Type of article: original

Quality of recovery following childbirth: A prospective, multicentre, cohort study

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Keywords: National Health Service; Obstetric Anaesthesia; postpartum; patient reported outcome measures; quality of recovery

* Abstract presented (in part) at the 54th Annual Meeting, Society of Obstetric Anesthesia and Perinatology, Chicago, USA. May 2022 and Annual Scientific Meeting, Obstetric Anaesthetists' Association, Newport, Wales. May 2022.

Short title: A multicentre cohort study of quality of recovery from childbirth

Summary

To better understand outcomes in postpartum patients who receive peripartum anaesthetic interventions, we aimed to assess quality of recovery metrics following childbirth in a UK-based multicentre cohort study. This study was performed in obstetric units within England, Scotland, Wales and Northern Ireland during a two-week period in October 2021 to assess in- and outpatient post-delivery recovery at one and 30 days postpartum. In total, 107 obstetric units participated in the study recruiting patients who delivered over a three consecutive day period. The following outcomes were reported: obstetric quality of recovery 10-item measure (ObsQoR-10); EuroQoL EQ-5D-5L survey; global health visual analogue scale; postpartum pain scores at rest and movement; length of hospital stay; readmission rates; and self-reported complications. In total, 1638 patients were recruited, and responses were analysed from 1631 (99.6%) and 1282 patients (80%) at one and 30 days postpartum, respectively. Median (IQR [range]) length of stay postpartum was 39.3 (28.5–61.0 [17.7–513.4]), 40.3 (28.5-59.1 [17.8–220.9]), and 35.9 (27.1–54.1 [17.9–188.4]) hours following caesarean, instrumental and vaginal deliveries, respectively. Median (IQR [range]) ObsQoR-10 score was 75 ([62–86] 4-100) on day 1, with the lowest ObsQoR-10 scores (worst recovery) reported by patients undergoing caesarean delivery. Of the 1282 patients, complications within the first 30 days postpartum were reported by 252 (19.7%) of all patients. Readmission to hospital within 30 days of discharge occurred in 69 (5.4%), with 49 (3%) for maternal reasons. In summary, we highlight population norms for in- and outpatient postpartum recovery following different delivery modes in the UK. These data can be used to inform patients regarding expected recovery trajectories; facilitate optimal discharge planning; and identify populations that may benefit most from targeted interventions to improve postpartum recovery experience.

Introduction

Up to 65% of patients giving birth receive anaesthesia or analgesia during their peripartum period, with obstetric anaesthesia accounting for a large proportion of urgent surgical interventions [1–3]. Optimising operative recovery and ensuring patient satisfaction following childbirth is an important goal for delivering high-quality clinical care [4,5]. Improving postpartum recovery has the potential to positively impact maternal physical and psychological morbidity and mortality. Despite the increase in postpartum-related research [6], studies examining recovery have predominantly been limited to single-centre studies with small patient numbers, using heterogeneous outcome measures or non-validated metrics to evaluate inpatient recovery, with limited assessment of outpatient recovery [7,8]. Patient-reported outcome measures (PROMs) allow patients to report their own health state, and are considered the gold standard for measuring postpartum recovery [9–12]. They can guide clinical care; facilitate regulatory approvals; provide a benchmark for service improvement [13]; and inform healthcare policy [14]. Postpartum population data surrounding the return of functional status, requirement for ongoing analgesia and the need for medical intervention are limited. Snapshot national projects in the field of anaesthesia, for example, Sprint National Anaesthesia Projects (SNAP), are able to provide contemporaneous data regarding patient and hospital factors which impact patient care [15,16].

Postpartum length of hospital stay (LOS) is an important indicator of quality for inpatient care [17,18]. Parturients delivering in the UK experience shorter postpartum periods of hospitalisation compared with other high-income countries [19]. There is currently no international consensus surrounding optimal LOS following childbirth. Postpartum complications are primarily seen in the community by either general practitioners or midwives, where morbidity is less frequently screened or captured. National prospectively collected postpartum recovery data using an optimal selection of measures would facilitate benchmarking of current practice and help identify potential areas for service improvement. Assessment of postpartum recovery following all delivery modes and in different birth centres could help identify potentially modifiable factors influencing postpartum recovery.

We conducted the ObsQoR study, a multicentre cohort study to assess postpartum recovery in obstetric units across England, Scotland, Wales and Northern Ireland, using validated PROMs at day 1 and day 30 following delivery in those receiving anaesthetic peripartum care. Additionally, we evaluated postpartum length of stay; pain scores; return of activities of daily living; drinking, eating and mobilisation; and readmission, reattendance and complications rates. We present the descriptive and outcome data from the ObsQoR cohort.

Methods

Ethical approval for the study was granted by the UK National Research Ethics Service (South Central - Berkshire B) The findings from this study are reported in accordance with the STROBE statement [20]. This study was supported by a patient and public involvement group, who were consulted at study inception to provide input to study design, PROMs used and patient-facing documents.

All NHS obstetric units with anaesthesia services were invited to participate in the study via National Institute for Health and Care Research clinical research networks and anaesthesia trainee networks in the UK. One hundred and seven obstetric units across the UK agreed to participate during a 2-week period in October 2021. Patients admitted for peripartum care were recruited over any consecutive 3-day period, within a 2-week timeframe, following similar methodology to previously published SNAP studies [15,16]. Local investigators received virtual training to ensure compliance with good clinical practice and enable familiarisation with the study protocol.

Inclusion criteria consisted of parturients aged ≥ 18 years; ≥ 32 weeks gestational age at delivery; ASA physical status 1–4; undergoing caesarean, instrumental or vaginal deliveries; and receiving any analgesia or anaesthesia intervention. Exclusion criteria were patient refusal; inability to understand the questions asked in English; neonatal death; external cephalic version; cervical cerclage insertion/removal; and non-NHS patients. All those participating in the study provided informed written consent.

Within each participating centre, all eligible parturients were screened, consented and enrolled at 24 (± 6) h following delivery. Investigators were instructed to use the predefined script given on the case record form (CRF) when asking questions both in person and by telephone, to limit potential response bias. Local study personnel collected baseline demographic data (age; weight at booking; BMI; ethnicity); obstetric history (gestational age; parity; gravity; labour category; previous caesarean delivery); previous medical history; ASA physical status; pre- and post-delivery laboratory haematology and biochemistry; labour analgesia; anaesthesia mode; and medications administered. On day 1 postpartum, part 1 of the CRF was completed in person with the patient by the local investigators, which included postpartum quality of life and recovery metrics assessed using EuroQoL 5-level 5-dimension quality of life score (EQ-5D-5L); global health visual analogue scale (GHVAS); Obstetric Quality of Recovery-10 item measure (ObsQoR-10); pain scores (numerical reporting scale 0-10 at rest and on movement) and postpartum times to resumption of drinking, eating and mobilising (DrEaMing). Responses were recorded on paper (Supporting Information Appendix S2) and later transcribed to an electronic CRF platform (CastorEDC https://www.castoredc.com/electronic-data-capture-system/) by the local study team. For data

continuity and checking for record consistency, anonymised paper CRFs were returned to the sponsor upon study conclusion.

At 30 (± 2) days postpartum, patients were contacted by telephone and asked to complete part two of the CRF. If the patient was unavailable, a maximum of two further attempts were made to establish contact. Questions were asked regarding pain score at rest and movement, analgesia requirement, EQ-5D-5L, GHVAS and physical activity. Patients were also asked regarding their readiness for discharge and in- and outpatient complications were retrieved. Further data from the medical record including postpartum LOS were collected. The presence of complications was assessed by the requirement for unanticipated blood tests, imaging investigations, or unplanned reattendance to see a healthcare professional and readmission to hospital within 30 days of discharge. To understand the impact of hospital-level factors on the quality of recovery, an electronic survey was conducted to the site local leads as part of the study.

Participating obstetric units sought to consent all eligible patients during the study window as part of this pragmatic study design. A convenience sample of all eligible patients from recruiting hospitals over 3 consecutive days was used. Data were cleaned, and statistical analyses were performed using, Excel v. 16.6 (Microsoft, Inc., Redmond, WA, USA.) and Stata v. 14.0 (Statacorp, College Station, TX, USA). Inpatient and outpatient recovery following delivery was measured using validated PROMs, specifically with EQ-5D-5L, GHVAS and ObsQoR-10. The Shapiro-Wilk test was used to assess for normal distribution of continuous variables. Mean (SD) or median (IQR [range]) were calculated for normally and non-normally distributed continuous variables, respectively. Categorical variables are summarised as frequencies and percentages. An uncorrected Chi-square test or Fishers' exact test was used to compare the frequencies of categorical variables and one-way analysis of variance or Kruskal-Wallis test was used to compare continuous variables between groups.

Results

We recruited 1638 patients from 107 obstetric units, with 1282 included after 30-day follow up (Fig. 1). Hospital-level data were submitted for 106 of the 107 obstetric units. Figure 2 shows the geographical location of these obstetric units. Mean (SD) age of those recruited was 31.5 (5.2) years and median (IQR [range]) BMI was 26.5 (23.0–30.9 [15.5–65.4]) $kg.m^{-2}$. Respiratory comorbidities were the most prevalent in the study cohort, affecting 118 (11.5%) patients. The demographic, medical, obstetric, anaesthetic, and neonatal characteristics by mode of delivery are summarised in Table 1.

Inpatient recovery PROMs, postpartum LOS, and pain at rest and movement are summarised in Table 2. Caesarean delivery was associated with worse ObsQoR-10, EQ-5D-5L, Global Health VAS scores and pain scores. The overall median (IQR [range]) postpartum LOS was 38.5 (28.4–59.5 [17.7–513.4]) hours following all delivery modes. There were no statistically significant differences in the median length of stay in each delivery mode. Among the 107 recruiting centres, 74 had institutional enhanced recovery protocols for elective caesarean delivery surgery. A total of 253 of 587 elective caesarean deliveries (43.1%) were performed using an enhanced recovery after caesarean delivery protocol. There were no significant differences in the median postpartum LOS of patients who were enrolled versus those who were not in an enhanced recovery programme, 30.6 h (26.3-49.0 [18.2-244.5]) and 31.6 h (27.3-50.8 [20.8-354.4]), p=0.075, respectively. Patient-reported readiness for discharge was described as ‘too soon’ by 11.0% (141/1282) and ‘delayed’ (wanted to leave hospital sooner) by 13.8% (177/1282) of patients. Delayed discharge was most commonly reported following instrumental delivery in 19% of patients (37/193) (Online Supporting Information Table S1.). Radar charts for EQ-5D-5L at day 1 for each delivery mode are provided in Figure 3. The proportion of patients DrEaMing by 24 h was 91% (1057/1163), 94% (236/249) and 96% (209/217) following caesarean, instrumental and spontaneous vaginal delivery, respectively. The times taken to achieve each metric following each delivery mode are provided in Online Supporting Information Table S2.

Table 3 summarises the 30-day recovery metrics and analgesia requirements. Sixty-nine of 1282 (5.4%) patients were readmitted to hospital within 30 ±2 days of delivery, with 49/1282 (3%) patients readmitted due to maternal, 17/1282 (1.3%) for neonatal and 3/1282 (0.2%) for anaesthesia-related complications. The most commonly reported maternal reasons for readmission within 30 days of delivery were wound infection (12/1282, 0.9%); hypertension or pre-eclampsia (10/1282, 0.8%); and haemorrhage (9/1282, 0.7%). Complications were experienced by 19.7% (252/1282) of patients in the first 30 days postpartum. (Online Supplementary Information Table S3.) Thirty percent of patients (393/1282) had ongoing analgesia requirements in the preceding week at

30 days, with 7/1282 (0.6%) requiring strong opioids. (Online Supporting Information Table S4.). Radar charts for EQ-5D-5L at day 30 for each delivery mode are provided in Figure 3. Total EQ-5D-5L scores at 30 days were highest (worse recovery) following caesarean delivery (Table 3; $p < 0.001$) and pain scores on movement were higher in patients following caesarean and operative vaginal deliveries (Table 3; $p < 0.001$). (Online Supporting Information Table S5-6)

Discussion

This study represents the largest multicentre dataset of day 1 and day 30 postpartum recovery metrics using validated PROMs in patients across England, Scotland, Wales and Northern Ireland to date. These data assessing both inpatient and outpatient postpartum recovery provides granular data to help inform patients and clinicians regarding norms of trajectory for postpartum recovery. These can help benchmark the expected outcomes for parturients and provide the basis for improving anaesthetic peripartum care. The patients are from a geographically and demographically diverse cohort with obstetric units from throughout the UK. Incomplete recovery, pain and analgesic requirements are still apparent at day 30 postpartum. The 30-day readmission and complication rates following childbirth were 5.4% and 19.7%, respectively.

ObsQoR-10 is the best currently available measure to assess inpatient postpartum recovery [21]. Inpatient ObsQoR-10 and GHVAS scores following delivery in this cohort were similar to those from single-centre studies in the UK, USA and Brazil [12,22,23]. In addition, our results are consistent with other studies showing inpatient postpartum recovery PROM, and pain scores are worse and analgesic utilisation are greater following caesarean compared to vaginal or instrumental delivery [12,23,24]. However, a Turkish study reported no significant difference in ObsQoR-10 score between patients delivering via caesarean and vaginal delivery (83 vs 82.5, respectively) [25]. Future studies can help to elucidate the factors which drive quality of recovery experience in different healthcare settings to compare recovery in different countries and cultures.

We report DrEaMing for each delivery mode as a simplified principle of enhanced recovery, which has been implemented to improve patients' recovery following surgery [26,27]. The benefits of enhanced recovery following caesarean delivery have been shown to be associated with a reduced length of stay and improved maternal outcomes without an increase in readmission rates or complications [28]. We did not see significant shorter postpartum LOS in those enrolled in an enhanced recovery following caesarean delivery programme. However, not all recommended core outcome measures were assessed, of which length of stay is one and the details of the included items in the programmes at each institution were not evaluated [29]. We have highlighted the EQ-5D-5L scores for each delivery mode on day 1 and 30 postpartum, which can be used to inform patients regarding what to expect following delivery with anaesthesia intervention. Our results are in keeping with the decrease in health-related quality of life seen during pregnancy and into the immediate postpartum phase [30]. We have shown that those delivering by caesarean report

minimally worse day 30 pain on movement scores compared with vaginal delivery with labour analgesia (1 vs 0), with no difference in pain at rest scores or other recovery metrics.

Median postpartum LOS was 38.5 h following all delivery modes. Postpartum LOS reflects a minimum level of recovery, which, when attained, can result in hospital discharge. Whilst the number of deliveries in the UK each year is relatively static, the average age and proportion of parturients with significant comorbid disease are increasing, contributing to an increased burden on healthcare services [31,32]. There have been decreases in postpartum LOS over recent decades, in part due efforts to reduce cost and demedicalise childbirth, in addition to national guidelines recommending to offer day 1 discharge following uncomplicated caesarean delivery [33]. Postpartum LOS varies hugely across the world, with the stay in the UK following singleton vaginal delivery reported as 1.5 days, which is similar to that in our cohort [19]. Hospital episode statistics data report that 19% of patients are discharged on the same day as delivery, 47% on day 1 and 18% on day 2 postpartum,[31] therefore we feel that our study is likely to have captured the majority of women eligible at each site during the study period. However, there remains a lack of consensus surrounding optimal postpartum LOS. Early discharge does not appear to impact maternal readmission rates but does lead to a slight increase in infant readmission[34]. A World Health Organization recommendation for patients to remain for at least 24 h following delivery does not account for maternal and neonatal factors, delivery mode or complications and is mainly targeted at healthcare professionals practicing in low- and middle-income countries [35].

The majority of postpartum recovery occurs following discharge from hospital. In the UK, community midwives, health visitors and general practitioners provide the bulk of postpartum follow-up, however the number of postpartum contacts in the community has decreased over recent decades [34]. Hospital readmission rates are a focus for quality improvement, can be used as a quality indicator and are linked to reimbursement for certain medical and surgical conditions [36,37]. More recently, readmission has been proposed as a quality indicator in the obstetric population [38]. Our reported rates of readmission to hospital within 30 days of delivery (5.4%) are higher than previously published data. A database analysis study in the US reported increasing postpartum readmission rates over an 8-year period to 2.2%, whilst retrospective caesarean delivery data from Ireland and Canada report readmission rates of 4.3% and 2.7%, respectively [39–41]. The postpartum needs of obstetric patients immediately following birth may differ by delivery mode with the likelihood of readmission previously reported to be higher in patients following caesarean delivery [42–44]. However, our findings suggest that both readmission and complication rates are similar between delivery modes. Our study demonstrates that the primary driver for readmission is

maternal indications (versus neonatal or anaesthetic complications). There is a paucity of evidence regarding the impact of discharge timing following all delivery modes and complications leading to readmission or reattendance in the UK [45]. Simple, cost-effective strategies are needed to minimise outpatient complication rates and readmission, which appear to affect a significant proportion of postpartum patients. Whilst 75% of all deliveries felt their discharge timing from hospital was 'just right', 11% felt their discharge was 'too soon'. Ultimately, decisions regarding discharge readiness must balance optimising maternal and infant health, patient preference against the potential for risk of readmission, reattendance or unanticipated primary care visits.

This study has the strengths as a snapshot of a large cohort recruited from multiple obstetric units across the UK. Whilst we did not recruit patients from all obstetric units, our recruited sample size represents approximately 30% of all UK deliveries in and out of hospital during the study period. Results are likely to be generalisable due to the institutional type and geographic location of the included hospitals and the socioeconomic and demographic variation among recruited patients. It was not feasible to evaluate all postpartum recovery domains and all postpartum time points of interest. Feasibility of this study and high response rates of 80% at day 30 was achieved with the concomitant use of a variety of simple metrics relating to pertinent aspects of in- and outpatient postpartum recovery applicable to all delivery modes.

This study had weaknesses. First, some patients may have been discharged prior to 18 h following their delivery, therefore enrolment by the local study team would not have been possible. However, we feel that this is likely to represent a minority of patients receiving anaesthesia intervention that delivered vaginally during the study period since 81% of patients are discharged >1 day after their delivery [31]. Future studies are needed to determine the proportion of patients receiving anaesthetic intervention for a vaginal delivery that are discharged on the day of delivery and the impact of time of delivery on postpartum length of stay. Additionally, we acknowledge that our vaginal delivery cohort excluded those that did not receive anaesthesia or analgesia interventions, and therefore may not fully reflect normative values for patients experiencing unmedicated in hospital vaginal delivery. Our study was conducted between waves of COVID-19, during which time there were modifications to practices which may have impacted the duration of hospital stay and in-person reattendance rates [46,47]. Study personnel were not blinded to the mode of delivery and could have been members of the team providing clinical care, this may have impacted patient reporting. We aimed to minimise this potential bias using a standardised script and training of all study personnel prior to study commencement. In addition, enrolled patients were required to understand the questions asked in English, which may have impacted recruitment from

certain ethnic and socioeconomic groups. We did not use translation services and the PROMs utilised are not available or validated in every language This highlights the challenge of conducting PROM postpartum based research whilst ensuring equality, diversity and inclusion [48]. Despite this, the proportions of patients recruited from each ethnic group are similar to nationally available data [49]. Finally, no causal conclusions can be drawn from these observational data.

In summary, our study provides detailed postpartum recovery outcomes from 1638 patients from 107 participating obstetric units within England, Scotland, Wales and Northern Ireland. Duration of postpartum hospitalisation was 38.5 h following all delivery modes. Complications occur in 1 in 5 postpartum patients following hospital discharge and 5% of these require hospital readmission. In our cohort of patients staying in hospital for more than 18 h postpartum, there were significant differences in pain scores and EQ-5D-5L scores between delivery modes, which are of questionable clinical significance. Differences between delivery mode reduce further by 30 days postpartum with patients reporting minimal pain and no differences demonstrable among other recovery metrics. Future studies are needed to determine factors that predict poor recovery and postpartum readmissions, optimal timing of discharge, and regimens to improve in- and outpatient postpartum recovery and pain experience.

Acknowledgments

The study was registered prospectively (ClinicalTrials.gov Identifier: NCT04192045.) This study was supported by a grant from the Obstetric Anaesthetists' Association and National Institute of Healthcare research portfolio adoption. The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the publications. We would like to acknowledge the patients who agreed to be part of this study. PS an Arline and Pete Harman Endowed Faculty Scholar of the Stanford Maternal and Child Health Research Institute. KE is an Editor of *Anaesthesia*.

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Figure legends

Figure 1. Flow diagram for patient recruitment

Figure 2. Map of United Kingdom with participating hospitals shown, their annual number of deliveries and the total number of births in that region in 2020.

Figure 3a. Radar chart of EuroQol EQ-5D-5L for each delivery mode at 24± 6 h postpartum

Figure 3b. Radar chart of EuroQol EQ-5D-5L for each delivery mode at day 30 ± 2 postpartum

Blue line, caesarean delivery; green dots, spontaneous vaginal delivery; red dashes, instrumental delivery.

Median self-reported EQ-5D-5L at day 1 and day 30 postpartum. patients rated each of five health dimensions; Mobility, self-care, usual activities, pain or discomfort, and anxiety or depression for 1=no problems; 2=slight problems; 3=moderate problems; 4=severe problems; 5=unable to/extreme problems.

Supporting Information Appendix S1. ObsQoR Collaborators

Supporting Information Appendix S2. Case Record Form

Supporting Information Table S1. Patient-reported readiness for discharge

Supporting Information Table S2. Patient-reported time to eating, drinking and mobilisation at 24±6 hours

Supplementary Information Table S3. Reasons for readmissions within the first 30 days postpartum

Supporting Information Table S4. Analgesia requirements: Patients requiring analgesia in the preceding week as assessed at 30±2 days postpartum.

Supplementary Information Table S5. Self-reported EQ-5D-5L scores assessed at 24 ±6 hours postpartum

Supplementary Table 6. Self-reported EQ-5D-5L assessed at 30 ±2 days postpartum

Table 1. Demographic, obstetric, anaesthetic and neonatal care characteristics of patients. Values are mean (SD), median (IQR [range]) or number (proportion).

	Vaginal delivery (n=218)	Instrumental delivery (n=249)	Caesarean delivery (n=1164)	All delivery modes (n=1631)	p value
Demographics					
Age; y	29.8 (5.3)	30.9 (4.9)	32.0 (5.2)	31.5 ± 5.2	< 0.001
BMI; $kg.m^{-2}$	26 (23-30.4 [15.5-56.3])	25 (21.9-29.6 [18-51.3])	27 (23.4-31.2 [15.9-65.4])	26.5 (23-30.9 [15.5-65.4])	< 0.001
Ethnicity*					0.023
White	166 (76.2%)	212 (85.1%)	911 (78.3%)	1289 (79.0%)	
Black	10 (4.6%)	6 (2.4%)	68 (5.8%)	84 (5.2%)	
Asian	21 (9.6%)	17 (6.8%)	126 (10.8%)	164 (10.1%)	
Mixed/multiple ethnic groups	9 (4.1%)	4 (1.6%)	30 (2.6%)	43 (2.6%)	
Other	12 (5.5%)	9 (3.6%)	28 (2.4%)	49 (3%)	
Obstetric characteristics					
Parity					< 0.001
Nulliparous	98 (45.0%)	184 (73.9%)	439 (37.7%)	721 (44.2%)	
Multiparous	120 (55.1%)	65 (26.1%)	725 (62.3%)	910 (55.8%)	
Gestation age; weeks	39.5 (1.5)	39.8 (1.6)	39.0 (1.6)	39.2 (1.6)	< 0.001
Gestational age; weeks	39.7 (38.7-40.4 [32.6-42.1])	40 (39-40.9 [32-42.3])	39.1 (38.3-39.9 [32-42.7])	39.3 (38.6-40.3 [32-42.7])	< 0.001
Previous caesarean delivery	10 (4.6%)	16 (6.4%)	458 (39.4%)	484 (29.7%)	< 0.001
Estimated blood loss†					< 0.001
< 500 ml	147 (67.4%)	122 (49%)	619 (53.2%)	888 (54.5%)	
501-1499 ml	55 (25.2%)	106 (42.6%)	495 (42.5%)	656 (40.2%)	
> 1500 ml	14 (6.4%)	19 (7.6%)	49 (4.2%)	82 (5.0%)	
Haemoglobin pre-operative $g.l^{-1}$	119.8 (10.7)	121.6 (10.4)	119.3 (12.1)	119.7 (11.7)	0.016
Haemoglobin postoperative; $g.l^{-1}$	100.8 (18.0)	100.4 (14.5)	105.9 (12.9)	104.7 (13.8)	< 0.001
ASA physical status‡					0.010
1	80 (36.7%)	95 (38.2%)	313 (26.9%)	488 (29.9%)	
2	129 (59.2%)	144 (57.8%)	772 (66.3%)	1045 (66.3%)	
3	8 (3.7%)	9 (3.6%)	72 (6.2%)	89(5.5%)	
4	0	0	1 (0.1%)	1 (0.1%)	
Anaesthesia technique					
Spinal	32 (14.7%)	70 (28.1%)	885 (76.0%)	987 (60.5%)	< 0.001
Epidural/epidural top-up	10 (4.6%)	68 (27.3%)	190 (16.3%)	268 (16.4%)	< 0.001
Combined spinal epidural	0	0	55 (4.7%)	55 (3.4%)	< 0.001
General anaesthesia	3 (1.4%)	3 (1.2%)	43 (3.7%)	49 (3.0%)	0.039

Neonatal care location					0.135
Postnatal ward	198 (90.8%)	232 (93.2%)	1028 (88.3%)	1458 (89.4%)	
Special care baby unit	3 (1.4%)	7 (2.8%)	48 (4.1%)	58 (3.6%)	
Neonatal intensive care	8 (3.7%)	6 (2.4%)	52 (4.5%)	66 (4.1%)	

* Two patients missing ethnicity data

† n = 1626

‡ n = 1623

Table 2. Inpatient pain and recovery metrics. Values are median (IQR [range]).

	Vaginal delivery (n = 218)	Instrumental delivery (n = 249)	Caesarean delivery (n = 1164)	All delivery modes (n = 1631)	p value
Length of stay; h	35.9 (27.1-54.1 [17.9-188.4])	40.3 (28.5-59.1 [17.8-220.9])	39.3 (28.5-61.0 [17.7-513.4])	38.5 (28.4-59.5 [17.7-513.4])	0.080
Pain at rest; 0-10	3 (2-5 [0-10])	3 (2-5 [0-10])	4 (2-6 [0-10])	4 (2-5 [0-10])	0.001
Pain on movement; 0-10	4 (2-6 [0-10])	5 (3-7 [0-10])	6 (4-8 [0-10])	4 (2-5 [0-10])	< 0.001
ObsQoR-10 scores; 0-100	82 (69-90 [29-100])	78 (66-87 [5-100])	72 (60-84 [4-100])	75 (62-86 [4-100])	< 0.001
EQ-5D-5L; 5-25	9 (7-11 [5-19])	10 (8-12 [5-20])	11 (9-14 [5-25])	11 (8-14 [5-25])	< 0.001
Global Health VAS; 0-100	70 (50-82.5 [0-100])	70 (55-80 [5-100])	65 (50-80 [0-100])	70 (50-80 [0-100])	< 0.001

Table 3. Pain, recovery metrics and complications up to 30 days postpartum. Values are number (proportion) or median (IQR [range]).

	Vaginal delivery (n=163)	Instrumental delivery (n=193)	Caesarean delivery (n= 926)	All delivery modes (n= 1282)	p value
Re-admission to hospital in previous 30 days; n (%)	8 (4.9%)	11 (5.7%)	50 (5.4%)	69 (5.4%)	0.946
Complications;* n (%)	29 (17.8%)	41 (21.2%)	182 (19.7%)	252 (19.7%)	0.716
Pain at rest; 0-10	0 (0-1[0-9])	0 (0-2 [0-8])	0 (0-2[0-10])	0 0-2 [0-10])	0.058
Pain on movement; 0-10	0 (0-2 [0-9])	0 (0-3 [0-10])	1 (0-3 [0-10])	1 (0-3 [0-10])	< 0.001
EQ-5D-5L; 5-25	6 (5-7 [5-15])	6 (5-7 [5-15])	6 (5-8 [5-21])	6 (5-8 [5-21])	< 0.001
Global Health VAS; 0-100	n=163 80 (75-90 [5-100])	n=192 80 (70-90 [20-100])	n=926 80 (70-90 [0-100])	n=1281 80 (70-90 [0-100])	0.114

* Readmission, unplanned hospital visit and/or investigations