

Exploratory analysis of Obstetric Anaesthetists' Association surveys

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Prepared for the Obstetric Anaesthetists' Association

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CONTENTS

SUMMARY	6
1 INTRODUCTION	8
1.2 LOCATION AND SIZE OF HOSPITALS	9
1.3 THE MEASURING CHANGE OVER TIME	10
1.4 DATA UNCERTAINTY	12
1.5 STRUCTURE OF CHAPTERS ON ANALYSIS	13
2 NUMBER OF DELIVERIES	14
2.1 INTRODUCTION	14
2.2 CHANGE IN NUMBER OF DELIVERIES	14
3 DOMAIN: GENERAL - ANALYSIS OF AVDS, CS AND ELECTIVE CS	16
3.1 INTRODUCTION	16
3.2 AVDS	16
3.3 CAESAREAN SECTIONS	18
3.4 TIMES SERIES ANALYSIS FOR ELECTIVE CAESAREAN SECTIONS	19
3.5 SUMMARY	20
4 DOMAIN: MAINTENANCE OF LABOUR	21
4.1 INTRODUCTION	21
4.2 TIMES SERIES ANALYSIS FOR MAINTENANCE OF LABOUR	22
4.3 COMPARISONS BETWEEN DIFFERING TREATMENTS WITH LEA	24
4.4 SUMMARY	26
5 DOMAIN: TYPE OF ANAESTHESIA OF C SECTION	27
5.1 INTRODUCTION	27
5.2 TIMES SERIES ANALYSIS FOR VARIABLES IN THE DOMAIN: TYPE OF ANAESTHESIA FOR C SECTION	28
5.3 SUMMARY	30
6 DOMAIN: COMPLICATIONS	31
6.1 INTRODUCTION	31
6.2 ANALYSIS FOR NO. LEA RESITES	34
6.3 ANALYSIS FOR NO. EBP FOR PDPH	36
6.4 ANALYSIS FOR NO. ICU ADMISSIONS	38
6.5 ANALYSIS FOR ADP	38
6.6 SUMMARY	39
7 DOMAIN: TECHNIQUE OF LABOUR ANALGESIA	40
7.1 INTRODUCTION	40
7.2 ANALYSIS FOR NO. LEA BY CSE	41
7.3 ANALYSIS FOR NO. LEA	42
7.4 ANALYSIS FOR NO LABOUR ANALGESIA BY PCA	42
7.5 ANALYSIS FOR NO. LABOUR ANALGESIA SPINAL CATHETER	43
7.6 SUMMARY	43
8 CONCLUSIONS	44
APPENDIX 1. VARIABLE DEFINITION AND DOMAIN	45

Tables

TABLE 1 NUMBER OF HOSPITALS AND AVERAGE DELIVERIES BY NATION.....	9
TABLE 2 NUMBER OF HOSPITALS RETURNING A QUESTIONNAIRE EACH YEAR	11
TABLE 3 THE NUMBER OF HOSPITALS PROVIDING DATA FOR EVERY QUESTION, BY NUMBER OF YEARS	11
TABLE 4 DELIVERIES IN 2014 IN HOSPITALS, WHO HAVE GIVEN DATA ON DELIVERIES FOR SIX YEARS, AS PROPORTIONS OF REGISTERED BIRTHS, BY NATION	14
TABLE 5 CHANGE IN NUMBER OF DELIVERIES 2009-2014, IN SAME HOSPITALS, BY NATION.....	14
TABLE 6 CHANGE IN HOSPITAL DELIVERIES FROM HOSPITALS WHO HAVE PROVIDED DATA FOR EACH YEAR COMPARED TO REGISTERED BIRTHS, 2009-2014, BY NATION	15
TABLE 7 NUMBER OF HOSPITALS WHICH HAVE RETURNED DATA ON AVDs, CS AND ELECTIVE CS AND DELIVERIES FOR EACH YEAR, BY NATION	16
TABLE 8 RELATIVE CHANGE IN NUMBER OF AVDs, 2009-2014, FOR THE SELECTED HOSPITALS, BY NATION	17
TABLE 9 AVDs AS A PROPORTION OF DELIVERIES 2014, BY NATION	17
TABLE 10 RELATIVE CHANGE IN NUMBER OF CS, 2009-2014, FOR THE SELECTED HOSPITALS, BY NATION	18
TABLE 11 CAESAREAN SECTIONS AS PROPORTIONS OF THE NUMBER OF DELIVERIES, 2009-2014, FOR THE SELECTED HOSPITALS, BY NATION	18
TABLE 12 RELATIVE CHANGE IN NUMBER OF ELECTIVE CS, FOR THE SELECTED HOSPITALS, BY NATION	19
TABLE 13 NUMBER OF HOSPITALS WHO HAVE RETURNED SOME DATA ON MAINTENANCE OF LABOUR	21
TABLE 14 NUMBER OF HOSPITALS PROVIDING DATA ON LEAs	21
TABLE 15 NUMBER OF HOSPITALS FOR TIME SERIES ANALYSIS OF LEAs, BY NATION	22
TABLE 16 No. LEA WITH CEI TREATMENTS AS PER CENTAGE OF NUMBER OF DELIVERIES FOR THE SELECTED HOSPITALS,, BY NATION	22
TABLE 17 No. LEA WITH TOP-UPS A PER CENTAGE OF NUMBER OF DELIVERIES, FOR THE SELECTED HOSPITALS, BY NATION	23
TABLE 18 No. LEA WITH PCEA NO CI AS A PER CENTAGE OF DELIVERIES, FOR THE SELECTED HOSPITALS, BY NATION.....	24
TABLE 19 AVERAGE NUMBER OF TREATMENTS WHERE LEA IS USED, FOR THE SELECTED HOSPITALS	25
TABLE 20 AVERAGE NUMBER OF TREATMENTS WHERE LEA IS USED AS A PER CENTAGE OF DELIVERIES, FOR THE SELECTED HOSPITALS	26
TABLE 21 AVERAGE NUMBER OF TREATMENTS FOR VARIABLES IN THE ANAESTHESIA OF C SECTION DOMAIN, FOR EACH YEAR, 2009-2014 ..	27
TABLE 22 POTENTIAL NUMBER OF HOSPITALS FOR TYPE OF ANAESTHESIA FOR C SECTION TIME SERIES, BY NATION	27
TABLE 23 No. GA CS AS PER CENTAGE OF DELIVERIES, 2009-2014, BY NATION.....	28
TABLE 24 No. SSS AS PER CENTAGE OF DELIVERIES, FOR THE SELECTED HOSPITALS, 2009-2014.....	29
TABLE 25 No. TOPPED UP LEA CS, 2009-2014, AS PER CENTAGE OF DELIVERIES, FOR THE SELECTED HOSPITALS.....	30
TABLE 26 PROPORTION OF HOSPITALS, BY YEAR, FOR COMPLICATION VARIABLES WHERE SURVEY RETURN IS BLANK	31
TABLE 27 WHERE HOSPITALS HAVE RETURNED DATA (ZERO OR GREATER), THE PROPORTION WHERE THE DATA IS ZERO, FOR COMPLICATION VARIABLES.....	32
TABLE 28 NUMBER OF HOSPITALS WHO HAVE RETURNED DATA GREATER THAN ZERO FOR COMPLICATION VARIABLES	32
TABLE 29 RETURNS BY HOSPITALS FOR No. TOTAL SPINAL, 2013 AND 2014: BLANK, ZERO, OR LARGER	33
TABLE 30 TREATMENT TOTALS FOR COMPLICATION VARIABLES	33
TABLE 31 NUMBER OF HOSPITALS FOR TIME SERIES ANALYSIS OF No. LEA RESITES, BY NATION	35
TABLE 32 NUMBER OF LEA RESITES FROM SELECTED HOSPITALS, PER 1,000 DELIVERIES, 2011-2014, BY NATION.....	35
TABLE 33 HOSPITALS FOR ANALYSIS FOR No. EBP FOR PDPPH, BY NATION	36
TABLE 34 No EBP FOR PDPPH, FOR SELECTED HOSPITALS, 2009-2014, BY NATION	37
TABLE 35 No EBP FOR PDPPH, FOR SELECTED HOSPITALS, PER 1,000 DELIVERIES, 2009-2014, BY NATION	37
TABLE 36 EXAMPLE OF VARIATION IN No EBP FOR PDPPH FOR TWO HOSPITALS	37
TABLE 37 No. ICU ADMISSION FOR SELECTED HOSPITALS PER 1,000 DELIVERIES, 2009-2014, BY NATION	38
TABLE 38 ADP ADMISSIONS PER 1,000 DELIVERIES, FOR SELECTED HOSPITALS, 2009-2014, BY NATION	38
TABLE 39 AVERAGE FOR TECHNIQUE OF LABOUR ANALGESIA VARIABLES IN 2014.....	40
TABLE 40 NUMBER OF HOSPITALS BY NATION WHO HAVE RETURNED DATA ON TECHNIQUE OF LABOUR ANALGESIA	40
TABLE 41 NUMBER LEA BY CSE FOR SELECTED HOSPITALS PER 1,000 DELIVERIES, 2009-2014, BY NATION	41
TABLE 42 NUMBER LEA BY CSE PER 1,000 DELIVERIES FOR HOSPITALS IN ENGLAND AND WALES WHERE THIS IS GREATER THAN 3 TIMES AVERAGE IN ANY ONE YEAR.....	41
TABLE 43 No LEA FOR SELECTED HOSPITALS AS A PER CENTAGE OF DELIVERIES, 2009-2014, BY NATION	42
TABLE 44 No LABOUR ANALGESIA BY PCA PER 1,000 DELIVERIES 2011-2014, BY NATION	42
TABLE 45 No LABOUR ANALGESIA BY PCA 2011-2014, FOR SELECTED HOSPITALS.....	42
TABLE 46 No LABOUR ANALGESIA SPINAL CATHETER, PER 1,000 DELIVERIES, 2011-2014, BY NATION	43

Figures

FIGURE 1 AVERAGE NUMBER OF DELIVERIES PER HOSPITAL.....	9
FIGURE 2 AVERAGE OF NUMBER OF HOSPITALS WHO HAVE SENT DATA, BY VARIABLE	12
FIGURE 3 CHANGE IN NUMBER OF DELIVERIES 2009-2014, IN SAME HOSPITALS, BY NATION	15
FIGURE 4 RELATIVE CHANGE IN NUMBER OF AVDs, 2009-2014, FOR THE SELECTED HOSPITALS, BY NATION	17
FIGURE 5 CAESAREAN SECTIONS AS PROPORTIONS OF DELIVERIES, 2009-2014, FOR THE SELECTED HOSPITALS, BY NATION	19
FIGURE 6 NON ELECTIVE CAESAREAN SECTIONS AS PROPORTIONS OF ALL CAESAREAN SECTIONS, FOR THE SELECTED HOSPITALS, BY NATION...	20
FIGURE 7 AVERAGE NUMBER OF TREATMENTS WHERE LEA IS USED, FOR THE SELECTED HOSPITALS.....	25
FIGURE 8 No. GA CS AS PER CENTAGE OF DELIVERIES, 2009-2014, BY NATION	28
FIGURE 9 No. SSS AS PER CENTAGE OF DELIVERIES, FOR THE SELECTED HOSPITALS, 2009-2014	29
FIGURE 10 No. TOPPED UP LEA CS AS PER CENTAGE OF DELIVERIES, 2009-2014, FOR THE SELECTED HOSPITALS	30
FIGURE 11 NUMBER OF LEA RESITES FROM SELECTED HOSPITALS, PER 1,000 DELIVERIES, 2011- 2014, BY NATION	35
FIGURE 12 AVERAGE NUMBER OF LEA RESITES PER 1,000 DELIVERIES, 2011-2014 PER FROM SELECTED HOSPITALS.....	36
FIGURE 13 ADP ADMISSIONS PER 1,000 DELIVERIES, FROM SELECTED HOSPITALS, 2009-2014	38

Glossary

Acronyms	Full description
AVD	Assisted vaginal delivery
CS	Caesarean section
LEA / CEI	Local epidural anaesthesia / continuous epidural infusion
PCEA / CI	Patient controlled epidural analgesia / continuous infusion
CSE	Combined spinal epidural
GA	General anaesthetic
SSS	Single shot spinal
CICV	Cannot intubate cannot ventilate
LA fits or CA	Local anaesthetic / cardiac arrest
EBP / PDPH	Epidural blood patch / post-dural puncture headache
PCA	Patient controlled analgesia
SVD	Spontaneous (unassisted) vaginal delivery

Summary

This report summarises work carried out for the Obstetric Anaesthetists' Association (OAA), exploring the annual surveys of hospitals for the six years 2009 to 2014. It looks at change over time in the nations in the UK.

As with any survey there can be some discrepancies between the information given and what has taken place. There are some cases where this is explored by looking at the data for individual hospitals.

The report uses the abbreviations for the variables and these are expanded in Appendix 1. The work on the analysis has identified the following:

1. There are differences between the nations in change over time in the number of AVDs. From 2009 to 2014 there has been an increase of 8% in England a four percent fall in Scotland and little change in Wales.
2. The per centage of deliveries which are caesarean sections has increased slightly in England, Scotland and Wales. For each year there are slightly lower rates in England compared to Scotland and Wales.
3. Elective caesarean sections are 41% of caesarean sections for the UK. This is slightly lower in Wales where they form 38% of caesarean sections.
4. The rates of LEA with CEI are much higher in Wales – close to five times the rate in England and Scotland.
5. For the No. LEA with top-ups (as proportions of deliveries) Scotland has the highest rates (average 11.6%). The average in England is 8.5% while in Wales the rates are very low.
6. Most hospitals tend to use one of the LEA treatments rather than more than one, though there is a small number who do carry out more than one LEA treatment.
7. There have been change 2009 to 2014 in which treatments have the larger numbers carried out. In 2009 the No. LEA with top-ups had the largest average number of patients and LEA with CEI was the second largest. In 2014 No. LEA with top-ups and LEA with CEI are both lower than PCEA with CI and No. LEA with PCEA no CI.
8. The average number of LEA treatments has declined. In 2009 – 2011 the average for all is c.250 a year. This decreased in 2012, 2013 and in 2014 the average is 209.
9. Taking account of the increasing number of deliveries, the average number of LEA treatments as a per centage of all deliveries halves (2009 to 2014) for No. LEA with CEI and No. LEA with top-ups.
10. The per centage of deliveries where there is No. GA CS has stayed the same in England, risen slightly in Scotland, and has fallen in Wales.
11. For No. SSS as per centage of deliveries there have been increases in England and Scotland, while the rate has not significantly risen.
12. For No. topped up LEA CS related to the number of deliveries, the proportions in Wales were lower than England and Scotland and have fallen from 2009 to 2014. The gap between the rates in Wales and Scotland has increased.

13. For the variables in the domain complication there are a number where most hospitals indicate none have taken place and some where most hospitals indicate these have occurred.
14. For the treatments individually, five (No. LEA resites, No. EBP for PDPH, No. HDU admissions in ICU, No. ICU admissions, and No. ADP) have total treatments as hundreds. The No. failed intubations and No. total spinal have totals of around 30. The treatments for the remaining variables are small (under 10).
15. With the number of LEA resites per thousand deliveries, the rates in Scotland and Wales are about 50% higher than the rates in England.
16. The rate of No EBP for PDPPH per 1,000 deliveries for 2009 to 2014 has risen in England while not changing significantly in Wales.
17. The figures showing the rate of ICU admission per 1,000 deliveries has stayed level for the UK over the six year period.
18. ADP admissions per 1,000 deliveries have increased from 2009 to 2014 in England and in the total for all nations.
19. The number LEA by CSE per 1,000 deliveries in England are higher than those for Scotland and Wales.
20. In England and Wales there are a small number of hospitals with much higher rates of LEA by CSE per 1,000 deliveries than other hospitals.
21. For the No labour analgesia by PCA per 1,000 deliveries there are higher rates for both Scotland and Wales compared to England.
22. Scotland and Wales each have one hospital which carries out a much higher number of No labour analgesia by PCA.

1 Introduction

- 1.1.1 This project is an exploratory analysis for the Obstetric Anaesthetists' Association (OAA) of an annual OAA survey of hospitals for the six years 2009 to 2014. Over the period the survey has data from **198 hospitals** in the United Kingdom, the Channel Islands and Isle of Man: hospitals where obstetric anaesthetists carry out work.
- 1.1.2 The annual survey requested that obstetric anaesthetists in each hospital provide data showing the totals for differing treatments¹ for women giving birth in that hospital² in each year. The questions asked for data on 35 treatments³. The Information collected by the surveys is the total for each hospital for each treatment in that year: there is no personal data such as information on the age or address of those receiving the treatment.
- 1.1.3 The analysis is descriptive, with concentration on trends over time and between different areas. Comparing areas has looked at patterns between UK nations⁴.
- 1.1.4 It does not put forward theories or explanations for any patterns. It does indicate those which might be explored in more detail.
- 1.1.5 The information relates to births in hospitals. These are most, but not all, births. In 2018 2.1% women gave birth at home⁵ in England and Wales.
- 1.1.6 To help carry out the work the data has been restructured⁶, building on work carried out by the OAA. A key element has been that, for every survey year, the hospitals and questions have been placed in the same order.
- 1.1.7 This introductory chapter describes characteristics of the data and assumptions made for the analyses. It sets out:
- the location and size of the hospitals
 - the data used to measure change over time: changes in the questions between surveys, the number of hospitals who answered questions each year and how this varies question to question
 - uncertainty in the data: where it might not exactly indicate the number of treatments
- 1.1.8 In order to help the analysis, by expanding the number of hospitals used for differing variables, the data was copied into different files and processed in each. Those used are given as sources for each table or graph.

¹ This is given as the number of treatments as it includes the possibility that a woman giving birth may have more than one of the treatments.

² Also includes private hospitals e.g. Portland Hospital, London.

³ More information in para 1.3.5 in the change in the questions over the six years.

⁴ England, Northern Ireland, Scotland and Wales. Data from the hospitals in the Isle of Man and Jersey are included in United Kingdom totals. The data for an individual nations is shown when the number of treatments is considered large enough to reflect patterns. Each chapter gives more information on the variables examined.

⁵ See Table 17 in Littleboy, K. (2019), Birth characteristics data set. Office for National Statistics. [viewed on 19th December 2019], available from:

<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/datasets/birthcharacteristicsinenglandandwales>

⁶ A note is available to document the processes applied.

1.2 Location and size of hospitals

1.2.1 **198 hospitals** have been able to provide data at least once, the number from each nation is shown in Table 1. This also gives an indication of the size of the hospitals⁷ through the average number of deliveries for the hospitals in each nation. This shows the larger size of the hospitals in England.

1.2.2 There is a range in the number of deliveries in hospitals, Figure 1 shows the average for each hospital for the years they were able to provide these. The smallest number of deliveries in a year is 141 in the Gilbert Bain Hospital, Shetland in 2011 (the average over the six years is 154). The largest was 10,840 at the Princess of Wales Maternity Unit in Birmingham in 2010. The maternity unit was able to provide data for two years. For the hospitals able to give data for each of the six years the John Radcliffe Hospital in Oxford had the largest average: 8,242 deliveries.

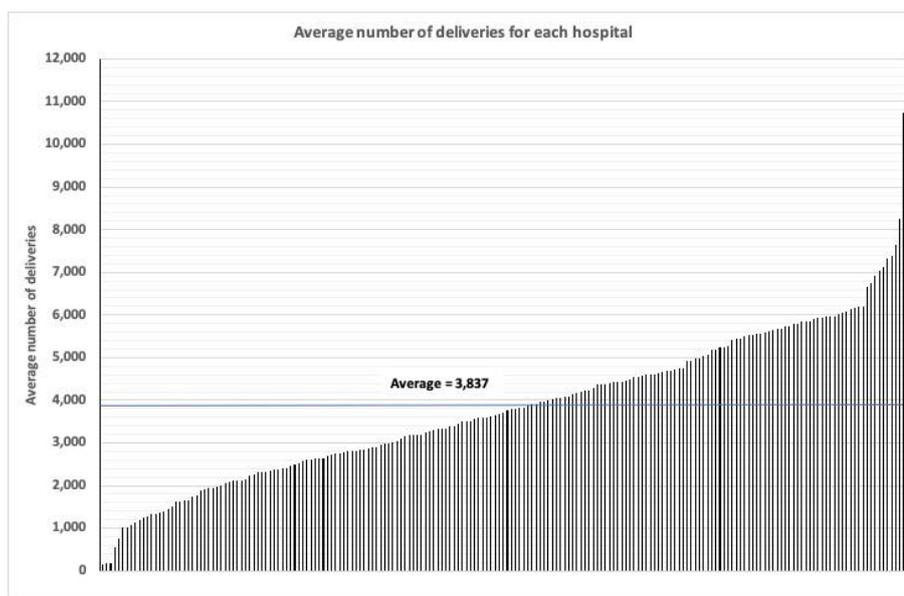
1.2.3 For the number of deliveries in hospitals⁸, five of the 10 smallest are in Scotland. The seven largest are in England, all outside London: two in Birmingham, and one in each of: Liverpool, Manchester, Newcastle, Oxford and Sheffield. The Edinburgh Royal Infirmary is the eighth largest.

Table 1 Number of hospitals and average deliveries by nation

Nation	Number of hospitals returning questionnaires	Average number of deliveries per hospital 2009 to 2014
England	158	4,112
Northern Ireland	7	2,863
Scotland	18	3,429
Wales	13	2,504
Channel Islands	1	1,009
Isle of Man	1	770
Total	198	3,837

Source: NOAD_Deliveries_f, Delivs_AnyYear

Figure 1 Average number of deliveries per hospital



Source: Deliveries_EveryYear

⁷ The term size of hospital refers to the number of deliveries rather than all the functions carried out.

⁸ Where the number of deliveries has been provided for at least one year.

1.3 The measuring change over time

- 1.3.1 A key element this report has been to look at change over time and there are two main ways this has been done. Treatments are shown in relation to the number of deliveries so that this not show change directly influenced by variation in the number of deliveries.⁹ If change in the number of deliveries influenced which treatments were available, or how many might be carried out, then some additional analysis would help explore this.
- 1.3.2 The second main element is that the data used for treatments is from hospitals which have been able to provide the data *for those treatments for each year*. This gives continuity in where the data comes from. The chapters give the number of hospitals in them on which the analysis is based.
- 1.3.3 Discussion with the OAA on why procedures in a hospital might change gave one reason as new equipment becoming available. If a hospital was not able to carry out a treatment (e.g. because of the equipment not available) and filled in the answer with zero then this is included in the analysis. However if the response was blank – no number given – then this has not been included (section 1.4 gives more information on this). If this has happened the time series shown will underestimate a rise that has taken place.
- 1.3.4 The next sections examine aspects of the data overall that influence how the analysis was done and issues which might influence patterns shown (or not shown).

Changes in questions between surveys

- 1.3.5 Appendix 1. Variable definition and domain gives a description of the variables from the 35 questions and also the years they were asked for. The surveys for 2009 and 2010 contained the same 30 questions. For the surveys from 2011 to 2014 five new questions were added and three existing questions were removed: the surveys for 2011 to 2014 had the same 32 questions each. For trends over the whole six years there are 27 questions available. Some trends have been explored for the three questions asked for 2011 to 2014¹⁰.

The amount of data available for all six years

- 1.3.6 The time series analysis is on data from hospitals who have provided this for each year. The 198 hospitals referred to are those who returned a questionnaire *at least once*. Not all have been able to return questionnaires **every** year: Table 2 shows the variation - in 2010 114 hospitals returned a questionnaire while in 2011 this was 145.
- 1.3.7 The amount of data for analysis where the hospitals have been able to provide this for every year also depends on the number of questions answered in a questionnaire. Not every questionnaire returned has been completely “filled in”. The extent of this is shown in Table 3, 104 hospitals have not been able to fully complete a questionnaire any year, and only two hospitals have answered every question every year.

⁹ Chapter 2 shows the number of deliveries.

¹⁰ LEA resites, labour analgesia by PCA and labour analgesia spinal catheter

Table 2 Number of hospitals returning a questionnaire each year

Year	Number of hospitals who have returned a questionnaire	Number of hospitals who have provided complete data
2009	141	34
2010	114	29
2011	145	36
2012	141	28
2013	138	29
2014	121	30

Source: count of hospitals in Copy of NOAD Analytics Cambridge June 19, minus one duplicate (see 2019_OAA_NoteOnRestructuring_final)

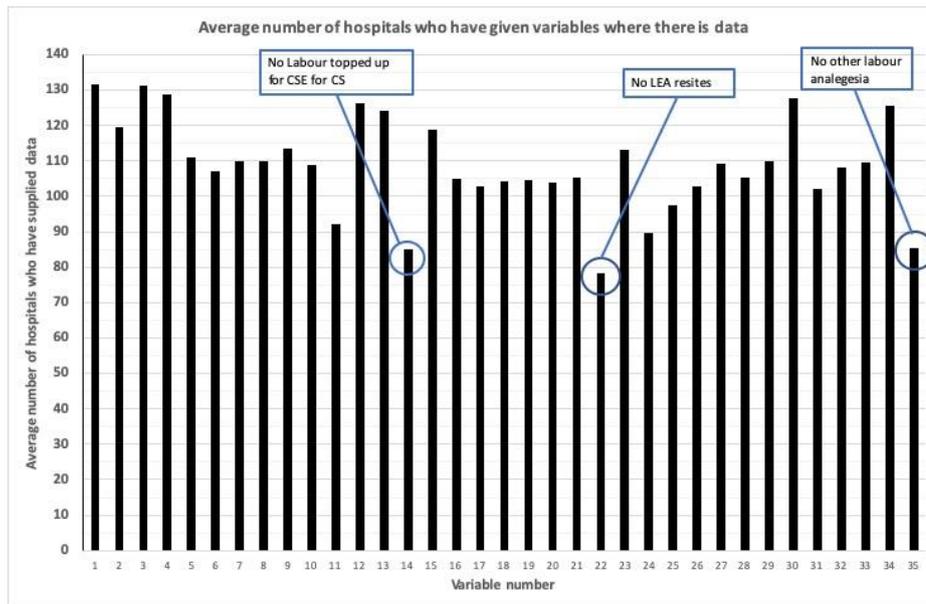
Table 3 The number of hospitals providing data for every question, by number of years

Number of years hospitals have provided data for each question	Number of hospitals
0	104
1	52
2	16
3	11
4	8
5	5
6	2
	198

Source: NOAD_HospitalsDataEveryYear.xlsx

- 1.3.8 The number of hospitals who have been able to provide the data for each year does vary between the questions. Although only two hospitals have been able to provide data for every question every year, 43 hospitals returned data on AVDs, CS, and Elective CS, for every year (Table 7) and 36 have returned information on No. LEA by CSE for every year (
- 1.3.9 Table 32).
- 1.3.10 The time series analysis has been carried out structured on the domains the variables have been grouped into (see Appendix 1. Variable definition and domain). The chapters indicate how many hospitals have been able to complete the questions in that domain every year - giving the number used for the time series.
- 1.3.11 Figure 2 gives an overall view by showing for each variable the average number of hospitals who have been able to give data. It labels the three variables which have the fewest hospitals being able to provide data.

Figure 2 Average of number of hospitals who have sent data, by variable



Source: NOAD_HospitalsDataEveryYear.xlsx

1.4 Data uncertainty

- 1.4.1 As set out, the time series analysis uses data from hospitals which have answered the relevant question for each year and this varies between questions. Examining this does need a decision on whether an answer had been given. Essentially if a cell is blank then does this mean that none of that treatment was carried out that year? Or does it mean that the answer wasn't known?
- 1.4.2 The decision taken was that if the number zero was given then it was assumed that the treatment could have been carried out but none was. If the answer was given as blank the assumption made is that the data was missing or could not be provided. These are general assumptions but it seemed clear that this wasn't always the case. As one example - in 2011 there were 4,455 deliveries at East Surrey Hospital, Redhill while the number of AVDs is given as 0. In 2012 the number of AVDs was given as 641. It's probable that the hospital was unable to provide the number of AVDs for 2011 rather than none were carried out.
- 1.4.3 From this, some of the change over time will reflect hospitals' ability to return the data rather than any change in practice.
- 1.4.4 It is also the case that some data provided are given as estimates rather than as confirmed exact numbers. For example, in 2014 one hospitals gave the number of 408 as the information on "The number of women having Caesarean sections under topped-up epidurals" with the remark "Cannot differentiate between new and topped up epidurals". In 2011 one hospital gave an answer to the question "The number of women provided level 2 care in labour ward" as "not recorded in 2011 but consensus is approximately 40".
- 1.4.5 The approach taken has been to show change over time and to compare areas has been through **data for those hospitals who have been able to answer the question every year**. The data used has been the numbers provided, they have not been adjusted.

- 1.4.6 Some variables have not been chosen for analysis due to the small number of treatments. This is also the reason when deciding for which areas is it valid to look at change. The chapters include the numbers of hospitals where the data has been used in the doand give a description of the amount of data to explain why an area or variable has not been included.
- 1.4.7 The focus for selecting which nations where the data could be shown separately has been the numbers of hospitals who have returned data for each year. So, if in a nation, only one hospital has been able to give data for each of the six years then that nation is not shown separately. A more detailed look has shown that not every treatment is commonly used in or reported by every hospital and data returned could be zeros. In looking at Scotland and No. LEA with CEI, four hospitals have given *some* data for every year and so the totals for Scotland are shown for trends over time and comparison with other nations. But a more detailed look shows that essentially the data on No. LEA with CEI is from one hospital – the others have very small numbers or have returned answers of 0. So trends over time and comparing nations would benefit from examining the contributions of individual hospitals.
- 1.4.8 The report highlights some text in yellow to indicate where numbers would benefit from further investigation for explanation. It can be the case where the number of treatments in a hospital are widely different for one year: while this might be a change in the number of treatments other possible explanations could be that the question has been interpreted differently one year or there might have been an error in the data given.

1.5 Structure of chapters on analysis

- 1.5.1 The next chapter provides background through changes in the number of deliveries.
- 1.5.2 The variables have been grouped into domains - shown in Appendix 1. Variable definition and domain. In the following chapters the data is then explored through these domains.
- Maintenance of labour
 - Type of anaesthesia of C section
 - Complications
 - Technique of labour analgesia
- 1.5.3 The main type of exploratory analysis carried out has been to look at change over time and also looking at change for different geographical areas: in this work from England, Northern Ireland, Scotland and Wales.

2 Number of deliveries

2.1 Introduction

- 2.1.1 This chapter looks at the information on the number of deliveries provided by the hospitals through the survey. The analysis here is on data from **54 hospitals** in the UK which have provided data for each year on the number of deliveries. This is 27.6% of the 196 hospitals in the UK which have provided data for any year¹¹.
- 2.1.2 The number of deliveries has been compared with the number of registered births¹². Table 4 shows the births in the 54 hospitals as a proportion of national registered births for 2014¹³. Overall these hospital deliveries are just over a quarter of the registered births. The proportions are higher in Wales, Northern Ireland and Scotland.

Table 4 Deliveries in 2014 in hospitals, who have given data on deliveries for six years, as proportions of registered births, by nation

Nation	2014
England	24%
Northern Ireland	38%
Scotland	30%
Wales	39%
All selected hospitals	26%

Source: NOAD_Deliveries_f.xlsx

2.2 Change in number of deliveries

- 2.2.1 Figure 3 and Table 5 show the change in number of deliveries in these hospitals in all four nations from 2009 to 2014. The number rose by 4% in the UK as a whole. For nations there was a 6% increase in England and a 3% increase in Northern Ireland. The number of deliveries in Scotland fell by 1% and in Wales by 3%.

Table 5 Change in number of deliveries 2009-2014, in same hospitals, by nation

Nation	2009	2010	2011	2012	2013	2014
England	100	103.5	107.2	109.7	105.9	106.0
Northern Ireland	100	99.9	99.2	99.6	100.8	103.1
Scotland	100	100.5	99.9	102.3	99.3	99.1
Wales	100	97.4	99.4	98.7	95.1	93.1
All selected hospitals	100	102.7	105.	107.8	104.3	104.3

Source: NOAD_Deliveries_f.xlsx

¹¹ This (196) is the hospitals in the UK but excludes those in the Channel Islands and the Isle of Man

¹² The registered births are from the national statistical agencies:

England and Wales:

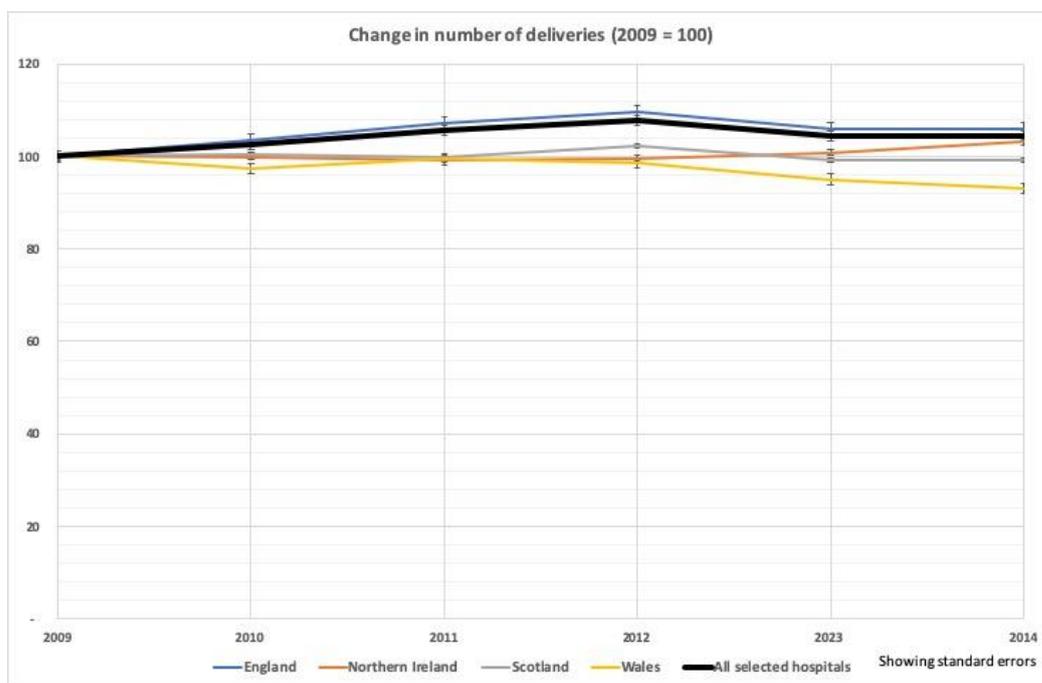
<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/datasets/birthsummarytables>

Northern Ireland: <https://www.nisra.gov.uk/publications/birth-statistics>

Scotland: <https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/births>

¹³ Deliveries as proportions of total births have remained similar in other years

Figure 3 Change in number of deliveries 2009-2014, in same hospitals, by nation



Source: NOAD_Deliveries_f.xlsx

2.2.2 Table 6 compares changes 2009 to 2014 in the number of deliveries in the hospitals to the number of registered births. In England and Northern Ireland the number of registered births fell while the number of deliveries in the hospitals rose. The implied greater proportion of births being deliveries in hospitals was similar in Scotland: although the number of hospital deliveries fell the number of registered births fell more. Wales was an exception as the number of registered births fell while the decrease in the number of hospital deliveries was greater.

Table 6 Change in hospital deliveries from hospitals who have provided data for each year compared to registered births, 2009-2014, by nation

Nation	per cent change 2009-2014	
	Hospital deliveries	Registered births
England	6.0	-1.4
Northern Ireland	3.1	-2.1
Scotland	-0.9	-3.9
Wales	-6.9	-4.0
All selected hospitals	4.3	-1.7

Source: NOAD_Deliveries_f.xlsx

3 Domain: general - analysis of AVDs, CS and elective CS

3.1 Introduction

3.1.1 This chapter examines trends and patterns in the variables in the *general* domain:

- AVD - the number of women having assisted vaginal deliveries (forceps and ventouse)
- CS - the number of women having caesarean sections (elective and emergency)
- No. elective CS - the number of women having category 4 (elective) caesarean sections

3.1.2 To allow changes in the number of AVDs, CS and elective CS be related to the number of deliveries a data set was established of **43 hospitals** which had returned data on these four variables and deliveries for each year (Table 7). Only one hospital in Northern Ireland was able to do this and so change is not shown separately – but the data is included in the totals for all selected hospitals.

Table 7 Number of hospitals which have returned data on AVDs, CS and Elective CS and deliveries for each year, by nation

Nation	Number of hospitals		Per cent of all hospitals
	No hospitals with data on all of Deliveries, AV, CS and elective CS	Total number of hospitals (all)	
England	31	158	20%
Northern Ireland	1	7	14%
Scotland	4	18	22%
Wales	7	13	54%
All selected hospitals	43	196	22%

Source: NOAD_General_AVD_CS_f

Note: the total comes to 196 as the two hospitals in the Isle of Man and Jersey have not been included.

3.1.3 Elective caesarean sections are a sub set of the total number of caesarean sections.

3.2 AVDs

3.2.1 The relative change in the number of AVDs over the six year period (Table 8 and Figure 4) shows an increase of 8% in England a four percent fall in Scotland and little change in Wales.

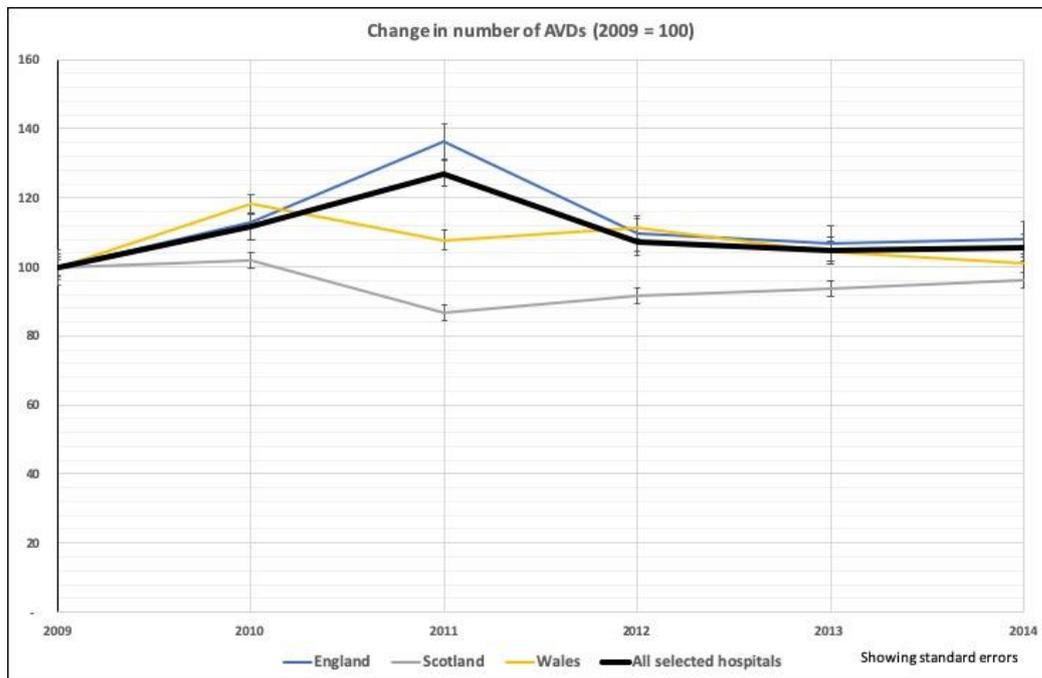
3.2.2 The greatest change is shown in 2010 to 2011: an increase in England and a decrease in Scotland. The amount change returned to smaller levels for 2012 and later years. In looking at the change in more detail the decline in numbers in Scotland was for each of the four hospitals which returned data for each year. In England there are some large extreme changes. These might be due to changes in the number of AVDs or errors in the data given. As an example, the Women's and Children's Hospital in Hull gave 446 AVDS for 2010 and 463 for 2012, however 3,916 were given for 2011. The other example of possible large error is Peterborough City Hospital which has the average of 500 AVDs for 2010 to 2014, but gives 1,516 for 2010.

Table 8 Relative change in number of AVDs, 2009-2014, for the selected hospitals, by nation

Nation	2009	2010	2011	2012	2013	2014
England	100	113	136	110	107	108
Scotland	100	102	87	92	94	96
Wales	100	118	108	111	105	101
All selected hospitals	100	112	127	107	105	106

Source: NOAD_General_AVD_CS_f

Figure 4 Relative change in number of AVDs, 2009-2014, for the selected hospitals, by nation



Source: NOAD_General_AVD_CS_f

3.2.3 Table 9 shows the number of AVDs as a proportion of deliveries for 2014 (there has been little change from 2009). From this there is a slightly higher proportion of deliveries in Scotland which are AVDs (15%) compared to UK (12%).

Table 9 AVDs as a proportion of deliveries 2014, by nation

No AVDs as proportion of deliveries	
Nation	2014
England	12%
Scotland	15%
Wales	12%
All selected hospitals	12%

Source: NOAD_General_AVD_CS_f

3.3 Caesarean sections

3.3.1 Table 10 shows the relative change in the number of caesarean sections (elective and emergency). The trends are an increase in England and Scotland (by 14% and 12% respectively) while there has been a decrease in Wales by 5%¹⁴.

Table 10 Relative change in number of CS, 2009-2014, for the selected hospitals, by nation

Nation	2009	2010	2011	2012	2013	2014
England	100	106	107	113	112	114
Scotland	100	101	105	104	111	112
Wales	100	85	98	101	96	95
All selected hospitals	100	103	106	111	111	112

Source: NOAD_General_AVD_CS_f

3.3.2 The change in the number of caesarean sections is likely to be influenced by the number of deliveries. As section 2.2 showed, the number of deliveries in Wales fell. Examining caesarean sections as proportions of the number of deliveries (Table 11) there have been small increases in every nation: a total of two per centage point rise for the all the selected hospitals.

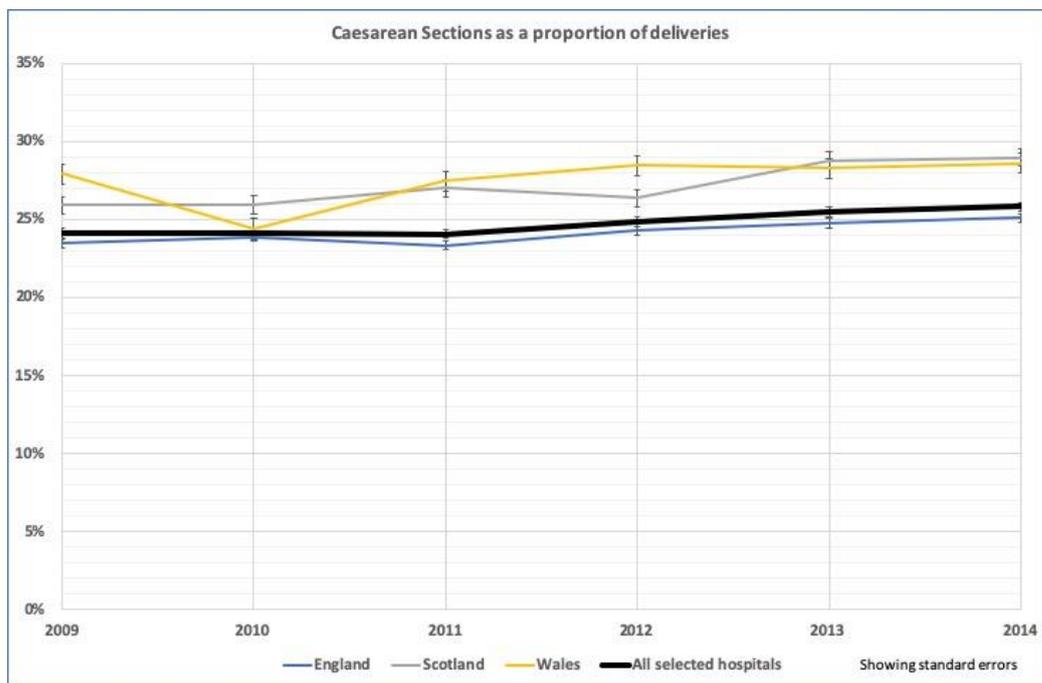
Table 11 Caesarean sections as proportions of the number of deliveries, 2009-2014, for the selected hospitals, by nation

Nation	Number of hospitals	2009	2010	2011	2012	2013	2014
England	31	23%	24%	23%	24%	25%	25%
Scotland	4	26%	26%	27%	26%	29%	29%
Wales	7	28%	24%	27%	28%	28%	29%
All selected hospitals	43	24%	24%	24%	25%	26%	26%

Source: NOAD_General_AVD_CS_f

¹⁴ The larger change in Wales between 2009 and 2010 is related to the number of CS recorded at Royal Glamorgan Hospital moving from 835 to 343. The number then return to an average of 726 a year.

Figure 5 Caesarean sections as proportions of deliveries, 2009-2014, for the selected hospitals, by nation



Source: NOAD_General_AVD_CS_f

3.4 Times series analysis for elective caesarean sections

3.4.1 The changes in the number of elective caesarean sections (see Table 12) is similar to that of caesarean sections (the number of elective caesarean sections are included in the number of caesarean sections). The number in England and Scotland have increased while the number in Wales has decreased.

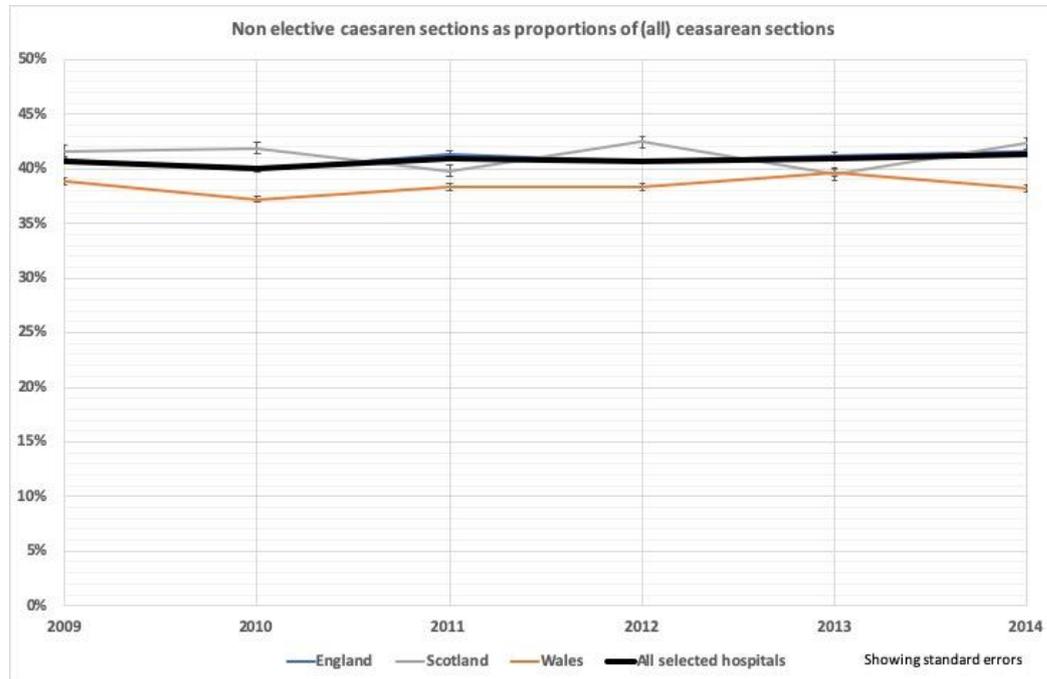
Table 12 Relative change in number of elective CS, for the selected hospitals, by nation

Nation	2009	2010	2011	2012	2013	2014
England	100	104	109	113	114	117
Scotland	100	101	100	107	105	114
Wales	100	82	97	99	98	94
All selected hospitals	100	102	107	111	111	114

Source: NOAD_General_AVD_CS_f

3.4.2 Elective caesarean sections are 41% of caesarean sections for all the selected hospitals. For 2009 to 2014 the difference between nations is the slightly lower per centage in Wales - where they form 38% of caesarean sections. The difference in 2014 is slightly higher as the proportion in England has increased slightly from 41% in 2009 to 42%.

Figure 6 Non elective caesarean sections as proportions of all caesarean sections, for the selected hospitals, by nation



Source: NOAD_General_AVD_CS_f

3.5 Summary

3.5.1 The areas highlighted in the chapter include the following. The points relate to the hospitals who have been able to supply data for each year the questions have been asked. The issues could be explored further, as there is some variation in how hospitals have answered surveys.

- There are differences between the nations in change over time in the number of AVDs. From 2009 to 2014 there has been an increase of 8% in England a four percent fall in Scotland and little change in Wales.
- The per centage of deliveries which are caesarean sections has increased slightly in England, Scotland and Wales. For each year there are slightly lower rates in England compared to Scotland and Wales.
- Elective caesarean sections are 41% of caesarean sections for the UK. This is slightly lower in Wales where they are 38% of caesarean sections.

4 Domain: maintenance of labour

4.1 Introduction

4.1.1 This section examines trends and patterns in the domain *maintenance of labour*. The variables explored are:

- No. LEA with CEI
- No. LEA with top-ups
- No. LEA with PCEA with CI
- No. LEA with PCEA no CI

4.1.2 The work on this domain (as with others) began with establishing a data set with hospitals who have been able to return or give data for each of the six years. Table 13 shows the number of hospitals who have been able to return some data, *for every year*. Over six years this averages as two thirds being able to provide data for at least one year, conversely one third of hospitals have not been able to provide any data on any of the LEA variables.

Table 13 Number of hospitals who have returned some data on maintenance of labour

	2009	2010	2011	2012	2013	2014
Number of hospitals where returns for all four LEA variables are blank	67	86	56	62	62	79
Number of hospitals who returned some data (including zeros)	131	112	142	136	136	119

Source: NOAD_LEA_f

4.1.3 Following this there was an examination of the four LEA variables looking at whether the data was greater than zero and whether this indicated that more than one type of treatment had taken place in each hospital (Table 14). Over the six years 72% of the hospitals had returned data (greater than zero) on one LEA variable and 20% returned data greater than zero on two LEA variables. This indicates that most hospitals provide one LEA treatment and some two, but only a very small number have provided more than two differing LEA treatments in a year.

Table 14 Number of hospitals providing data on LEAs

	2009	2010	2011	2012	2013	2014
Number of hospitals who returned some data, but any data returned is only zeros	12	6	6	6	6	1
Number of hospitals who returned one value greater than zero	94	79	102	98	94	91
Number of hospitals who returned two values greater than zero	22	23	28	29	31	25
Number of hospitals who returned more than two values greater than zero	3	4	6	3	5	2
Total: Hospitals which have returned any data including only zeros	131	112	142	136	136	119

Source: NOAD_LEA_f

4.1.4 This chapter now looks at trends over time for each of the LEA treatments and variation between different nations.

4.2 Times series analysis for maintenance of labour

4.2.1 The data used was from 23 hospitals which for all of the six years had been able to provide data for all the four variables¹⁵ and also the number of deliveries (Table 15). The trends by nation are for England, Scotland and Wales. For England although the data to be used is only from nine per cent of hospitals this is 15 hospitals. The number of hospitals in Scotland and Wales (three and four respectively) amount to around 22-23% of the total. The data for Northern Ireland is not shown separately as it is only from one hospital, though it is part of the totals for “all selected hospitals”.

Table 15 Number of hospitals for time series analysis of LEAs, by nation

Nation	A. Number of hospitals	B. Total number of hospitals	C. Selected hospitals as per cent of total	D. Total No. LEA with CEI in 2014 for hospitals providing data for six years	E. Total No. LEA with CEI, 2014	D as a percent of E
England	15	158	9%	2,662	14,835	18%
Northern Ireland	1	7	14%	408	1,839	22%
Scotland	4	18	22%	564	3,006	19%
Wales	3	13	23%	1,253	1,293	97%
Chanel Islands, Isle of Man	0	2	0%		80	0%
All nations	23	198	12%	4,887	21,053	23%

Source: NOAD_LEA_f

No. LEA with CEI treatments

4.2.2 The number of No. LEA with CEI treatments (from hospitals which have given this data for every year) was compared to the total number of deliveries in them (see Table 16). Three nations were compared.

Table 16 No. LEA with CEI treatments as per centage of number of deliveries for the selected hospitals,, by nation

Nation	2009	2010	2011	2012	2013	2014
England	7%	9%	7%	6%	6%	4%
Scotland	3%	3%	3%	3%	3%	4%
Wales	19%	20%	20%	20%	19%	19%
All selected hospitals	8%	9%	8%	7%	7%	5%

Note: number of hospitals as in Table 15

Source: NOAD_LEA_f

¹⁵ As with other chapter, if for any of the four variables over the six years an answer had been given as a blank then that hospital is not included. A hospital is included if it has returned the data for the each of the four variables for each of the six years even if some have been given zeros.

- 4.2.3 The picture in Wales is different to England and Scotland. In Wales close to one in five of the deliveries in has been counted as of No. LEA with CEI.
- 4.2.4 The data from the English hospitals who have returned the data for all six years shows the no. LEA with CEI treatments average at six per cent of deliveries – a much smaller ratio than that in Wales. A more detailed examination of the data for English hospitals showed that of the 15 who have supplied some data for each of the six years the No. LEA with CEI treatments essentially came from the same six hospitals each year¹⁶, with the data from the other (nine) hospitals being zero for each year. The reduction in 2014 is due to two hospitals (St Richard's Hospital, Chichester, and Whiston, Hospital St Helens and Knowsley) returning zeros rather than the numbers at the level of previous years where they were in the hundreds.
- 4.2.5 Until 2014 the no. LEA with CEI treatments as proportion of deliveries in Scotland was around half the rate in England¹⁷. A closer look at the data for the four hospitals in Scotland showed that the No. LEA with CEI treatments were carried out at the St John's Hospital in Livingston: with 99% of the total for the four hospitals over the six years.

No. LEA with top-ups

- 4.2.6 Table 17 shows the No. LEA with top-ups as proportions of deliveries. The proportions for England are similar to that for No. LEA with CEI treatments. The proportions for Scotland and Wales could be described as reversed - in that the average for Scotland is 11% and 0% for Wales.
- 4.2.7 The highest rate is Scotland where four the hospitals added together have an average of 12%. Looking at the data in more detail this is showing this essentially measures the Simpson's Centre for Reproductive Health at the Royal Infirmary of Edinburgh where 99% of the No. LEA with top-ups for the four hospitals are carried out. The No. LEA with top-ups as a per centage of number of deliveries at the Simpson Centre is around 24%. There was a gradual increase from 23% in 2009 to 30% in 2013. In 2014 the rate went down to 13%. Further investigation would be needed into whether this was due to a change in practice or simply how the data had been classified or counted.
- 4.2.8 The No. LEA with top-ups is very small in Wales, a total of 33 over six years in the three hospitals.

Table 17 No. LEA with top-ups a per centage of number of deliveries, for the selected hospitals, by nation

Nation	2009	2010	2011	2012	2013	2014
England	8%	7%	9%	10%	9%	8%
Scotland	10%	11%	12%	12%	13%	6%
Wales	0%	0%	0%	0%	0%	0%
All selected hospitals	8%	7%	9%	9%	9%	7%

Source: NOAD_LEA_f

¹⁶ The one exception was Lancashire Women and Newborn Centre, Burnley which gave data more than zero (984) for 2010 and 0 for the other years.

¹⁷ For 2009 to 2013. The comparison between England and Scotland for 2014 depends the interpretation of the change at the two English hospitals St Richard's Hospital, Chichester, and Whiston, Hospital St Helens and Knowsley.

No. LEA with PCEA with CI

4.2.9 Treatments for No. LEA with PCEA with CI are small when considered with the number of deliveries: being from 2% to 4% of the deliveries in the same hospitals England, with no substantive data available for Scotland or Wales.

No. LEA with PCEA no CI

4.2.10 Table 18 shows the No. LEA with PCEA no CI as a per centage of deliveries. Again the number of hospitals underlying this are small, substantively from one hospital in England and also one in Scotland. In 2014 most of the data¹⁸ is from four hospitals.

4.2.11 The small number of hospitals reporting this type of treatment are from the number who have provided the data for every year. The proportions may be similar for all hospitals who have given data in a year and the number of hospitals will be larger. In 2012 in England 3 hospitals of the 15 who have given data for each of the six years, have given values greater than 50, so 20% of the 15 hospitals. For the total of 158 English hospitals, in 2012 27 indicate more than 50 treatments have taken place, and this is 17% of the 158.

Table 18 No. LEA with PCEA no CI as a per centage of deliveries, for the selected hospitals, by nation

Nation	2009	2010	2011	2012	2013	2014
England	2%	2%	2%	4%	4%	5%
Scotland	7%	6%	7%	6%	7%	7%
Wales	0%	0%	0%	0%	0%	0%
All selected hospitals	3%	2%	3%	4%	4%	5%

Source: NOAD_LEA_f

4.3 Comparisons between differing treatments with LEA

4.3.1 The provision of LEA data in the form of these four variables also shows the concentrated differences in individual hospitals in terms of the proportions of patients who receive only one treatment. In 2009 119 hospitals returned data on these four variables and only 11 had less than 95% of patients receiving one of the treatments. In 2014 118 hospitals had been able to return data and only 9 had less than 95% of patients receiving one treatment. To show some variation, in 2009 four of the hospitals had the proportion of patients receiving treatment split with from one third to half receiving one treatment. In 2014 four also had the proportion of patients receiving treatment split with from one third to half receiving one treatment. However this was not an “established” practice: the four hospitals in 2009 are not the four hospitals in 2014.

4.3.2 There have been changes in the average number of treatments received in hospitals over the six years (Table 19 and Figure 7). The main pattern from the four variables is that the number of people treated with No. LEA with CEI and LEA with top-ups has declined, PCEA with no CI has only risen slightly (from 2011 onwards), while PCEA with CI has risen to have the largest number of treatments.

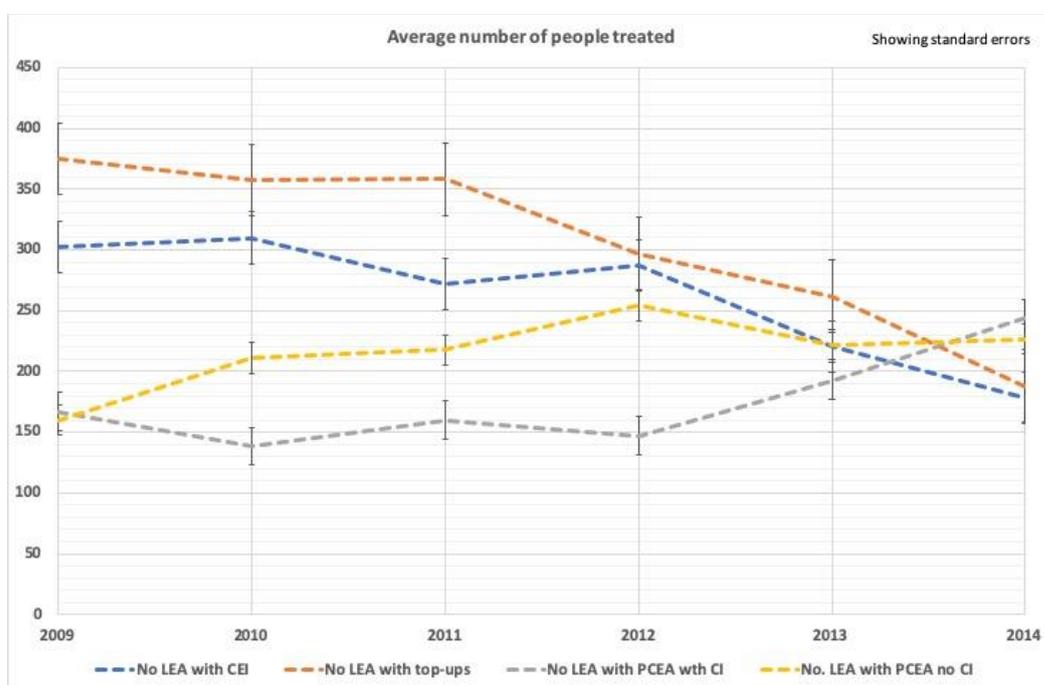
¹⁸ i.e. data greater than zero

Table 19 Average number of treatments where LEA is used, for the selected hospitals

Year	No. LEA with CEI	No. LEA with top-ups	No. LEA with PCEA with CI	No. LEA with PCEA no CI
2009	302	375	167	160
2010	310	357	138	211
2011	271	358	160	218
2012	287	297	147	254
2013	221	262	192	222
2014	178	188	243	227

Source: NOAD_LEA_f

Figure 7 Average number of treatments where LEA is used, for the selected hospitals



Source: NOAD_LEA_f

4.3.3 In 2009 the No. LEA with top-ups was the treatment with the largest average number of patients (375), LEA with CEI was the second largest with the average of 302 treatments. The remaining two variables, LEA with PCEA with CI and No. LEA with PCEA no CI had smaller numbers of treatments (around 160 or about half). This has changed and in 2014 No. LEA with top-ups and LEA with CEI and now both *lower* than PCEA with CI and No. LEA with PCEA no CI.

4.3.4 In looking at the change over time, it is also the case that the average number of *the total* of LEA treatments as has declined. In 2009 – 2011 the average for all is c.250 a year. This decreases in 2012, 2013 and in 2014 the average is 209. As Table 2 showed, between 2009 and 2014 the number of deliveries increased, Table 20 shows the influence of this in that the average number of LEA treatments as a per centage of all deliveries halves (2009 to 2014) for No. LEA with CEI and No. LEA with top-ups.

Table 20 Average number of treatments where LEA is used as a per centage of deliveries, for the selected hospitals

Year	No. LEA with CEI	No. LEA with top-ups	No. LEA with PCEA with CI	No. LEA with PCEA no CI
2009	8.3%	10.3%	4.6%	4.4%
2010	8.2%	9.5%	3.7%	5.6%
2011	7.1%	9.4%	4.2%	5.7%
2012	7.3%	7.6%	3.8%	6.5%
2013	5.7%	6.8%	5.0%	5.8%
2014	4.4%	4.7%	6.1%	5.6%

Source: NOAD_LEA_f

4.4 Summary

4.4.1 The areas highlighted in the chapter include the following. The points relate to the hospitals who have been able to supply data for each year the questions have been asked. The issues could be explored further, as there is some variation in how hospitals have answered surveys.

- Between the nations, the rates of LEA with CEI are much higher in Wales – close to five times the rate in England and Scotland.
- For No. LEA with top-ups (as proportions of deliveries) Scotland has the highest rates (average 11.6%). The average in England is 8.5% while in Wales the rates are very low.
- Most hospitals tend to use one of the LEA treatments rather than more than one, though there is a small number who do carry out more than one LEA treatment.
- There have been change 2009 to 2014 in which treatments have the larger numbers carried out. In 2009 the No. LEA with top-ups had the largest average number of patients and LEA with CEI was the second largest. In 2014 No. LEA with top-ups and LEA with CEI and now both lower than PCEA with CI and No. LEA with PCEA no CI.
- The average number of LEA treatments has declined. In 2009 – 2011 the average for all is c.250 a year. This decreases in 2012, 2013 and in 2014 the average is 209.
- Taking account of the increasing number of deliveries, the average number of LEA treatments as a per centage of all deliveries halves (2009 to 2014) for No. LEA with CEI and No. LEA with top-ups.

5 Domain: type of anaesthesia of C section

5.1 Introduction

5.1.1 The domain *type of anaesthesia of C section* comprises seven variables:

- No. de novo CSE CS
- No. de novo Epi CS
- No. de novo GA CS
- No. GA CS
- No. SSS CS
- No. Labour topped up CSE for CS
- No. topped up LEA CS

5.1.2 The first action was to create a file with these variables for all hospitals and examine this to judge the data which might be used for time series analysis. Table 21 shows the average values for the variables for each year. Trends over time and differences between nations for surveys have been guided by the number of treatments provided and the number of hospitals who have been able to return data. Table 21 shows the average number of treatments for each of the seven variables. From this the decision was made to continue with the four variables where with the largest numbers of treatments: No. deliveries, No. GA CS, No. SSS CS and No. topped up LEA CS.

Table 21 Average number of treatments for variables in the anaesthesia of C section domain, for each year, 2009-2014

Year	No. delivs	No. de novo CSE CS	No. de novo Epi CS	No. de novo GA CS	No. GA CS	No. SSS CS	No. Labour topped up CSE for CS	No. topped up LEA CS
2009	3,654	63	6	56	79	563	12	171
2010	3,787	85	8	58	81	612	16	176
2011	3,846	88	10	52	81	601	10	198
2012	3,943	75	10	53	84	657	8	197
2013	3,881	79	10	14	78	622	18	171
2014	4,012	91	7	57	82	682	12	190
Av of averages	3,854	80	8	48	81	623	13	184

Source: Domain_AnaeforCsection

Table 22 Potential number of hospitals for Type of anaesthesia for C section time series, by nation

Nation	Number of hospitals
England	29
Northern Ireland	2
Scotland	4
Wales	6
Total	41

Source: Domain_AnaeforCsection_TimeSeries

5.2 Times series analysis for variables in the domain: type of anaesthesia for C section

5.2.1 This section looks at change over time for the three variables, with this shown as the percentage of incidents as proportions of deliveries – in order to account for changing numbers of deliveries.

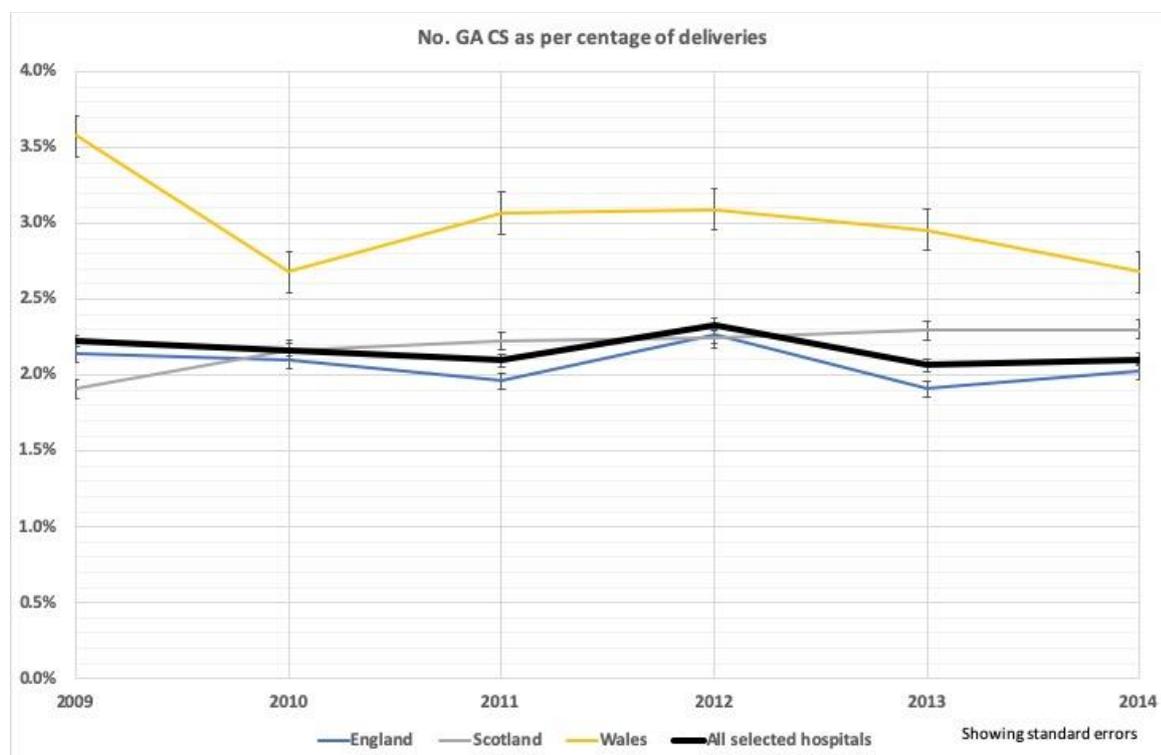
5.2.2 Table 23 and Figure 8 provide the details on change for *No. GA CS* as per centage of deliveries. The overall picture (for all 41 selected hospitals) is that the proportion of deliveries for this stay the same. This is the position for the 29 hospitals in England used for this (who make up 70% of the hospitals in this time series). In Scotland there is a small rise (0.4 per centage points). There is a larger fall (0.9 percentage points) in Wales. The differences between these three nations becomes smaller, moving from 1.7 per centage points in 2009 to 0.7 per centage points in 2014.

Table 23 No. GA CS as per centage of deliveries, 2009-2014, by nation

Nation	2009	2010	2011	2012	2013	2014
England	2.1%	2.1%	2.0%	2.3%	1.9%	2.0%
Scotland	1.9%	2.2%	2.2%	2.2%	2.3%	2.3%
Wales	3.6%	2.7%	3.1%	3.1%	3.0%	2.7%
All selected hospitals	2.2%	2.2%	2.1%	2.3%	2.1%	2.1%

Source: Domain_AnaeforCsection_TimeSeries

Figure 8 No. GA CS as per centage of deliveries, 2009-2014, by nation



Source: Domain_AnaeforCsection_TimeSeries

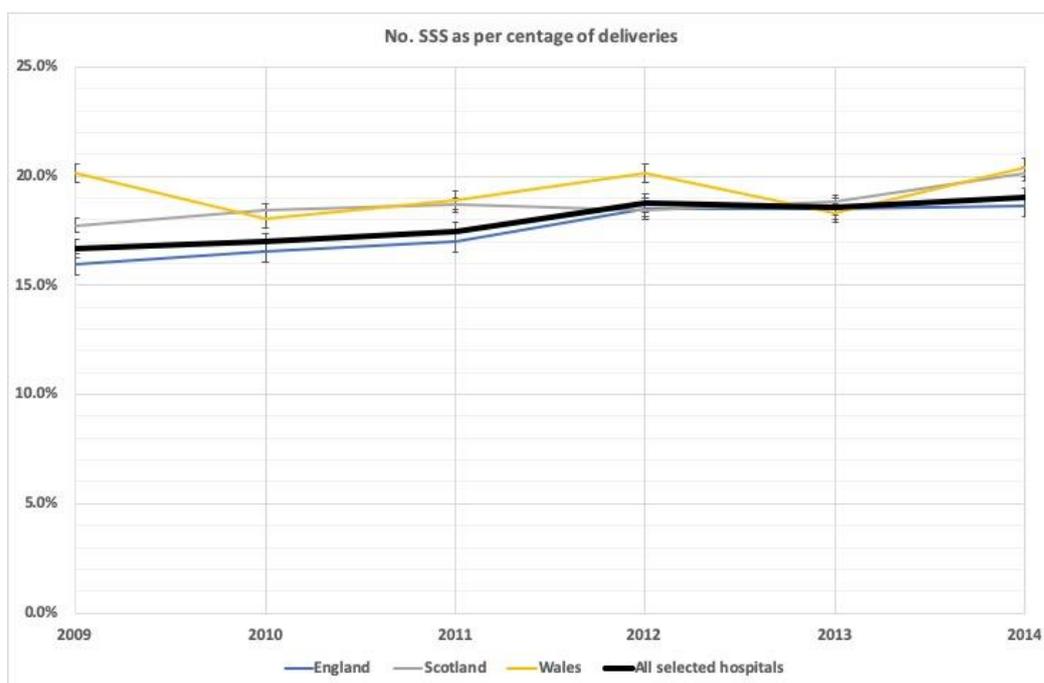
5.2.3 Table 24 and Figure 9 show the changes over time for *No. SSS* as per centage of deliveries. For all selected hospitals there has been an increase of 2.3 per centage points. This level of increase represents that in England and Scotland, the change in Wales has been a lower, slight increase (0.3 percentage points increase 2009 to 2014, within the standard error of the 2009 level).

Table 24 No. SSS as per centage of deliveries, for the selected hospitals, 2009-2014

Nation	2009	2010	2011	2012	2013	2014
England	16.0%	16.5%	17.0%	18.5%	18.5%	18.6%
Scotland	17.8%	18.4%	18.7%	18.5%	18.8%	20.1%
Wales	20.1%	18.0%	18.9%	20.1%	18.3%	20.4%
All selected hospitals	16.7%	17.0%	17.5%	18.8%	18.6%	19.0%

Source: Domain_AnaeforCsection_TimeSeries

Figure 9 No. SSS as per centage of deliveries, for the selected hospitals, 2009-2014



Source: Domain_AnaeforCsection_TimeSeries

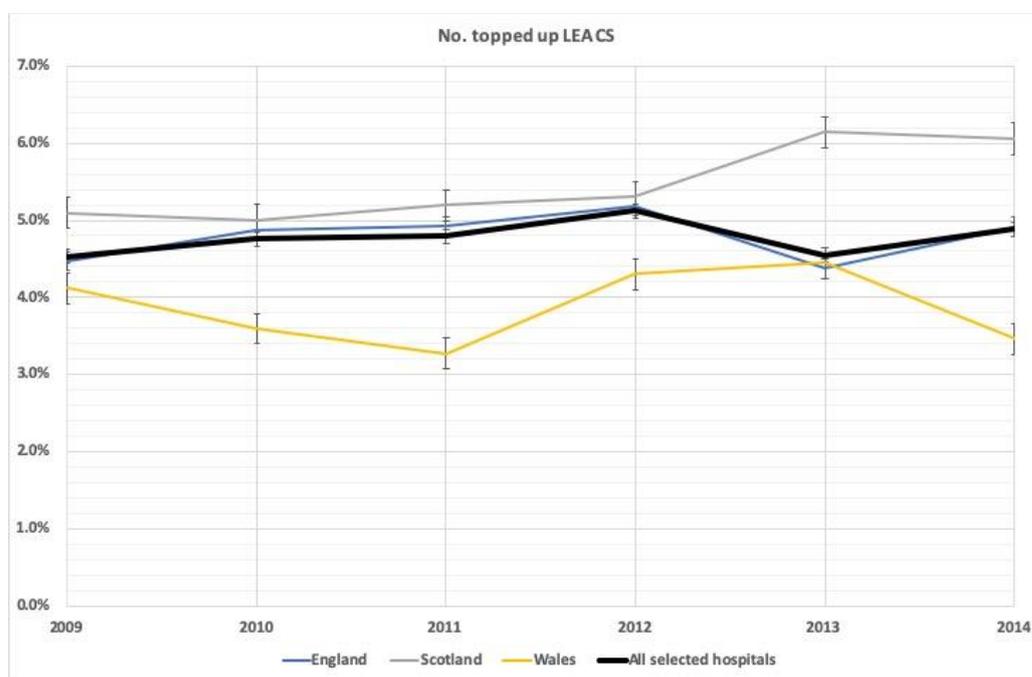
5.2.4 Table 25 and Figure 10 show change in *No. topped up LEA CS*. A key feature is the increased gap between the rate in Wales and the rates in England and Scotland. Scotland had the highest rate in 2009 and this has increased. The rate in Wales was the lowest and this has become smaller.

Table 25 No. topped up LEA CS, 2009-2014, as per centage of deliveries, for the selected hospitals

Nation	2009	2010	2011	2012	2013	2014
England	4.5%	4.9%	4.9%	5.2%	4.4%	4.9%
Scotland	5.1%	5.0%	5.2%	5.3%	6.1%	6.1%
Wales	4.1%	3.6%	3.3%	4.3%	4.4%	3.5%
All selected hospitals	4.5%	4.8%	4.8%	5.1%	4.5%	4.9%

Source: Domain_AnaeforCsection_TimeSeries

Figure 10 No. topped up LEA CS as per centage of deliveries, 2009-2014, for the selected hospitals



Source: Domain_AnaeforCsection_TimeSeries

5.3 Summary

5.3.1 The areas highlighted in the chapter include the following. The points relate to the hospitals who have been able to supply data for each year the questions have been asked. The issues could be explored further, as there is some variation in how hospitals have answered surveys.

- The per centage of deliveries where there is No. GA CS as per centage has stayed the same in England, risen slightly in Scotland, and has fallen in Wales.
- For No. SSS as per centage of deliveries there have been increase in England and Scotland, while the rate has not significantly risen.
- For No. topped up LEA CS related to the number of deliveries, the proportions in Wales were lower than England and Scotland and have fallen from 2009 to 2014. The gap between the rates in Wales and Scotland has increased.

6 Domain: complications

6.1 Introduction

6.1.1 This domain examines the thirteen variables in this domain (listed in Table 26). As the table shows approximately half the hospitals have been able returned data for each variable. This is the first step in identifying which hospitals have been able to return data for *every* year.

Table 26 Proportion of hospitals, by year, for complication variables where survey return is blank

Variable	Year					
	2009	2010	2011	2012	2013	2014
No. epidural haematoma	45%	58%	38%	42%	44%	54%
No. CICV	49%	58%	40%	43%	45%	54%
No. failed intubations	46%	58%	39%	41%	45%	54%
No. epidural haemtoma requiring surgery	43%	58%	39%	44%	45%	54%
No. lipid treatments	45%	58%	41%	40%	46%	54%
No. LA fits or CA	45%	57%	38%	40%	47%	53%
No. LEA resites	Question not asked		60%	60%	61%	62%
No. EBP for PDPH	46%	49%	38%	39%	39%	45%
No. HDU admissions in ICU	Question not asked		54%	51%	55%	61%
No. ICU admissions	53%	57%	49%	43%	44%	57%
No. permanent nerve injury	Question not asked		44%	42%	49%	58%
No. ADP	44%	53%	39%	42%	41%	49%
No. total spinal	48%	58%	40%	39%	44%	51%

Source: Domain_Complications

6.1.2 The data was also examined to see when the number of treatments were given as zero (Table 27). For *six variables more than 90% of the hospitals have indicated that no treatments have been given*. These variables are:

- No. epidural haematoma
- No. lipid treatments
- No. CICV
- No. LA fits or CA
- No. epidural haemtoma requiring surgery
- No. permanent nerve injury

6.1.3 There are two variables where the proportion of hospitals returning zeros are close to 80%:

- No. failed intubations
- No. total spinal

6.1.4 For No. HDU admissions in ICU, around three quarters show some treatments (i.e. the numbers greater than zero).

6.1.5 There are *four variables* where around *90% have given data greater than zero* (i.e. proportions of zeros are less than or close to 10%):

- No. LEA resites
- No. ICU admissions
- No. EBP for PDPH
- No. ADP

Table 27 Where hospitals have returned data (zero or greater), the proportion where the data is zero, for complication variables

Variable	Year						Average
	2009	2010	2011	2012	2013	2014	
No. epidural haematoma	99%	99%	100%	90%	100%	97%	97%
No. CICV	99%	95%	99%	98%	98%	98%	98%
No. failed intubations	80%	82%	87%	77%	72%	70%	78%
No. epidural haemtoma requiring surgery	100%	100%	100%	98%	100%	99%	100%
No. lipid treatments	100%	96%	97%	88%	96%	100%	96%
No. LA fits or CA	99%	100%	97%	87%	98%	98%	97%
No. LEA resites	Question not asked		20%	6%	5%	4%	9%
No. EBP for PDPH	8%	4%	6%	15%	3%	5%	7%
No. HDU admissions in ICU	Question not asked		22%	35%	20%	19%	24%
No. ICU admissions	14%	12%	10%	24%	8%	12%	13%
No. permanent nerve injury	Question not asked		95%	86%	93%	89%	91%
No. ADP	5%	6%	7%	8%	5%	3%	6%
No. total spinal	84%	83%	84%	76%	77%	72%	79%

Source: Domain_Complications

Table 28 Number of hospitals who have returned data greater than zero for complication variables

Variable	Year					
	2009	2010	2011	2012	2013	2014
No. epidural haematoma	54%	42%	62%	52%	56%	45%
No. CICV	50%	40%	60%	56%	54%	45%
No. failed intubations	43%	34%	53%	45%	39%	32%
No. epidural haemtoma requiring surgery	57%	42%	61%	55%	55%	46%
No. lipid treatments	55%	41%	57%	53%	52%	46%
No. LA fits or CA	54%	43%	60%	52%	52%	46%
No. LEA resites	Question not asked		8%	3%	2%	2%
No. EBP for PDPH	4%	2%	4%	9%	2%	3%
No. HDU admissions in ICU	Question not asked		10%	17%	9%	8%
No. ICU admissions	7%	5%	5%	14%	5%	5%
No. permanent nerve injury	Question not asked					
No. ADP	3%	3%	4%	5%	3%	2%
No. total spinal	44%	35%	51%	46%	43%	35%

Source: Domain_Complications

6.1.6 Table 28 has looked at change over time in the hospitals which have carried out *some* treatments. This has generally fallen, particularly in 2014 compared to 2013. To explore this further the variable No. total spinal for 2013 and 2014 was examined (Table 29). In the two years the main change is the number of hospitals returning blank cells blank increases and the number which return values of zeros decreases. The number returning values which are greater than zero stays the same.

Table 29 Returns by hospitals for No. total spinal, 2013 and 2014: blank, zero, or larger

Values or returns given for variable	Number of hospitals	
	2013	2014
Blank	88	101
Zero	85	70
Greater than zero	25	27
Total	198	198

Source: Domain_Complications

6.1.7 The number of treatments for each variable and each year are in Table 30. This shows:

- five of the variables (No. LEA resites, No. EBP for PDPH, No. HDU admissions in ICU, No. ICU admissions, and No. ADP) have total treatments as hundreds
- No. failed intubations and No. total spinal have totals of around 30 treatments
- treatments for the remaining six variables are small (under 10)

6.1.8 Table 30 does show five instances where the numbers for those variables and those years are much larger than in other years (highlighted in yellow). Two have been explored in more detail.

Table 30 Treatment totals for complication variables

Variable	Year					
	2009	2010	2011	2012	2013	2014
No. epidural haematoma	1	1	0	287	0	3
No. CICV	1	5	1	2	2	4
No. failed intubations	22	18	20	32	36	33
No. epidural haemtoma requiring surgery	0	0	0	17	0	1
No. lipid treatments	0	3	4	45	5	0
No. LA fits or CA	1	0	4	32	2	2
No. LEA resites	Question not asked		2,413	2,093	2,633	2,568
No. EBP for PDPH	507	582	745	734	944	973
No. HDU admissions in ICU	Question not asked		319	300	352	6,321
No. ICU admissions	418	435	405	477	500	451
No. permanent nerve injury	Question not asked		6	88	8	14
No. ADP	803	709	953	1,019	1,059	1,041
No. total spinal	20	19	28	35	30	38

Source: Domain_Complications

6.1.9 For the No. epidural haematoma in 2012¹⁹ there were seven hospitals who gave values greater than ten: the values add to 282 and the values ranged from 17 to 53. The next highest value from those returned was 2. Of these seven hospitals in 2011 and 2013 six had returned values as zeros and each year there was one blank return²⁰. The reasons cannot be determined from the numbers only; three possibilities are:

- data was entered for these seven hospitals *classifying* something as No. epidural haematoma in 2012 but it was counted as something else in the other years
- No. epidural haematoma in 2011 and 2013 given as zeros indicates the values were not found i.e. the data was *missing*. The hospitals did return other data for 2011 and 2013
- there were *special circumstances* for these seven hospitals in which No. epidural haematoma was carried out in 2012 but not in the other years

6.1.10 Another issue for these variables was the total of 6,231 for No. HDU admissions in ICU in 2014. In 2014 one hospital returned 5,311. For 2013 the value given was 15, so the most likely explanation is a “mistyping” for the hospital in 2014. This is also likely to be the case for two hospitals in 2014 who had given high values: 233 and 523. The next highest value was 23. And in 2013 these two hospitals returned one blank answer and one of three treatments.

6.1.11 A number of variables were selected for more detailed analysis. This was based on the totals shown in Table 30:

- No. LEA resites
- No. EBP for PDPH
- No. ICU admissions
- No. ADP

6.2 Analysis for No. LEA resites

6.2.1 The number of deliveries and the number of LEA resites was put together for each hospital for each year (the data is available for the four years 2011 to 2014 as the question was not asked in 2009 or 2010). Hospitals which have not submitted either deliveries or number of LEA resites for each year were then removed from the data set used. Table 31 shows the number of hospitals which met these criteria. Analysis was then carried out for England, Scotland and Wales.

6.2.2 Table 32 shows the number of LEA resites per thousand deliveries. The rates in Scotland and Wales are higher (about 50% higher) than the rates in England.

6.2.3 The average number of LEA resites per thousand deliveries, for each of the selected hospitals, is shown in Figure 12. The range is from 0 through to 23.4, indicating different likelihoods of the LEA resites occurring. A brief examination of the data doesn't indicate that the larger incidence occurs in smaller hospitals.

¹⁹ There are more hospitals who gave data for 2012 than the number who gave data for 2012 and the other years.

²⁰ The blank in 2011 and the blank in 2013 were two different hospitals.

Table 31 Number of hospitals for time series analysis of No. LEA resites, by nation

Nation	Number of hospitals
England	24
Scotland	4
Wales	5
All selected hospitals	34

Source: Domain_Complications

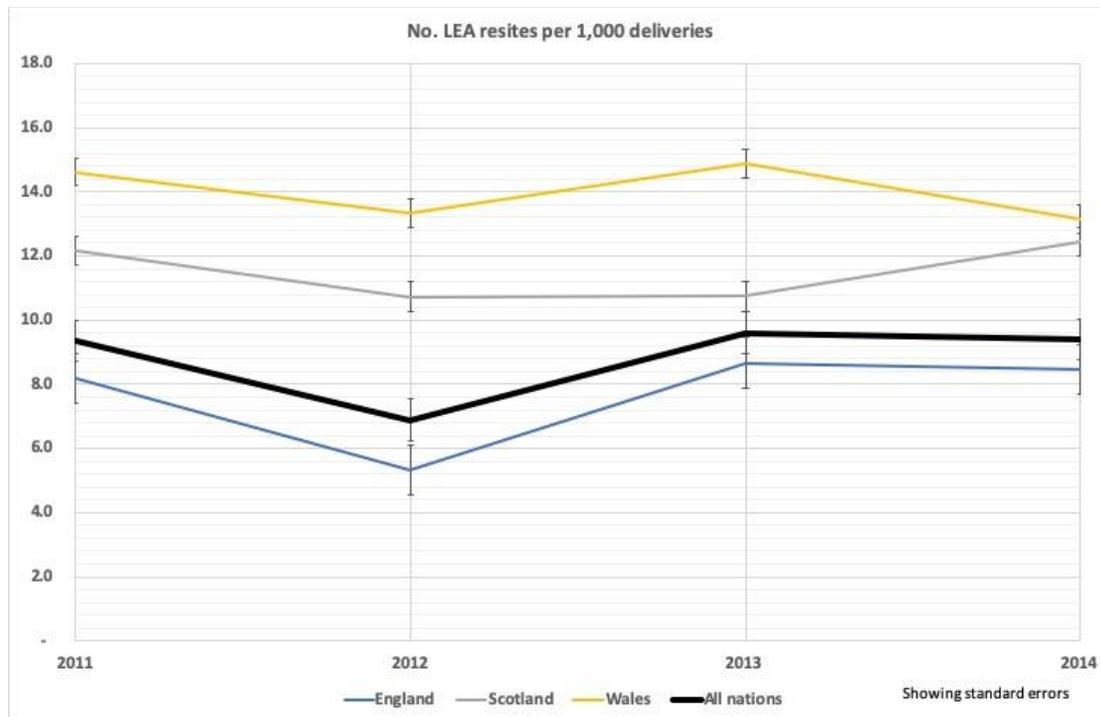
Note: The relevant hospital in Northern Ireland is included in the total for all selected hospitals

Table 32 Number of LEA resites from selected hospitals, per 1,000 deliveries, 2011-2014, by nation

Nation	2011	2012	2013	2014
England	8.2	5.3	8.7	8.5
Scotland	12.2	10.7	10.7	12.4
Wales	14.6	13.3	14.9	13.1
All selected hospitals	9.4	6.9	9.6	9.4

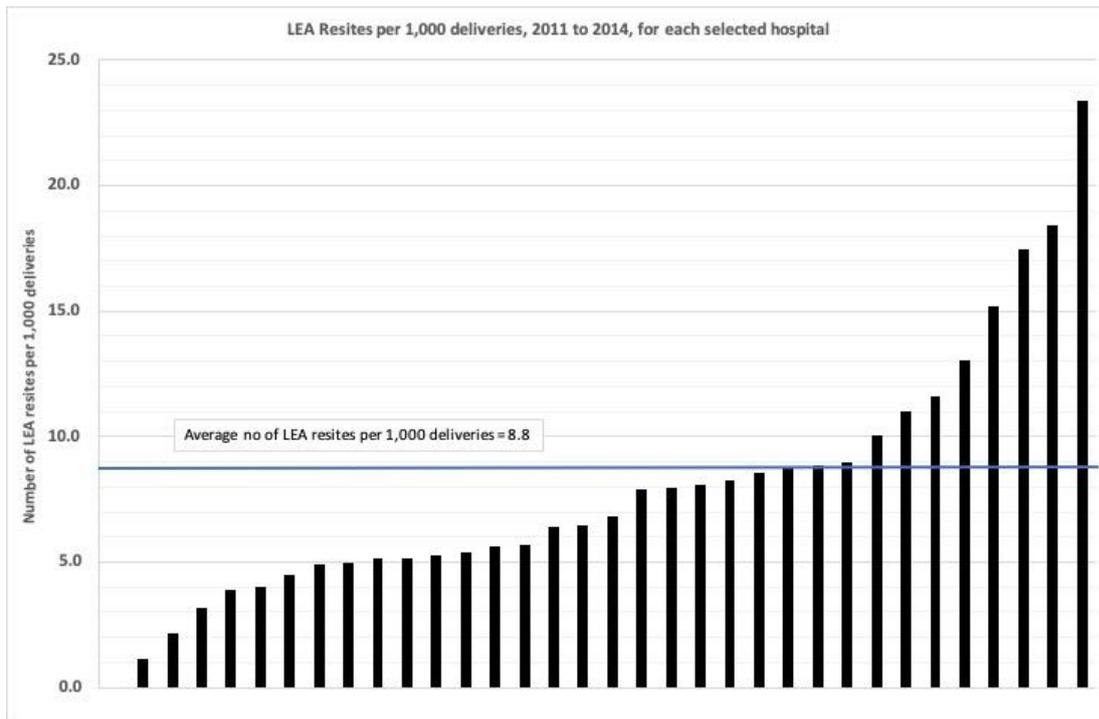
Source: Domain_Complications

Figure 11 Number of LEA resites from selected hospitals, per 1,000 deliveries, 2011- 2014, by nation



Source: Domain_Complications

Figure 12 Average number of LEA resites per 1,000 deliveries, 2011-2014 per from selected hospitals



Source: Domain_Complications

6.3 Analysis for No. EBP for PDPH

6.3.1 The same approach as with other analyses was used. The data on the number of deliveries and No. EBP for PDPH was brought together and Table 33 shows the number of hospitals by nation which returned this data for each of the six years the question was asked. Following from this the decision was made that the time series could be examined for all 34 hospitals, and separating those in England and Wales. Although the total of 34 hospitals is the same as for No. LEA resites, the differing number by nation indicates that these are not exactly the same hospitals. For example in the four hospitals in Wales, the Nevill Hall Hospital, in Abergavenny can be used for No. EBP for PDPH but not for No. LEA resites.

Table 33 Hospitals for analysis for No. EBP for PDPH, by nation

Nation	Number of hospitals
England	26
Northern Ireland	1
Scotland	3
Wales	4
All selected hospitals	34

Source: Domain_Complications

Table 34 No EBP for PDPPH, for selected hospitals, 2009-2014, by nation

Nation	2009	2010	2011	2012	2013	2014
England	126	151	182	210	230	346
Wales	14	20	17	12	10	15
All selected hospitals	171	201	230	262	279	391

Source: Domain_Complications

Table 35 No EBP for PDPPH, for selected hospitals, per 1,000 deliveries, 2009-2014, by nation

Nation	2009	2010	2011	2012	2013	2014
England	1.2	1.3	1.6	1.8	2.0	3.0
Wales	1.6	2.4	2.0	1.4	1.2	1.8
All selected hospitals	1.3	1.5	1.6	1.8	2.0	2.9

Source: Domain_Complications

- 6.3.2 Table 34 shows the change over time in number of EBP for PDPPH in the selected hospitals and Table 35 shows this in relation to the number of deliveries. This relationship has stayed at a similar level over time in Wales but seems to have risen in England.
- 6.3.3 For England the largest rise is from 2013 to 2014. Looking at this in more detail the most likely explanation is around the data for the Queen Alexandra Hospital in Portsmouth. For many years the hospital indicated 8 EBP for PDPPH, but in 2014 the figure 123 was submitted, this might be an error in the data entry. If this is changed to 12 (i.e. assuming that was the probable value) then the No EBP for PDPPH, for selected hospitals in England per 1,000 deliveries changes to 2.1. This is still a relatively large increase as it is close to a doubling of the rate in 2009. The change for all selected hospitals falls from 2.9 to 2.0, but this is still an increase from 1.3 in 2009.
- 6.3.4 Given the small numbers there are examples of what can be termed “large” variation between years. Two examples are given in Table 36.

Table 36 Example of variation in No EBP for PDPPH for two hospitals

Hospital	2009	2010	2011	2012	2013	2014
Royal Hospital City Hospitals Sunderland	1	4	7	3	11	15
Women's and Children's Hospital Hull	14	18	17	54	27	42

Source: Domain_Complications

6.4 Analysis for No. ICU admissions

6.4.1 There is a relatively small number of hospitals which have been able to submit information on the No. ICU admissions for each year: 20 in total with 13 of these from England. Data for the seven hospitals from Northern Ireland, Scotland and Wales has been put together. The data for rate of ICU admission per 1,000 deliveries has stayed level for both over the six year period (Table 37).

Table 37 No. ICU Admission for selected hospitals per 1,000 deliveries, 2009-2014, by nation

Nation	2009	2010	2011	2012	2013	2014
England	1.0	1.1	1.0	0.6	1.1	1.0
Remaining nations	1.6	1.4	1.7	1.7	1.8	1.9
All selected hospitals	1.2	1.2	1.2	0.9	1.3	1.3

Source: Domain_Complications

6.5 Analysis for ADP

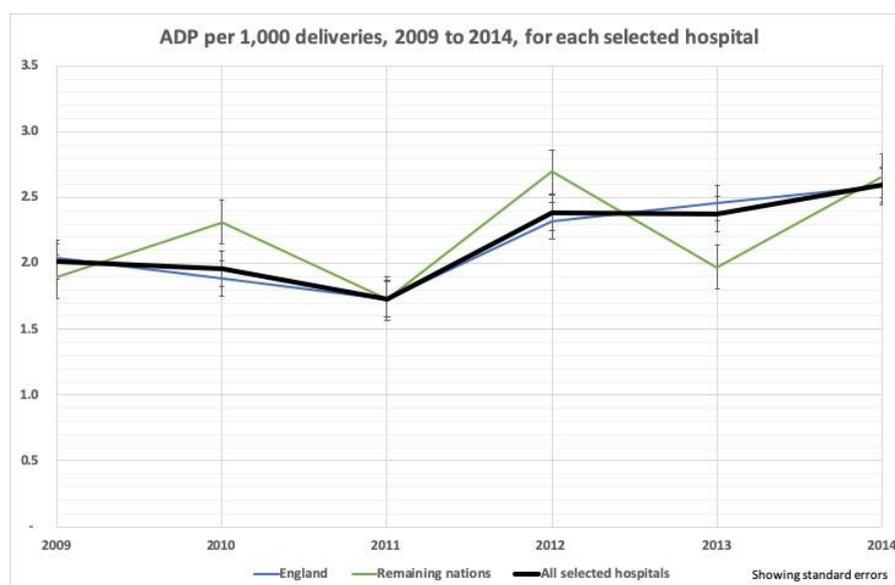
6.5.1 Thirty six hospitals returned data on ADP for all six years: 28 in England and eight in the other nations. Four of the hospitals were located in Wales but with the relatively small number of incidents the decision was made to examine trends in two categories by location: England and other nations (shown in Table 38 and Figure 13). This shows an increase from 2009 to 2014 in both areas.

Table 38 ADP admissions per 1,000 deliveries, for selected hospitals, 2009-2014, by nation

Nation	2009	2010	2011	2012	2013	2014
England	2.0	1.9	1.7	2.3	2.5	2.6
Remaining nations	1.9	2.3	1.7	2.7	2.0	2.7
All selected hospitals	2.0	2.0	1.7	2.4	2.4	2.6

Source: Domain_Complications

Figure 13 ADP admissions per 1,000 deliveries, from selected hospitals, 2009-2014



Source: Domain_Complications

6.6 Summary

6.6.1 The areas highlighted in the chapter include the following. The points relate to the hospitals who have been able to supply data for each year the questions have been asked. The issues could be explored further, as there is some variation in how hospitals have answered surveys.

- For the variables in the domain complication there are a number where most hospitals indicate none have taken place and some where most hospitals indicate these have occurred.
- For the treatments individually five (No. LEA resites, No. EBP for PDPPH, No. HDU admissions in ICU, No. ICU admissions, and No. ADP) have total treatments as hundreds. The No. failed intubations and No. total spinal have totals of around 30. The treatments for the remaining six variables are small (under 10).
- With the number of LEA resites per thousand deliveries, the rates in Scotland and Wales are about 50% higher than the rates in England.
- The rate of No EBP for PDPPH per 1,000 deliveries for 2009 to 2014 has risen in England while not changing significantly in Wales.
- The data for rate of ICU admission per 1,000 deliveries has stayed level for the UK over the six year period.
- ADP admissions per 1,000 deliveries have increased from 2009 to 2014 in England and in the total for all nations.

7 Domain: technique of labour analgesia

7.1 Introduction

- 7.1.1 This chapter examines the four variables in this domain, shown in Table 39.
- 7.1.2 As background on interpreting change, Table 39 shows that for 2014 the covariance is much lower for No LEA than for the other three variables. The implication here is that smaller change is more likely to be real than caused by random influence. The sections in the chapter give more detail on each variable and explore this further²¹.
- 7.1.3 For the time series, No. LEA by CSE and No. LEA were asked for each of the six years; while the request for both No labour analgesia by PCA and No. labour analgesia spinal catheter was the four years 2011 to 2014.

Table 39 Average for technique of labour analgesia variables in 2014

Variable	Maximum	Minimum	Average	Standard Deviation	Covariance
No. LEA by CSE	2,038	0	53	209	3.96
No. LEA	2,046	0	783	446	0.57
No labour analgesia by PCA	549	0	23	77	3.35
No. labour analgesia spinal catheter	125	0	4	13	3.70

Source: Domain_LabourAnalgesia

- 7.1.4 The number of hospitals which returned data for each year the question was asked is shown in Table 40. As with some previous variables, the results in Northern Ireland are shown separately so that data attributed to a nation is not that from one hospital. The data from the hospital in Northern Ireland is included in the totals for all nations.

Table 40 Number of hospitals by nation who have returned data on technique of labour analgesia

Nation	No. LEA by CSE	No. LEA	No labour analgesia by PCA	No. labour analgesia spinal catheter
England	25	33	34	36
Northern Ireland	1	3	2	3
Scotland	6	5	6	7
Wales	4	5	7	7
All nations	36	36	49	53

Source: Domain_LabourAnalgesia

²¹ These sections use information from the hospitals which have been able to submit data for each year the question was asked.

7.2 Analysis for No. LEA by CSE

7.2.1 Table 41 shows the Number LEA by CSE per 1,000 deliveries for the 36 hospitals supplying data for both this and the number of deliveries for the six years. The immediate question is why the rates in England are higher than those for Scotland and Wales. The difference is the England rate being around 10 per thousand greater than Scotland and in many years 5 per thousand greater than that for Welsh hospitals. The rate for the hospitals in Wales has increased and is in 2014 is close to that for England.

Table 41 Number LEA by CSE for selected hospitals per 1,000 deliveries, 2009-2014, by nation

Nation	2009	2010	2011	2012	2013	2014
England	10.7	11.4	12.5	11.3	11.6	10.9
Scotland	1.0	0.3	0.4	3.8	0.9	1.5
Wales	1.9	2.4	5.2	4.7	4.7	9.5
All selected hospitals	8.5	9.1	10.3	9.7	9.5	9.4

Source: Domain_LabourAnalgesia

7.2.2 Looking at the variation, there are a small number of hospitals where there are much higher levels of Number LEA by CSE per 1,000 deliveries. In England and Wales there are four hospitals (Table 42) with rates of LEA by CSE per 1,000 deliveries more than three times the national averages for each nation. For England, over the six year period, the average Number LEA by CSE²² per 1,000 deliveries is 11.4 while that for the three hospitals in England shown in Table 42 it is 41²³. For Wales the national average over the six years is 4.7. The Prince Charles Hospital in Merthyr, one of the four Welsh hospitals in this analysis, has the rate of 18.5.

7.2.3 Compared to both England and Wales the opposite is true for Scotland in that the rate at each hospitals is broadly the same, there is no one hospital with a much higher rate of LEA by CSE per 1,000 deliveries.

Table 42 Number LEA by CSE per 1,000 deliveries for hospitals in England and Wales where this is greater than 3 times average in any one year

Nation	Hospital	2009	2010	2011	2012	2013	2014
England	Dudley, Russells Hall Hospital,	65.3	71.8	75.3	62.0	32.0	8.8
England	Kingston upon Thames, KT2 7QB	30.2	34.9	25.6	41.7	40.9	44.8
England	St Michael's Hospital, Bristol	26.7	25.5	38.4	35.6	49.0	28.8
Wales	Merthyr Tydfil, Prince Charles Hospital, CF47 9DT	8.8	5.3	19.3	19.3	22.3	35.7

Source: Domain_LabourAnalgesia

²² for selected hospitals per 1,000 deliveries for all the six year period

²³ And the figure of 11.4 does include the three hospitals with the high rates.

7.3 Analysis for No. LEA

7.3.1 For Analysis for No. LEA the analysis of time and comparing nations for this variable shows that there is little difference between years and between nations (Table 43).

Table 43 No LEA for selected hospitals as a per centage of deliveries, 2009-2014, by nation

Nation	2009	2010	2011	2012	2013	2014
England	21%	20%	22%	22%	20%	21%
Scotland	21%	21%	22%	21%	23%	24%
Wales	20%	18%	21%	19%	21%	19%
All selected hospitals	21%	20%	21%	21%	20%	20%

Source: Domain_LabourAnalgesia

7.4 Analysis for No labour analgesia by PCA

7.4.1 Table 44 shows the No labour analgesia by PCA per 1,000 deliveries for the four years the question was asked. The areas for exploration in this are the higher rates for Scotland and Wales compared to England. There is one hospital in each which carries out a much higher number of No labour analgesia by PCA (see Table 45) shows the number for the hospitals and also the averages for England, Scotland and Wales. Blackpool Hospital in England also has much greater numbers than England's averages, but the larger number of hospitals in this data set for England give this less impact on the England average.

Table 44 No labour analgesia by PCA per 1,000 deliveries 2011-2014, by nation

Nation	2011	2012	2013	2014
England	2.1	1.7	2.5	2.5
Scotland	30.5	36.4	24.5	22.2
Wales	7.7	23.1	34.7	32.9
All selected hospitals	4.8	6.7	7.6	7.1

Source: Domain_LabourAnalgesia

Table 45 No labour analgesia by PCA 2011-2014, for selected hospitals

Nation	Hospital	2011	2012	2013	2014
Average for England		3	4	5	5
England	Blackpool, Blackpool Victoria Hospital NHS Teaching Trust	194	120	179	182
Average for Scotland		2	4	6	5
Scotland	Aberdeen Maternity Hospital	399	487	297	278
Average for Wales		6	9	10	16
Wales	Swansea, Singleton Hospital	120	405	621	549

Source: Domain_LabourAnalgesia

Notes: the average for England, Scotland and Wales are without the three identified hospitals.

7.5 Analysis for No. labour analgesia spinal catheter

7.5.1 Table 46 shows the No labour analgesia by PCA per 1,000 deliveries for the four years the question was asked. The number of treatments is small, the average for the 53 hospitals is four.

7.5.2 In looking at the data for each of the selected hospitals the only area for further exploration is the rate for Leicester General Hospital. For 2013 the No. labour analgesia spinal catheter is given as 68, which is much larger than any other hospital. The next highest number is 20, given by the University Hospital of Wales, Cardiff for 2011. The data might simply indicate levels of variation that can occur. The numbers for Leicester General Hospital, for 2011 to 2014 are 2, 18, 68 and 2. For the University Hospital of Wales Maternity Unit, Cardiff the numbers are 20, 7, 16, and 9.

Table 46 No labour analgesia spinal catheter, per 1,000 deliveries, 2011-2014, by nation

Nation	2011	2012	2013	2014
England	0.6	0.9	1.5	0.9
Scotland	0.2	0.2	0.3	0.2
Wales	1.3	0.9	1.1	0.7
All selected hospitals	0.4	0.6	1.0	0.6

Source: Domain_LabourAnalgesia

7.5.3 The data for **all** hospitals in 2014 was examined more closely as the number given for the Delivery Suite, Clarendon Wing, Leeds General Infirmary was 125 for 4,824 deliveries with the rate being 25.9 per 1,000 deliveries. The number provided by Clarendon Wing for 2012 was 0 and for 2013 was 3. It is not clear without checking with the Clarendon Wing whether the 123 represents “extraordinary” events or an error in entering the data. This does not impact on the average for England as the Clarendon Wing did not provide data for 2011 and so is not in the 53 hospitals whose data is used for the time series analysis.

7.6 Summary

7.6.1 The areas highlighted in the chapter include the following. The points relate to the hospitals who have been able to supply data for each year the questions has been asked. The issues could be explored further, as there is some variation in how hospitals have answered surveys.

- The number LEA by CSE per 1,000 deliveries in England are higher than those for Scotland and Wales.
- In England and Wales there are a small number of hospitals with much higher rates of LEA by CSE per 1,000 deliveries than other hospitals.
- For the No labour analgesia by PCA per 1,000 deliveries there are higher rates for both Scotland and Wales compared to England.
- Scotland and Wales each have one hospital which carries out a much higher number of No labour analgesia by PCA.

8 Conclusions

- 8.1.1 There are no firm conclusions in this report in the sense that no theory has been put forward to be tested. What has been presented are descriptive patterns in data returned by hospitals for the surveys carried out by the Obstetric Anaesthetists' Association.
- 8.1.2 The main elements that have been shown are trends over time and these for different nations. The nations where the trends or patterns are shown are those where there is considered to be a sufficient number of hospitals providing data and so giving results which can be more widely attributable.
- 8.1.3 The surveys have shown that there are some patterns which indicate large variation between values in some hospitals from one year to the next. The most likely explanation is that there can be errors in some of the data returned. It is also clear that there are some variables where there are high levels in some hospitals for a number of years.
- 8.1.4 The analysis carried out for each domain has been based on the number of hospitals that have been able to return data every year. This allows continuity in the data returned, but it is also possible that there might be bias if those hospitals have different characteristics to those who have not been able to provide data every year.
- 8.1.5 The analysis shows trends over time and compares nations. It shows where nations are heading in the same direction and it shows incidents where some nations are more likely to provide treatments than other nations. It is also the case that there are variables where there has been little change over time and nations have similar characteristics. This can be worth considering if there has been expectation there would be difference.
- 8.1.6 And all of these are topics for discussion.

[end]

Appendix 1. Variable definition and domain

Field Name	Domain	Description	Years in surveys
No. deliveries	General	The number of deliveries (women not babies) in your obstetric unit per annum (including midwifery led deliveries)	2009-2014
No. AVD		The number of women having assisted vaginal deliveries (forceps and ventouse)	2009-2014
No. CS		The number of women having Caesarean sections (elective and emergency)	2009-2014
No. elective CS		The number of women having category 4 (elective) Caesarean sections	2009-2014
No. LEA with CEI	Maintenance of labour	The number of women whose analgesia was maintained with a continuous infusion	2009-2014
No. LEA with top-ups		The number of women whose analgesia was maintained with intermittent top ups	2009-2014
No. LEA with PCEA with CI		The number of women whose analgesia was maintained with PCEA (with background infusion)	2009-2014
No. LEA with PCEA no CI		The number of women whose analgesia was maintained with PCEA (without background infusion)	2009-2014
No. de novo CSE CS	Type of anaesthesia for C section	The number of women having Caesarean sections under de novo combined spinal	2009-2014
No. de novo Epi CS		The number of women having Caesarean sections under de novo epidurals	2009-2014
No. de novo GA CS		The number of women having Caesarean sections under de novo general anaesthesia	2009-2014
No. GA CS		The number of women having Caesarean sections under general anaesthesia	2009-2014
No. SSS CS		The number of women having Caesarean sections under single shot spinals	2009-2014
No. Labour topped up CSE for CS		The number of women having Caesarean sections under topped-up CSE's	2009-2014
No. topped up LEA CS		The number of women having Caesarean sections under topped-up epidurals	2009-2014
No. epidural haematoma	Complications	Epidural hematoma: confirmed of an epidural hematoma following regional anaesthesia	2009-2014
No. CICV		Failed intubation/ventilation: The number of patients in whom the trachea could not be intubated and the lungs could not be ventilated	2009-2014
No. failed intubations		Failed intubation: The number of patients undergoing general anaesthesia for Caesarean section in whom the trachea could not be intubated	2009-2014
No. epidural haemtoma requiring surgery		Laminectomy: The number of these patients in whom surgical decompression for epidural hematoma was required	2009-2014

Field Name	Domain	Description	Years in surveys
No. lipid treatments	Complications (continued)	Lipid rescue: The number of patients in which lipid rescue therapy was started	2009-2014
No. LA fits or CA		Local anaesthetic toxicity: The number of patients in whom convulsions or cardiac arrest occurred as a result of local anaesthetic	2009-2014
No. LEA resites		The number of epidurals/CSE needing a resite for labour analgesia	2011-2014
No. EBP for PDPH		The number of women requiring a blood patch for PDPH caused by epidural or spinal needle or epidural catheter	2009-2014
No. HDU admissions in ICU		The number of women transferred to ICU for level 2 care	2011-2014
No. ICU admissions		The number of women transferred to ICU for level 3 Care	2009-2014
No. permanent nerve injury		The number of women who developed permanent neurological damage following regional analgesia/anaesthesia	2011-2014
No. ADP		The number of women with a recognised accidental dural puncture with epidural needle or catheter	2009-2014
No. total spinal		Total Spinal Anaesthesia having a high neuraxial block resulting in loss of consciousness	2009-2014
No. LEA by CSE		Technique of labour analgesia	The number of women provided labour analgesia with CSE
No. LEA	The number of women provided labour analgesia with epidurals		2009-2014
No labour analgesia by PCA	The number of women provided labour analgesia with PCA		2011-2014
No. labour analgesia spinal catheter	The number of women provided labour analgesia with spinal catheter		2011-2014
No. SVD		The number of women having spontaneous (unassisted) vaginal deliveries	2009-2010
No. regional labour analgesia		REGIONAL ANALGESIA: The number of women having regional analgesia (regional block for pain relief initially and NOT for Caesarean section initially)	2009-2010
No. other labour analgesia		INITIATION OF LABOUR ANALGESIA: The number of women whose analgesia was initiated with another method, e.g. spinal catheter, PCA	2009-2010