National Maternity and Perinatal Audit

NHS Maternity Care for Women with Multiple Births and Their Babies

A study on feasibility of assessing care using data from births between 1 April 2015 and 31 March 2017 in England, Wales and Scotland

The National Maternity and Perinatal Audit (NMPA) is led by the Royal College of Obstetricians and Gynaecologists (RCOG) in partnership with the Royal College of Midwives (RCM), the Royal College of Paediatrics and Child Health (RCPCH) and the London School of Hygiene and Tropical Medicine (LSHTM).

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The NMPA Project Team and Board

Abbreviations and glossary

Definitions for abbreviations and terms that are not specific to the audit of multiple birth can be found in the NMPA Clinical Report 2019.[1]

Amnionicity	The number of amniotic membranes that surround the fetuses in a multiple pregnancy.
Birth order	Denotes which baby of a multiple birth was born first, second, third or fourth.
Chorionicity	The number of outer membranes of the pregnancy, indicating the number of placentas in a multiple pregnancy.
CVS	Chorionic villus sampling. An invasive test to sample genetic material from the placenta, to diagnose fetal genetic disorders.
DCDA	Dichorionic diamniotic twin pregnancy. Each baby has a separate placenta (dichorionic) and amniotic sac (diamniotic).
Higher order birth	Birth of three or more babies.
Intrauterine death	Death of a fetus during pregnancy as a result of stillbirth or termination of the pregnancy.
Great Britain (GB)	The island consisting of England, Scotland and Wales.
Intrauterine fetal laser therapy	An invasive procedure where a laser is introduced through a keyhole port into the pregnant uterus to block blood vessels that communicate between two fetuses, causing twin-to-twin transfusion syndrome.
ISUOG	International Society of Ultrasound in Obstetrics and Gynecology
LNU	Local neonatal unit. An intermediate level of neonatal care, usually used for the admission of neonates born between 28 and 34 weeks of gestation.
MCDA	Monochorionic diamniotic twin pregnancy. Both babies share a placenta (monochorionic) but have separate amniotic sacs (diamniotic).
MCMA	Monochorionic monoamniotic twin pregnancy. Both babies share a placenta (monochorionic) and amniotic sac (monoamniotic).
Multiple birth	A birth of more than one infant, regardless of whether that infant is liveborn or stillborn.
Multiple Births Foundation	A UK charity providing information and education for professionals, and support for families with multiple births.
Multiple pregnancy	A pregnancy with more than one fetus.
NICU	Neonatal intensive care unit. Provides neonatal care for the most preterm (< 28 weeks of gestation) and most unwell babies.
Prelabour caesarean birth	A caesarean birth that is carried out prior to the spontaneous or induced onset of labour. This may be planned or conducted as an emergency.
SCBU	Special care baby unit. The lowest level of neonatal unit, usually providing care for babies born after 34 weeks of gestation.
TAMBA/Twins Trust	Twins Trust (formerly TAMBA – Twins and Multiple Births Association). A UK charity supporting women and families with multiple births.
Trichorionic triamniotic	Usually a triplet pregnancy with three placentas (trichorionic) and three amniotic sacs (triamniotic).
Twin-to-twin transfusion syndrome	Also known as feto-fetal transfusion syndrome. A complication of monochorionic pregnancies where twins share communicating blood vessels, resulting in one twin getting a disproportionate amount of the blood supply, to the cost of the other twin.

Executive summary

Introduction

This report focuses on the maternity care for women with multiple births during the period 1 April 2015 to 31 March 2017 and their babies. The purpose of this report is to describe the feasibility of assessing maternity care for women with multiple births and their babies, using routinely collected data.

Methods

This study examines the feasibility of using existing data sources and linkages within NMPA to report the characteristics and outcomes of twin pregnancy and birth and to assess the care of women with multiple birth.

National guidelines from the National Institute for Health and Care Excellence (NICE) and the Royal College of Obstetricians and Gynaecologists (RCOG) and recommendations from Twins Trust and the Multiple Births Foundation were consulted in the development of audit measures. Maternal outcomes were reported per pregnancy. Perinatal outcomes were reported per pregnancy or per baby, as appropriate. The characteristics and outcomes of higher order births were assessed and reported separately from those of twins.

Given that many of the national guidelines referred to local service configuration, an evaluation of the availability of specific services for women with multiple birth was conducted, by linking the results of the NMPA Organisational Survey 2017 with the location of birth of the women with multiple pregnancy.[2]

Key findings

We have demonstrated that an audit of maternity and neonatal care for women and babies affected by multiple birth is feasible using NMPA methodology and data sources, but such an audit will be limited by data availability and quality issues.

We identified 41 608 babies born from multiple pregnancies in 20 655 women from England, Scotland and Wales. When compared with the number of multiple births reported in data from the Office for National Statistics, this represented an estimated case ascertainment of 89.5%, compared with case ascertainments of 92% in 2015/16 and 97% in 2016/17 for singleton births. Case ascertainment is affected by inaccuracies in the recorded number of infants born to each woman and by unavailability of data on the number of fetuses identified in the first trimester of pregnancy.

Only two of 174 clinical guideline statements can be directly assessed using NMPA methods. These relate to recommendations that mothers should be supported to breastfeed and that neonatal networks should aim to reduce term neonatal admissions. The most common reason that recommendations or clinical guideline statements cannot be assessed is the absence of information on chorionicity and amnionicity in the data. This information is not routinely collected in maternity datasets.

Challenges were also identified in classifying caesarean section into categories according to whether the procedure was planned or the procedure was urgent or an emergency, particularly in the context of risk of spontaneous preterm labour in multiple pregnancies in women with planned caesarean birth. It is also not possible to assess provision of specialist services for twin babies with fetal complications (e.g. twin-to-twin transfusion syndrome) because these diagnoses and related therapeutic procedures are poorly recorded in the data.

Case mix adjustment using standard NMPA methods is more complex for women with twin births, compared with those with singleton births. For each pregnancy, a choice has to be made which of the two birthweights need to be included in the case mix adjustment. There is also a small number of women affected by less common comorbidities (e.g. hypertension) and antenatal complications (e.g. placenta praevia), usually included in the established NMPA adjustment method.

A study of variation in measures of maternity care between NHS trusts or boards, or between hospital sites, is only possible for measures where the outcome is common (e.g. prelabour caesarean birth). When relevant features of care or outcomes are rare, maternity and neonatal care can only be assessed at regional or national level.

For the evaluation of maternity and neonatal care that is specific to those babies admitted to a neonatal unit, successful linkage of NMPA maternity data with the NNRD was slightly lower for twin births before 32^{+0} weeks of gestation than the existing linkage of singleton neonates. For example, the linkage rate at 30^{+0} to 31^{+6} weeks of gestation was 87.7% for liveborn twins compared with 94.9% for all liveborn babies. This was particularly noted at gestations less than 28^{+0} weeks. The most likely explanation for this lower linkage rate is less complete and maybe less accurate data entry, including possible errors or omissions with neonatal NHS numbers.

It is possible to assess the availability of specialist services at the level of NHS trust or board, or hospital site, for women giving birth following multiple pregnancy. However, this can currently only be studied according to the place of birth, as information on where antenatal care was received is not available. It should be noted that a similar problem exists for singleton births.

Recommendations

R1 Maternity service providers should consider the local reasons for inaccuracies in the recording of 'number of infants' at birth and work to correct these by the end of the 2020/21 reporting year. This might require auditing local data, mandating the 'number of infants' data item and checking data download reports for national datasets to ensure that 'birth order' has not been mislabelled as 'number of infants'.

R2 Maternity service providers and national organisations responsible for collating and managing maternity datasets should request/record data on the number of fetuses in the first trimester of pregnancy, in addition to number at birth, for women with multiple pregnancy, and should plan to be compliant with this for the next version of the national data specification.

R3 Maternity service providers and national organisations responsible for collating and managing maternity datasets should make chorionicity and amnionicity a compulsory data item in maternity information systems and national datasets for women with multiple pregnancy. This should be implemented in the next version of the national data specification.

R4 Maternity service providers who offer specialist fetal procedures, such as intrauterine fetal laser therapy, should work with their coding departments to ensure that the fetal complications and procedures are properly coded into HES, SMR and PEDW by the end of the 2020/21 reporting year.

R5 Maternity service providers and national organisations responsible for collating and managing maternity datasets should work to include a compulsory field on planned mode of birth, to enable distinction between those women who have an urgent caesarean birth following labour onset for new clinical reasons and those who have planned caesarean birth. This should be implemented in the next version of the national data specification.

R6 Maternity service providers should put local systems in place by the end of the 2020/21 reporting year to ensure that the NHS number for every newborn baby is stored in the maternity information system and linked to the mother's number. Particular care must be taken to ensure that the baby's NHS number is not linked to the baby record of the other twin.

Key findings, recommendations, report evidence and related national guidance

	Key finding (KF) **Recommendation (R)** *(Audience)*	**Report findings underlying this recommendation**	**Page**	**Related national guidance**
KF1	Labelling of multiple births in maternity data did not reflect the number of baby records provided. The most common problem was that the baby's order of birth (i.e. first-born twin, second-born twin) was supplied in place of the number of infants (e.g. two babies born).	Table 2	5–6	
R1	**Maternity service providers should consider the local reasons for inaccuracies in the recording of 'number of infants' at birth and work to correct these by the end of the 2020/21 reporting year. This might require auditing local data, mandating the 'number of infants' data item and checking data download reports for national datasets to ensure that 'birth order' has not been mislabelled as 'number of infants'.** *(Maternity service providers)*			
KF2	The NMPA does not hold data that identify pregnancies which commence with more than one fetus but continue as a singleton pregnancy following early intrauterine fetal death (< 24^{+0} weeks of gestation) of the other fetus(es). Therefore, we are not able to include such multiple pregnancies in the descriptions or measures.	Discussion	9	
R2	**Maternity service providers and national organisations responsible for collating and managing maternity datasets should request/record data on the number of fetuses in the first trimester of pregnancy, in addition to number at birth, for women with multiple pregnancy, and should plan to be compliant with this for the next version of the national data specification.** *(Maternity service provider and national organisations responsible for managing maternity datasets)*			
KF3	Case ascertainment in England and Wales was 89.5% of multiple births in 2016, compared with 92% in 2015/16 and 97% in 2016/17 for singleton births.	Table 4	7–8	

	Key finding (KF) **Recommendation (R)** *(Audience)*	**Report findings underlying this recommendation**	**Page**	**Related national guidance**
KF4	Of the 174 identified national statements and recommendations made for women with multiple pregnancy and birth, only two clinical statements can be tested using the available data. These relate to support for mothers who are breastfeeding infants and to avoidable neonatal admissions at term.	Throughout	11 and 46	Multiple – see Table 6
KF5	The greatest limiting factor in the ability to test more national recommendations is the absence of information on chorionicity and amnionicity.	Throughout		NICE (2011) *Multiple Pregnancy: Antenatal Care for Twin and Triplet Pregnancies*,[3] RCOG (2016) *Management of Monochorionic Twin Pregnancy* (Green-top Guideline No. 51),[4] ISUOG (2016) *Role of Ultrasound in Twin Pregnancy*[5]
R3	**Maternity service providers and national organisations responsible for collating and managing maternity datasets should make chorionicity and amnionicity a compulsory data item in maternity information systems and national datasets for women with multiple pregnancy. This should be implemented in the next version of the national data specification.** *(Maternity service providers and national organisations responsible for managing maternity datasets)*			
KF6	Diagnostic codes do not distinguish between type of chorionicity or between types of intrauterine transfusion (e.g. feto-maternal, twin-to-twin) and so cannot currently be used to report on these complications. **See R3** *(Maternity service providers and national organisations responsible for managing maternity datasets)*		11–12	RCOG (2016) *Management of Monochorionic Twin Pregnancy* (Green-top Guideline No. 51),[4] ISUOG (2016) *Role of Ultrasound in Twin Pregnancy*[5]
KF7	Procedure codes can identify cases of intrauterine fetal laser therapy; however, they are very poorly recorded.		11–12	RCOG (2016) *Management of Monochorionic Twin Pregnancy* (Green-top Guideline No. 51),[4] ISUOG (2016) *Role of Ultrasound in Twin Pregnancy*[5]
R4	**Maternity service providers who offer specialist fetal procedures, such as intrauterine fetal laser therapy, should work with their coding departments to ensure that the fetal complications and procedures are properly coded into HES, SMR and PEDW by the end of the 2020/21 reporting year.** *(Maternity service providers)*			
KF8	It was possible to report on onset of labour, mode of birth, postpartum haemorrhage and severe perineal trauma for women with multiple births, although presentation of mode of birth differed from that in singleton birth because of the potential for each twin to be born by a different method.	Tables 7–11	17–21	NICE (2011) *Multiple Pregnancy: Antenatal Care for Twin and Triplet Pregnancies*,[3] RCOG (2016) *Management of Monochorionic Twin Pregnancy* (Green-top Guideline No. 51)[4]

	Key finding (KF) **Recommendation (R)** *(Audience)*	**Report findings underlying this recommendation**	**Page**	**Related national guidance**
KF9	The unavailability of information on chorionicity limits the interpretation of measures related to timing and mode of birth.	Tables 7 and 8	17–18	NICE (2011) *Multiple Pregnancy: Antenatal Care for Twin and Triplet Pregnancies*,[3] RCOG (2016) *Management of Monochorionic Twin Pregnancy* (Green-top Guideline No. 51)[4]
KF10	It was necessary to alter case mix adjustment methods for this audit on multiple birth compared with the established methodology in NMPA reports on singleton birth. This is largely due to (i) there being two baby birthweights or gestational ages for each woman and (ii) small numbers of women with medical comorbidities.		15–16	
KF11	The absence of data on 'planned mode of birth' meant that type of caesarean birth had to be presented differently in this audit ('prelabour' and 'in-labour') than in audits on singleton birth. The available data are the same, but the risk of a woman labouring prematurely or before a planned caesarean birth at 'term' is higher in a twin pregnancy.	Table 8	17–19	NICE (2011) *Multiple Pregnancy: Antenatal Care for Twin and Triplet Pregnancies*,[3] RCOG (2016) *Management of Monochorionic Twin Pregnancy* (Green-top Guideline No. 51)[4]
R5	**Maternity service providers and national organisations responsible for collating and managing maternity datasets should work to include a compulsory field on planned mode of birth, to enable distinction between those women who have an urgent caesarean birth following labour onset for new clinical reasons and those who have planned caesarean birth. This should be implemented in the next version of the national data specification.** *(Maternity service providers and national organisations responsible for collating and managing maternity datasets)*			
KF12	While evaluating epidural use in twin pregnancies is useful, the group of women to whom this measure is relevant, i.e. those who intend to have a vaginal birth, could not be defined owing to the lack of information on intended mode of birth. **See R5** *(Maternity service providers and national organisations responsible for collating and managing maternity datasets)*		20	NICE (2011) *Multiple Pregnancy: Antenatal Care for Twin and Triplet Pregnancies*,[3] NICE (2019) *Twin and Triplet Pregnancy*[6]
KF13	The usefulness of funnel plots to demonstrate variation in outcomes for women and babies affected by multiple birth is limited by the small number of women affected by the outcome, particularly for the less common outcomes.		23–24	

	Key finding (KF) **Recommendation (R)** *(Audience)*	**Report findings underlying this recommendation**	**Page**	**Related national guidance**
KF14	As the location at which antenatal care was received is unknown, information on availability of specialist services is limited to those available at the place of birth. This information is expected to become available for births in England because information on location of care at each antenatal visit is a field in MSDS v2.0.	Table 13	22–23	NICE (2011) *Multiple Pregnancy: Antenatal Care for Twin and Triplet Pregnancies*[3]
KF15	A different approach is required for the presentation of neonatal outcomes in twin birth compared with that used for singleton birth. Some neonatal outcomes for a baby born from a twin pair are dependent upon the outcomes of the other twin (so are presented per pregnancy, not per baby), or on whether the baby is first- or second-born.	Throughout, including Tables 14–18 and 21–23		
KF16	Successful linkage of NMPA maternity data with the NNRD is lower in twin than in singleton pregnancies. It seems unlikely that this is related to linkage methodology and is most likely to be caused by issues with data entry.	Table 20	34–35	
R6	**Maternity service providers should put local systems in place by the end of the 2020/21 reporting year to ensure that the NHS number for every newborn baby is stored in the maternity information system and linked to the mother's number. Particular care must be taken to ensure that the baby's NHS number is not linked to the baby record of the other twin.** *(Maternity service providers)*			
KF17	The use of a linked NNRD baby record as a proxy indicator for neonatal care admission should be interpreted with caution, given that the NNRD linkage rates are lower in twins.	Table 20	34–35	TAMBA (2017) *Twin Pregnancy and Neonatal Care in England*[7]
KF18	Rates of immediate postnatal geographical separation of mother and one or both babies can be calculated.	Table 23	34–38	TAMBA (2017) *Twin Pregnancy and Neonatal Care in England*[7]
KF19	Presentation and further analysis of rates of term mechanical ventilation and neonatal encephalopathy in twin babies is limited by the small number of babies affected.	Table 22	34–36	
KF20	Presentation of maternal and perinatal characteristics and outcomes is feasible on a national level for women and babies with higher order birth, but further analysis is limited by the small number of cases.	Tables 24, 25 and 27	39–40	NICE (2011) *Multiple Pregnancy: Antenatal Care for Twin and Triplet Pregnancies*,[3] ISUOG (2016) *Role of Ultrasound in Twin Pregnancy*[5]

Introduction

The National Maternity and Perinatal Audit

The National Maternity and Perinatal Audit (NMPA) is a national audit of NHS maternity services across England, Scotland and Wales, commissioned by the Healthcare Quality Improvement Partnership (HQIP) on behalf of NHS England, the Welsh Government and the Health Department of the Scottish Government. The NMPA is led by the Royal College of Obstetricians and Gynaecologists (RCOG) in partnership with the Royal College of Midwives (RCM), the Royal College of Paediatrics and Child Health (RCPCH) and the London School of Hygiene and Tropical Medicine (LSHTM).

The NMPA aims to produce high-quality information that can be used by providers, commissioners and users of maternity services to benchmark against national standards and recommendations where these exist, and to identify good practice and areas for improvement.

Background on multiple births

Approximately 3% of all babies are born from multiple pregnancies. The incidence of multiple pregnancy has increased, primarily owing to an ageing maternal population and higher use of assisted conception techniques. Of twin births, approximately 70% are of babies born from dichorionic diamniotic (DCDA) pregnancies and 30% are babies born from monochorionic pregnancies.[4] Fewer than 1% of all babies born in the UK are from higher order pregnancies (triplets, quadruplets or more).[8]

Multiple pregnancies are associated with an increased risk of adverse maternal and neonatal outcomes. These outcomes include maternal complications such as anaemia, pre-eclampsia, emergency caesarean birth and postpartum haemorrhage,[6] and fetal-neonatal complications such as growth restriction and prematurity, or complications specific to monochorionic pairs, such as twin-to-twin transfusion syndrome.[4,6]

The National Institute for Health and Care Excellence (NICE) published an antenatal guideline on multiple pregnancy in 2011 accompanied by a NICE quality standard in 2013.[3,9] The guideline was updated in 2019.[6] It provides guidance on the care that women with twin or triplet pregnancies should expect to receive above that which is routinely offered to women with uncomplicated singleton pregnancies. Other national and international guidelines have also been developed on specialist topics. These include the Royal College of Obstetricians and Gynaecologist (RCOG) Green-top Guideline on the *Management of Monochorionic Twin Pregnancies* and the International Society of Ultrasound in Obstetrics and Gynecology (ISUOG) Practice Guidelines on the *Role of Ultrasound in Twin Pregnancy*.[4,5] These are further supported by patient advocacy and updated clinical information to healthcare providers and families from organisations such as Twins Trust (formerly TAMBA) and the Multiple Births Foundation.

Both Twins Trust and the National Perinatal Epidemiology Unit (NPEU) have previously conducted national reviews on maternity care for women with twin pregnancies and their babies. Twins Trust and NPEU produced a joint report (published 2011) following a survey of women's experiences of birth in 2007.[10] The NPEU, through MBRRACE-UK (Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK), has also reported on perinatal mortality specific to twin pregnancy, showing a reduction in the stillbirth rate for twin pregnancies between 2014 and 2016 from 11.07 (95% CI 9.78–12.47) to 6.16 (95% CI 5.20–7.24) per 1 000 total births and in the neonatal

mortality rate from 7.81 (95% CI 6.73–9.01) to 5.34 (95% CI 4.47–6.36) per 1 000 live births. Relative to the reduction in mortality rate in singleton pregnancies, these were more significant reductions.[11] This has been attributed to the introduction and uptake of the NICE and RCOG national guidelines, including the recommendation for antenatal care from specialist multidisciplinary teams.[12]

Audit standards from singleton pregnancies cannot automatically be applied to multiple pregnancies, given the inherent increased risk of multiple pregnancies and differences in surveillance and clinical management between these groups. Therefore, this multiple pregnancy sprint audit aims to provide information to drive quality improvement initiatives for this population of mothers and babies.

Aims and objectives of the multiple births sprint audit

This audit was planned to assess the feasibility of undertaking a national audit of maternity and perinatal care provided to women with multiple births and their babies, using routinely collected data and established NMPA methodology.

The objectives were to:

- determine the feasibility of undertaking a national audit of maternity and perinatal care for women with multiple births using NMPA methodology, including an assessment of data quality and linkage
- assess variation in care processes and outcomes in relation to the existing clinical guidelines for multiple pregnancy, where possible
- provide recommendations to improve feasibility of evaluating the care of women with multiple births.

Data sources

The NMPA uses data routinely collected in the course of maternity and neonatal care and links these datasets together to produce a central maternity and neonatal dataset. A different approach to obtaining data is used in each participating country, reflecting the status and maturity of centralised national maternity datasets. The data sources have previously been described in the NMPA Clinical Report 2019.[1]

Assessment of data quality

The NMPA has existing approaches to assess data quality and uses these to determine which trusts/boards can be included in the report. These approaches are set out in the NMPA Clinical Report 2019 and NMPA Measures Technical Specification.[1,13] The analysis in this report is restricted to (i) trusts/boards that passed the NMPA trust/board level data quality checks and (ii) birth records within those trusts or boards that contained the required data to construct the measure. The number of trusts and boards for which results were available therefore varied from measure to measure, depending on the specific data requirements. The included trusts and boards in this report are the same as those in the same years from the earlier clinical reports,[1,14]

An assessment of data quality specific to the identification of women with multiple births and their babies is detailed in the next chapter.

Data quality considerations in identifying multiple births

Key findings and recommendations

KF1 Labelling of multiple births in maternity data did not reflect the number of baby records provided. The most common problem was that the baby's order of birth (i.e. first-born twin, second-born twin) was supplied in place of the number of infants (e.g. two babies born).

KF2 The NMPA does not hold data that identify pregnancies which commence with more than one fetus but continue as a singleton pregnancy following early intrauterine fetal death (< 24^{+0} weeks of gestation) of the other fetus(es). Therefore, we are not able to include such multiple pregnancies in the descriptions or measures.

KF3 Case ascertainment in England and Wales was 89.5% of multiple births in 2016, compared with 92% in 2015/16 and 97% in 2016/17 for singleton births.

R1 Maternity service providers should consider the local reasons for inaccuracies in the recording of 'number of infants' at birth and work to correct these by the end of the 2020/21 reporting year. This might require auditing local data, mandating the 'number of infants' data item and checking data download reports for national datasets to ensure that 'birth order' has not been mislabelled as 'number of infants'.

R2 Maternity service providers and national organisations responsible for collating and managing maternity datasets should request/record data on the number of fetuses in the first trimester of pregnancy, in addition to number at birth, for women with multiple pregnancy, and should plan to be compliant with this for the next version of the national data specification.

An assessment of data quality relevant to a national audit on multiple birth must include:

- an evaluation of the data required in identifying the women and babies to be included (or excluded) from the audit
- an assessment of case ascertainment compared with the gold standard
- an assessment of the quality of linkage between routinely collected datasets.

The scope of the audit was all women receiving maternity care in England, Scotland and Wales who experienced a multiple birth during the period 1 April 2015 to 31 March 2017. We therefore planned to exclude women with the following pregnancy types:

- women with singleton pregnancies
- pregnancies that commenced with more than one fetus but were later affected by an intrauterine death before 24 weeks of gestation, leaving only one registrable baby at birth; this is because the NMPA only holds information on babies who are registrable at birth (babies born at or after 24^{+0} weeks of gestation regardless of viability, or at any gestation with signs of life) and does not have information on number of fetuses in *early pregnancy*.

In identifying women who gave birth to more than one baby, the 'number of infants' variable is used. Each woman's record should have a value for this and it should correspond with the number of baby

records attached to the maternal record, for a given pregnancy (Table 1). All babies in whom birth was registrable are expected to have a baby record in the maternal information system. Table 1 has been included to demonstrate a simulated example of how maternity data for women with multiple births are expected to look. Each mother (identifiers M123 and M456 in this example) has a duplicated record (duplicated identifier and characteristics) for each baby born from the pregnancy. The baby identifiers (IDs) and characteristics are unique and should not be duplicated. The value for 'number of infants' should reflect the number of baby records attached to each maternal record.

Table 1 A simulated example demonstrating the expected format of maternal and baby records; one maternal ID (and relevant maternal characteristics) is linked to more than one baby ID (and corresponding baby characteristics)

Mother ID	Maternal age	Baby ID	Number of infants	Birth order	Birthweight
M123	35	B12	2 (twins)	1	2400 g
M123	35	B22	2 (twins)	2	2550 g
M456	39	B82	3 (triplets)	1	1410 g
M456	39	B92	3 (triplets)	2	1520 g
M456	39	B98	3 (triplets)	3	1320 g

Methods

Identifying multiple births

We compared the expected number of infants (as per the information provided on number of babies at birth) with the number of baby records provided per birth. Where there was a discrepancy, we identified common reasons for the mismatch. In each case, we developed and applied a rule that was used to generate a new 'number of infants' variable, which better reflected the data provided to us and assisted in the identification of multiple births.

Following the data management steps detailed above, we excluded women and babies with singleton births and duplicated records of singleton births from the study population.

Assessing case ascertainment

To assess case ascertainment, it was necessary to compare the number of births in a single calendar year from the audit population (England and Wales) with those published on multiple birth by the Office for National Statistics for England and Wales.[8] Since the only complete calendar year in this audit is 2016, case ascertainment was assessed only for this year. Case ascertainment for the other partial years (April–December 2015 and January–March 2017) is expected to approximate to this.

Determining pregnancy outcome

In the NMPA clinical reports, we have previously excluded births of babies who were not liveborn (due to stillbirth or termination of the pregnancy). The characteristics of these births are studied in the MBRRACE Perinatal Mortality Surveillance reports. Multiple pregnancy presents the unique challenge of a discordant fetal outcome; that is, one baby liveborn and the other stillborn.

Rather than excluding all pregnancies in which there was at least one (registrable) fetal loss, we present data on the percentage of pregnancies affected by late ($\geq 24^{+0}$ weeks) fetal loss in one or both twins. This grouping is then used in later chapters of this report, where measures of maternity care are reported in the group to which the measure is most appropriate.

Results

Identifying multiple births

The number of baby records attached to a maternal record did not always represent the expected number of babies. For example, there were 1 237 instances where we expected two baby records, one for each twin of a twin birth, but only one baby record was provided (Table 2).

Table 2 Number of records versus number of infants in entire dataset

Number of infants expected	Number of baby records linked to the maternal record	England		Scotland		Wales		GB	
		n	%	n	%	n	%	n	%
Singleton	1-expected	1 198 407	99.7%	105 019	99.8%	56 599	99.8%	**1 368 242**	**99.7%**
	2	3 434	0.3%	190	0.2%	126	0.2%	**3 758**	**0.3%**
	3	50	<0.1%	3	<0.1%	3	<0.1%	**56**	**<0.1%**
	>3	5	<0.1%	0	0.0%	0	0.0%	**5**	**<0.1%**
	Subtotal	1 201 896		105 212		56 728		**1 372 061**	
Twins	1	1 212	3.3%	20	0.6%	4	0.3%	**1 237**	**3.0%**
	2-expected	35 436	96.0%	3 076	99.4%	1 521	99.3%	**40 204**	**96.4%**
	3	60	0.2%	0	0.0%	6	0.4%	**66**	**0.2%**
	>3	198	0.5%	0	0.0%	0	0.0%	**198**	**0.5%**
	Subtotal	36 906		3 096		1 531		**41 705**	
Triplets	1	24	2.9%	0	0.0%	0	0.0%	**24**	**2.6%**
	2	28	3.4%	0	0.0%	0	0.0%	**28**	**3.0%**
	3-expected	777	93.4%	66	100.0%	21	100.0%	**867**	**9.4%**
	>3	3	0.4%	0	0.0%	0	0.0%	**3**	**0.3%**
	Subtotal	832		66		21		**922**	
Quadruplets	1	#[a]	12.5%	0	0.0%	0	N/A	**#[a]**	**11.1%**
	2	0	0.0%	0	0.0%	0	N/A	**0**	**0.0%**
	3	0	0.0%	0	0.0%	0	N/A	**0**	**0.0%**
	4-expected	28	87.5%	#[a]	100.0%	0	N/A	**32**	**88.9%**
	Subtotal	32		#[a]		0		**36**	
Total		1 239 666		108 378		58 280		**1 414 724**	

NB. The total of the three countries does not add up to the total of GB because 8 400 babies have missing information for 'country' of birth.
[a] Numbers less than 5 are suppressed.

The reasons for mismatch and corresponding developed rules for data management were:

- More than one birth during the audit period – these were not modified.
- Birth order (i.e. first- or second-born) used in place of the 'number of infants' variable. This resulted in a different value for 'number of infants' for each baby born from the same pregnancy.
  - In these cases, the maximum birth order (i.e. second-born = '2') was used to replace the value of 'number of infants' for all babies in a multiple birth.
- Only one baby record provided for a given mother, despite the 'number of infants' variable stating that there was more than one baby expected.
  - In these cases, births were assumed to be singleton births and removed from the current audit report. This is likely to account for some of the reduction in case ascertainment achieved.
- More than one baby record provided for a given mother and pregnancy, despite the value of 'number of infants' suggesting this to be a singleton pregnancy (for all linked baby records).

- In these cases, an assessment of the baby characteristics (e.g. birthweight, Apgar score, time of birth) was carried out to determine whether the multiple records were likely to represent multiple babies from the same birth, or duplicates of a singleton baby.

The NMPA has access to records for 20 655 women having 41 608 babies from multiple births, during the period 1 April 2015 to 31 March 2017 in England, Scotland and Wales. No women are known to have had more than one multiple pregnancy during the audit period. The construction of the final population is explained in Figure 1.

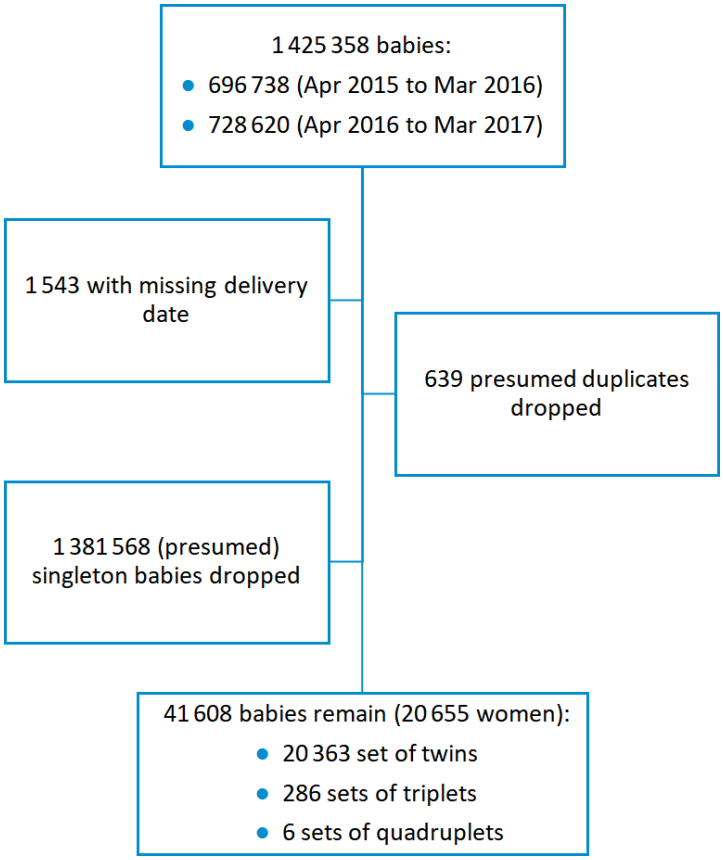

Figure 1 Construction of the multiple birth audit population

The number of women giving birth to twins and triplets is detailed per country in Table 3. Owing to small numbers, pregnancies with quadruplets or higher order births are not included. Overall, there were six recorded quadruplet births in Great Britain during the study period and no recorded births where more than four babies were born.

Table 3 Number of women with multiple birth who have twins or triplets

Number of infants born to the woman	Women							
	England		Scotland		Wales		GB	
	n	%	n	%	n	%	n	%
2	18 000	98.6%	1 535	98.5%	830	99.2%	**20 365**	**98.6%**
3	254	1.4%	23	1.5%	7	0.8%	**284**	**1.4%**
Total	18 254	100%	1 558	100%	837	100%	**20 649**	**100%**

[a] Numbers less than 5 are suppressed.

Assessing case ascertainment

The dataset contains antenatal and birth information on 19 780 babies born to 9 822 mothers in 2015/16 and 21 828 babies born to 10 833 mothers in 2016/17 (Table 4). Case ascertainment for 2016 was estimated to be 89.5%.

Table 4 Births in financial and calendar years used to calculate case ascertainment in 2016

Source	Period		
	April 2015 to December 2015	January 2016 to December 2016	January 2017 to March 2017
NMPA multiple births dataset (E, W and S)	April 2015 to March 2016: 19 780 babies born to 9 822 women	April 2016 to March 2017: 21 828 babies born to 10 833 women	
NMPA multiple births dataset (E and W)		19 759 babies born to 9 809 women	
ONS data (E and W)		22 072 babies born to 10 951 women	

Abbreviations: E = England, W = Wales, S = Scotland.

The methodology used when describing the characteristics of the women with multiple births is the same as that used for women with singleton births. The characteristics of women included in this audit are presented in Appendix 1.

Determining pregnancy outcome

What is measured: The proportion of twin births in which none, one or two babies are liveborn.

Table 5 presents data for twin pregnancies where complete data was provided for the fetal outcome.

Table 5 Fetus outcome in twin pregnancies where information was available for outcome of both babies

	England	Scotland	Wales	GB
Number of trusts/boards included in analysis	130	12	6	**148**
Number of pregnancies included in analysis	17 164	1 503	814	**19 481**
Number of pregnancies with both babies liveborn	16 893	1 485	803	**19 181**
Proportion	98.4%	98.8%	98.6%	**98.5%**
Number of pregnancies with one liveborn baby	210	15	11	**236**
Proportion	1.22%	1.00%	1.35%	**1.21%**
Number of pregnancies with neither baby liveborn	61	#[a]	0	**#[a]**
Proportion	0.36%		0.0%	

[a] Numbers less than 5 are suppressed.

Discussion

Constructing an audit population of women with multiple births and their babies is feasible using NMPA methodology but has limitations. Despite such limitations, we achieved an estimated case ascertainment of 89.5%, although this is lower than the case ascertainment achieved for singleton births in 2015/16 (92%) and 2016/17 (97%).[1,14]

Routinely collected maternity data includes information on the number of infants born from a given pregnancy. We found that the expected number of infants did not always reflect the number of baby

records provided in the raw data. Following exploration of the data, a common reason for this was that information on birth order (e.g. first- or second-born twin) was often used in place of information on the number of infants born. Following data management processes to improve the information provided on number of infants, we were able to construct a study population of women with multiple births and their babies.

We acknowledge that it is possible that a birth is labelled as multiple because the pregnancy commenced with more than one fetus but there was an intrauterine fetal death before the gestation at which this is registrable (< 24^{+0} weeks). We do not hold separate information on number of fetuses in the first trimester and therefore cannot identify a multiple pregnancy that did not lead to multiple birth. Such a pregnancy would therefore appear to be a singleton mislabelled as a twin pregnancy. Current estimates suggest that such early intrauterine fetal death (< 24 weeks of gestation) occurs in approximately 14.2% of monochorionic pregnancies and 2.6% of dichorionic pregnancies. Since monochorionic pregnancies comprise approximately 30% of all twins, this early fetal loss is expected to affect about 6.1% of all twin pregnancies.[4,15] So in this cohort, some of the 1 237 births labelled as twins but with only one baby record may be explained by early fetal loss.

Exclusion of pregnancies in which there was a late fetal loss must be managed differently in multiple compared with singleton pregnancies because of the possibility of discordant fetal outcome. For this reason, we have not excluded all women with a late fetal loss from this audit.

Feasibility of auditing existing recommendations

Key findings and recommendations

KF4 Of the 174 identified national statements and recommendations made for women with multiple pregnancy and birth, only two clinical statements can be tested using the available data. These relate to support for mothers who are breastfeeding infants and to avoidable neonatal admissions at term.

KF5 The greatest limiting factor in the ability to test more national recommendations is the absence of information on chorionicity and amnionicity.

KF6 Diagnostic codes do not distinguish between type of chorionicity or between types of intrauterine transfusion (e.g. feto-maternal, twin-to-twin) and so cannot currently be used to report on these complications.

KF7 Procedure codes can identify cases of intrauterine fetal laser therapy; however, they are very poorly recorded.

R3 Maternity service providers and national organisations responsible for collating and managing maternity datasets should make chorionicity and amnionicity a compulsory data item in maternity information systems and national datasets for women with multiple pregnancy. This should be implemented in the next version of the national data specification.

R4 Maternity service providers who offer specialist fetal procedures, such as intrauterine fetal laser therapy, should work with their coding departments to ensure that the fetal complications and procedures are properly coded into HES, SMR and PEDW by the end of the 2020/21 reporting year.

The NMPA aims to present a broad range of measures that enable maternity service providers, commissioners and other stakeholders to reflect on service provision, and to benchmark their results against national averages and other services. In developing these measures, we first consult national reports and guidelines relevant to the study population.

Methods

In constructing the list of potential audit measures, the reports and guidelines listed in Table 6 were reviewed.

The relevant statements from these reports and guidelines were listed and statements that were duplicated in more than one report were excluded. For each distinct statement, the information required to test the recommendation or standard was considered and then the source datasets were checked for the availability of this information.

Table 6 Guidelines and reports used in producing the list of UK recommendations and standards for maternity care for multiple births

NICE (2011)[a] *Multiple Pregnancy: Antenatal Care for Twin and Triplet Pregnancies* (Clinical Guideline CG129)[3]
NICE (2019) *Twin and Triplet Pregnancy* (NICE Guideline NG137)[6]
NICE (2008, updated 2019) *Antenatal Care for Uncomplicated Pregnancies* (Clinical Guideline CG62)[16]
NICE (2013) *Multiple Pregnancy: Twin and Triplet Pregnancies* (Quality Standard QS46)[9]
NICE (2019) *Hypertension in Pregnancy: Diagnosis and Management* (NICE Guideline NG133)[17]
RCOG (2016) *Management of Monochorionic Twin Pregnancy* (RCOG Green-top Guideline No. 51)[4]
ISUOG (2016) *Role of Ultrasound in Twin Pregnancy* (ISUOG Practice Guidelines)[5]
NPEU/TAMBA (2011) *Maternity Care for Women Having a Multiple Birth*[10]
TAMBA (2017) *Twin Pregnancy and Neonatal Care in England*[7]
Scottish Government (2017) *The Best Start: A Five-Year Forward Plan for Maternity and Neonatal Care in Scotland*[18]
Multiple Births Foundation (2011) *Guidance for Health Professionals on Feeding Twins, Triplets and Higher Order Multiples*[19]

[a] The 2011 *Multiple Pregnancy: Antenatal Care for Twin and Triplet Pregnancies* NICE guideline was current at the time of maternity care provision for women and babies included in this report. It was later updated and replaced by the 2019 *Twin and Triplet Pregnancy* NICE guideline.

Results

Clinical recommendations for maternity care

There were 174 distinct statements of recommendation relevant to the maternity care of women with multiple pregnancies or births. This includes both clinical recommendations and statements relevant to the composition or availability of maternity services.

Of the statements that refer directly to clinical care (as opposed to organisational characteristics), two were considered feasible for testing using the current NMPA datasets. These are:

> *Breast milk is the best nutrition for all babies – whether singletons or multiples – and mothers should be supported and encouraged to provide breast milk or breastfeed their infants.* (Multiple Births Foundation: *Guidance for Health Professionals on Feeding Twins, Triplets and Higher Order Multiples*, 2011)[19]

> *NHS England and NHS Improvement should look to extend their efforts in trying to reduce term neonatal admissions to include reducing avoidable admissions in multiple pregnancies starting with the neonatal networks with the highest admission rates.* (TAMBA: *Twin Pregnancy and Neonatal Care in England*, 2017)[7]

The information that would be necessary to audit national clinical recommendations and standards is listed in Appendix 2, categorised according to availability from all, some or no data sources. In particular, chorionicity (and/or amnionicity) is required to test 70 of the clinical recommendations but is not currently available in any of the routinely collected maternity datasets. Other commonly required information that was not available from any data source includes referral to a tertiary care centre for fetal complications and frequency of antenatal/ultrasound appointments.

While NMPA does hold data on diagnoses coded using the standardised International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) within the Hospital Episode Statistics (HES), Patient Episode Database for Wales (PEDW) and Scottish Morbidity Record (SMR) datasets, this version of ICD-10 does not distinguish between types of intrauterine transfusion (e.g. materno-fetal, feto-maternal or twin-to-twin). Procedure codes are derived from the Office of

Population Censuses and Surveys (OPCS) Classification of Surgical Operations and Procedures. These do identify cases of percutaneous or endoscopic intrauterine fetal laser therapy, used to treat higher grades of twin-to-twin transfusion syndrome, but there were only two recorded cases in the whole twin dataset, and so it was concluded that it is very poorly recorded.

Organisational recommendations for maternity care

With regard to statements of recommendation that refer to the characteristics of the organisation providing care, one of these can be tested using data collected during the NMPA organisational survey:

Antenatal clinical care for women with a twin or triplet pregnancy should be provided by a nominated multidisciplinary team consisting of:

- *a core team of named specialist obstetricians, specialist midwives and sonographers, all of whom have experience and knowledge of managing twin and triplet pregnancies*
- *an enhanced team for referrals, which should include:*
  - *a perinatal mental health professional*
  - *a women's health physiotherapist*
  - *an infant feeding specialist*
  - *a dietitian*[2]

In order for the NMPA to test *all* recommendations relevant to characteristics of organisations providing maternity care to women with multiple pregnancy and birth, some additional information would be required:

- evidence of sonographer update training and local audits of the accuracy of determining chorionicity and amnionicity
- referral pathways for complicated multiple pregnancies
- number of procedures undertaken annually at sites that conduct invasive fetal procedures (e.g. amniocentesis, fetal laser therapy)
- site-specific guidance on appointment length for twin ultrasound scans
- site-specific guidance on the gestation at which to commence monitoring for twin-to-twin transfusion.

Discussion

We have previously concluded that very few standards exist in maternity care that can be measured via a national audit and there are no clear standards to define ‘acceptable ranges’ for rates of common interventions such as caesarean birth and induction of labour.[14] In this sprint audit on multiple birth, we have identified only two distinct clinical statements or recommendations that can be tested using routinely collected maternity data in the UK.

It may be possible to test a further five statements for England, once the NMPA changes the source of English maternity data from local maternity information systems (MIS) to the centralised NHS Digital Maternity Service Data Set (MSDS). This is because the planned MSDS dataset includes data on screening for fetal trisomies and on timing of fetal growth scans. There are no planned changes that would facilitate this in Scottish or Welsh datasets.

The most common reason for not being able to audit national recommendations or statements was that data on chorionicity and amnionicity is not available from any of the routinely collected datasets. This is the greatest limitation on our ability to test many of the national clinical recommendations in this sprint audit.

All three countries within Great Britain have current plans to implement nationally standardised electronic maternity records, accessible to the woman and transferable between trusts/boards.[20,21,22] Only the planned English maternity record data specification outlines a plan to include chorionicity and amnionicity for women with multiple birth, although NHS Digital acknowledges that further work is required with the record suppliers to implement this data item.[23] Chorionicity and amnionicity are not currently data items within MSDS, SMR or PEDW.

With regard to other fetal complications and procedures, specific to multiple pregnancy, OPCS diagnostic codes were rarely recorded and currently cannot be used to audit recommendations that refer to these.

For these reasons, we have not limited the set of audit measures to only those with published 'auditable standards'. Clinical measures reported in later chapters have been developed following clinical consensus from the NMPA Project Team and Sprint Audit Advisory Group.

Feasibility of constructing measures to audit maternity care for women with twin births

Key findings and recommendation

KF8 It was possible to report on onset of labour, mode of birth, postpartum haemorrhage and severe perineal trauma for women with multiple births, although presentation of mode of birth differed from that in singleton birth because of the potential for each twin to be born by a different method.

KF9 The unavailability of information on chorionicity limits the interpretation of measures related to timing and mode of birth.

KF10 It was necessary to alter case mix adjustment methods for this audit on multiple birth compared with the established methodology in NMPA reports on singleton birth. This is largely due to (i) there being two baby birthweights or gestational ages for each woman and (ii) small numbers of women with medical comorbidities.

KF11 The absence of data on 'planned mode of birth' meant that type of caesarean birth had to be presented differently in this audit ('prelabour' and 'in-labour') than in audits on singleton birth. The available data are the same, but the risk of a woman labouring prematurely or before a planned caesarean birth at 'term' is higher in a twin pregnancy.

KF12 While evaluating epidural use in twin pregnancies is useful, the group of women to whom this measure is relevant, i.e. those who intend to have a vaginal birth, could not be defined owing to the lack of information on intended mode of birth.

KF13 The usefulness of funnel plots to demonstrate variation in outcomes for women and babies affected by multiple birth is limited by the small number of women affected by the outcome, particularly for the less common outcomes.

KF14 As the location at which antenatal care was received is unknown, information on availability of specialist services is limited to those available at the place of birth. This information is expected to become available for births in England because information on location of care at each antenatal visit is a field in MSDS v2.0.

R5 Maternity service providers and national organisations responsible for collating and managing maternity datasets should work to include a compulsory field on planned mode of birth, to enable distinction between those women who have an urgent caesarean birth following labour onset for new clinical reasons and those who have planned caesarean birth. This should be implemented in the next version of the national data specification.

The measures presented are a sample of those that are possible but have been chosen to demonstrate the feasibility of assessing variation in outcomes, specific to women affected by multiple birth. Measures intended to assess the availability of specialist services, as recommended by NICE,[3] are also included here.

Methods

As with the NMPA clinical reports, adjustment of results using clinical and demographic risk factors that are outside the control of care providers is necessary to ensure that fair and meaningful comparisons can be drawn across services. Further details regarding the methodology commonly used in NMPA clinical audit can be found in the NMPA Clinical Report 2019 and NMPA Measures Technical Specification on the NMPA website.[1,13]

In this sprint audit on multiple births, the following characteristics were used in the case mix adjustment model: maternal age, ethnicity, index of socio-economic deprivation, parity, previous caesarean birth, neonatal birthweight, gestational age at birth, maternal BMI, smoking status, diabetes, eclampsia, placental problems (e.g. placenta praevia). Where factors are included in the outcome (e.g. twin birthweight discrepancy or stratification by gestational age), these factors were not adjusted for.

Additional adjustments from the usual case mix methodology were applied for two reasons:

1. Where outcomes are presented per mother (e.g. postpartum haemorrhage), there is not a single birthweight or gestational age (in some cases) for a twin pregnancy. We have adjusted results for each maternal measure using the latest gestational age or higher birthweight, because adverse maternal outcomes (e.g. postpartum haemorrhage, third or fourth degree perineal tear) are usually associated with the higher values rather than lower.[24,25]
2. When outcome measures were stratified (e.g. by gestational age at birth), there were often few cases of outcomes in each stratum for these two years of data. Since some of the adjustment factors are also uncommon, the case mix adjustment procedure was modified to remove maternal BMI, smoking status, diabetes, eclampsia and placental problems.

Auditing organisational measures of care

To test the feasibility of auditing recommendations on service composition, we used the information collected using the NMPA organisational survey. Since this audit centres on the maternity care of women who gave birth to multiple babies during the period 1 April 2015 to 31 March 2017, the 2017 organisational report is most relevant.[2]

Results

Clinical measures of care for women before, during and after twin birth.

Onset of labour

What is measured: The proportion of all women with a twin pregnancy whose birth commences with:

- spontaneous onset of labour
- induction of labour
- or a prelabour caesarean birth.

Spontaneous onset of preterm labour is known to be higher among twin pregnancies than for singletons.[6] It therefore follows that a woman runs the risk of labouring before the date of a planned elective caesarean birth. For this reason, the term ‘prelabour’ caesarean birth is used, rather than elective caesarean birth, to describe onset of labour.

Table 7 Proportion of women with a twin pregnancy whose birth commenced with spontaneous onset of labour, induction of labour or prelabour caesarean birth

	England	Scotland	Wales	GB
Number of trusts/boards included in analysis	128	12	5	**145**
Number of women included in analysis	16 275	692	1 513	**18 480**
Number of women who had a prelabour caesarean birth	8 018	232	583	**8 833**
Proportion (adjusted)[a]	48.9%	39.2%	39.1%	**47.8%**
Number of women who had spontaneous onset of labour	3 972	264	608	**4 844**
Proportion (adjusted)[a]	24.7%	33.7%	36.9%	**26.2%**
Number of women who had induction of labour	3 952	195	318	**4 465**
Proportion (adjusted)[a]	24.3%	25.2%	22.1%	**24.2%**

[a] Country-level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).

Mode of birth

At the time of data collection for this audit, recommendations regarding mode of birth for women with DCDA twin pregnancies were not specific. New guidance was published by NICE in September 2019 which states that both planned vaginal birth and planned caesarean birth are safe choices for women with uncomplicated pregnancies.[6] For women with MCDA (monochorionic diamniotic) pregnancies, existing RCOG guidance states that vaginal birth is safe in most cases but recommends that MCMA (monochorionic monoamniotic) twins be born by elective caesarean birth because of the risk of cord entanglement.[4]

Evaluating mode of birth for twins requires additional considerations compared with when evaluating this in singleton pregnancy. We do not hold data that clearly defines emergency or elective caesarean birth in this group; for example, an emergency caesarean birth may be conducted because a woman labours before a planned elective caesarean birth. It is for this reason that caesarean birth has been separated into prelabour caesarean birth and caesarean birth following induced or spontaneous onset of labour, rather than the conventional categorisation for singleton birth of elective and emergency caesarean birth.

Furthermore, with more than one baby there is potential for more than one mode of birth. An additional category of sequential vaginal/caesarean birth has therefore been added to the common categories of mode of birth.

What is measured: Of women who give birth to at least one liveborn baby in a twin birth, the proportion with each mode of birth:

a) unassisted vaginal: vaginal birth without the use of instruments for either baby
b) instrumental: vaginal birth with the assistance of instruments for at least one baby
c) caesarean birth for both babies (prelabour or following spontaneous onset/induced labour)
d) sequential vaginal birth and caesarean birth.

This measure has been stratified by gestational age at birth, to demonstrate the feasibility of doing so in a measure where the outcome is common.

Table 8 Proportion of women giving birth to twin babies by (a) unassisted vaginal birth, (b) instrumental vaginal birth, (c) caesarean birth or (d) sequential methods

		England	Scotland	Wales	GB
Number of trusts/boards included in analysis		129	12	6	**147**
Number of mothers included in analysis		16 817	1 513	757	**19 087**
Number of women who gave birth vaginally, unassisted		3 724	272	179	**4 175**
Proportion (adjusted)[a]		22.1%	18.4%	23.6%	**21.9%**
Number of women who gave birth vaginally with the assistance of instruments for either baby		1 473	99	46	**1 618**
Proportion (adjusted)[a]		8.7%	6.4%	6.8%	**8.5%**
Number of women who gave birth by caesarean for both babies		11 129	1 105	498	**12 732**
Proportion (adjusted)[a]		66.2%	72.6%	65.2%	**66.7%**
Prelabour caesarean birth		8 045	583	232	**8 860**
Proportion (adjusted)[a]		47.5%	38.7%	36.6%	**46.4%**
Caesarean birth following spontaneous onset or induction of labour		2 970	508	263	**3 741**
Proportion (adjusted)[a]		18.1%	32.7%	24.2%	**19.6%**
Number of women who gave birth with sequential vaginal birth and caesarean birth		560	48	37	**645**
Proportion (adjusted)[a]		3.3%	3.2%	4.8%	**3.4%**
Proportion of women who gave birth by each method, by gestational age category (adjusted)[a]					
23^{+0} to 27^{+6} weeks[b]	Unassisted vaginal	50.0%	56.3%	#[c]	**50.0%**
	Any assisted vaginal birth	1.7%	0.0%	0.0%	**1.6%**
	Prelabour caesarean birth	22.7%	#[c]	#[c]	**21.2%**
	Caesarean birth in labour	21.2%	37.5%	#[c]	**22.5%**
	Sequential vaginal/caesarean	4.5%	#[c]	#[c]	**4.5%**
28^{+0} to 31^{+6} weeks[b]	Unassisted vaginal	22.3%	21.8%	30.5%	**22.5%**
	Any assisted vaginal birth	5.4%	#[c]	#[c]	**5.0%**
	Prelabour caesarean birth	43.4%	14.3%	18.4%	**39.7%**
	Caesarean birth in labour	24.5%	60.8%	37.0%	**28.2%**
	Sequential vaginal/caesarean	4.3%	#[c]	#[c]	**4.3%**
32^{+0} to 36^{+6} weeks	Unassisted vaginal	19.8%	15.9%	23.8%	**19.6%**
	Any assisted vaginal birth	8.0%	7,1%	5.4%	**7.9%**
	Prelabour caesarean birth	48.9%	33.8%	37.5%	**47.2%**
	Caesarean birth in labour	19.7%	40.0%	25.3%	**21.8%**
	Sequential vaginal/caesarean	3.2%	3.4%	3.8%	**3.2%**
37^{+0} to 38^{+6} weeks	Unassisted vaginal	21.7%	18.0%	20.7%	**21.4%**
	Any assisted vaginal birth	10.5%	6.5%	8.9%	**10.2%**
	Prelabour caesarean birth	49.9%	54.4%	41.4%	**49.9%**
	Caesarean birth in labour	14.7%	18.4%	20.1%	**15.3%**
	Sequential vaginal/caesarean	3.0%	2.4%	4.9%	**3.1%**
39^{+0} to 41^{+6} weeks[b]	Unassisted vaginal	41.6%	27.6%	#[c]	**40.5%**
	Any assisted vaginal birth	9.8%	#[c]	#[c]	**9.6%**
	Prelabour caesarean birth	21.7%	27.4%	#[c]	**21.9%**
	Caesarean birth in labour	19.3%	#[c]	19.9%	**18.9%**
	Sequential vaginal/caesarean	6.6%	#[c]	#[c]	**7.5%**

[a] Country-level results are adjusted for case mix (unadjusted overall rates can be obtained using the numerators and denominators provided in the table).

[b] Numbers of cases are small for groups stratified by gestational age and mode of birth so rates should be interpreted with caution.

[c] Numbers less than 5 are suppressed; this affects presentation of both country-level and GB-wide results.

Epidural

The Advisory Group determined that it would be useful to report on the rate of epidural for women planning vaginal birth of twins, given NICE recommendations that this be offered.[6] Unfortunately, we were not easily able to determine the group of women in whom offer of epidural was applicable. This was because information on planned mode of birth was not available and we did not wish to restrict the measure only to women who had a vaginal birth (by excluding in-labour caesarean births).

Obstetric anal sphincter injury (OASI)

OASI is a major complication of vaginal birth, defined as a tear occurring during birth that extends into the anal sphincter and/or anal mucosa.[26] The risk of OASI in twin birth may be lower than that in singleton birth because of the frequency of birth at earlier gestational ages of babies with lower gestational weight.

The rates of severe perineal trauma (third or fourth degree perineal tear) and postpartum haemorrhage differ by mode of birth; for example, third and fourth degree tears are more common in instrumental birth and haemorrhage is more common in instrumental and caesarean birth. These measures have therefore been presented stratified by mode of birth.

What is measured: Of women who give birth vaginally to at least one baby of a twin birth, the proportion who sustain a third or fourth degree tear.

Table 9 Proportion of women who gave birth vaginally to at least one baby of a twin birth, who sustained a third or fourth degree tear

	England	Scotland	Wales	GB
Number of trusts/boards included in analysis	128	12	4	**144**
Number of mothers included in analysis	5 876	424	172	**6 472**
Number of women sustaining a third or fourth degree tear	94	#[b]	#[b]	**100**
Proportion (adjusted)[a]	1.6%	0.7%	1.2%	**1.5%**
By mode of birth (proportion)				
Unassisted vaginal birth only (adjusted)[a]	1.1%	#[b]	#[b]	**1.0%**
Any assisted vaginal birth (adjusted)[a]	3.1%	#[b]	#[b]	**3.0%**

[a] Country-level results are adjusted for case mix (unadjusted overall rates can be obtained using the numerators and denominators provided in the table).
[b] Numbers less than 5 are suppressed; this affects presentation of both country-level and GB-wide results.

Obstetric haemorrhage

Obstetric haemorrhage is a major source of morbidity and one of the most common direct causes of maternal mortality worldwide.[27] The most common cause of any postpartum haemorrhage is failure of the uterus to contract after birth; this is more likely in women who have a multiple birth.[24] A threshold of 1 500 ml of blood loss is used to define severe obstetric haemorrhage for the purpose of the NMPA.[14] An apparently low rate of postpartum haemorrhage can be due to poor practice in estimation.

In the Scottish data sources, information on postpartum haemorrhage is only available using a threshold of 500 ml.

What is measured: Of women who give birth to twin babies, the proportion who have an obstetric haemorrhage of 1 500 ml or more (England and Wales only).

Table 10 Proportion of women who had an obstetric haemorrhage of **1 500 ml** or more, following a twin birth (England and Wales only)

	England	Wales	England & Wales[b]
Number of trusts/boards included in analysis	121	6	**127**
Number of mothers included in analysis	14 967	736	**15 703**
Number of women having a haemorrhage ≥ 1 500 ml	1 419	80	**1 499**
Proportion (adjusted)[a]	9.5%	10.2%	**9.5%**
By mode of birth			
Unassisted vaginal birth only (adjusted)[a]	4.5%	5.7%	**4.5%**
Any instrumented vaginal birth (adjusted)[a]	13.6%	14.2%	**13.6%**
Caesarean birth only (adjusted)[a]	10.3%	10.1%	**10.3%**
Vaginal birth followed by caesarean birth (adjusted)[a]	18.5%	24.2%	**18.8%**

[a] Country-level results are adjusted for case mix (unadjusted overall rates can be obtained using the numerators and denominators provided in the table).
[b] Data on obstetric haemorrhage over 1 500 ml are not available for Scotland.

What is measured: Of women who give birth to twin babies, the proportion who have an obstetric haemorrhage of 500 ml or more (England, Scotland and Wales).

Table 11 Proportion of women who had an obstetric haemorrhage of **500 ml** or more, following a twin birth

	England	Scotland	Wales	GB
Number of trusts/boards included in analysis	121	12	5	**138**
Number of mothers included in analysis	14 967	1 535	736	**17 238**
Number of women having a haemorrhage ≥ 500 ml	10 332	1 059	483	**11 874**
Proportion (adjusted)[a]	69.0%	68.8%	67.3%	**68.9%**
By mode of birth				
Unassisted vaginal birth only (adjusted)[a]	32.5%	30.9%	32.6%	**32.4%**
Any instrumented vaginal birth (adjusted)[a]	66.3%	66.6%	65.4%	**66.3%**
Caesarean birth only (adjusted)[a]	81.3%	78.7%	78.8%	**81.0%**
Vaginal birth followed by caesarean birth (adjusted)[a]	86.2%	80.9%	79.7%	**84.9%**

[a] Country-level results are adjusted for case mix (unadjusted overall rates can be obtained using the numerators and denominators provided in the table).

Organisational measures of care for the mother

Place of birth

NICE suggests that pregnant women carrying multiple pregnancies should be encouraged to plan birth in obstetric units.[28] Unfortunately, the NMPA is currently unable to report on planned place of birth owing to low data quality, but we are able to report on actual place of birth. This has been presented in Table 12.

Table 12 Type of maternity unit in which women gave birth to twin babies (regardless of fetal outcome)

Type of site	England		Scotland		Wales	
Number of trusts/boards included in analysis	131		12		6	
Number of women included in analysis	15 993		1 167		830	
Obstetric unit (OU)	16 046	96.0%	395	33.8%	0	0.0%
Obstetric unit with alongside midwifery unit[a]	N/A		772	66.2%	827	99.6%
Alongside midwifery unit (AMU)	571	3.4%	Unable to report[a]		Unable to report[a]	
Freestanding midwifery unit (FMU)	14	0.1%	0	0.0%	0	0.0%
Home (planned)	63	0.4%	Unable to report[b]		#[c]	0.2%
Other (e.g. in transit, unplanned homebirth, non-maternity ward such as A&E)	12	0.1%	0	0.0%	0	0.0%

[a] Information available on place of birth is limited to site type in Scotland and Wales, rather than maternity unit type.
[b] Homebirth is not recorded in SMR-02 and so is not included in the calculation of the percentages for place of birth by site in Scotland.
[c] Numbers less than 5 are suppressed.

Availability of specialist services at place of birth

The NMPA Organisational Report 2017 surveyed sites regarding the availability of general and specialist services.[2] Some of the report findings are relevant to the care of women with multiple births, and these can be read using the following references:

- neonatal service configuration (pages 29–31)
- transitional care (page 44)
- clinical networks (page 46)
- access to the following specialist teams and allied health professionals (pages 37 and 41):
  - community perinatal mental health teams
  - weight management
- provision of obstetric specialist support (pages 37 and 44):
  - dedicated twin clinics
  - fetal medicine subspecialist consultant
  - fetal procedures – amniocentesis
  - fetal procedures – in utero transfusion, shunt insertion, chorionic villus sampling (CVS)
  - fetal laser therapy for twin-to-twin transfusion syndrome
  - advanced fetal growth assessment.

While the NMPA does hold data on site of birth, we do not hold data on the primary site of antenatal care. Site of birth is therefore used as a proxy when measuring the proportion of women with access to the specialist services recommended by NICE.[3] This is presented in Table 13.

Table 13 Proportion of women with twin birth who had access to NICE-recommended specialist services at the site/trust in which they gave birth

		England	Scotland	Wales	GB
Number of trusts/boards included in analysis		134	14	7	**155**
Number of women included in analysis		16 947	1 559	793	**19 299**
Community perinatal mental health team	Site	77.4%	75.1%	93.4%	**77.9%**
	Trust	77.9%	82.0%	100.0%	**79.1%**
Physiotherapy	Site	8.1%	30.3%	0.0%	**9.6%**
	Trust	8.6%	33.1%	0.0%	**10.2%**
Weight management services	Site	39.4%	65.5%	89.8%	**43.6%**
	Trust	43.3%	71.3%	90.8%	**47.5%**
Dedicated twin clinic	Site	54.9%	94.4%	32.8%	**57.1%**
	Trust	58.6%	95.5%	41.6%	**60.9%**
Maternal fetal medicine subspecialist consultant	Site	76.5%	73.8%	33.2%	**74.5%**
	Trust	82.1%	81.3%	34.6%	**80.1%**
Fetal procedures – amniocentesis	Site	81.4%	91.4%	73.6%	**81.9%**
	Trust	84.6%	97.0%	100.0%	**86.2%**
Fetal procedures – in utero transfusion, shunt insertion, CVS	Site	47.6%	35.7%	21.6%	**45.5%**
	Trust	51.4%	59.1%	21.6%	**50.8%**
Fetal laser therapy for twin-to-twin transfusion syndrome	Site	9.8%	12.6%	0.0%	**9.6%**
	Trust	11.2%	30.3%	0.0%	**12.3%**
Advanced fetal growth assessment	Site	84.2%	92.6%	61.0%	**84.0%**
	Trust	86.2%	98.3%	77.4%	**86.9%**
Transitional care	Site	71.0%	46.4%	78.9%	**69.3%**
	Trust	72.9%	65.3%	80.3%	**72.5%**
Infant feeding specialist team	Site	12.5%	0.0%	16.8%	**11.6%**
	Trust	15.5%	0.0%	34.6%	**15.1%**

Feasibility of measuring variation in outcomes at site, trust/board or regional level

The NMPA uses funnel plots to demonstrate variation in outcomes for given measures at site, trust/board and regional level. A funnel plot is a graphical method for comparing the case mix adjusted performance of organisations with each other and with the national mean. The main advantage of this technique is that it takes the activity of each organisation into account. The amount by which the result of an individual service may vary from the national mean is influenced by random fluctuations that are related to the number of births within the service as well as by service-related factors.

In this sprint audit, funnel plots for many of the measures are limited by the small number of recorded outcomes in the numerator or by the small number of women included in the measure's denominator. Figure 2 shows an example of this in the funnel plot of rates of third or fourth degree perineal tears, despite presenting the adjusted rates by region (rather than by site or trust/board of birth).

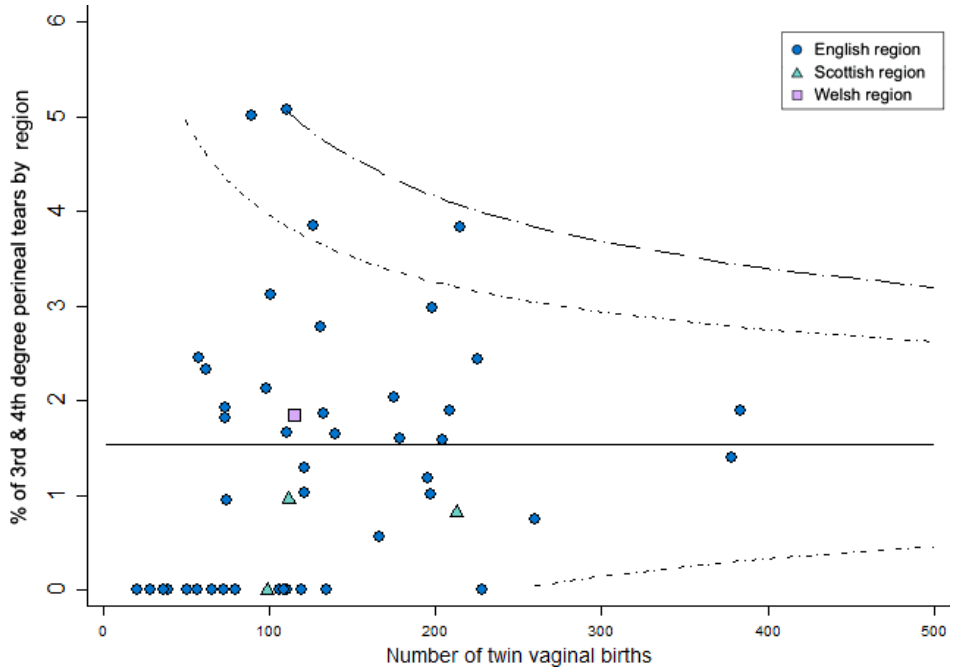

Figure 2 Funnel plot showing variation in rate of third or fourth degree perineal tears in women giving birth vaginally to at least one twin baby, by region

Figure 3 is included to show an example of a more useful funnel plot, demonstrating the rate of prelabour caesarean birth by site of birth. Funnel plots were also generated and deemed useful for some other measures: onset of labour, different modes of birth and postpartum haemorrhage.

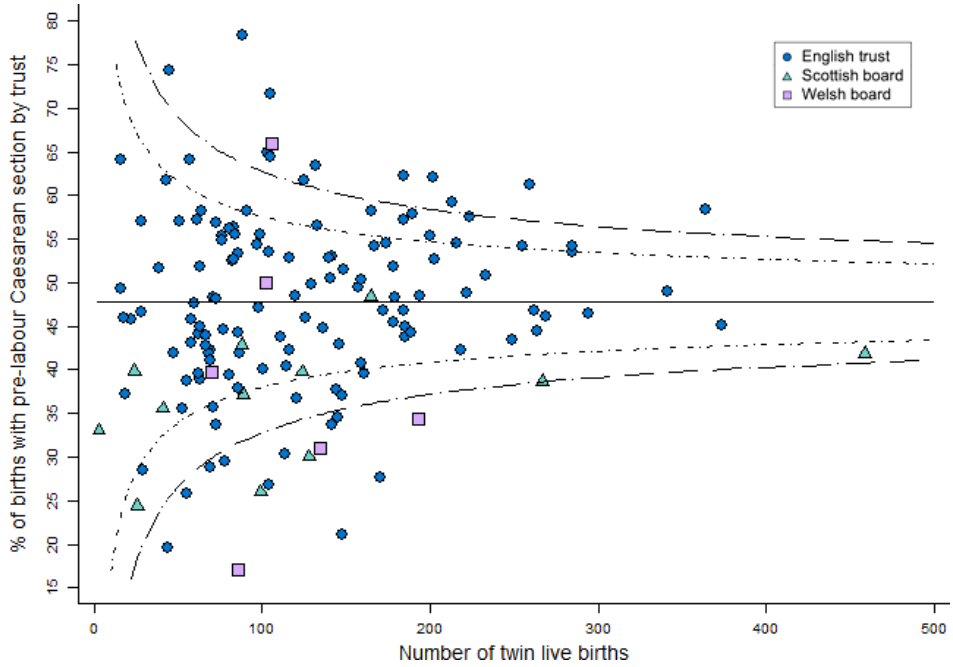

Figure 3 Funnel plot showing the variation in the rate of prelabour caesarean birth in twin births, presented by site

Discussion

The construction of measures relevant to the maternity care of women with multiple births, specifically onset of labour, mode of birth, severe perineal tears and postpartum haemorrhage, is possible using NMPA methodology.

The unavailability of information on chorionicity limits the interpretation of the results, given that recommendations on timing and mode of birth differ according to this characteristic. Stratification according to gestational age is feasible but limited at extremely preterm gestations (<28 weeks) and for less common outcomes (e.g. third or fourth degree perineal tear) because of small numbers in each stratum.

Small numbers meant that alterations were also required for the case mix adjustment methods, to include fewer adjustment parameters. The usefulness of funnel plots that demonstrate variation in outcomes for women and babies affected by multiple birth is also limited by small numbers in either the number of women affected or the number at risk.

The NMPA does not hold high-quality information on category of caesarean birth. It is not clear whether caesarean birth that is conducted urgently following spontaneous labour onset is indicated because caesarean birth was planned or because a new indication arose during labour. For this reason, caesarean birth has been reclassified for the purposes of this report into 'prelabour' or 'following induced/spontaneous labour onset'.

NICE guidance recommends that women planning twin vaginal birth be offered epidural analgesia.[6] It is considered likely to improve the success rate and optimal timing of assisted vaginal birth for babies born from multiple pregnancy, and it reduces discomfort if internal manoeuvres are required to deliver the second twin. It can also enable a quicker birth by emergency caesarean section should this be required.[6] While information on epidural analgesia is available from NMPA data sources, the information required to define the group of women in whom this is relevant is not available.

NMPA data are provided according to place of birth, rather than site at which antenatal care was received (either partly through referral, or in entirety). Assessing specialist services available to women experiencing multiple pregnancy and birth is feasible at a site/trust/board level if it is assumed that women give birth in the same site/trust/board in which they receive the majority of their antenatal care. We recognise that this assumption does not always hold.

Furthermore, when assessing the number of women who had access to a dedicated twin clinic, it is important to note that there is no nationally agreed definition for what such a clinic does. We are aware, through collaboration with Twins Trust, that these clinics are often only offered to women with monochorionic or higher order pregnancies. It therefore cannot be assumed that a woman with a DCDA twin pregnancy who is cared for at a site with a dedicated twin clinic is actually cared for in that clinic. Similarly, other services may not be specifically tailored or specialist enough to provide personalised care to women with multiple birth.

Feasibility of constructing measures to assess neonatal outcomes following maternity care for women with multiple births

Key finding

KF15 A different approach is required for the presentation of neonatal outcomes in twin birth compared with that used for singleton birth. Some neonatal outcomes for a baby born from a twin pair are dependent upon the outcomes of the other twin (so are presented per pregnancy, not per baby), or on whether the baby is first- or second-born.

Methods

The methods for deriving measures for the maternity care for babies born from twin births have already been summarised in the previous chapter on maternity care for women with multiple births.

Specifically, for measures related to the care of the baby, results are presented per baby born or, where outcomes are expected to affect one twin selectively, they are presented per twin pair. Additional stratification is then provided as to whether no, one or both babies are affected. Where the measure evaluates the outcome of a liveborn baby at birth, e.g. Apgar score, only pregnancies in which both babies were liveborn have been studied.

Results

Characteristics of twin babies included in the audit

This section reports on two characteristics of twin pregnancies at birth – gestational age and a birthweight discrepancy of >20%.

Gestational age at birth

National guidance recommends elective birth at the following gestational ages for:

- uncomplicated DCDA twin pregnancies – between 37^{+0} and 38^{+0} weeks
- uncomplicated monochorionic twin pregnancies – from 36^{+0} (but before 38^{+0}) weeks
- monochorionic monoamniotic (MCMA) twin pregnancies – between 32^{+0} and 34^{+0} weeks.

What is measured: The proportion of pregnancies that end (last twin born) during each gestational age period, regardless of fetal outcome.

Table 14 Proportion of pregnancies that ended during each gestational age period

		England	Scotland	Wales	GB
Number of trusts/boards included in analysis		132	12	6	**150**
Number of pregnancies included in analysis		17 583	1 514	797	**19 894**
Gestational age at the end of pregnancy					
23^{+0} to 27^{+6} weeks	n	511	36	13	**560**
	%	2.9%	2.4%	1.6%	**2.8%**
28^{+0} to 31^{+6} weeks	n	1 121	116	48	**1 285**
	%	6.4%	7.7%	6.0%	**6.5%**
32^{+0} to 36^{+6} weeks	n	8 560	834	389	**9 783**
	%	48.7%	55.1%	48.8%	**49.2%**
37^{+0} to 38^{+6} weeks	n	6 916	500	330	**7 746**
	%	39.2%	33.0%	41.4%	**38.9%**
39^{+0} to 41^{+6} weeks	n	475	28	17	**520**
	%	2.7%	1.9%	2.1%	**2.6%**

Birthweight discordance

Fetal or neonatal weight discordance of >20% is commonly used as a diagnostic criterion for selective intrauterine growth restriction, affecting one twin of the pair.[4]

What is measured: Of twin pairs where both babies are liveborn, the proportion with >20% weight discordance at birth, stratified by gestational age at birth.

Table 15 Proportion of twin pairs with > 20% weight discordance at birth

		England	Scotland	Wales	GB
Number of trusts/boards included in analysis		125	12	6	**143**
Number of twin pairs included in analysis		15 875	1 482	719	**18 076**
Number of twin pairs having >20% birthweight discordance		3 943	383	186	**4 512**
Proportion (adjusted)[a]		24.9%	25.2%	25.9%	**25.0%**
Proportion of twin pairs having > 20% birthweight discordance by gestational age category					
23^{+0} to 27^{+6} weeks (adjusted)[a]	n	120	11	#[b]	**#[b]**
	%	29.6%	33.5%		**29.8%**
28^{+0} to 31^{+6} weeks (adjusted)[a]	n	354	51	8	**413**
	%	36.8%	44.0%	21.8%	**36.9%**
32^{+0} to 36^{+6} weeks (adjusted)[a]	n	2 064	207	105	**2 376**
	%	26.8%	25.5%	28.2%	**26.8%**
37^{+0} to 38^{+6} weeks (adjusted)[a]	n	1 303	108	66	**1 477**
	%	20.4%	21.6%	23.3%	**20.6%**
39^{+0} to 41^{+6} weeks (adjusted)[a]	n	84	#[b]	#[b]	**90**
	%	24.3%			**23.7%**

[a] Country-level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).
[b,c] Numbers less than 5 are suppressed; this affects presentation of both country-level and GB-wide results.

Measures of condition and care for newborn twin babies

In this section, we report on measures relating to liveborn babies from twin births: condition at birth, skin-to-skin contact and babies receiving breast milk.

5 minute Apgar score less than 7

The Apgar score is a five-component score used to summarise the condition of a newborn baby at 1, 5 and 10 minutes of age. An Apgar score of less than 7 at 5 minutes has been associated with an increased risk of cerebral palsy, epilepsy and developmental delay.[29,30] While it is acknowledged that the Apgar score may not always be correctly calculated, it is recorded almost universally, unlike arterial cord pH that is usually only measured and recorded when there is a clinical concern.

What is measured: Of liveborn babies born from twin pregnancies at or after 34^{+0} weeks of gestation, the proportion who are assigned an Apgar score of less than 7 at 5 minutes of age.

Table 16 Proportion of liveborn babies from twin pregnancy who were assigned on Apgar score of less than 7 at 5 minutes of age

	England	Scotland	Wales	GB
Number of trusts/boards included in analysis	123	12	6	**141**
Number of pregnancies included in analysis	12 243	1 180	644	**14 067**
Number of pregnancies with at least one baby with an Apgar score of less than 7 at 5 minutes	453	44	22	**519**
Proportion (adjusted)[a]	3.7%	3.8%	3.1%	**3.7%**
Both twins (adjusted)[a]	2.2%	2.1%	1.9%	**2.2%**
First-born twin only (adjusted)[a]	1.1%	1.3%	1.6%	**1.2%**
Second-born twin only (adjusted)[a]	2.2%	2.1%	1.9%	**2.2%**

[a] Country-level results are adjusted for case mix (unadjusted overall rates can be obtained using the numerators and denominators provided in the table).

Skin-to-skin contact within 1 hour of birth

Early skin-to-skin contact has been shown to improve breastfeeding initiation and continuation rates for healthy newborns from 35 weeks of gestation.[31] Information about skin-to-skin contact is only available for babies born in England. This information is presented on a per-baby basis because it affects babies individually and skin-to-skin contact for one twin is not expected to affect the outcome of the second twin. The level of variation between trusts in the NMPA clinical reports indicates that this is not always a reliably documented measure.[1,14]

What is measured: Of liveborn babies from twin pregnancies born at or after 34^{+0} weeks of gestation, the proportion who receive skin-to-skin contact within 1 hour of birth.

Table 17 Proportion of liveborn babies from twin pregnancies born between 34^{+0} and 38^{+6} weeks of gestation who received skin-to-skin contact within 1 hour of birth

	England
Number of trusts/boards included in analysis	102
Number of babies included in analysis	18 310
Number of babies receiving skin-to-skin contact within 1 hour of birth	8 982
Proportion (crude)[a]	49.1%
Proportion of babies receiving skin-to-skin contact within 1 hour of birth by gestational age category	
34^{+0} to 36^{+6} weeks (crude)[a]	39.4%
37^{+0} to 38^{+6} weeks (crude)[a]	57.9%
39^{+0} to 41^{+6} weeks (crude)[a]	73.8%

[a] Results for a single nation cannot be adjusted where results for other devolved nations are not available.

Breastfeeding – breast milk at first feed and at discharge

Breastfeeding is associated with significant benefits for mothers and babies. This measure captures the proportion of babies given any breast milk, regardless of the route (e.g. expressed) or of the addition of formula feed (mixed feeding). It also captures whether babies received breast milk at their first feed and at the point of discharge from hospital. Data were not available in this form for Wales. Again, the level of variation between trusts in the NMPA clinical reports indicates that this is not always a reliably documented measure.[1,14]

This measure has also been presented on a per-baby basis, for the same reason as with skin-to-skin contact.

What is measured: Of liveborn babies from twin pregnancies born at or after 34^{+0} weeks of gestation, the proportion who receive any breast milk for their first feed, and at discharge from the maternity unit.

Table 18 Proportion of liveborn babies from twin pregnancies who received breast milk for their first feed and at discharge

		England	Scotland	England & Scotland
Number of trusts/boards included in analysis		107	8	**115**
Number of babies included in breast milk first feed analysis		17 659	1 106	**18 765**
Number of babies receiving breast milk at first feed		11 191	673	**11 864**
Proportion (adjusted)[a]		63.3%	62.2%	**63.2%**
Number of babies included in breast milk at discharge analysis		18 093	2 141	**20 234**
Number of babies receiving breast milk at discharge		11 190	1 074	**12 264**
Proportion (adjusted)[a]		61.5%	52.9%	**60.6%**
Proportion of babies who received breast milk, presented by gestational age category				
34^{+0} to 36^{+6} weeks	At first feed (adjusted)[a]	58.0%	58.2%	**58.0%**
	At discharge (adjusted)[a]	57.7%	49.7%	**56.8%**
37^{+0} to 38^{+6} weeks	At first feed (adjusted)[a]	68.1%	63.7%	**67.8%**
	At discharge (adjusted)[a]	65.0%	52.0%	**63.8%**
39^{+0} to 41^{+6} weeks	At first feed (adjusted)[a]	70.1%	66.6%	**69.8%**
	At discharge (adjusted)[a]	65.8%	69.1%	**65.9%**

[a] Country-level results are adjusted for case mix (unadjusted overall rates can be obtained using the numerators and denominators provided in the table).

Organisational measures of care for twin babies

The Department of Health defines the types of neonatal unit as follows:

- neonatal intensive care unit (NICU): intensive care for all babies who require it including all those less than 28^{+0} weeks of gestation or with a birthweight < 800 g or any baby requiring complex or prolonged intensive care
- local neonatal unit (LNU): typically for singleton births at or after 27^{+0} weeks of gestation and multiple births at or after 28^{+0} weeks, providing the birthweight is > 800 g
- special care baby unit (SCBU): typically for births at or after 32^{+0} weeks of gestation provided the birthweight is > 1000 g.[32]

What is measured: The proportion of women giving birth to at least one liveborn baby from a twin pregnancy at sites with access to the appropriate level of neonatal care.

Table 19 Proportion of women who gave birth to at least one liveborn baby from a twin pregnancy at sites with access to the appropriate level of neonatal care

Type of site		England	Scotland	Wales	GB
Number of trusts/boards included in analysis		132	12	6	**150**
Number of women included in analysis		17 472	1 533	759	**19 764**
Number of women who gave birth at 23^{+0} to 27^{+6} weeks		518	34	14	**566**
NICU available on site	n	381	32	11	**424**
	%	73.6%	94.1%	78.6%	**74.9%**
Number of women who gave birth at 28^{+0} to 31^{+6} weeks		2 608	281	108	**2 997**
NICU/LNU available on site	n	2 413	277	82	**2 772**
	%	92.5%	98.6%	75.9%	**92.5%**
Number of women who gave birth at 32^{+0} to 36^{+6} weeks		7 124	693	316	**8 133**
Neonatal care available on site	n	7 109	693	316	**8 118**
	%	99.8%	100.0%	100.0%	**99.8%**
Number of women who gave birth at 37^{+0} to 41^{+6} weeks		7 222	525	321	**8 068**
Neonatal care available on site	n	7 191	523	321	**8 035**
	%	99.6%	99.6%	100%	**99.6%**

Discussion

Since chorionicity and amnionicity of multiple pregnancy are important determinants of iatrogenic preterm birth but data on chorionicity are not available, gestational age at birth can only be presented overall, rather than for each of DCDA, MCDA and MCMA twin pregnancies. Gestational age at birth cannot therefore be used to assess quality of maternity care against national guidance on timing of birth.

Evaluating Apgar score at 5 minutes, skin-to-skin contact and breastfeeding rates for women and babies affected by multiple birth is feasible, but with additional considerations on presenting per pregnancy or per baby compared with when evaluating for singleton births. It was necessary to consider whether the measure is relevant to the whole pregnancy (i.e. mother and/or both babies) versus only relevant to one baby, and to present results accordingly. Selective intrauterine death must also be taken into account and the inclusion criteria for measures adjusted according to whether the outcome is likely to be affected by the intrauterine death of one or both fetuses.

Feasibility of assessing care for newborn twin babies who require additional care on a neonatal unit

Key findings and recommendation

KF16 Successful linkage of NMPA maternity data with the NNRD is lower in twin than in singleton pregnancies. It seems unlikely that this is related to linkage methodology and is most likely to be caused by issues with data entry.

KF17 The use of a linked NNRD baby record as a proxy indicator for neonatal care admission should be interpreted with caution, given that the NNRD linkage rates are lower in twins.

KF18 Rates of immediate postnatal geographical separation of mother and one or both babies can be calculated.

KF19 Presentation and further analysis of rates of term mechanical ventilation and neonatal encephalopathy in twin babies is limited by the small number of babies affected.

R6 Maternity service providers should put local systems in place by the end of the 2020/21 reporting year to ensure that the NHS number for every newborn baby is stored in the maternity information system and linked to the mother's number. Particular care must be taken to ensure that the baby's NHS number is not linked to the baby record of the other twin.

The National Neonatal Research Database (NNRD) contains close to 100% of all babies admitted to neonatal care in England and Scotland (except NHS Lothian). A baby record from the NMPA maternity dataset that links to a corresponding NNRD record can therefore be interpreted as evidence of neonatal admission. For babies born at or after 32 weeks of gestation where the baby record from maternal data does not have a linked NNRD record, it is most likely to be because the baby was indeed not admitted to neonatal care, although it is also possible that there is a problem with linkage.

The quality of data linkage between the NMPA maternity dataset and the NNRD for all babies admitted to a neonatal unit in England and Scotland during the period 1 April 2015 to 31 March 2017 has previously been reported in the NMPA Technical Report for 2015/16 data and the NMPA Clinical Report 2019.[1,33] It was noted in these reports that the mean gestational age and birthweight of babies with unlinked NNRD records reflected that this group contained smaller, more preterm, babies than the group in which records had been linked. This was interpreted to mean that poor linkage rates more commonly affected babies born at an earlier gestational age.

Methods

Quality of data linkage with the NNRD

The existing linkage of NNRD records with NMPA records, detailed in the background section above, was used to assess the quality of data linkage of the NNRD specific to twin babies. A comparison was conducted between linkage rates in all liveborn babies (as reported in the NMPA Technical Report on

linking NMPA and NNRD data)[33] and in liveborn twin babies, stratified by category of gestational age at birth. A separate comparison was also conducted for twin babies born in maternity units where the linkage was assessed to be of higher quality. As per the NMPA Technical Report, this was defined as units where >85% of NNRD records linked with baby records.[33]

Development of clinical and organisational measures of care

Measures of care were developed using the same procedure as for the measures reported above and using data from the linked NNRD records.

All results in this chapter relate to England and Scotland only. It was not possible to include Wales as the NMPA was not able to obtain permission in time to receive identifying information for births in Wales, which is required to link the NMPA's maternity data to the NNRD. Scottish figures do not include births in NHS Lothian owing to data availability, and therefore should be interpreted with caution.

The rates of admission to a neonatal unit and rates of postnatal geographical separation of mother and babies have been presented on a per-pregnancy basis. The measures of mechanical ventilation or encephalopathy within the first 72 hours of life are the same as those used in the NMPA Clinical Report 2019 for outcomes in 2016/17.[1]

For rates of postnatal geographical separation of babies, we were interested in separation during the first 24 hours of life because it was considered that the majority of these neonatal transfers would be instigated for service reasons (i.e. insufficient neonatal cots or staffing at place of birth or lower level of care at place of birth than that required for the baby's gestational age or birthweight).

Results

Quality of data linkage with the NNRD

The percentage of liveborn twin babies born at early preterm gestations (<32 weeks) with a linked NNRD record is lower than the percentage in the 'all liveborn babies' group (Table 20). This did not change when trusts with low linkage rates (<85% NNRD records linked) were dropped from the analysis.

Table 20 Percentage of liveborn babies with a linked NNRD record, by gestational age at birth

Gestational age (weeks)	All liveborn babies[a] N = 559 245		Liveborn twin babies[a] N = 36 154		Liveborn twin babies at trusts with >85% linkage with NNRD N = 34 589	
	n	%	n	%	n	%
23^{+0} to 23^{+6}	176	74.6%	68	66.7%	67	67.7%
24^{+0} to 25^{+6}	675	90.0%	277	82.7%	265	82.8%
26^{+0} to 27^{+6}	1 075	92.7%	453	85.0%	440	85.1%
28^{+0} to 29^{+6}	1 697	94.3%	815	90.7%	790	90.5%
30^{+0} to 31^{+6}	2 599	94.9%	1 237	87.7%	1 188	87.4%
32^{+0} to 33^{+6}	5 169	95.0%	2 604	88.7%	2 472	88.4%
34^{+0} to 36^{+6}	13 650	42.1%	7 109	48.3%	6 782	48.3%
37^{+0} to 38^{+6}	11 412	9.0%	2 240	15.9%	2 119	15.7%
39^{+0} to 41^{+6}	18 177	4.7%	115	16.6%	114	16.6%
All gestational ages	54 630	9.8%	15 039	41.7%	12 816	41.6%

[a] Babies born in Wales and NHS Lothian are not included in the total count.

Measures of care for newborn babies who require additional neonatal care

Admission to neonatal care is more common in twin babies, who are at higher risk of preterm birth. In 2017, Twins Trust (formerly TAMBA) recommended that NHS England and NHS Improvement should extend their efforts in trying to reduce term neonatal admissions to include reducing avoidable admissions in multiple pregnancies.[7] There is an overwhelming body of evidence showing that keeping mother and baby together after birth, where safe to do so, is better for both formation of the maternal–neonatal bond and postnatal feeding.[34] National neonatal services are under pressure, with approximately 15% of neonatal transfers being conducted because the transferring unit has insufficient cot space or unsafe staffing levels, and 70% of neonatal intensive care units report consistently looking after more babies than it is safe to do so.[35,36] It follows that finding neonatal cots for twin babies in the same unit is more difficult than finding one cot for a singleton baby or finding cots for twins each in a different unit.

Admission to neonatal unit (including level of care)

What is measured: Of twin births where both babies are liveborn at or after 34^{+0} weeks of gestation, the proportion in which one or both babies are admitted to a neonatal unit.

Table 21 Proportion of liveborn babies from twin pregnancies admitted to a neonatal unit

			England	Scotland[a]	England & Scotland
Number of trusts/boards included in analysis			117	11	**128**
Number of twin pregnancies included in analysis			13 065	981	**14 046**
Number of pregnancies in which at least one baby was admitted to a neonatal unit			4 293	369	**4 662**
Proportion (adjusted)[b]			32.9%	37.6%	**33.2%**
Pregnancies delivered between 34^{+0} and 36^{+6} weeks of gestation by caesarean birth for both babies (adjusted)[bc]	First-born twin only	n	315	28	**343**
		%	5.0%	5.1%	**5.0%**
	Second-born twin only	n	445	48	**493**
		%	7.0%	8.5%	**7.1%**
	Both twins	n	1456	153	**1 609**
		%	22.8%	29.1%	**23.3%**
Pregnancies delivered between 34^{+0} and 36^{+6} weeks of gestation by vaginal birth for both babies (adjusted)[bc]	First-born twin only	n	102	9	**111**
		%	1.6%	1.6%	**1.6%**
	Second-born twin only	n	213	18	**231**
		%	3.4%	3.0%	**3.3%**
	Both twins	n	518	43	**561**
		%	8.2%	7.7%	**8.1%**
Pregnancies delivered between 34^{+0} and 36^{+6} weeks of gestation by sequential vaginal-caesarean birth (adjusted)[bc]	First-born twin only	n	15	#[d]	
		%	0.2%		**0.2%**
	Second-born twin only	n	25	#[d]	
		%	0.4%		**0.4%**
	Both twins	n	70	#[d]	
		%	1.1%		**1.1%**
Pregnancies delivered between 37^{+0} and 41^{+6} weeks of gestation by caesarean birth for both babies (adjusted)[bc]	First-born twin only	n	172	7	**179**
		%	2.7%	1.%	**2.6%**
	Second-born twin only	n	282	15	**297**
		%	4.4%	3.5%	**4.3%**
	Both twins	n	217	17	**234**
		%	3.3%	4.5%	**3.4%**
Pregnancies delivered between 37^{+0} and 41^{+6} weeks of gestation by vaginal birth for both babies (adjusted)[bc]	First-born twin only	n	80	6	**86**
		%	1.2%	1.4%	**1.2%**
	Second-born twin only	n	166	9	**175**
		%	2.6%	2.3%	**2.5%**
	Both twins	n	120	9	**129**
		%	1.9%	2.1%	**1.9%**
Pregnancies delivered between 37^{+0} and 41^{+6} weeks of gestation by sequential vaginal-caesarean birth (adjusted)[bc]	First-born twin only	n	10	#[d]	
		%	0.2%		**0.1%**
	Second-born twin only	n	30	#[d]	
		%	0.5%		**0.4%**
	Both twins	n	16	#[d]	
		%	0.2%		**0.2%**

[a] Scottish figures do not include births in Edinburgh and Lothian owing to data availability and should therefore be interpreted with caution.

[b] Country-level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).

[c] Analysis restricted to those pregnancies in which birth order could be deduced.

[d] Numbers less than 5 are suppressed; this affects presentation of both country-level and GB-wide results.

Mechanical ventilation and neonatal encephalopathy

Since this audit on multiple birth is limited by small numbers, compared with the audit on singleton birth, mechanical ventilation and encephalopathy rates can only be presented nationally.

What is measured (mechanical ventilation): Of twin pregnancies in which both babies are liveborn at or after 34^{+0} weeks of gestation, the proportion in which at least one baby receives mechanical ventilation during the first 72 h of life.

What is measured (neonatal encephalopathy): Of twin pregnancies in which both babies were liveborn at or after 35^{+0} weeks of gestation, the proportion in which at least one baby is diagnosed with encephalopathy during the first 72 h of life, defined as the baby showing two or more of the following neurological signs in the same day:

- abnormal tone
- reduced consciousness (lethargic or comatose)
- convulsions (seizures)

Table 22 Proportion of liveborn babies from twin pregnancies who received mechanical ventilation (if born at or after 34^{+0} weeks of gestation) or who were diagnosed with neonatal encephalopathy (if born at or after 35^{+0} weeks) within the first 72 hours of life

	England	Scotland[a]	England & Scotland
Number of trusts/boards included in analysis	117	11	**128**
Mechanical ventilation			
Number of pregnancies included in analysis	6 664	420	**7 084**
Number of pregnancies where at least one baby received mechanical ventilation	91	#[b]	**#[b]**
Proportion (adjusted)[c]	1.4%	#[b]	**1.3%**
Neonatal encephalopathy			
Number of pregnancies included in analysis	11 814	880	**12 694**
Number of pregnancies in which at least one baby was diagnosed with neonatal encephalopathy	31	#[b]	**#[b]**
Proportion (adjusted)[c]	0.3%	#[b]	**0.3%**

[a] Scottish figures do not include births in Edinburgh and Lothian owing to data availability, and should therefore be interpreted with caution.
[b] Numbers less than 5 are suppressed; this affects presentation of both country-level and GB-wide results.
[c] Country-level results are adjusted for case mix (unadjusted overall rates can be obtained using the numerators and denominators provided in the table).

Separation of twin babies postnatally

This analysis is restricted to the population of babies admitted to neonatal care in whom we hold linked data on place of neonatal care during the first 24 hours of life. This time frame was chosen as transfers during it were expected to reflect indications related to service delivery (i.e. baby born at a unit with lower level of care than required, cot shortage, staff shortage) that were present at the time of birth.

What is measured: Of twin pregnancies in which both babies are liveborn, the proportion who are separated geographically from mother or twin for neonatal care during the first 24 hours after birth.

Table 23 Proportion of liveborn babies from twin pregnancies who were separated for neonatal care

		England	Scotland[a]	England & Scotland
Number of trusts/boards included in analysis		119	11	**130**
Number of pregnancies included in analysis		15 935	1 206	**17 141**
Number of pregnancies in which at least one baby was admitted to neonatal care during the first 24 hours after birth		7 819	413	**8 132**
One baby admitted		2 009	86	**2 095**
Both babies admitted		5 810	227	**6 037**
Pregnancies in which at least one baby was transferred externally following neonatal admission				
One baby transferred externally while mother still admitted on postnatal ward – baby separated from mother and twin	n	144	#[b]	**#**[b]
	%	1.8%		
Both babies transferred externally to same location while mother still admitted on postnatal ward – babies separated from mother	n	144	#[b]	**#**[b]
	%	1.8%		
Both babies transferred externally to different locations regardless of ongoing maternal admission – babies separated from each other and mother	n	7	#[b]	**#**[b]
	%	0.09%		

[a] Scottish figures do not include births in Edinburgh and Lothian owing to data availability, and should therefore be interpreted with caution.
[b] Numbers less than 5 are suppressed.

Discussion

As reported previously, of all baby records in the NNRD dataset, 88% linked with records from the all-babies NMPA dataset, using a combination of identifiers that always included the baby's NHS number.[33] 11% of NNRD records did not link with NMPA baby records at all. Assuming that the NHS number was not accidentally swapped between babies born to one mother, this linkage should not be affected by multiple birth. Only 1% of records for all babies admitted to a neonatal unit (including singletons) were linked with baby records in the NMPA maternity dataset using only postcode and date of birth as identifiers. Since these are expected to be the same for both twins of a pair, it is possible that any twins included in this 1% were linked with the opposite twin, but still with the correct maternal record. This is likely to represent a very small number overall and would not affect the proposed twin measures that are presented on a per-mother, not per-baby, basis.

Even though the expected rate of neonatal admission for babies born at or between 24^{+0} and 27^{+6} weeks of gestation is not 100%, because it is acknowledged that resuscitation of some babies in the delivery room would be unsuccessful or inappropriate, the linkage rate of 80–90% was lower than we expected. Since the linkage process is not expected to have contributed to this problem any differently in twins than it did in singletons, the cause must either be clinical (e.g. if twin babies are more likely to have an immediately poor outcome meaning neonatal care is inappropriate) or with data entry (both twin NHS numbers not linked to the maternal record). Rate of neonatal admission and other measures related to neonatal care should therefore also be interpreted with caution, given that results could be biased by the linkage rates that are skewed by gestational age.

It was feasible to present rates of postnatal geographical separation of mother and one or both babies within the first 24 hours of life.

While countrywide rates of term mechanical ventilation and diagnoses of neonatal encephalopathy at or after 35 weeks of gestation can be presented for England, reporting for Scotland and further analysis for both countries are limited by small numbers.

Feasibility of assessing care of women and babies with higher order births

Key finding

KF20 Presentation of maternal and perinatal characteristics and outcomes is feasible on a national level for women and babies with higher order birth, but further analysis is limited by the small number of cases.

Higher order pregnancy refers to pregnancies in which there are more than two babies. This is rare in the UK. During the period 1 April 2015 to 31 March 2017, 286 triplet pregnancies and 6 quadruplet pregnancies were identified in the NMPA data. These represent 0.02% of all maternities.

Measures of care for higher order births, including characteristics of the babies at birth, are presented separately to twin births, in this chapter. The small numbers in this analysis prevents anything other than the presentation of crude rates for all women with higher order birth in England, Scotland and Wales. The characteristics of women with higher order births are presented in Appendix 1.

Results

The perinatal characteristics and outcomes of higher order pregnancies are summarised in Table 24, and the maternal outcomes for women with higher order births are summarised in Table 25.

Discussion

Presentation of maternal and perinatal characteristics and outcomes is feasible on a national level for women and babies with higher order birth, but further analysis is limited by the small number of cases.

Table 24 Perinatal characteristics and outcomes for higher order births

Characteristic	GB	
	n	%
Total number	292	
Number liveborn babies per pregnancy		
0	#[a]	#[a]
1	#[a]	#[a]
2	9	3.3%
3–4	260	94.9%
Missing/poor-quality data	12	4.1%
Gestational age at birth		
23^{+0} to 27^{+6} weeks	28	9.9%
28^{+0} to 31^{+6} weeks	70	24.7%
32^{+0} to 36^{+6} weeks	179	63.3%
37^{+0} weeks and above	6	2.1%
Missing/poor-quality data	9	3.1%
Number of small-for-gestational-age babies per pregnancy		
0	156	54.4%
1	84	29.3%
2	29	10.1%
3–4	18	6.3%
Missing/poor-quality data	5	1.7%
Number of babies admitted to neonatal care		
0	61	22.3%
1	20	7.3%
2	45	16.4%
3–4	148	54.0%
Missing /poor-quality data	18	6.2%

[a] Numbers less than 5 are suppressed.

Table 25 Maternal outcomes for higher order birth

Characteristic	GB	
	n	%
Total number	292	
Mode of birth		
Caesarean birth	263	94.3%
Vaginal birth	#[a]	#[a]
Vaginal and caesarean birth	14	5.0%
Missing/poor-quality data	#[a]	#[a]
Postpartum haemorrhage >1500 ml		
Yes	56	19.2%
No	195	66.8%
Missing/poor-quality data	41	14.0%
Postpartum haemorrhage >500 ml		
Yes	221	75.7%
No	30	10.3%
Missing/poor-quality data	41	14.0%

[a] Numbers less than 5 are suppressed.

Appendix 1
Characteristics of women with multiple births

The NMPA provides a unique opportunity to describe the diversity of the women who gave birth during the audit period. Demographic data provided in this appendix refers to all women with multiple births, regardless of fetus outcome.

The characteristics of all women who gave birth to twin babies, included in this report population, are shown in Table 26.

Table 26 Characteristics of all women with twin births included in the audit

Characteristic	England		Scotland		Wales		GB	
	n	%	n	%	n	%	n	%
Total number	17 998		1 535		830		**20 363**	
Age								
<15	4	0.0%	0	0.0%	2	0.2%	**6**	**0.0%**
15–19	251	1.4%	29	1.9%	15	1.8%	**295**	**1.5%**
20–24	1 690	9.5%	134	8.8%	106	12.8%	**1 930**	**9.6%**
25–29	4 172	23.5%	347	22.8%	213	25.7%	**4 732**	**23.5%**
30–34	5 862	33.0%	548	35.9%	257	31.0%	**6 667**	**33.1%**
35–39	4 325	24.3%	365	23.9%	187	22.5%	**4 877**	**24.2%**
40–44	1 173	6.6%	89	5.8%	45	5.4%	**1 307**	**6.5%**
45+	295	1.7%	13	0.9%	5	0.6%	**313**	**1.6%**
Missing age	226	1.3%	10	0.7%	0	0.0%	**236**	**1.2%**
Ethnic origin								
White	12 807	78.7%	1 107	93.1%	515	90.0%	**14 429**	**80.0%**
Black	1 186	7.3%	19	1.6%	16	2.8%	**1 221**	**6.8%**
Asian	1 598	9.8%	41	3.4%	25	4.4%	**1 664**	**9.2%**
Other	691	4.2%	22	1.9%	16	2.8%	**729**	**4.0%**
Missing ethnicity	1 716	10.5%	346	29.1%	258	45.1%	**2 320**	**12.9%**
Index of multiple deprivation (IMD)[a]								
1 = least deprived	3 289	19.4%	316	20.8%	N/A		**3 605**	**19.5%**
2	2 536	15.0%	282	18.6%	N/A		**2 818**	**15.3%**
3	3 338	19.7%	286	18.8%	N/A		**3 624**	**19.6%**
4	3 696	21.8%	290	19.1%	N/A		**3 986**	**21.6%**
5	4 097	24.2%	346	22.8%	N/A		**4 443**	**24.0%**
Missing IMD	1 042	6.1%	15	1.0%	830	100.0%	**1 887**	1 042
Body mass index (BMI) (kg/m^2)								
<18.5	326	2.3%	28	1.9%	11	1.5%	**365**	**2.2%**
18.5–24.9	6 426	44.9%	605	41.5%	271	38.2%	**7 302**	**44.3%**
25.0–29.9	4 271	29.8%	437	30.0%	229	32.3%	**4 937**	**29.9%**
30.0–34.9	2 044	14.3%	212	14.6%	97	13.7%	**2 353**	**14.3%**
35.0–39.9	842	5.9%	113	7.8%	66	9.3%	**1 021**	**6.2%**
≥40.0	416	2.9%	62	4.3%	36	5.1%	**514**	**3.1%**
Missing BMI	3 673	25.6%	78	5.4%	120	16.9%	**3 871**	**23.5%**
Parity								
Primiparous	7 719	43.8%	691	45.6%	340	41.2%	**8 750**	**43.8%**
Multiparous	9 899	56.2%	824	54.4%	486	58.8%	**11 209**	**56.2%**
Missing parity	380	2.2%	20	1.3%	4	0.5%	**404**	**2.0%**

[a] The IMD is derived from the recorded standardised socio-economic quintile of the individual's local area based on postcode (LSOA) in England and on postcode in Scotland. The IMD for Wales is only available from the area of the GP cluster and so is not presented here. As the areas used are of different granularity, these are not comparable between the three countries.

The characteristics of women with triplet and quadruplet births are summarised in Table 27.

Table 27 Characteristics of all women with triplet or quadruplet births included in the audit

Characteristic	GB	
	n	%
Total number	292	
Age		
<15	0	0.0%
15–19	5	1.7%
20–24	11	3.8%
25–29	62	21.7%
30–34	91	31.8%
35–39	75	26.2%
40–44	22	7.7%
45+	19	6.6%
Missing	1	0.3%
Ethnic origin		
White	164	57.3%
Black	28	9.8%
Asian	31	10.8%
Other	18	6.3%
Missing	45	15.7%
Index of multiple deprivation (IMD)[a]		
1 = least deprived	57	19.9%
2	37	12.9%
3	42	14.7%
4	69	24.1%
5	54	18.9%
Missing	27	9.4%
Body mass index (BMI) (kg/m^2)		
<18.5	4	1.4%
18.5–24.9	88	30.8%
25.0–29.9	62	21.7%
30.0–34.9	28	9.8%
35.0–39.9	14	4.9%
≥40.0	11	3.8%
Missing	79	27.6%
Parity		
Primiparous	138	48.3%
Multiparous	142	49.7%
Missing	6	2.1%

[a] The IMD is derived from the recorded standardised socio-economic quintile of the individual's local area based on postcode (LSOA) in England and on postcode in Scotland. IMD is missing for women with pregnancies in Wales because neither maternal postcode nor IMD was provided.

Appendix 2
Information required to test all national recommendations and standards

Table 28 Availability of information required to audit all national recommendations and standards for maternity care of multiple pregnancy and birth

	Available in *all* datasets	Available in *some* datasets	Available in no datasets
Maternal details	• Maternal age • BMI • Parity	• Previous history of preterm birth	• Pregnancy interval • Family history of pre-eclampsia
Pregnancy details	• Number of babies • Diagnosis of twin-to-twin transfusion syndrome • Selective feticide	• Estimated date of delivery • Presenting diagnosis for emergency antenatal attendances/admissions	• Chorionicity/amnionicity • Evidence of counselling • Antenatal aspirin prescription • Venous thromboembolism (VTE) assessment and score • Offer of thromboprophylaxis • Data on cervical length scans • Date/gestational age of tests and management for anaemia • Evidence of blood pressure and urine testing • Growth scan results including date/gestational age • Method of diagnosing preterm labour • Management offered for threatened preterm labour
Birth outcomes	• Labour onset method • Mode of birth	• Obstetric complications in labour • Indication for caesarean birth	• Cardiotocography (CTG) interpretation and management • Risk of postpartum haemorrhage • Evidence of cannulation in labour
Fetal/ neonatal details	• Fetal presentation • Fetus outcome • Date of delivery • Gestational age at delivery • Birthweight • Feeding method at birth and hospital discharge	• Date of antenatal corticosteroids • Result of screening for T21 • Diagnoses of fetal complications • Antenatal fetal procedure codes • Result of fetal anomaly screening • Cord arterial blood gas results	• Method of feticide if offered • Fetal procedures offered • Indication for antenatal corticosteroids • Data on specialist imaging – fetal echocardiography or brain magnetic resonance imaging (MRI)
Markers of service delivery	• Date/gestational age of first antenatal appointment • Location of neonatal unit • Neonatal unit admission • Date of postnatal hospital discharge	• Dating scan – gestational age, date • Evidence of combined screening offer • Date of antenatal appointments	• Dating scan – fetal viability, crown–rump length (CRL), nuchal translucency (NT) • Type of screening offered for T21 • Evidence of scan type and appropriateness of images stored • Evidence of referral for second opinion (second sonographer, obstetric consultant, tertiary centre) • Professional job title (midwife/ obstetrician) of the lead clinician for antenatal appointments • Location of postnatal care • Date of postnatal appointments/visits

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