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Patient-reported outcome and experience measures for quality improvement in pregnancy and childbirth care: a retrospective cohort study

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ABSTRACT

Background Patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) can highlight issues that remain unnoticed when using standard clinical quality indicators. However, estimations of the potential power of measuring PROMs and PREMs to identify unrecognised areas suitable for quality improvement are often limited by a lack of reliable real-world data. Here, we report on how the indicator set for PROMs and PREMs that was recently developed by the International Consortium for Health Outcome Measures can change perspectives on quality assessment in women receiving care for pregnancy and childbirth.

Methods PROMs and PREMs were captured 6 months after childbirth via an online survey in a single academic maternity unit in the Netherlands between 2018 and 2019. Indicators of abnormality were scored using predefined cut-off values established by a national consensus group. We used regression analysis to identify associations between PROMs, PREMs and healthcare use, and further stratified data to explore the distribution of indicators among relevant patient subgroups.

Results Of 2775 questionnaires, 645 were completed and linked to medical health records. Despite only 5% of women reporting overall dissatisfaction with care, suboptimal scores were often found; in birth experience for 32% of the population, and 42% who experienced painful sexual intercourse. Subgroup analysis further revealed associations with relevant indicators of quality of care; inadequate pain relief among women with preterm birth (OR 8.8), pain with sexual intercourse among women undergoing vaginal assisted delivery (OR 2.2) and women living in a deprived area had problematic birth experiences (coefficient −3.2).

Conclusion Use of PROMs and PREMs in pregnancy and childbirth care provides new insights on quality of care, resulting in potentially actionable targets for improvement not normally identified with standard clinical quality indicators. Implementation strategies and follow-up are needed to act on these findings.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Patient-reported outcome and experience measures (PROMs and PREMs) are increasingly recognised as key elements in patient-centred quality improvement. However, limited data exist on the prevalence of suboptimal PROMs and PREMs from well-sampled cohort data using predefined cut-off values for abnormality.

WHAT THIS STUDY ADDS

⇒ In this study, we unravel potential actionable insights for quality of care improvement among women who delivered at a maternity unit by linking the recently developed patient-reported indicator standard set for pregnancy and childbirth to care processes and patient characteristics.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Satisfaction with care is too generic and should be accompanied by specific PROMs and PREMs. In addition, our findings support the evaluation of PROMs and PREMs, but further refinement of definitions and validation of cut-offs in future research is needed.

INTRODUCTION

In several fields of medicine, including pregnancy and childbirth care, it is widely acknowledged that clinical outcome measures, for example, mortality and morbidity statistics or the number of hospital admissions, fail to capture the full picture of patient health and well-being needed for meaningful evaluation of quality of care. To solve this problem, systematic assessment of patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) is increasingly being suggested as a tool to better capture outcomes that matter to patients. This is believed to play a central role in the transition from volume-based to value-based healthcare (VBHC) in high-income countries.[1 2] Also in low-income and middle-income countries, PROMs and PREMs assessment is an important element

in the rising expectations on patient-centredness.[3] The International Consortium for Health Outcomes Measurement (ICHOM) has developed standard sets of patient-centred outcome measures, such as PROMs, PREMs and predefined clinical outcomes, for various medical conditions including pregnancy and childbirth care.[4]

PROMs and PREMs are best known as a tool to improve shared decision making at the individual patient level, but may also help to improve quality of care at the meso (patient group) level.[5 6] This is particularly useful in fields where clinical outcomes are generally favourable, that is, have a low frequency of serious adverse events. In pregnancy and childbirth care, current quality measures mostly focus on negative outcomes such as morbidity and mortality, while for most high-income countries these outcomes will be rare, and the majority of pregnancies are expected to be uneventful from a clinical perspective. Second, quality improvement in pregnancy and childbirth care in the Netherlands is challenged by its organisational design consisting of different, more or less independent, groups of care providers; primary care is provided by community midwives and secondary and tertiary care is provided by obstetric teams situated in hospitals. Most women receive care from both primary and secondary care providers during a single pregnancy, and both of these care providers are known to have widely different points of view on quality of care.[7–9] This is again further enhanced by the narrow focus on clinical outcomes, represented in the standard clinical quality indicators, which are mostly rare serious adverse events. Therefore, capturing PROMs and PREMs can provide a broader perspective on quality of pregnancy and childbirth care and there are several encouraging examples of initiatives of using PROMs and PREMs in the Netherlands.[10–13]

Before the standard set by ICHOM was developed, studies on implementation of patient-reported quality measures in pregnancy and childbirth care were limited to PREMs with heterogeneous national instruments, and PROMs specific for maternity care were lacking.[10–14] Our study uses uniform international PROMs and PREMs specific for pregnancy and childbirth, enabling comparative effectiveness analysis (eg, benchmarking). Nonetheless, a number of pitfalls remain that could undermine producing useful data, for example, accurate translation and cultural adaptation is required to prevent lack of consistency when aggregating data from each population.[15 16] Other inclusivity and equity issues in PROMs and PREMs collection are digital inclusion, literacy and health literacy. Implementation has also proven to be challenging on how the data should be used for clinical purposes, training clinicians on the validity and value of PROMs and PREMs and administration barriers among others.[17 18]

In this study, we aim to provide insight in the added value of PROMs and PREMs and its use for clinical purposes, by analysis of the ICHOM pregnancy and childbirth standard set. Outcomes of the standard set have recently been tested and appear to be feasible and reliable instruments for standardised outcome measurements.[19–22] However, little is known about the added value of implementing PROMs and PREMs for quality control in a real-world setting 6 months after childbirth, while this is a valuable time point to reflect on long-term recovery. Furthermore, the distribution of the scores on PROMs and PREMs among subgroups of patients and processes of care is unknown, while this information provides actionable insights for quality improvement. In order to bridge this research gap, we studied the distribution of the PROMs and PREMs of the ICHOM pregnancy and childbirth standard set 6 months post partum among women who delivered at a single academic maternity unit; as a single observational cohort, as well as across a number of relevant subgroups of women. Furthermore, we sought to assess associations of the PROMs and PREMs of the ICHOM standard set with patient, clinical and process indicators.

METHODS

Study design and setting

We explored frequencies of PROMs and PREMs of the ICHOM pregnancy and childbirth standard set by asking women who delivered a baby at our single tertiary obstetric referral centre via an online survey.[4] The standard set has been validated and translated for use in the Netherlands and is considered as a feasible instrument for PROM and PREM assessment by Dutch patients and obstetric professionals.[21 23] We measured the scores on PROMs and PREMs and linked these via unique identifiers to data on clinical outcomes, use of care and patient characteristics. This paper is written following the Strengthening the Reporting of Observational Studies in Epidemiology checklist.[24]

Study population

Women who delivered in 2018 and 2019 at a gestational age of at least 28 weeks were eligible. The other inclusion criteria were maternal age of at least 16 years old at the time of delivery and availability of an email address. Exclusion criteria were fetal death, neonatal death and termination of pregnancy, since the survey has not yet been validated for these groups. Women with multiple pregnancies were excluded to ensure that patient-reported data was linked to the corresponding medical health records. Surveys of women who could not be uniquely linked to medical health records were also excluded. The response rate was expected to be 20%.

Data collection

We emailed surveys through a web-based secure survey tool LimeSurvey and obtained written consent, as per ethics approval, to link and analyse the data for research purposes at the start of the questionnaire (online supplemental appendix A).[25] A reminder to fill in the questionnaire was sent via email 1 week after the initial invitation. While respondents had given birth 6–30 months before the survey date, women were asked to answer the

questions with reference to the 6 months postpartum time point, which is the fifth and last time point recommended by ICHOM. The survey started with general questions about casemix factors such as age, parity, ethnicity and their social network. Questions of PROMs about incontinence, pain with intercourse and mental health were asked at the end of the survey, because these subjects have been identified as taboo and were expected to cause most dropouts.[23] Data on clinical outcomes and process measures were derived from medical health records at our hospital. Therefore, data not directly registered at the time of delivery were incomplete for women who received pregnancy and childbirth care from multiple centres, concerning medical indications, lengths of stay, admission and visit rates.

Variables

PROMs and PREMs

Twelve PROMs and PREMs were included based on the ICHOM standard set validated for the Netherlands (table 1). A national-level working group, supported by the National Healthcare Institute, aims to implement the ICHOM standard set in seven obstetric care networks in the Netherlands, including our hospital, and they made the Dutch questionnaires and scoring guidelines publicly available.[26] A few domains have been added to the

Table 1 PROM and PREM structures

	Validated scoring tool	No of questions	Min score	Max score	Threshold for a suboptimal score	Interpretation ↑ score
Social support	SIMSS	1	0	3	Score≤1	↑ Social support
PROM						
Health-related quality of life	PROMIS-10	10	10	50	Total score ≤19 and/or pain score ≥3	↑ Quality of life
Mental health						
Screening	PHQ-2	2	0	6		↑ Depression risk
Follow-up	EPDS	10	0	30	Total score ≥10 and/or question 10 ≥2	↑ Depression risk
Urinary incontinence (UI)						
Screening	N/A	1	0	1		
Follow-up	ICIQ-SF	3	0	21	Total score ≥6	↑ Severity UI
Anal incontinence (AI)						
Screening	N/A	1	0	1		
Follow-up	Wexner	5	0	20	Question 1, 2, 3 or 5 ≥1	↑ Severity AI
Pain with intercourse	PROMIS_ SFFAC102	1	0	5	Score ≥2	↑ Impact of pain
Role confidence	N/A	1	1	5	Score ≤2	↑ Confidence
PREM						
Birth experience	BSS-R	10	0	40	Total score <25	↑ Better experience
Satisfaction with care	N/A	1	0	4	Score ≤1	↑ Satisfied
HCR and shared decision making	N/A	8	0	16	One or more questions answered with 0	↑ Better experience
Continuity of care	N/A	3	0	12	One or more questions answered with 1	↑ Better experience
Pain relief	N/A	2	0	6	Question 1=0 and/or question 2 ≤1	↑ Better experience
Partner involvement	N/A	2	0	10	One or more questions answered with 1	↑ Better experience

Grey shade are dependent questions: EPDS is asked if mental health screening with PHQ-2 ≥3, ICIQ-SF if urinary incontinence screening question=1, Wexner if anal incontinence screening question=1.
Continuity of care, pain relief, partner involvement and four questions in healthcare responsiveness and shared decision making were Dutch additions to the ICHOM standard set.
BSS-R, Birth Satisfcation Scale-Revised; EPDS, Edinburgh Postnatal Depression Scale; HCR, healthcare responsiveness; ICHOM, International Consortium for Health Outcomes Measurement; ICIQ-SF, International Consultation on Incontinence Questionnaire-Short Form; N/A, not available; PHQ-2, Patient Health Questionnaire; PREM, patient-reported experience measure; PROM, patient-reported outcome measure; PROMIS, Patient-Reported Outcomes Measurement Information System; SFFAC102, Sexual Function and Satisfaction; SIMMS, Single Item Measure of Social Supports.

ICHOM set by the working group to fit Dutch pregnancy and childbirth care, such as continuity of care and pain relief (table 1).[23] The questionnaires from the ICHOM set have been translated forward to Dutch and back by a medical translating agency. Thereafter, four women with low health literacy tested the surveys by the Dutch centre of expertise on health disparities (Pharos). Minor adaptations were carried out where possible, such as language adjustments. Scores on PROMs and PREMs were tracked as proposed by the national-level working group via a validated scoring questionnaire when they were available. For example, the PROMIS-10 and BSS-R for health-related quality of life and birth experience, respectively.[19 27] For the PROMs and PREMs without a validated scoring tool, the working group developed scoring guidelines. Based on available literature of validated questionnaires and expert opinion, cut-off values for suboptimal scores that require immediate action were defined for all PROMs and PREMs by the working group (table 1).[26] The PROMs about early bonding and breast feeding from the ICHOM standard set were not included, they were considered too specific for our study population who had given birth 6–30 months before the survey date and excluding these 2 domains with 22 questions could benefit the response rate.

Clinical outcomes

Clinical outcomes were also based on the ICHOM standard set. In this study, mortality measures were excluded since the surveys have not yet been validated for this group. Postpartum lengths of stay at the hospital for mother and neonate were used as proxies for maternity and neonatal morbidity, respectively. Infant morbidity was measured for preterm births (live birth before 37 weeks of gestation) and subdivided into spontaneous preterm birth or iatrogenic preterm birth. Other morbidity measures, such as maternal need for blood transfusion, maternal need for admission to intensive care, were excluded from further analysis in this study because few or no respondents suffered from these.

Use of care

Antenatal clinical admissions and the number of outpatient visits during pregnancy at our hospital were included to provide insight in the use of care during pregnancy. In the survey, women were asked whether they had a single care provider (exclusively from our hospital) or multiple care providers, since data on medical indications, lengths of stay, admission and visit rates were incomplete for women who received care from multiple centres.

Casemix factors

Casemix factors known to influence pregnancy and childbirth care were included; the woman's age at time of delivery, parity and Western origin. Ethnic categories were defined as they were registered in the medical health registries. A limited social network was tracked via the Single Item Measure of Social Support in the survey as proposed by ICHOM.[4 28] Living in a deprived area has been associated with adverse perinatal outcomes and was identified with four-digit postcodes in the survey; neighbourhood socioeconomic status scores are calculated by the Dutch Healthcare Authority based on area-level statistics about the proportion of population with a low household income, economically inactive citizens and non-Western migrants or Central and Eastern Europeans).[29 30] Whether the woman was treated at our hospital because of a maternal indication, fetal indication or other indication that suggests an elevated risk of adverse outcomes for the mother and/or baby was taken into account if registered in the medical health record. ICHOM proposed other casemix factors as well, for example, obstetric history and medical history, yet this information was missing for many women and therefore excluded. Treatment variables known to influence pregnancy and childbirth included the route of delivery; spontaneous vaginal deliveries, assisted vaginal deliveries (vacuum and forceps assisted deliveries) and caesarean sections. Another casemix factor was whether labour started spontaneously or iatrogenic (defined as induction or primary caesarean section, these two could not be separated).

Data analysis

We used descriptive statistics for patient characteristics, clinical outcomes, use of care and scores on PROMs and PREMs for women who completed the survey. Continuous variables were tested for normality by using the Shapiro-Wilk test, we reported both the means with SDs and the medians with ranges for ease of comparison. For categorical data, we computed frequencies with proportions. Furthermore, we calculated the percentage of women that scored suboptimal per PROM and PREM.

Differences across subgroups of individuals on scores of PROMs and PREMs were estimated using three types of multivariate regressions analyses. First, we used linear regression analysis for the continuous measures for health-related quality of life and birth experience. Second, logistic regression analysis was used for mental health, urinary incontinence, anal incontinence, healthcare responsiveness and shared decision making, continuity of care and pain relief. These outcomes were based on multiple questions and were coded as binary (optimal vs suboptimal outcome). Lastly, we used ordinal regression analysis for pain with intercourse, role confidence and satisfaction with care, which consisted of a single question with an ordered sequence. The determinants we used in the regression models were based on the factors proposed by ICHOM to affect PROMs and PREMs and that were available in our dataset.[4] They included clinical outcomes, use of care and casemix factors.

We calculated regression coefficients for the linear regression models and ORs for the logistic and ordinal logistic regression analyses. We implemented Bonferroni correction for the rate of 18 multiple comparisons. Results of the regression analyses are plotted for six determinants, to visualise which patient characteristics or care

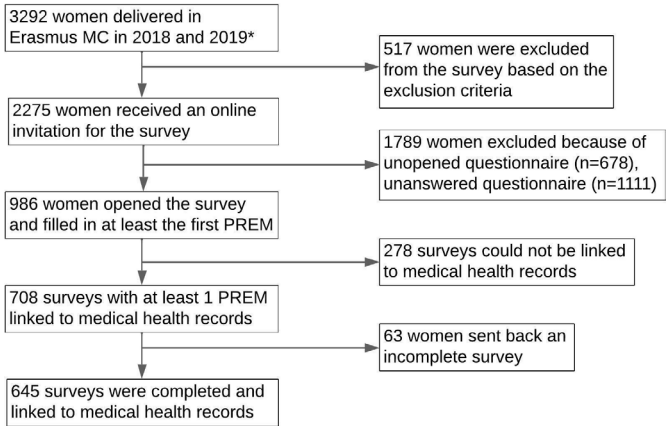

Figure 1 Recruitment of respondents. *Women with >1 pregnancy in 2018 and 2019 and women who had a termination of pregnancy were excluded. PREM, patient-reported experience measure.

process is more at risk for suboptimal scores on PROMs and PREMs. We did not perform a regression analysis for the outcome 'partner involvement' because the number of women with a suboptimal score for that PREM was too small. Sensitivity analysis was performed to control for mean differences caused by the duration between childbirth and the survey. STATA V.15.1 (StataCorp) was used for all analyses.

Patient and public involvement

Patients and/or the public were not involved in the design, conduct or reporting of this research.

RESULTS

Characteristics of participants

The final sample that completed the survey and were linked to medical records included 645 women, representing 20% of all women who met the inclusion criteria to participate (figure 1). Patient characteristics, use of care, clinical outcomes and scores on PROMs and PREMs of the 645 women are shown in table 2. With the exception of age, mental health and urinary incontinence screening, all continuous variables were not normally distributed. The mean age was 33 years and 51% of women were primiparous. Respondents were slightly older, higher educated, more often from Western origin and lived less often in deprived areas than non-respondents (online supplemental appendix B). Surveys were completed in 14 min on average.

Scores on PROMs and PREMs

The distribution of the number of suboptimal scores per PROM and PREM are shown in figure 2. The median woman had 2 suboptimal scores out of 12 PROMs and PREMs. Pain with intercourse (42%), birth experience (32%) and healthcare responsiveness and shared decision making (22%) resulted most frequently in suboptimal scores. Satisfaction with care (5%) and partner involvement (2%) resulted in a suboptimal score least often. The full results for each of the questions underlying the PROMs and PREMs for the study sample who completed the survey are presented in online supplemental appendix A. Sensitivity analysis showed that responses were not significantly affected by the duration from birth (online supplemental appendix C).

Distribution of PROMs and PREMs among patient groups

The full results of the linear, logistic and ordinal regression analysis show the difference in the scores on PROMs and PREMs for subgroups of patients (online supplemental appendix D). Regression analysis identified groups with an increased risk of suboptimal scores on multiple PROMs and PREMs. We show the subgroups associated with significant poor scores on multiple domains graphically (figure 3).

Women living in a deprived area and women having a limited social network, had lower (worse) scores for birth experience and were less likely to score a better level on pain with intercourse, respectively.

Women undergoing an assisted vaginal delivery were at risk for poor patient-reported outcomes. They had poorer scores on health-related quality of life, birth experience and were also less likely to report a better score on pain with intercourse and role confidence, compared with women who had a spontaneous vaginal delivery. Finally, women who had a preterm delivery and primiparous women had worse scores on multiple PROMs and PREMs compared with women who gave birth at term and multiparous women, respectively. However, despite persistent poor scores compared with multiparous women who delivered at term, primiparous women who had a preterm birth, were not less likely to report better scores on satisfaction with care.

DISCUSSION

In this retrospective cohort analysis, PROMs and PREMs of the ICHOM standard set revealed a high prevalence of suboptimal scores. We also identified subgroups of patients and care processes associated with specific suboptimal scores, indicating care pathways that need to be prioritised for quality improvement. Our findings show that capturing PROMs and PREMs and relating these to care processes and patient characteristics provides a promising approach to improve and personalise maternity care, as was indicated by a previous study with the ICHOM breast cancer standard set.[31] Furthermore, capturing PROMs and PREMs has the ability to shift the perspective of quality improvement towards outcomes relevant to patients that have previously been unnoticed. To the best of our knowledge, we are the first to present frequencies of scores on a large share of PROMs and PREMs from the ICHOM pregnancy and childbirth standard set at 6 months post partum and relate these to both care processes and patient characteristics. In our setting, the ICHOM standard sets provide a useful tool for

Table 2 Baseline characteristics

Patient characteristics (n=645)	Mean (SD) / n (%)	Median (range)
Age at time of delivery (years)	32.7 (4.6)	32.7 (18.3–49.4)
Primiparous	330 (51.2)	
Western origin	488 (75.7)	
Living in a deprived area	82 (12.7)	
Limited social network	56 (8.7)	
Medical indication		
Maternal	204 (31.6)	
Fetal	131 (20.3)	
Other	206 (31.9)	
Unknown	118 (18.3)	
Clinical outcomes		
Neonatal morbidity		
Spontaneous preterm birth	46 (7.1)	
Iatrogenic preterm birth	59 (9.2)	
Length of stay (days)		
Mother	1.7 (1.5)	1 (0–10)
Neonate	3.3 (6.5)	0 (0–28)
Treatment variables		
Type of delivery		
Spontaneous vaginal delivery	343 (53.2)	
Assisted vaginal delivery	84 (13.0)	
Delivery by caesarean section	218 (33.8)	
Start of labour		
Iatrogenic	369 (57.2)	
Use of care		
Antenatal admissions	0.1 (0.4)	0 (0–5)
Visits	10.4 (7.8)	10 (0–44)
Single care provider	336 (52.0)	
PROMs and PREMs		
Health related quality of life	34.0 (7.7)	34 (12–50)
Mental health screening	1.2 (1.5)	1 (0–6)
Mental health follow-up*	17.2 (5.6)	17 (2–29)
Urinary incontinence screening	0.4 (0.5)	0 (0–1)
Urinary incontinence follow-up†	7.0 (3.8)	6 (0–20)
Anal incontinence screening	0.3 (0.4)	0 (0–1)
Anal incontinence follow-up‡	2.9 (2.5)	2 (0–16)
Pain with intercourse	1.4 (1.5)	1 (0–5)
Role confidence	3.9 (1.1)	4 (1–5)
Birth experience	27.8 (7.5)	28 (3–40)
Satisfaction with care	2.9 (0.9)	3 (0–4)
Healthcare responsiveness and shared decision making	13.6 (3.3)	15 (0–16)
Continuity of care§	8.6 (2.1)	9 (3–12)
Pain relief	4.5 (1.4)	5 (0–6)
Partner involvement¶	8.2 (1.5)	8 (2–10)

Continued

Table 2 Continued

Patient characteristics (n=645)	Mean (SD) / n (%)	Median (range)

Grey shade are dependent questions.
*Answered by women who screened positive on mental health screening questions (N=86).
†Answered by women who screened positive on urinary incontinence screening questions (N=226).
‡Answered by women who screened positive on anal incontinence screening questions (N=165).
§Answered by women who had multiple care providers during pregnancy (N=589).
¶Answered by women who had a partner (N=596).
PREM, patient-reported experience measure; PROM, patient-reported outcome measure.

reporting healthcare outcomes to patients, clinicians and healthcare organisations.

Some of the patient-reported outcomes and experiences we captured were unexpected and instantly prompt an actionable target for quality improvement. Pain with intercourse was reported by almost half of all women more than 6 months after childbirth. This result emphasises the need for awareness among healthcare professionals regarding persistent pain and sexual health problems.[32] Other highly prevalent suboptimal outcomes were reported for health-related quality of life domains. Suboptimal experiences (reported by approximately one third of women) were problematic birth experience and poor healthcare responsiveness and shared decision making. Interestingly, only a small minority of women reported overall dissatisfaction with the care they received, which emphasises the added value of a much more targeted and detailed questionnaire such as proposed by ICHOM.

We identified different factors that were associated with worse scores on specific PROMs and PREMs, providing potential actionable targets for quality improvement.

Living in a deprived area was associated with lower birth experiences compared with women without such a background, while no significant association was found with overall satisfaction. This finding contradicts the mechanism 'adaptive preferences'; people living in underprivileged conditions tend to adjust their aspirations for a better and healthier life to their unfavourable circumstances and this is also applicable to satisfaction with care.[33 34] Again, we assume that this may be the result of using too generic measures of satisfaction with care that are likely to have more limited value in socially disadvantaged groups with adaptive preferences.

The next actionable insights we identified were adverse pelvic floor muscle-related outcomes, such as pain with sexual intercourse, in women undergoing vaginal assisted delivery compared with women with spontaneous vaginal deliveries, which is in line with other studies.[35] Dutch registries show substantial practice variation in the prevalence of assisted vaginal delivery, suggesting that obstetricians' preferences largely determine the likelihood of undergoing delivering with or without an obstetric intervention.[36] This association by no means proves causality, but the scores on PROMs and PREMs we observed underline the need for greater scrutiny by obstetricians when evaluating the use of assisted vaginal delivery, and for careful follow-up of these associations by continuous measurement of outcomes over time. Another factor was spontaneous preterm birth, this was associated with insufficient pain relief experienced during labour compared

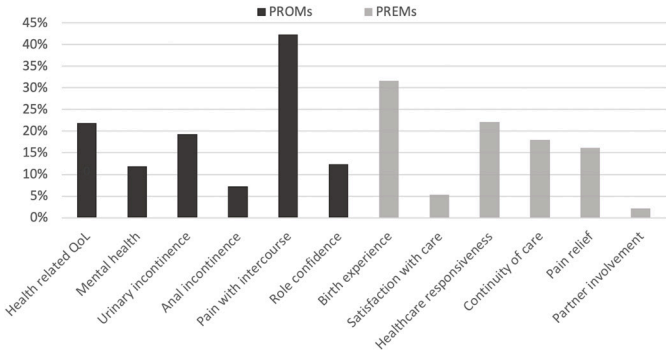

Figure 2 Share of respondents with suboptimal scores, for each PROM and PREM (%). PREM, patient-reported experience measure; PROM, patient-reported outcome measure.

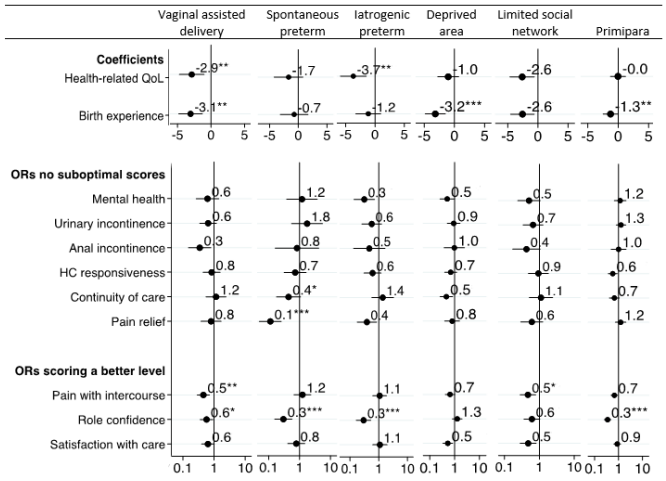

Figure 3 Effects of patient characteristics, use of care and clinical outcomes on health-related quality of life (QoL) and birth experience, estimated by coefficients from linear regression. ORs for scoring no suboptimal score on mental health, urinary incontinence, anal incontinence, healthcare (HC) responsiveness, continuity of care and pain relief, estimated by logistic regression and ORs for scoring a better level of pain with intercourse (less pain), role confidence and satisfaction with care, estimated by ordinal regression. Left-sided differences visualise the risk of worse scores. *p<0.0056, **p<0.0028, ***p<0.0006 on the basis of Bonferroni correction.

with women who gave birth at term, prompting extra attention for pain management in this specific patient group.

Finally, our findings confirm the notion that simply measuring satisfaction of care with a general quantitative questionnaire by no means reflects the picture of quality of care that analyses of PROMs and PREMs can provide, and can indeed be deceptive. All of the groups with significant poor scores on PROMs and/or PREMs were as likely as the comparison groups to give a high score to the PREM about satisfaction with care. Patient satisfaction scores are currently promoted as performance indicators, but satisfaction with care is more likely to reflect hospitality than the outcomes of care and is codetermined by factors external to the healthcare system, such as personal control, individual expectations and needs.[37–39] A mismatch between birth expectations and experiences has a negative impact on women's satisfaction with care.[40] For example, the ability to control pain has a higher impact on satisfaction with care than pain itself and interventions. Personal control has been identified to be lower among primiparous women, while in our study, they were as likely as multiparous women to give a high score to satisfaction with care.[41] Our findings reconfirm that satisfaction with care should be accompanied by measurement of other PROMs and PREMs of specific domains.

Using PROMs and PREMs at the mesolevel, that is, as indicators of patient group outcomes using aggregated data, may be of benefit for quality improvement programmes through rapid feedback and evaluation of interventions. However, wide implementation into clinical practice requires preparation and improvements. First, training patients and professionals to report, collect and discuss PROMs and PREMs is necessary. Patients are required to translate their outcomes and experiences of care into scores on PROMs and PREMs, and patients and professionals need to learn how to use these for shared decision making, as aspired in a future VBHC system.[42] Second, future development of the set we used could benefit from personalising questionnaires and thereby shorten the questionnaire as proposed by another study on the ICHOM pregnancy and childbirth standard set.[43] As indicated by our findings, subgroups of patients and aspects of care processes were associated with lower scores on specific domains, suggesting that some aspects of the questionnaire are more relevant for a subgroup of patients than other aspects are. Third, benchmarking PROMs and PREMs with other patient populations would help to assess the macrolevel performance and value assessment of the healthcare system.[42]

Some limitations to our study need to be taken into account. First, implementation of the ICHOM standard set has a number of important caveats. Although our results show that the PROMs and PREMs survey provides a clear window into meaningful indicators of quality of care, the standard set definitely needs further refinement of the definitions and validation of the cut-offs for suboptimal scores tested on a larger scale is needed, as was recently performed by Depla *et al*.[22] Second, extension to other units to allow for external validation and benchmarking was limited in our single-centre study. The proportion of women reporting abnormal PROMs and PREMs scores might well show substantial variation in a different population or a different healthcare provider network. Contrary to cohort studies with an etiological research question, when studying indicators of quality variation is actually a useful attribute to identify factors associated with care, rather than intrinsic population differences (or casemix). Third, respondents may have social desirable answered the taboo topics (eg, incontinency and pain with intercourse). This would lead to an underestimation of our findings and was addressed by assuring participants that their responses were anonymous. Some selection bias is likely to have occurred and was taken into account in multivariate regression analysis by inclusion of age, ethnicity and living in a deprived area. The likelihood of false positive associations due to multiple comparisons was decreased by the Bonferroni correction. However, this could also have introduced overcorrection and a better way to check the significance of our associations would be to reproduce the analyses in different cohorts. Lastly, data on use of care were incomplete for women who received part of their pregnancy care at another centre. To account for this, we included care provided by single/multiple care centres as a variable in our analyses.

CONCLUSION

We show that PROMs and PREMs from the ICHOM pregnancy and childbirth standard set provide actionable insights in quality of care that would otherwise not have been identified by the usual clinical outcomes. Specific patient characteristics and care processes were associated with suboptimal scores on multiple PROMs and PREMs. In spite of suboptimal scores on multiple PROMs and PREMs women reported good satisfaction with care. Thus, just measuring satisfaction is not helpful to identify the gaps and points of improvement of care. We conclude that measuring and reporting PROMs and PREMs is a useful and promising methodology for prioritising programmes to improve the quality of pregnancy and childbirth care.

Contributors Conceptualisation: AK, PB, AF, HE-S and BvR; methodology: AK, PB, ML-dR and BvR; recruitment of participants: AK; analysis and interpretation of data: AK, PB, AF, ML-dR and BvR; writing—original draft and preparation: AK, PB, AF, HB, HE-S, ML-dR, AP and BvR. AK is responsible for the overall content as guarantor.

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Competing interests AF has affiliations with Sprink at the UK (for advisory work) and is co-chair of the Linnean Initiative (a national network for implementation of Value-Based Health Care in the Netherlands), both are not related to this research. AF and MLR were working group members of ICHOM's Pregnancy and Childbirth Standard Set. HES was a project manager of the national working group that was subsided by the National Health Care Institute. MLR and HES had an advisory role at the College for Perinatal Care in the Netherlands regarding use of PREMs.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

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