International Journal of Obstetric Anesthesia 64 (2025) 104708

Contents lists available at ScienceDirect

International Journal of Obstetric Anesthesia

journal homepage: www.elsevier.com/locate/ijoa

Brief Report

Obstetric anaesthesia quality metrics: local implementation of data utilisation in the United Kingdom

L. Parker *, N. Richards

Kingston Hospital NHS Foundation Trust, London, United Kingdom

ARTICLE INFO

Keywords:
Clinical benchmarking
Data visualisation
National data collection

ABSTRACT

Local data collection and analysis are acknowledged as common barriers to generation of, and benchmarking against clinical outcome standards in obstetric anaesthesia. We present a replicable model for departmental data collection, processing and visualisation, in the form of a data dashboard. The dashboard has enabled contemporaneous data analysis, leading to real clinical and organisational improvements. By using widely available software and expertise, we present a replicable model, which if adopted at other centres would improve local ownership over obstetric anaesthetic data and provide service insights. We believe that this represents an important step towards national data collection projects in obstetric anaesthesia.

Background

The Royal College of Anaesthetists and the Obstetric Anaesthetists' Association (OAA) have both produced standards for obstetric anaesthetic care in the United Kingdom (UK), via the Quality Improvement Compendium[1] and a subsequent Delphi Method[2] process respectively. However, since the National Obstetric Anaesthetic Database was discontinued in 2014,[3] there is no required national collection of obstetric anaesthetic activity data and complication rates to provide comparative estimates, and best practice requires regular local auditing. Internationally, projects such as the Society for Obstetric Anesthesia and Perinatology (SOAP)'s Centers of Excellence (COE)[4] demonstrate how centralised data submission can be used to drive standards in obstetric anaesthesia.

Issues with data collection are recognised as a significant limiting factor in attempts to produce and benchmark against clinical outcome measures, as highlighted in a recent review.[5] This is also reflected in a survey of lead obstetric anaesthetists in the UK conducted by the OAA in 2019.[6] Only 54% of 98 respondents routinely analysed their data, with 29 hospitals citing insufficient resources for data collection as the main reason for failure to analyse. This is despite recommendation from the RCOA in the Guidelines for Provision of Anaesthesia Services that data collection and analysis should be organisationally supported.[7].

Effective data utilisation has positive impacts on clinical outcomes, as demonstrated by the California Maternal Quality Care Collaborative (CMQCC).[8] Their implementation of a Maternal Data Centre,[9] has seen improvements in outcomes for women and their babies, including maternal mortality decline in California, versus an overall rise in national maternal mortality in the United States.[8] In the UK The National Maternal and Perinatal Audit[10] (NMPA) produces risk-adjusted maternal and neonatal outcomes for individual units. There is limited anaesthetic data however, indeed the most recent 2022 report cites "data completeness issues for many NMPA measures, especially for anaesthesia". Moreover, the delayed publication of reports remains a major issue.

Considering the above, we set out to improve local obstetric anaesthetic data utilisation, by creating a dashboard display enabling real time analysis of clinical and system outcomes. By using globally available software, we present a replicable model. Fig. S1

Methods

At our institution, with 4,607 deliveries and 1,872 caesarean deliveries (CD) in 2023, anaesthetists recorded their clinical documentation on Cerner Millenium using "ad hoc" forms for theatre anaesthesia (Fig. 1), labour analgesia and follow up (Supplementary Materials 1 and 2 respectively). To incorporate this data into the dashboard, Trust-employed business analysts used a Structured Query Language script to automate monthly extraction of clinical data from Cerner Millennium. This script generated Microsoft Excel raw data files, which then underwent a protocoled clinician review to sense-check for errors. The cleaned data was added then to a master Excel file (Fig. 2) linked to the

* Corresponding author at: 42 Priory Road, Kenilworth, Warwickshire CV8 1LL, United Kingdom.
E-mail address: luke.parker@doctors.org.uk (L. Parker).

https://doi.org/10.1016/j.ijoa.2025.104708
Accepted 16 June 2025
Available online 20 June 2025

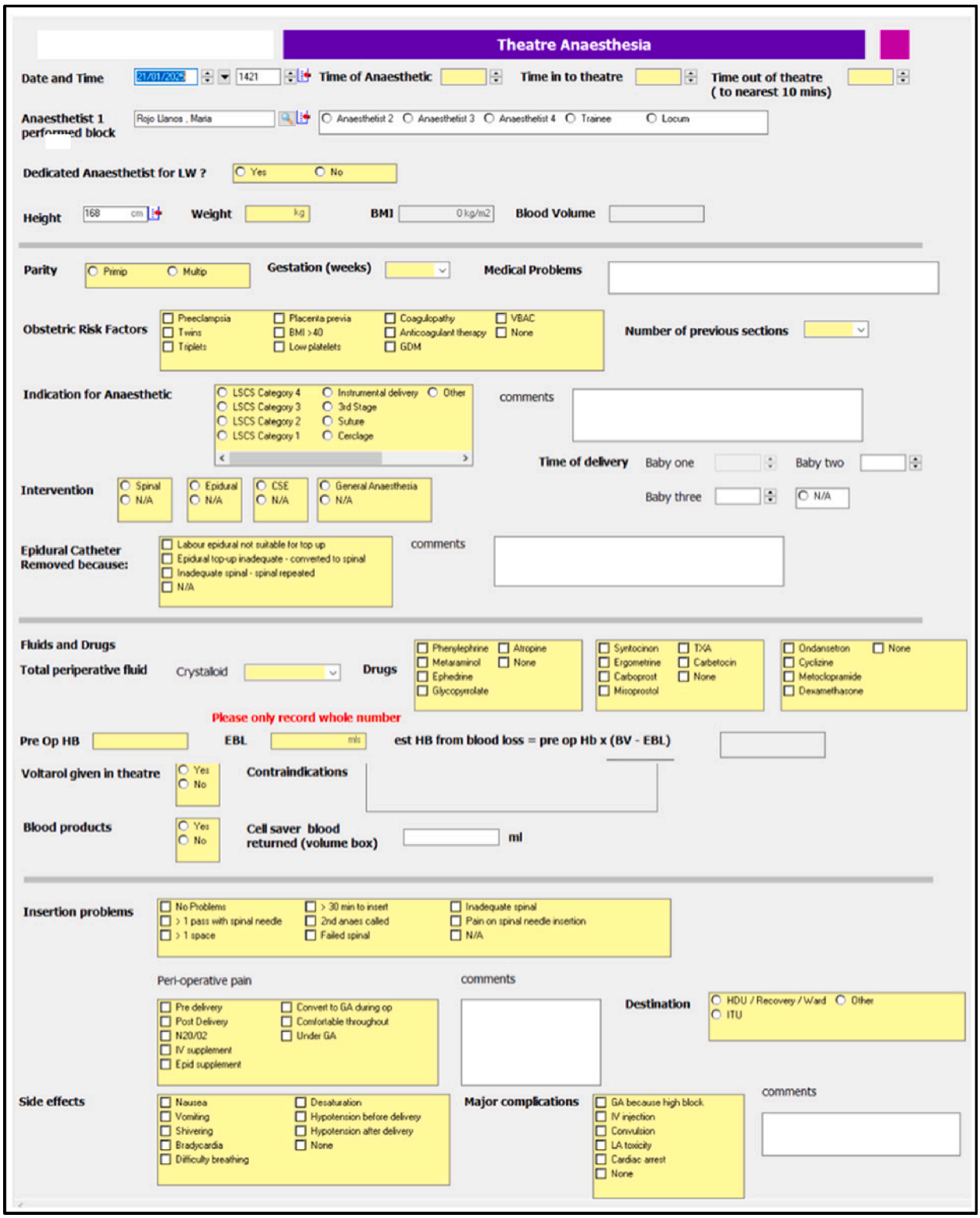

Fig. 1. Clinical data input form for theatre anaesthesia provision.

dashboard.

The data dashboard was built using a data visualisation application available via Microsoft Office 365[11] called PowerBI. PowerBI is a globally available, established data tool and is used by NHS England Digital to present the National Maternity dashboard.[12] Our data dashboard used the master Excel file as a data source, and using PowerBI, various graphs (termed "visualisations") were constructed and added to the dashboard for display and analysis.

Results

A dashboard homepage was created displaying an overview of key indicators (Fig. 3), reporting specifically:

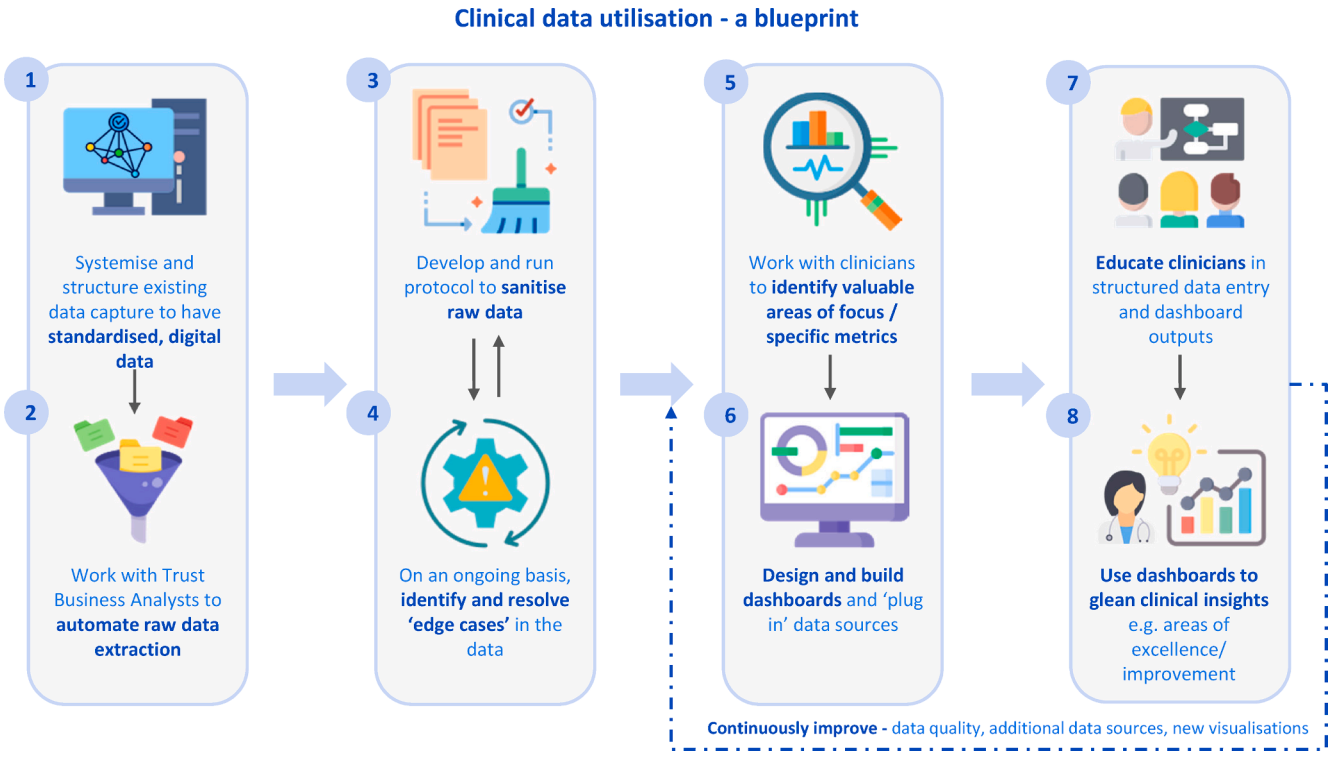

Fig. 2. Graphical overview of data collection, processing and visualisation pathway.

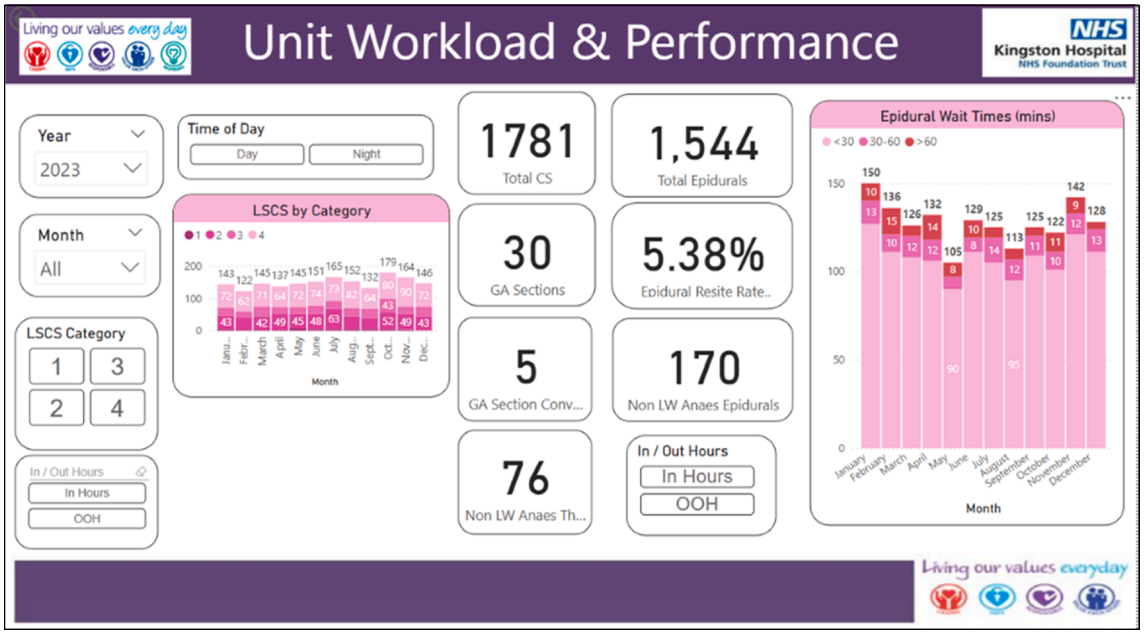

Fig. 3. **CD data:** total CD, CD under GA and GA conversions. **Epidural data:** total labour epidurals and re-site rate. **Non LW Anaesthetist provision:** theatre cases and labour epidurals.

- CD Data: total number, total under GA, total converted to GA, non labour ward anaesthetist provision
- Epidural data: total number, resite rate, wait times by category, non labour ward anaesthetist provision
- Filters: year, month, time of day

Subsequent pages displayed:

- Non-Labour Ward Anaesthetist Workload (Fig. 4a):
  - o Frequency of anaesthetists not assigned to labour ward assisting
- Labour Epidural Data – total number, re-site and recognised dural tap rates
- Theatre Epidural Usage (Fig. 4b)
  - o Epidural top up success rates & reasons for not proceeding with top up
- Long Epidural Waits – by wait time category, and reason for delay
- Non-CD Theatre Workload

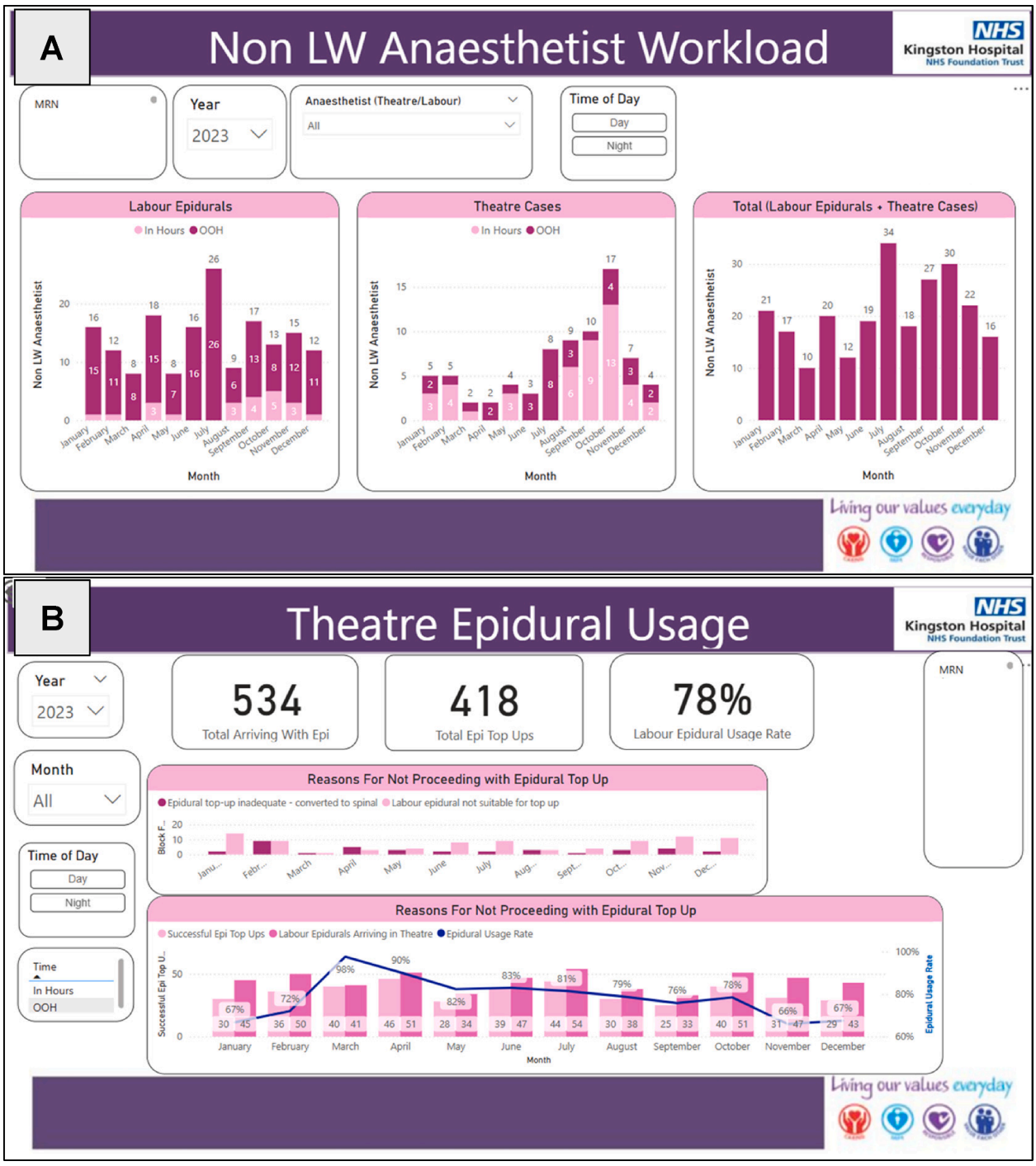

Fig. 4. A) Non LW Anaesthetist Workload: Additional anaesthetic support required for theatre cases and labour epidurals. **B) Epidural Top Up Success in Theatre:** Total number and proportion of labour epidurals successfully topped up for operative delivery.

- Intra-operative Discomfort – including management strategies employed
- CD Estimated Blood Loss – displayed by category, including blood product administration
- CD GA rates – both de novo and GA conversion
- Local Leaderboard – top five proceduralists for CD / epidurals by month
- Automated monthly data submission for multi-centre audit project[13]

When viewing the dashboard, filters can be selected and combined to display a subset of data. All pages contain filters for in or out of hours and non labour ward anaesthetist involvement. Alternatively, users can click directly on an area of interest on the graphs, such as a specific month's epidurals, and all other data (resite and dural puncture rates, non-labour ward anaesthetist provision) updates live to reflect this selection. This functionality makes it easy to drill down on potential trends in our data.

Discussion

The visualisation of our data via the dashboard has already led to improvements in four key areas: (1) better understanding of workload

patterns out of hours; (2) quality of data collection; (3) metrics for epidural conversion success in theatre; and (4) monthly reports on intraoperative discomfort.

The dashboard, alongside a recent department audit project have identified that 75% of labour epidurals are performed out of hours, and all epidural procedures delayed by over 60 minutes occurred out of hours. Our input forms capture how often anaesthetists not rostered to labour ward are called in for labour analgesia or operative cases out of hours.

The combination of these data has been used for a business case to staff an extra obstetric trained anaesthetist on the out of hours rota.

By cross-referencing data from labour epidural insertion and theatre anaesthesia, we are now able to view the success and failure rates of our epidural top ups in theatre (Fig. 4b). We feel that such insights enable us to give more informed consent when siting epidurals or proceeding to theatre, by giving patients up to date, local figures.

In the process of setting up the data processing pathways, we have identified areas for improvement in our input forms. For example, we now include a hard Yes/No for suspected postdural puncture headache (PDPH) to aid complication analysis. Most recently we have added time in and out of theatre, to gain more detailed understanding of the anaesthetic workload in theatre as a function of time. The dashboard makes such additions quick to produce, allowing contemporaneous examination of our practice.

An example of direct improvement in patient care is the Intra-operative Discomfort page. All cases of recorded intra-operative discomfort are displayed, filterable by month, management steps taken, in or out of hours, and unique patient identifiers update according to selected filters. This allows for timely identification of cases, senior clinician review of notes, and decision to offer a debrief and or clinic follow-up as appropriate.

We are currently building an individual report page. This will only be available to the department lead and will help to provide insights such as how novices' skills progress over time. It will also provide a comprehensive individual logbook for each member of staff when shared with them. This functionality can also be adapted to view complications, which can be used by the department to target teaching.

While we acknowledge that access to existing digital infrastructure and business analyst support facilitated our approach, the software and skills used are widely available and transferable. Even starting with simple metrics and gradually building capacity can offer meaningful insights.

In addition to this, existing access to the software used in our project may be UK specific and may not be available in low- and middle-income countries.

The availability of trust employed business analysts and clinicians with Excel and PowerBI capability has also been invaluable. Whilst this may not be immediately available to all anaesthesia departments, these are skills that the authors have learned and developed during the process of the project. Engagement of trust employed business analysts, whilst vital, has not always been a given, and is something the authors have had to advocate for throughout the project.

With national data collaboration projects such as the NHS England Digital Maternity dashboard being built using the same software, replication of projects such as described by the authors could pave the wave towards renewed national obstetric anaesthetic data collection in the UK.

In the conditions described, we provide a blueprint for local centres in the UK to establish similar data pathways and visualisation. Whilst data dashboards are by no means novel, data collection and analysis are areas in which anaesthesia is falling behind our colleagues, in particular maternity services. We propose that obstetric anaesthetic units should not only collect data electronically but should also have a robust way of analysing and displaying this data to improve care of patients.

The model we present enables this, and replication at other centres, even for very simple metrics, would improve the understanding of local service provision and highlight areas to commend or improve on. Scaled adoption of data dashboards in the UK could also represent an important step towards central data submission, and reviving national obstetric anaesthetic benchmarking projects.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CRediT authorship contribution statement

L. Parker: Writing – review & editing, Writing – original draft, Conceptualization. **N. Richards:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijoa.2025.104708.

References

1. Chereshneva M, Johnston C, Colvin JR, Peden CJ. Raising the Standards: Royal College of Anaesthetists quality improvement compendium. 4th ed. London: Royal College of Anaesthetists; 2020. Accessed July 5, 2024. https://www.rcoa.ac.uk/safety-standards-quality/quality-improvement/raising-standards-rcoa-quality-improvement-compendium.
2. Bamber JH, Lucas DN, Plaat F, Allin B, Knight M. The identification of key indicators to drive quality improvement in obstetric anaesthesia: results of the Obstetric Anaesthetists' Association/National Perinatal Epidemiology Unit collaborative Delphi project. *Anaesthesia*. 2020;75:617–625. https://doi.org/10.1111/anae.14861.
3. Bamber JH, Lucas DN, Plaat F, Russell R. Obstetric anaesthetic practice in the UK: a descriptive analysis of the National Obstetric Anaesthetic Database 2009–14. *Br J Anaesth*. 2020;125:580–587. https://doi.org/10.1016/j.bja.2020.06.053.
4. Society for Obstetric Anaesthesia and Perinatology Centers of Excellence. Accessed January 14, 2025. https://www.soap.org/centers-of-excellence_program.
5. Bamber JH, Sultan P. Measuring Quality in obstetric anaesthesia. *BJA Educ*. 2024;24:296–303. https://doi.org/10.1016/j.bjae.2024.04.005.
6. Pritchard N, Lo Q, Wikner M, Bamber J. Collecting data for quality improvement in obstetric anaesthesia. *Int J Obstet Anesth*. 2019;39:142–143. https://doi.org/10.1016/j.ijoa.2019.02.008.
7. Royal College of Anaesthetists. Guidelines for the Provision of Anaesthesia Services (GPAS). Chapter 9: Guidelines for the Provision of Anaesthesia Services for an Obstetric Population. London: RCoA; 2024. Accessed July 2, 2024. https://www.rcoa.ac.uk/gpas/chapter-9.
8. California Department of Public Health, Maternal, Child and Adolescent Health Division. The California Pregnancy-Associated Mortality Review. Report from 2002-2007 Maternal Death Reviews. Sacramento, CA: California Department of Public Health; 2018. Accessed July 5, 2024. https://www.cmqcc.org/research/ca-pamr-maternal-mortality-review.
9. Markow C, Main EK. Creating change at scale: quality improvement strategies used by the California Maternal Quality Care Collaborative. *Obstet Gynecol Clin North Am*. 2019;46:317–328. https://doi.org/10.1016/j.ogc.2019.01.014.
10. National Maternity and Perinatal Audit Project Team. National Maternity and Perinatal Audit: Clinical Report 2017. RCOG London, 2022. Accessed January 14, 2025. https://maternityaudit.org.uk/filesUploaded/Ref%20336%20NMPA%20Clinical%20Report_2022.pdf.
11. NHSMail Support. Power BI Guidance. Accessed January 14, 2025. https://support.nhs.net/knowledge-base/power-bi-guidance/.
12. NHS England Digital. National Maternity Dashboard. Accessed January 14, 2025. https://app.powerbi.com/view?r=eyJrIjoiOTg1YTkzNWQtNTM1NS00YmE0LWEzNTktMWQ3ZTRlNWM5ZmUyIiwidCI6IjM3YzM1NGIyLTg1YjAtNDdmNS1iMjIyLTA3YjQ4ZDc3NGVlMyJ9.
13. Obstetric Anaesthetists' Association. GOALPOSTs: Scoring for quality improvement in obstetric anaesthesia. Accessed January 14, 2025. https://www.oaa-anaes.ac.uk/news/latest-news-and-opinion/post/16-goalposts-scoring-for-quality-improvement-in-obstetric-anaesthesia.