Received: 9 January 2019 | Revised: 8 May 2019 | Accepted: 13 May 2019

DOI: 10.1111/jep.13208

ORIGINAL PAPER

WILEY Journal of Evaluation in Clinical Practice
International Journal of Public Health Policy and Health Services Research

Value-based health care in obstetrics

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Abstract

Rationale, Aims, and Objectives: We strive to maximize outcomes that are relevant to the women who deliver in our hospital. We demonstrate a practical method of using value-based health care (VBHC) concepts to analyse how care can be improved.

Method: Using International Consortium of Health Outcome Measurements (ICHOM) set, a practical outcome set was constructed for women who go into spontaneous labour at term of a singleton in cephalic presentation and used for benchmarking. We included data on interventions that are major drivers of outcomes. Data from two hospitals in Amsterdam and for The Netherlands for 2011 to 2015 were collected.

Results: Benchmarking of readily available data helped identify a number of statistically significant and clinically relevant differences in obstetric outcomes. Caesarean section rate was significantly different at 13.7% in hospital 2 compared with 11.5% in hospital 1 with similar neonatal outcomes. Third and fourth degree tearing rates were significantly higher for hospital 1 at 5.5% compared with 3.6% for hospital 2 and the national average of 3.5%. On the basis of the guidelines, literature, and discussion, initiatives on how to improve these outcomes were then identified. These include caesarean section audit and guidelines regarding caesarean section decision making. In order to reduce the rate of third and fourth degree tearing, routine episiotomy on vaginal operative deliveries was introduced, and a training programme was set up to make care providers more aware of risk factors and potential preventive measures.

Conclusion: Defining, measuring, and comparing relevant outcomes enable care providers to identify improvements. Collection and comparison of readily available data can provide insights in where care can be improved. Insights from literature and comparison of care practices and processes can lead to how care can be improved. Continuous monitoring of outcomes and expanding the set of outcomes that is readily available are key in the process towards value-based care provision.

KEYWORDS

caesarean section, outcomes, quality improvement, Robson-1, value-based health care, VBHC

1 | RATIONALE, AIMS, AND OBJECTIVES

The desired outcome of pregnancy and labour is clear: a healthy mother and baby. What care is needed to achieve this is subject to opinion. Interpractice variation in outcomes and common interventions like caesarean section rates, episiotomies, and pain relief during labour is large[1-3] and cannot be explained by differences in patient characteristics alone.[4] Without information on outcomes and costs, this leaves room for the question: where is the patient better off? Value-based health care (VBHC) aims to integrate health outcomes and costs. Internationally, health outcomes are not necessarily better if spending is higher.[5] VBHC providers focus on producing the best health outcomes relative to costs. Value is defined as patient-relevant outcomes per dollar spent for a specific medical condition over the full cycle of care.[6,7] Instead of focussing on the relative merits of one intervention over the other, it focusses on short- and long-term clinical outcomes of all care provided including the utility and disutility of that care to patients.

Through comparison of outcomes and costs at clinic and practitioner level and over time, we can identify where care can be improved. A fair comparison of outcomes requires that patients being compared are relatively homogeneous or that outcomes are adjusted for case mix. Depending on how care is organized, comparing outcomes across the whole care chain may imply comparing outcomes of care provided by multiple (subsequent) care providers.

Benchmarking with reported outcomes from literature may provide further insight in where value of care can be improved. Once clear targets for improvement have been identified, the next step is to determine how to realize these improvements. Defining and testing hypotheses on own data, analysis of process differences between hospitals, or simply using existing evidence from literature as well as best practices may aid in identifying how to improve outcomes.

Research has been done on implementation of VBHC in other areas but not in the field of obstetrics. How do we use VBHC concepts in practice; how do we identify not only where the value we provide to patients differs from other providers but also why we differ and how we can improve care for all our patients? In this paper, we aim to demonstrate a practical approach to VBHC for obstetrics and demonstrate what is necessary to learn through benchmarking.

2 | MATERIALS AND METHODS

2.1 | Setting

In The Netherlands, obstetric care has an echelon system. Healthy women with a low-risk profile enter the primary care system, and their deliveries are assisted by community midwives at home, in birth centres, or at the hospital. In case complications arise or pathology is suspected, women are referred to a gynecologist. Monitoring of high-risk women is performed in general hospitals (secondary care) and academic referral centres (tertiary care). These deliveries will primarily be assisted by clinical midwives or residents in obstetrics and gynecology, under supervision of an obstetrician/gynecologist. Hospitals and individual midwifery practices collaborate in obstetric cooperations (OC) and agree on when and for what reasons to transfer care.

In VBHC, the focus lies on analysing outcomes across the whole value chain. In line with this thinking, in this paper, we compare outcomes for obstetric cooperations of two recently merged hospitals: the former Sint Lucas Andreas Hospital (hospital 1) and the Onze Lieve Vrouwe Gasthuis (OLVG, hospital 2), and national outcomes. Each obstetric cooperation includes one hospital and a number of affiliated but independent midwifery practices. Outcome data are presented for the entire OC, for hospital-led deliveries, and for midwifery-led deliveries. The rationale for this is that in this particular setting, both the individual performance and the cooperation between hospital and midwifery practice influence outcomes.

2.2 | Group and outcome definition

We collected outcomes for women classified as category 1 in the Robson classification: nulliparous women who go into spontaneous labour with a singleton in cephalic procedure at term.[8] We used the International Consortium of Health Outcome Measurements (ICHOM) outcome set as a starting point, as these are developed by a worldwide expert group of healthcare professionals and patients.[9] We excluded from this set the indicators that pertain to premature birth as we focus on women who deliver at term. Quite a few of the ICHOM indicators are not currently collected, notably Patient-Reported Outcome Measures (PROMs). We added to our set the adverse Outcome Index-5 proposed by Perined, the Dutch organization responsible for registering perinatal information.[10] This index includes perinatal mortality, admission to neonatal intensive care, Apgar score* below 7 after 5 minutes, third or fourth degree tearing†, episiotomy, and hemorrhage post-partum‡. Table 1 shows the full set of ICHOM indicators and which we were able to collect.

We also collected data on interventions: mode of delivery, episiotomy, and oxytocin augmentation. These interventions have a high impact on patient-related outcomes, and it is our belief that a higher intervention rate without better outcomes for mother or child provides a clear target for value improvement.

2.3 | Outcome data

Data were collected and aggregated over the 5-year period (January 2011-December 2015) for Robson-1 classified women[8] nationwide and for the obstetric cooperation of hospitals 1 and 2. We gathered data using Perined Insight.[10] Obstetric care providers in The Netherlands register information about every pregnancy and birth through Perined. Perined Insight data are designed to give care providers insight into their own performance. We used a Pearson's chi-squared

*Apgar score is a measure to summarize the health of newborn children, evaluating newborns on skin color, pulse rate, reflex, activity, and respiratory effort.

†Third and fourth degree perineal ruptures involve tearing of the anal sphincter and anal mucosa.

‡Defined as more than 1000 mL of blood loss.

TABLE 1 International Consortium of Health Outcome Measurements (ICHOM) set of outcomes for obstetrics patients—availability and substitute

ICHOM Category	Item	Supporting Information	Available	Substitute
Survival	Maternal death	WHO definition	Yes	
	Still birth	WHO definition	Not applicable	
	Neonatal death	WHO definition	Yes	
Severe maternal morbidity	Maternal need for ICU	ICU admission	No	
	Maternal length of stay	Number of consecutive days in the hospital from delivery to discharge	Yes	
	Late maternal complication	Admission or readmission within the first 42-d post-partum for childbirth-related complications	No	Third/fourth degree tearing
	Transfusion	Any transfusion of red blood cells within the first 42-d post-partum	No	Blood loss >1000 mL
Neonatal morbidity	Spontaneous preterm birth	Live birth at <37 + 0-wk gestation	Not applicable	
	Iatrogenic preterm birth	Caesarean or labour induced at <37 + 0-wk gestation	Not applicable	
	Oxygen dependence	Administration of O_2 by any route for greater than 24 h through 28 d of life	No	
	Neonate length of stay	Number of consecutive days in hospital from birth through 28 d of life	No	
	Birth injury	As defined by the California Maternal Quality Care Collaborative	No	Apgar score <7 at 5 min
Patient-reported health status	Health-related quality of life	Tracked via the PROMIS Global10	No	
	Incontinence	Tracked via either the ICIQ-SF or Wexner	No	
	Pain with intercourse	Tracked via PROMIS SFFAC102	No	
Breastfeeding	Success with breastfeeding	Exclusive or partial breastfeeding	No	Breastfeeding on day 7
	Confidence with breastfeeding	Option to track via the BSES-SF	No	
Role transition	Mother-infant attachment	Tracked via the MIBS	No	
	Confidence with role as a mother	Woman's confidence in caring for her baby	No	
Mental health	Post-partum depression	Assessed via the PHQ-2 with optional follow-up with the EPDS	No	
Satisfaction with care	Satisfaction with the results of care	N/A	No	
Healthcare responsiveness	Confidence as an active participant in healthcare decisions	N/A	No	
	Confidence in healthcare providers	N/A	No	
Birth experience	Birth experience	Assessed via the BSS_R	No	

Abbreviations: ICU, intensive-care unit; N/A, not applicable; WHO, World Health Organization.

test for calculating whether binary outcomes differed significantly. We used a *P* value below .05 to define statistical significance.

2.4 | Ethical approval

Local ethical committee approved this study and specified that further ethics approval was not necessary for this study as it did not involve any intervention imposed on human test subjects and we did not use patient-specific data or access individual patients' medical records but used register data that could not be traced back to individual patients.

3 | RESULTS

3.1 | Patient population

In The Netherlands, almost 30% of all women who deliver in The Netherlands belong to the Robson-1 category. Table 2 summarizes the main characteristics of these women.

TABLE 2 Patient characteristics 2011 to 2015

Characteristics of Included Women and Nationwide	The Netherlands	Obstetric Cooperation Hospital 1	Obstetric Cooperation Hospital 2
Total deliveries, n	878 713	17 954	17 916
Robson-1 women, n (%)[a]	246 116 (28)	6075 (34)	5736 (32)
Mean age, y	28.7	30.8	31.3
Age >35, %	11	20	23
Ethnicity: non-Dutch, %	19	20	31
Mean gestational age at delivery, d	280	281	280
Gestational diabetes, %	1	1	1
Hypertension, %	4	3	3

[a]Robson-1: Women who go into spontaneous labour, at term, with a singleton in cephalic presentation.

3.2 | Mode of delivery and interventions

Data show that caesarean section rates were higher nationally (9.7%) compared with OC hospital 1 (8.3%) (*P* < .001) and compared with OC hospital 2 (9.4%) (*P* = .44) (Table 3). If we only look at hospital-led deliveries, caesarean section rates were significantly different, 11.5% for hospital 1 compared with 13.7% for hospital 2 (*P* = .002). Episiotomies were used relatively infrequently in both hospitals compared with the national average.

3.3 | Maternal outcomes

There were no maternal deaths in either hospital (Table 4). Postpartum hemorrhage—blood loss over 1000 mL—is similar at the OC level. Third and fourth degree tearing was significantly higher in OC of hospital 1 compared with hospital 2 (*P* = .001) and nationally (*P* < .001) (see Section 3.5). We were not able to collect data on PROMs or patient satisfaction of care. This is a clear target for improvement going forward.

3.4 | Neonatal outcomes

The rates of neonatal mortality did not differ (Table 4), except for rate of neonatal death for midwifery practices in OC of hospital 1. Apgar score below 7 after 5 minutes was significantly different in OC of hospital 2 (1.6%) compared with the national rate (1.3%, *P* = .048) but not compared with OC of hospital 1 (1.4%, *P* = .37).

3.5 | Potential improvement: Rate of tearing

Rate of third and fourth degree tearing is significantly higher in OC hospital 1 than in OC hospital 2 (5.7% vs 4.4%, *P* = .001) and more pronounced for hospital-led deliveries (5.5% vs 3.6%, *P* < .0001) (Figure 1). When looking at only instrumental deliveries, this difference is even larger. We hypothesized that this may in part be driven by a difference in episiotomy rates.[11] Further analysis showed that episiotomy rate was only 72% in instrumental deliveries for hospital 1 compared with 93% for hospital 2. We further hypothesize that this

TABLE 3 Mode of delivery and interventions 2011 to 2015

	Obstetric Cooperation (OC)			Hospital		
Mode of Delivery or Intervention	Netherlands	OC Hospital 1	OC Hospital 2	Netherlands	Hospital 1	Hospital 2
Total deliveries, n	246 116	6075	5736	180 456	4397	3954
Caesarean section rate, %	9.7	8.3*,**	9.4**	13.2	11.5*, **	13.7**
Operative vaginal delivery rate, %	17.5	14.3*	14.0*	23.8	19.8*	20.4*
Vaginal delivery rate, %	73	77*	77*	63	69*, **	66*, **
Episiotomy rate, %	40	24*, **	31*, **	47	31*, **	41*, **
Oxytocin augmentation rate, %	46	46**	50*, **	63	63**	73*, **

**P* < .05 (significant difference between this hospital's average and the national average).

***P* < .05 (significant difference between the two hospitals).

TABLE 4 Outcomes per care provider

Outcome	Obstetric Cooperation			Midwifery Practices			Hospital		
	Netherlands	OC Hospital 1	OC Hospital 2	Netherlands	OC Hospital 1	OC Hospital 2	Netherlands	Hospital 1	Hospital 2
Total deliveries, n	246 116	6075	5736	65 660	1678	1782	180 456	4397	3954
Maternal death, n	3	0	0	0	0	0	3	0	0
Hemorrhage post-partum >1000 mL, %	6.7	6.3	6.4	5.0	6.7*, **	4.0**	7.3	6.1*, **	7.5**
Third and fouth degree tearing rate, %	4.1	5.7*, **	4.4**	5.5	6.4	5.9	3.5	5.5*, **	3.6**
Neonatal death,[a] %	0.1	0.1	0.1	0.0	0.1*	0.1	0.1	0.1	0.1
APGAR[b] 5 min <7, %	1.3	1.4	1.6*	0.5	0.5	0.6	1.6	1.7	2.1*

Abbreviation: OC, obstetric cooperation.

[a]Death during labour or up to 7 days after delivery.

[b]Score summarizing health of newborn, scoring skin color, pulse rate, reflex irritability, activity, and respiratory effort.

*$P < .05$ (significant difference between this hospital's average and the national average).

**$P < .05$ (significant difference between the two hospitals).

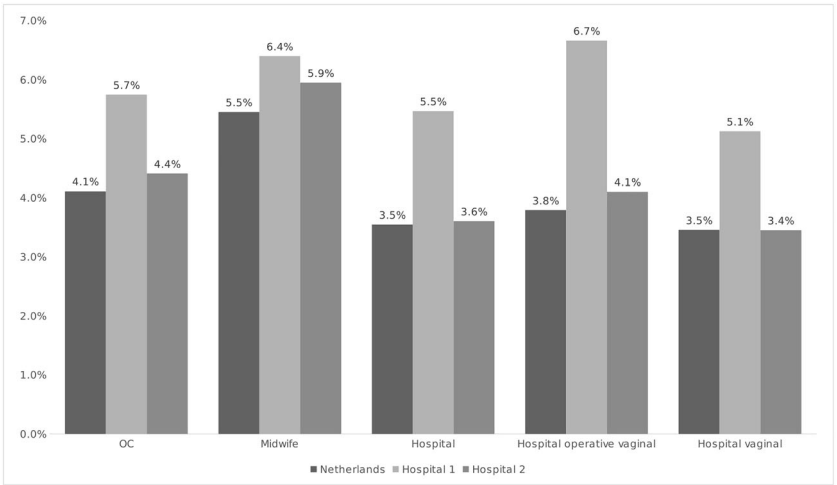

FIGURE 1 Rates of third and fourth degree tearing by care provider and mode of delivery

difference is partly driven by the difference in training of obstetric care providers. In OC of hospital 2, a perineal support training of all obstetric care providers—including those of midwifery practices—in line with Laine[12,13] has been in place for several years.

3.6 | Potential improvement: Rate of caesarean section

Caesarean section rate was lowest in OC hospital 1, and that difference increases when only looking at hospital-led deliveries (Table 3). The lower rate of caesarean section in hospital 1 was not accompanied by lower Apgar scores in any mode of delivery. We hypothesized that there may be a difference in the reason for caesarean section due to differences in care practice—for example, how many hours of lack of progression in labour is accepted or how foetal distress is defined. We noted that hospital 1 has a relatively large proportion for which no clear indication was registered (Table 5). Hospital 2 had a relatively high percentage of secondary caesareans based on dystocia of labour compared with both hospital 1 and nationally. It was hypothesized that this could be partly driven by the difference in the way midwifery

TABLE 5 Registered indications for secondary caesarean section (SCS)

Indication	SCS The Netherlands	SCS Hospital 1	SCS Hospital 2
Number of SSC	23 862	506	539
No. documented indication, %	7	14*, **	0*, **
Foetal distress, %	21	31*, **	19**
Foetal distress + dystocia, %	13	0*, **	10*, **
Dystocia of labour, %	57	53**	71*, **

*$P < .05$ (significant difference between this hospital's average and the national average).

**$P < .05$ (significant difference between the two hospitals).

practices and hospitals work together. In women who are transferred during labour from midwifery practice to hospital care, caesarean section rates were significantly higher in OC hospital 2 with 14% compared with hospital 1 with 12% (Figure 2, $P = .001$). Further hypotheses could not be tested on own data, so we looked towards best practices from literature in order to formulate improvement initiatives, which are discussed in the comments section.

4 | DISCUSSION

There are an increasing number of international examples of VBHC medical practice[14,15] and in this paper we have presented a practical approach of using VBHC concepts to identify areas of improvement for individual obstetrics care providers.

Comparing standardized outcomes and interventions for relatively homogeneous patient subgroups enables care providers to analyse where their care may be improved. We advocate using a standard outcome set—notably that of ICHOM—as a starting point of determining which outcomes to collect. As time progresses and more care providers collect and publish these standardized outcomes, the potential of value improvement through benchmarking increases. Subgroup comparison of homogeneous patients—as opposed to comparison across all patients—allows for an intuitive understanding of care provided and reduces the need for case-mix correction. In our dataset, there were differences in the percentage of women aged 35 or older and of non-Dutch ethnic descent. These differences are a reflection of the population the hospital serves. Both age and ethnicity will likely impact outcomes to different degrees. If differences are large, further subgroup analysis or case-mix correction should be carried out.

The Robson classification is useful for comparing obstetric outcomes. Its categories are comprehensive, mutually exclusive, and based on objective criteria.[2,16,17] Robson-1, nulliparous women who go into spontaneous labour with a singleton in cephalic position at term, is of specific interest due to the relatively large size of this group and the benefits of improving health and reducing interventions in first time delivery on subsequent deliveries.[18,19]

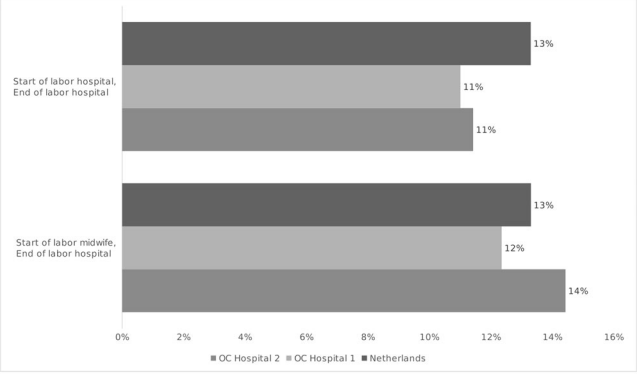

FIGURE 2 Caesarean section rates for The Netherlands, OC hospital 1, and OC hospital 2 based on care provider at start of labour

Per subgroup, an internationally agreed upon set of outcomes should ideally be defined and reported. Many of the ICHOM outcomes (nine) are not publicly available for comparison between care providers or even regularly collected by individual care providers. In our approach, we have substituted some by data that are readily available and were already able to identify a number of key value improvements that we are currently implementing. One of them is that we aim to improve outcome data availability and want to benchmark with more hospitals. We also included interventions as these are a logical focus of value improvement. Outcomes should include both clinical outcomes, PROMs, and satisfaction of care. PROMs and satisfaction of care data were not available in our two hospitals. Using patient questionnaires may provide valuable information on how to improve value.[20]

Care providers could use this benchmarking as a tool to set initial goals for improvements. There may be trade-offs between outcomes, some outcomes—even if significantly different from those of other hospitals—may not have a substantial clinical impact. In general, logical targets are outcomes that are significantly worse than those of others, those that have high impact (mortality and serious morbidity), those that can be improved without much financial cost or potential negative side effect, and those with involve large numbers of patients are clear first targets as these will improve value the most.

Value-based health care does not immediately answer how outcomes may be improved. A high caesarean section rate may be the result of high-risk patients, of (lack of) earlier interventions, or the way care is organized or personal assessment of risks and benefits. Formulating and testing hypotheses based on what is known in literature about risk factors for unwanted outcomes and efficiency and efficacy of interventions can help identify how to improve outcomes. For our own results, we were able to test a few hypotheses on the underlying drivers of difference in rate of tearing but were not able to do so for caesarean section rates. Evaluating to what extend evidence-based guidelines are adhered to and analysing how insights from best practices in literature fit our own care practice are then starting points to formulate improvement initiatives.

4.1 | Application to our own practice

One of our main conclusions for our own practice is that we want better information on PROMs, patient (dis)utility of care, and a better connection between obstetric and neonatal outcomes. Key targets for improvement are reducing third and fourth degree tearing in hospital 1 for both instrumental and vaginal deliveries. Improvement initiatives include introduction of use of routine episiotomy during instrumental deliveries. The efficacy of this has been demonstrated in recent literature.[11] In addition, a perineal support training for all obstetric staff has been initiated in hospital 1, similar to techniques in hospital 2 and as described in literature.[12,21,22] Best published practice results[12,23-25] are rates of 1.2% to 3.4%. Data—including on presence of proven risk factors—are being collected prospectively to evaluate whether this results in the desired reduction.

Reducing caesarean section rates has also been set as a goal for the combined hospital. Overall caesarean section rate across the entire population above 15% is not found to be associated with improved neonatal outcomes.[26] Best practice rates that have been published for Robson-1 women[18] are as low[2] as 3% or 6.6%, although most published rates[27-30] are higher: 12.6 to 23.1%. Other centres have demonstrated that a combination of clear targets, training, and continuous feedback can result in reductions in caesarean section rates without an adverse effect on neonatal outcomes.[1,18,31,32] We have introduced a caesarean section audit in which decision making is analysed retrospectively. We are implementing more lenient definitions of dystocia of labour in line with World Health Organization (WHO) recommendations. Finally, we have introduced a bed-site intrapartum scalp sampling to evaluate foetal condition in order to improve on decision making use of foetal heart tracing only.[33,34]

The relatively high rate of neonates with a 5-minute Apgar score below 7 in hospital 2 raises questions about neonatal morbidity. Improvement here is focussed on better collection of neonatal outcome data in the short term and further action based on those data in the longer term.

4.2 | Strengths and limitations

A practical approach is provided to integrate the concept of value in a current medical setting for obstetric patients. This is the first paper on how value-based concepts might be used in the field of obstetrics. We have found one other paper that compared a set of outcomes across countries; this paper did not include discussion on what improvements could be formulated with the differences identified.[17] We also identified one paper on benchmarking outcomes for women with hypertensive disorders of pregnancy,[35] which has a similar aim for a different population. There are multiple papers reporting on single goal improvement initiatives regarding both reducing caesarean section rates[1,18,31,32] and reducing OASIS,[12,13,24] but these studies look at one specific outcome instead of considering a wider set of outcomes for a particular group of women. We used the ICHOM-standardized outcome set as an ideal and demonstrated that even without access to all these outcomes, it is possible to identify potential improvements. We propose how to identify which targets are most likely to result in the largest value improvement. Further, we offer methods in which to then identify how to improve value. Moving beyond identifying where care could be improved towards using practical ways to define how that improvement can be realized. We use both what is already known in literature and where further deep dive of own processes and outcomes is necessary. As a result, we have demonstrated a practical way that can be reproduced by others who also aim to improve value. In terms of limitations, we could not include data on all ICHOM outcomes. Quality of data is limited by using data collected as part of daily operations retrospectively. This is less relevant to more objective variables (patient characteristics and interventions used) and more relevant to more subjective outcomes like degree of tearing or post-partum hemorrhage. At this moment, we did not collect information on quality of life of our patients.

5 | CONCLUSION

Defining what outcomes are important to specific patient groups and benchmarking these outcomes result in clear targets for improvement of care. The ideal is to continuously and systematically compare a full set of patient-relevant outcomes between many care providers. Such systematic reporting is not available in practice, but improving where value can be improved is possible even with more limited availability of data. Once these areas are identified, evidence from literature on risk factors and efficacy of interventions, as well as comparing differences in more practical care between providers, helps in determining how these improvements can be realized. Using this practical VBHC approach, it was possible to identify a number of key areas of improvement for our patients and a number of improvement initiatives. We also identified that further insight is wanted and needed in longer-term patient-reported outcomes. We aim to take this step with a group of six peer hospitals we have an alliance with, allowing us to learn from one another, and we urge others to follow this example and move towards increased transparency in outcomes so that care can be improved across the board.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

FUNDING INFORMATION

No specific funding was obtained for this research.

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How to cite this article: Van Den Berg K, Dijksman LM, Keus SHJ, Scheele F, Van Pampus MG. Value-based health care in obstetrics. *J Eval Clin Pract*. 2019;1–8. https://doi.org/10.1111/jep.13208