or small the units are and no matter where in the world it is situated. In Sweden, the TGCS has been used nationwide for more than 15 years to study CS rates and there are annual TGCS meetings to compare CS rates between hospitals. Knowing your outcomes in particular in relation to parity is the key to good counseling of patients. A woman who goes into labour and gives birth in a unit has the right to know what to expect. Hence, we decided to analyse all outcome data according to the TGCS. This makes it possible to compare our rates of specified events and outcomes in labour to other units who also present various data in TGCS groups [7]. As in a previous study [8], our results show that not only CS rates but also other outcomes are different between the TGCS groups. This may change over time and it may vary between units. With confidence in our results and with an increased knowledge of the quality in our service we encourage other units to use the TGCS for analyses of events and outcomes in labour and delivery and to present the results for us all to learn from each other to improve quality of care for all women and babies.

Conflict of interest

The authors report no conflict of interest.

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