

NICE guidelines

# **Safe midwifery staffing for maternity settings**

## **Appendix 1: Evidence to recommendations tables**

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[www.nice.org.uk/guidance/NG4](http://www.nice.org.uk/guidance/NG4)

The following tables summarise the Committee's considerations when making the recommendations.

The references cited in the tables are listed in the evidence documents on the NICE website. For more information about the evidence the Committee considered, see section 2 of the guideline.

# Organisational strategy

Recommendations	<b>Focus on care for women and babies</b>
1.1.1	<p>Ensure women, babies and their families receive the midwifery care they need, including care from specialist and consultant midwives, in all:</p> <ul style="list-style-type: none"> <li>• maternity services (for example, pre-conception, antenatal, intrapartum and postnatal services, clinics, home visits and maternity units)</li> <li>• settings where maternity care is provided (for example, home, community, free-standing and alongside midwifery-led units, hospitals including obstetric units, day assessment units, and fetal and maternal medicine services).</li> </ul> <p>This should be regardless of the time of the day or the day of the week.</p>
	<b>Accountability for midwifery staffing establishments</b>
1.1.2	<p>Develop procedures to ensure that a systematic process is used to set the midwifery staffing establishment (see recommendation 1.2.2) to maintain continuity of maternity services and to provide safe care at all times to women and babies in all settings. The board should ensure that the budget for maternity services covers the required midwifery staffing establishment for all settings.</p>
1.1.3	<p>Ensure that maternity services have the capacity to do the following.</p> <ul style="list-style-type: none"> <li>• Deliver all pre-conception, antenatal, intrapartum and postnatal care needed by women and babies.</li> <li>• Provide midwifery staff to cover all the midwifery roles needed for each maternity service, including coordination and oversight of each service.</li> <li>• Allow for locally agreed midwifery skill mixes (for example, specialist and consultant midwives, practice development midwives).</li> <li>• Provide a woman in established labour with supportive one-to-one care.</li> <li>• Provide other locally agreed staffing ratios.</li> <li>• Allow for: <ul style="list-style-type: none"> <li>– uplift (which may include consideration of annual leave, maternity leave, paternity leave, study leave including mandatory training and continuing professional development, special leave, and sickness absence)</li> <li>– time for midwives to give and receive supervision in line with professional guidance</li> <li>– ability to deal with fluctuations in demand (such as planned and unplanned admissions and transfers, and daily variations in midwifery requirements for intrapartum care).</li> </ul> </li> </ul>
1.1.4	<p>Ensure that maternity services use local records of predicted midwifery requirements and variations in demand for midwifery staff to help plan ahead and respond to anticipated changes (for example, local demographic changes and women's preferences for place of care).</p>
1.1.5	<p>Develop procedures to ensure that the midwifery staffing establishment is developed by midwives with training and experience in setting staffing establishments. Procedures should ensure that the midwifery staffing establishment is approved by the head of midwifery and the director of nursing and midwifery or chief nurse.</p>
1.1.6	<p>Ensure a senior midwife or another responsible person is accountable for the midwife rosters that are developed from the midwifery staffing establishment.</p>
1.1.7	<p>Ensure that there are enough midwives with the experience and training to assess the differences in the number and skill mix of midwives needed</p>

and number of midwives available for each shift (see section 1.3).

**Organisational level actions to enable responsiveness to variation in demand for maternity services**

1.1.8 Develop escalation plans to address demand for maternity services and variation in the risks and needs of women and babies in the service.

1.1.9 Develop escalation plans in collaboration with midwives who are responsible for determining midwifery staffing requirements at unit or departmental level.

1.1.10 Ensure that escalation plans contain actions to address unexpected variation in demand for maternity services and midwifery needs. These plans could include:

- sourcing extra staff such as using
  - on-call staff
  - temporary staff
- redistributing the midwifery workload to other suitably trained and competent staff
- redeploying midwives to and from other areas of care
- rescheduling non-urgent work.

Action in relation to these plans must not cause midwifery red flag events to occur in other areas. Only consider service cancellations or closures as a last resort.

1.1.11 Actions within the escalation plans related to midwifery staffing should be approved by the head of midwifery and director of nursing and midwifery or chief nurse.

**Monitoring the adequacy of midwifery staffing establishment**

1.1.12 Review the midwifery staffing establishment at board level at least every 6 months, ensuring the review includes analysis of:

- data on variations in maternity service demand
- midwifery red flag events (see box 3)
- safe midwifery indicators (see box 4 and section 7).

1.1.13 Review the midwifery staffing establishment at board level more often than every 6 months if the head of midwifery or director of nursing and midwifery identifies that this is needed. For example if:

- the implementation of escalation plans is increasing
- local services are reconfigured
- midwifery staffing deficits occur frequently
- the quality of the service has deteriorated as indicated by complaints, midwifery red flag events or other quality measures
- staff absenteeism is increasing
- there is unexpected increase or decrease in demand for maternity services.

1.1.14 Change the midwifery staffing establishment if the review indicates this is needed and consider flexible approaches such as adapting shifts and amending assigned location.

**Monitoring and responding to changes**

1.1.15 Ensure that maternity services have procedures in place for monitoring and responding to unexpected changes in midwifery staffing requirements.

	<p>1.1.16 Ensure maternity services have procedures in place for:</p> <ul style="list-style-type: none"> <li>• informing members of staff, women, family members and carers about what midwifery red flag events (see box 3) are and how to report them</li> <li>• the registered midwife in charge of the shift or service to take appropriate action in relation to midwifery red flag events</li> <li>• recording and monitoring midwifery red flag events as part of exception reporting.</li> </ul> <p>1.1.17 Involve midwives in developing and maintaining midwifery staffing policies and governance, including escalation planning.</p> <p>1.1.18 Ensure that actions in relation to midwifery red flag events or unexpected changes in midwifery staffing requirements:</p> <ul style="list-style-type: none"> <li>• take account of women and babies who need extra support from a midwife</li> <li>• do not cause midwifery red flag events to occur in other areas of the maternity service.</li> </ul> <p><b>Promoting staff training, education and time for indirect care activities</b></p> <p>1.1.19 Ensure that midwives have time for:</p> <ul style="list-style-type: none"> <li>• participating in continuing professional development, statutory and mandatory training, and supervision</li> <li>• receiving training, mentoring and preceptorship</li> <li>• providing training and mentoring for student midwives or other maternity service staff</li> <li>• supervising and assessing the competencies of other midwives and non-midwifery staff (including maternity support workers)</li> <li>• taking part in indirect care activities such as clinical governance, safeguarding, administration and liaison with other professionals</li> <li>• setting the midwifery staffing establishment</li> <li>• assessing the midwifery requirements for each day or shift, including collecting and analysing data.</li> </ul>
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<b>Evidence</b>	<p>Evidence review 2 addressed 6 review questions that aimed to explore relationships between midwifery staffing and outcomes. One of the review questions specifically focused on identifying organisational factors that influence safe midwifery staffing (see review question 6, page 77 of evidence review 2).</p> <p>Evidence review 3 (economics) also aimed to identify evidence on organisation factors that influence safe midwifery staffing.</p> <p>None of the reviews identified any evidence about organisational strategy.</p>
<b>Committee considerations</b>	<p>The committee agreed that it was of upmost importance to ensure that senior managers, board and commissioners are accountable for staffing decisions in order to support the implementation of the recommendations in other sections of this guideline. The committee also agreed that the organisational context for midwifery staffing in maternity settings is the same as the organisational context for nurse staffing in inpatient settings, since the same board and senior managers would be responsible for both midwives and nurses. Therefore the committee extrapolated from the evidence and recommendations that were part of the organisational strategy section in the <a href="#">safe staffing for nursing in adult inpatient wards in acute hospitals</a>, and the draft safe nurse staffing for A&amp;E departments guidelines</p> <p>The committee reviewed each of the recommendations that were developed for the safe staffing for nursing in adult inpatient wards in acute hospitals guideline. Recommendations that were based on evidence that was not relevant to midwifery staffing were removed, and recommendations that could be adapted for midwives were amended and used. Additional recommendations were also made to cover specific issues related to midwifery.</p>
<b>Equality considerations</b>	<p>Potential equality issues were considered throughout the committee's discussions. The committee highlighted that organisations have a responsibility to monitor a range of patient, demographic, and organisational factors so that maternity services are able to identify and meet the needs of women and babies.</p>

## Setting the midwifery staffing establishment and assessing differences in the number of midwives needed and the number of midwives available on a day to day basis

<b>Recommendations</b>	<p><b>1.2</b>      <b>Setting the midwifery staffing establishment</b></p> <p>1.2.1      Determine the midwifery staffing establishment for each maternity service (for example, pre-conception, antenatal, intrapartum and postnatal services) at least every 6 months.</p> <p>1.2.2      Undertake a systematic process to calculate the midwifery staffing establishment. The process (or parts of the process) could be supported by a NICE endorsed toolkit (if available). The process should contain the following components.</p> <ul style="list-style-type: none"> <li>• Use historical data about the number and care needs of women who have accessed maternity services over a sample period (for example, the past 12 months or longer).</li> <li>• Estimate the total maternity care hours needed over the sample period based on a risk categorisation of women and babies in the service. This should consider the following: <ul style="list-style-type: none"> <li>– risk factors, acuity and dependency (see box 1 part A for examples).</li> <li>– the estimated time taken to perform all routine maternity care activities (see box 2 part A for examples).</li> <li>– the estimated time taken to perform additional activities (see box 2 part B for examples).</li> </ul> </li> <li>• Divide the total number of maternity care hours by the number of women in the time period to determine the historical average</li> </ul>
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	<p>maternity care hours needed per woman.</p> <ul style="list-style-type: none"> <li>• Use data on the number of women who are currently accessing the maternity service and the trend in new bookings to predict the number of women in the service in the next 6 months.</li> <li>• Multiply the predicted number of women in the service over the next 6 months by the historical average maternity care hours needed per woman to determine the predicted total maternity care hours needed over the next 6 months.</li> <li>• From the total predicted maternity care hours, identify the hours of midwife time and skill mix to deliver the maternity care activities that are required. Take account of: <ul style="list-style-type: none"> <li>– environmental factors including local service configuration (see box 1 part B for examples)</li> <li>– the range of staff available, such as maternity support workers, registered nurses or GPs, and the activities that can be safely delegated to or provided by them (see box 1 part C for examples).</li> </ul> </li> <li>• Allow for the following: <ul style="list-style-type: none"> <li>– one-to-one care during established labour (unless already accounted for in the historical data)</li> <li>– more than one-to-one care during established labour if circumstances require it (unless already accounted for in the historical data)</li> <li>– any staffing ratios for other stages of care that have been developed locally depending on the local service configuration and the needs of individual women and babies</li> <li>– the locally defined rate of uplift (for example, to allow for annual leave, maternity leave, paternity leave, study leave, special leave and sickness absence).</li> </ul> </li> <li>• Divide the total midwife hours by 26 to give the average number of midwife hours needed per week over the next 6 months.</li> <li>• Divide the weekly average by the number of hours for a full time working week to determine the number of whole time equivalents needed for the midwife establishment over the next 6 months.</li> <li>• Convert the number of whole time equivalents into the annual midwife establishment.</li> </ul> <p>Figure 1 summarises this process.</p> <p>1.2.3 Base the number of whole-time equivalents on registered midwives, and do not include the following in the calculations:</p> <ul style="list-style-type: none"> <li>• registered midwives undertaking a Local Supervising Authority Programme</li> <li>• registered midwives with supernumerary status (this may include newly qualified midwives, or midwives returning to practice)</li> <li>• student midwives</li> <li>• the proportion of time specialist and consultant midwives who are part of the establishment spend delivering contracted specialist work (for example, specialist midwives in bereavement roles).</li> <li>• the proportion of time midwives who are part of the establishment spend coordinating a service, for example the labour ward.</li> </ul> <p>1.2.4 Use professional judgement at each stage of the calculation and when checking the calculations for the midwifery staffing establishment.</p> <p>1.2.5 Base the midwife roster on the midwifery staffing establishment calculations, taking into account any predictable peaks in activity, and risk categorisation of women and babies (for example, during the day when midwife activities are likely to be planned, or for a service dealing with higher risk category</p>
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women and babies).

**1.3 Assessing differences in the number and skill mix of midwives needed and the number of midwives available**

1.3.1 As a minimum, assess the differences between the number of midwives needed and the number of midwives available for each maternity service in all settings:

- once before the start of the service (for example, in antenatal or postnatal clinics) or the start of the day (for example, for community visits), or
- once before the start of each shift (for example, in hospital wards).

This assessment could be facilitated by using a toolkit endorsed by NICE.

1.3.2 During the service period or shift reassess differences between the midwifery staff needed and the number available when:

- there is unexpected variation in demand for maternity services or midwifery care (for example, if there is an unexpected increase in the number of women in established labour)
- there is unplanned staff absence during the shift or service
- women and babies need extra support or specialist input
- a midwifery red flag event has occurred (see box 3).

1.3.3 Consider the following when undertaking the assessment:

- risk factors and risk categorisation, acuity and dependency of each woman and baby in the service (use box 1 part A as a prompt)
- environmental factors (use box 1 part B as a prompt)
- time taken to perform the necessary midwifery care activities (use box 2 parts A and B as a prompt).

1.3.4 Follow escalation plans if the number of midwives available is different from the number of midwives needed (see recommendation 1.1.10). Service cancellations or closures should be the last option. Take into account the potential of cancellations or closures to limit women's choice and to affect maternity service provision and the reputation of the organisation.

1.3.5 If a midwifery red flag event occurs (see box 3 for examples), the midwife in charge of the service or shift should be notified. The midwife in charge should determine whether midwifery staffing is the cause, and the action that is needed. Action may include allocating additional midwifery staff to the service.

1.3.6 Record midwifery red flag events (including any locally agreed midwifery red flag events) for reviewing, even if no action was taken.

## Evidence

The committee considered evidence reviews 1, 2, 3 and the economic analysis report when making decisions about calculating midwifery staffing requirements.

**Evidence review 1** aimed to assess the effectiveness of toolkits or other approaches for determining midwifery staffing requirement. The review identified only two studies that were of low quality (Allen and Thornton, 2013; Allios et al, 2014). The two studies provided insufficient evidence to determine if toolkits or other approaches are effective or not, but the evidence did suggest that a commonly used toolkit, Birthrate Plus, may not calculate sufficient staff to enable one-to-one midwifery care during labour to be achieved.

Following the publication of the evidence review, stakeholder feedback has indicated that the Allen and Thornton (2013) research was based on the Birthrate Plus methodology which does not attempt to assess the number of midwives needed on a daily basis (unlike the Birthrate Plus Intrapartum Acuity Tool which does allow this assessment). Thus the conclusions of Allen and Thornton (2013) could be misleading

Question 1 of **evidence review 2** aimed to identify what outcomes are influenced by midwifery staffing. Overall, eight studies were identified that met the inclusion criteria, but they differed in quality (from ++ to -), meaning that the results of some studies may be less reliable than others. Overall the evidence showed that higher levels of midwifery staffing significantly influenced the following outcomes (see page 33 of evidence review 2 for evidence statements):

- increase in delivery with bodily integrity (Sandall et al, 2014)
- increase in attendance by known midwife during labour (NSCCRT, 2000)
- increase in the duration of labour (NSCCRT, 2000)
- decrease in straightforward birth (Rowe et al, 2014)
- decrease in decision to delivery time (Cerbinskaite et al. 2011)
- decrease in emergency c-section process times (Cerbinskaite et al. 2011)
- decrease in maternal readmission within 28 days (Gerova et al. 2010)

No evidence of an association with midwifery staffing and the following outcomes was found:

- healthy mother (Sandall et al, 2014)
- normal birth (Tucker et al, 2003; Sandall et al, 2014; Rowe et al, 2014)
- instrumental vaginal delivery (Joyce et al, 2002; Gerova et al 2010)
- overall caesarean sections (Sandall et al, 2014; Joyce et al, 2002)
- elective caesarean section (NSCCRT, 2000; Sandall et al, 2014)
- spontaneous vaginal delivery (Sandall et al, 2014)
- induction of labour (NSCCRT, 2000)
- multiple and breech delivery (NSCCRT, 2000)
- preoperative time in theatre for emergency caesarean sections (Cerbinskaite et al. 2011)
- any foetal outcome (NSCCRT, 2000; Tucker, 2003; Joyce 2004)

It was not clear if increases in midwifery staffing caused an increase, a decrease, or had no association with the following outcomes:

- perineal outcomes (NSCCRT, 2000; Tucker et al, 2003)
- epidural use (NSCCRT, 2000; Sandall et al, 2014; Rowe et al. 2014)
- emergency caesarean section (NSCCRT, 2000; Sandall et al, 2014; Rowe et al. 2014)
- augmentation (NSCCRT, 2000; Rowe et al. 2014)
- straightforward birth (Rowe et al. 2014)

Other important outcomes (for example, maternal mortality, dystocia etc.) were not reported in the evidence.

Questions 2 to 6 of **evidence review 2** specifically aimed to identify factors that may influence, or modify, the relationship between midwifery staffing and outcomes such as maternal and neonatal risk factors (7 studies), environmental factors (6 studies), staffing factors (5 studies), management factors (2 studies) and

	<p>organisational factors (no studies). The evidence was difficult to interpret as studies were often not appropriately designed to enable the modifying factors to be explored properly. The evidence also drew mixed conclusions which made interpretation of the evidence difficult. However, some quite strong and clear evidence did emerge from the study by Sandall et al, (2014) (Quality score ++) which suggested that maternal clinical risk influences the relationship between midwifery staffing and outcomes. That is, for women with low clinical risk, higher levels of midwifery staffing led to better outcomes than in women with high clinical risk.</p> <p><b>Evidence review 3</b> identified economic evidence from two partially applicable studies, but none of the evidence assessed the cost-effectiveness of toolkits or other approaches for determine midwifery staffing requirement. One study by Allen and Thornton (2013) with very serious limitations suggested a reduction in midwifery overload (the number of women exceed the scheduled workload) could be achieved with a small increase in budget. A reduction in midwifery overload could also be achieved by reducing staffing on Saturday night and all of Sunday and reapplied at peak weekday times with no increase in costs. One study by Sandall et al, (2014) with potentially serious limitations showed that an additional midwife would increase the number of deliveries possible in a trust between 18 and 94 deliveries in a year. The study also showed that midwives and other doctors are complements (should be used together) and midwives are consultants are complements. However, it was unclear if midwives and support staff might be complements or substitutes (can replace each other).</p> <p><b>The economic analysis report</b> developed for this guideline identified which outcomes were associated with midwifery staffing levels and the cost-effectiveness of adding one additional full time equivalent midwife per 100 deliveries.</p> <p>The analysis found a statistical relationship between midwifery staff levels and</p> <ul style="list-style-type: none"> <li>• healthy mother</li> <li>• delivery with bodily integrity</li> </ul> <p>The analysis did not find a relationship between midwifery staff levels and</p> <ul style="list-style-type: none"> <li>• maternal mortality</li> <li>• stillbirth</li> <li>• delivery of a healthy baby.</li> </ul> <p>The analysis estimated the Incremental Cost Effectiveness Ratios (ICER) of one additional full time equivalent midwife per 100 deliveries as £85,560 per healthy mother and £193,426 per mother with bodily integrity.</p> <p>The economic analysis report also showed that worse hospital load ratios (a proxy for patient to staff ratios) were statistically significantly associated with healthy mother outcome, but had positive but weak and significant effects on both the healthy baby and bodily integrity.</p>
<p><b>Committee considerations</b></p>	<p><b><u>Toolkits and other approaches to calculating midwifery staffing</u></b></p> <p>The committee acknowledged the advice provided by the Department of Health and the Royal Colleges of Anaesthetists, Midwives, and Obstetricians and Gynaecologists for maternity services use toolkits to support decision making. This advice has led to many maternity units in England to use the Birthrate Plus toolkit to determine midwifery staffing requirements.</p> <p>A small amount of low quality evidence relating to Birthrate plus (Allen and Thornton, 2013) suggested that the calculations performed by the tool may underestimate the number of midwives that organisations need to achieve one to one midwife care during labour. Another low quality study on UK maternity units (Allios et al, 2014) also indicated that existing systems used to calculate staffing may be underestimating the number of midwives needed, and although this study didn't specify how the calculations were being performed, contact with the authors of the paper indicated that it is highly likely that Birthrate Plus would have been</p>

used in the majority of organisations where the data underpinning the study was collected from. No other evidence was available about Birthrate Plus (or other toolkits or approaches to support midwifery staffing calculations). See evidence review 1 and 3.

The committee acknowledged that many other articles have been published about Birthrate Plus, however, these articles were descriptive accounts of either the development or implementation of the toolkit and therefore did not meet the inclusion criteria for the evidence review and would not provide sufficient data to help inform decisions. The committee were disappointed in the lack of evidence which met the review criteria to support the use of Birthrate Plus. Many members of the committee had personal experience of using Birthrate Plus and felt that it did have professional credibility.

Overall, the committee felt that studies showing that Birthrate Plus underestimated midwife requirements were not supported by their personal experiences and the studies themselves were not of high enough quality to make a recommendation that it should not be used. The committee were unable to make a positive or negative recommendation about Birthrate Plus, and instead made a research recommendation, as it is important that evidence about this tool (and others) is collected in order to inform future recommendations aimed at helping organisations accurately calculate their staffing requirements.

No other evidence was available about other approaches for determining midwifery staffing requirements.

#### **Systematic processes for calculating midwifery staffing**

Although the committee couldn't specifically recommend Birthrate Plus, it did agree that systematic processes should be used to help inform decisions about the number and skill mix of midwives needed. This is because systematic processes make staffing decisions more explicit and reduce the opportunity for organisations to inadvertently over or under- estimate the number of midwives that are required. They also reduce inappropriate variation in the number and skill mix of midwives needed, and improve consistency of staffing decisions taken by different members of staff. Using a systematic process may also improve efficiency by identifying if too many midwives are available and not required, or could help to avert harm by identifying when there are too few midwives available. In addition, using systematic processes to determine midwifery staffing may also be cost neutral or cost saving if they indicate areas of care that are inappropriately over staffed, as organisations could redeploy staff to other areas of need, or reduce the amount of staff required in a service. As such, the committee felt the using a systematic process would be a safe and cost-effective use of resources.

#### **Setting the midwifery staffing establishment**

The committee agreed that both historical demand and predicted demand should be used to base staffing calculations on. The committee then focused on identifying the key components that a systematic approach should contain. The committee discussed the evidence provided in evidence reviews 2 and 3 and the economic analysis report in detail in order to identify the elements that should be part of a systematic process for determining midwifery staffing requirement. Overall, the evidence was difficult to interpret and findings were often unclear as some studies showed that particular factors were significantly related to midwifery staffing, whereas other studies found the same factors were not significantly related to midwifery staffing. The committee felt that these contradictory and confusing findings could be caused by the following problems with the studies included in the evidence reviews:

- Lack of data on rare events: many of the important safety outcomes that occur in maternity settings, such as maternal death, are relatively rare. A very large sample would need to be examined to detect statistical differences in death rates according to variance in staffing numbers. This means that if a study is too small, it is difficult to establish if the lack of a statistically significant finding is because there is no relationship, or because the sample was too small to observe the relationship.
- Lack of sufficient variation in the data: if data are very similar it prevents differences being observed. Currently most organisations use Birthrate Plus for setting staffing levels and this may stop researchers from identifying outcomes that are sensitive to changes in the number of midwives available.

- Lack of sufficient shift by shift data: there was no data on the number and skill mix of midwifery staff available on each shift. Staffing data was only available on a monthly and yearly basis and so it was difficult to estimate the staff to woman/baby ratio and its association to outcomes.
- Endogeneity: This problem can occur when an outcome is partly determined by an explanatory factor. For example, when adverse outcomes are felt more likely to happen in a particular area of care, more qualified staff might be allocated to that area of care. This means that the techniques used in research to analyse the data can over- or under-estimate the impact of a factor (such as staffing) on an outcome (such as adverse effects). In the context of midwifery staffing, the use of systems or rules (such as Birthrate Plus) makes this problem especially likely, and we would expect it to cause research to under-estimate the impact of staffing on outcomes.
- Multicollinearity: This problem is caused when two or more explanatory factors being examined are highly correlated meaning that one can be closely predicted from the other (e.g. staffing and clinical risk, as it is likely that more staff will be required for higher risk cases). If a researcher wanted to understand what factors influence the outcome 'healthy mother' it would be difficult to separate out the individual impacts of staffing and clinical risk on a 'healthy mother' outcome. When multicollinearity is present in data it means the relationship between an outcome and staffing may not be accurately estimated in the evidence.

The committee agreed that the biggest problem affecting the evidence is endogeneity and agreed that it is likely that genuine relationships between midwifery staffing and outcomes are present, but the evidence is underestimating the relationship. The economic analysis attempted to address some of these issues using econometric methods, but it was unable to fully address endogeneity issues because no realistic instrumental variable could be identified. The committee agreed that the results of the studies included in the evidence reviews and economic analysis could be misleading, and should be treated with caution. Thus, the committee used its knowledge and experience to list the factors that should be considered when determining the number of midwives needed (see box 2 of the guideline).

The committee recognised that the main driver of midwife time and skill mix was the individual risk factors, acuity, dependency, and risk categorisation of each woman and baby, and that adequate consideration needs to be given to both the mother and the baby, since two (or more) people require care. Thus systematic consideration of each woman and baby in the service is required.

The committee also debated other factors that should also be taken into account when determining midwifery staffing establishment, such as the model of care used by the organisation (for example case load midwifery, or team midwifery), the availability of other departments, and availability of other staff in the organisation. Since no evidence was available to inform which additional factors were more important or that influence midwifery staffing the most, the committee populated this list based on its knowledge and experience.

It was acknowledged that maternity care be highly variable. In some cases this variation is appropriate and driven by clinical need and local circumstance, but in other cases the variation is inappropriate and may be driven by insufficient staff, financial pressures or other factors and could lead to safety issues. To deal with this the committee discussed whether it could state recommended timings for key maternity activities to help organisations identify the time (and therefore the number of) midwives needed to provide safe care. The committee agreed that providing recommended timings could be unhelpful and unsafe, as it was felt that timings need to be driven by the needs of women and babies and these will vary between cases as well as between settings and localities. This finding was also supported by the economic analysis report which suggested that variation in outcomes was mostly due to the clinical risk associated with the mother and baby. There was an overwhelming concern that:

- setting minimum or average times could be interpreted as maximum times by commissioners, and this could lead to the delivery of unsafe care
- setting time ranges would be unhelpful as the range would need to be extremely wide to allow for the range of factors that impact on time

- setting timings for tasks that are easier to time than others could be confusing for users of the guideline
- timings could be different depending on the staff group undertaking the activity.

Instead, the committee agreed that it could recommend key activities, and that local organisations should be responsible for collecting information about the time needed to perform the activities, depending on their local needs and service configuration.

The committee agreed that organisations need to apply an 'uplift' to take into account factors that affect midwife availability such as training, supervision, annual leave, maternity leave etc. Different organisations calculate uplift differently, and this means that some organisations may be underestimating the amount of uplift that is actually required. Thus, in the absence of evidence, the committee used its knowledge and experience to develop a list of factors that organisations should take into account when determining uplift.

The committee also emphasised the need for the midwifery establishment to be based on registered midwives only, and that some registered midwives (such as consultant midwives who may occupy non-clinical roles, or student midwives) whilst being available to undertake some midwifery activities should not be counted in midwifery staffing calculations. However, the committee acknowledged that some activities undertaken by a midwife could also be delegated to other appropriately trained professionals (such as maternity support workers or other registered nurses). Any delegation of midwife activities should be determined locally depending on the clinical circumstances and on the skills and experience of the staff available.

The committee also debated how often the systematic process for calculating staffing should be applied to maternity services, recognising the compromise between applying the process regularly and burdening services with data collection and analysis that may not be necessary. It was agreed that when calculating the historical average maternity care needed data should be obtained from the previous 12 months or longer. This is so that the calculated average is as accurate as possible and takes into account a range of peaks and troughs in demand. The committee also agreed that establishment reviews should take place at least every 6 months, so that services can identify and act on any staffing changes that may be necessary. However, the committee emphasised that this doesn't mean that the staffing establishment should change every 6 months. It should only change if the 6 month review indicates this is needed.

#### ***On the day assessments***

For the on the day assessments, the committee discussed how different services in different settings are set up. For example an antenatal clinic may only need assessing at the start of the clinic as the workload here is quite predictable. Services that run continuously, such as the ward-based services will need to do the assessment before each shift change. Services providing intrapartum care, may need to do the assessment more frequently than each shift change as the staffing requirement for this area of care can change quickly (for example if more women than expected go into established labour, or if a woman develops serious complications).

#### **Staffing ratios**

The committee agreed that care during the intrapartum period (the period of time during labour, and delivery of baby and placenta) is associated with the most serious safety issues. Because of this, services often prioritise midwife activities in relation to providing intrapartum care over and above other midwife activities (such as ante-natal and post-natal activities), and will draw in midwives from lower priority activities to cover intrapartum activities. Whilst this prioritisation aims to reduce the occurrence of the most serious safety issues it leaves other midwife activities depleted and this can have a knock on effect which puts strain on the maternity service and can lead to the development of preventable safety issues later on (for example if antenatal activities are de-prioritised this may result in women not being able to receive regular antenatal screening so changes in her risk status could be undetected leading to increased preventable safety issues during intrapartum care).

Because of this, the committee agreed that it was essential to consider the entire

	<p>maternity pathway when making safe midwifery staffing decisions. The committee debated whether it should recommend specific midwife to woman staffing ratios for each stage of the maternity care pathway or for each setting where maternity care is provided. It was felt that having ratios could go some way to ensure that all areas of midwifery care achieve some sort of minimum staffing level, and could reduce the likelihood of staff being pulled in to cover intrapartum care at the expense of antenatal or postnatal care provision. It was also felt that a ratio could help reduce inappropriate variation in midwifery staffing across provider services. However, no published evidence was available that provided information about safe midwifery staffing ratios. The committee was aware that professional guidance does exist on midwifery staffing ratios, but this information is not based on evidence and because of this there is no way of measuring the impact of different staffing ratios on important outcomes.</p> <p>An economic analysis was undertaken for the purposes of this guideline (see the economic analysis report) which provided some evidence on staffing ratios. This used health episode statistics (HES) activity data from 2003-2013, and annual workforce staffing data. In the absence of good quality shift by shift staffing data, hospital load ratios were used as a proxy for patient to staff ratios. The report determined that changes in hospital load ratios were statistically associated with large changes in health outcomes. However, the interpretation of the hospital load ratio was difficult – the hospital load ratio was based on annual staffing data that included other non-midwife staff groups such as doctors, consultants and maternity support workers. The analysis also assumed that shift patterns and staffing levels would follow the same patterns over the period investigated, but this assumption was considered unlikely to hold by the committee because staffing levels and rotas will often be different for each shift. The hospital load ratio also ignored the length of the delivery and other patients who may be admitted to the maternity service but who did not deliver on that day. The committee felt that due to the limitations of the hospital load ratio proxy, it could not specify a specific staffing ratio based on the economic analysis results. However, it acknowledged the importance of patient to staff ratios and its likely association on some health outcomes.</p> <p>The committee also reflected on national policy from the Department of Health and the Royal College of Midwives, and on the NICE Intrapartum Care guideline which recommends one-to-one care during established labour. The committee felt that it would be inappropriate for this guideline not to recommend one-to-one care during established labour, as although no evidence was identified to support this recommendation, the committee felt that this did represent the minimum ratio to ensure safe care. The committee acknowledged that there may be circumstances when more than one-to-one care is needed to provide safe care during established labour (such as when babies are delivered at home). However, it was felt that ratios for other areas of care (such as community ratios, or antenatal and postnatal ratios) should not be included in this guideline, and instead be determined locally. The committee felt it would not be helpful to identify other ratios because of the lack of evidence and the large amount of variation in care provision. Furthermore, ratios could have disadvantages, if for example the ratios become default maximum ratios and not take into consideration additional care needs of some women and babies.</p>
<p><b>Equalities considerations</b></p>	<p>Potential equality issues were considered throughout the committee's discussions. When calculating the number of midwives needed for the establishment, and for day to day assessments, the committee agreed that specific consideration needs to be given to particular groups of women and babies who may require extra support from a midwife. For example, people with complex social situations, people where safeguarding issues have been identified, and people with physical or sensory impairment. Specific examples were listed in box 1 and 2 in the guideline to prompt users of the guideline to give consideration to these factors.</p>

## Monitoring and responding to variation in staffing

<p><b>Recommendations</b></p>	<p>1.4.1 Monitor whether the midwifery staffing establishment adequately meets the midwifery care needs of women and babies in the service using the safe midwifery staffing indicators in box 4. Consider continuous data collection of these safe midwifery staffing indicators (using data already routinely collected locally where available) and analyse the results. Section 7 gives further guidance on these indicators.</p> <p>1.4.2 Compare the results of the safe midwifery staffing indicators with previous results at least every 6 months.</p> <p>1.4.3 Analyse reported midwifery red flag events detailed in box 3 and any additional locally agreed midwifery red flag events and the action taken in response.</p> <p>1.4.4 Analyse records of differences between the number of midwives needed and those available for each shift to inform planning of future midwifery establishments:</p> <p>1.4.5 Review the adequacy of the midwifery staffing establishment (see recommendations 1.1.12 and 1.1.13) if indicated by the analysis of midwifery red flag events, midwifery staffing indicators or differences between the number of midwives needed and those available.</p>
<p><b>Evidence</b></p>	<p>Evidence review 2 identified 8 studies that differed in quality, meaning that the results of some studies may be less reliable than others. Overall the evidence showed that higher levels of midwifery staffing significantly influenced the following outcomes:</p> <ul style="list-style-type: none"> <li>• increase in delivery with bodily integrity</li> <li>• increase in attendance by known midwife during labour</li> <li>• increase in the duration of labour</li> <li>• decrease in straightforward birth</li> <li>• decrease in emergency c-section process times</li> <li>• decrease in maternal readmission within 28 days</li> </ul> <p>No evidence in the evidence review identified an association with midwifery staffing and the following outcomes:</p> <ul style="list-style-type: none"> <li>• elective c-section</li> <li>• healthy mother</li> <li>• normal birth</li> <li>• non-intact perineum</li> <li>• multiple and breech delivery</li> <li>• instrumental vaginal delivery</li> <li>• spontaneous vaginal delivery</li> <li>• induction of labour</li> <li>• any foetal outcome.</li> </ul> <p>It was not clear if increases in midwifery staffing caused an increase, a decrease, or had no association with the following outcomes:</p> <ul style="list-style-type: none"> <li>• intact perineum,</li> <li>• augmentation,</li> <li>• epidural use,</li> <li>• emergency c-section</li> </ul> <p>Other important outcomes were not reported in the evidence.</p>

	<p>No evidence on the cost-effectiveness on monitoring and responding to variation in staffing was found (see evidence review 3). The economic analysis (see economic analysis report) showed that higher levels of midwifery staffing significantly influenced the following outcomes:</p> <ul style="list-style-type: none"> <li>• increase in delivery with bodily integrity</li> <li>• healthy mother</li> </ul>
<p><b>Committee considerations</b></p>	<p>The committee agreed that it was imperative that organisations should be alerted to potential safety issues so that appropriate responses can be actioned. To do this requires continuous data collection and monitoring of events that may be warning signs that further action relating to staffing may be required. This requires the monitoring of both midwifery red flag events which require immediate escalation if they occur, and indicators of safe staffing over a period of time to check if the planned midwifery establishment is sufficient to provide safe care.</p> <p>The majority of the evidence focused on the intrapartum period of care and did not provide evidence about potential red flag events and indicators for other periods of care in the maternity pathway such as preconception, antenatal or postnatal care. Furthermore, the committee was not confident in the findings of the evidence review, and noted that some important outcomes were not reported. One area where evidence was available showed that 'healthy mother' and bodily integrity were significantly and positively associated with midwifery staffing (that is, as midwife staffing increases, healthy mother and bodily integrity increases). A key component of healthy mother and bodily integrity is the lack of genital tract trauma (or perineal tears). Thus, genital tract trauma was chosen as an indicator based on this evidence.</p> <p>The committee used its knowledge and experience to develop the other red flags and indicators listed in boxes 3 and 4. These focus on what the committee felt were the most important to women and midwives. The committee also agreed that additional midwifery red flag events could be determined locally. When midwifery red flag events have taken place, the committee agreed that the numbers of midwives available and the number required, the red flag events and the response should be recorded so that they can be used for future planning, alongside regular reviewing of safe midwifery staffing indicators. The committee developed a list of midwifery red flag events and indicators based on the evidence reviews.</p> <p>The committee discussed the costs and benefits associated with continuous monitoring of red flag events and indicators and agreed that there may be a small cost increase because of time taken to collect the data and any necessary electronic data systems that might need to be put in place. To minimise this cost the committee agreed that indicators and midwifery red flag events should, as far as possible, be based on data which is already collected by the organisation (such as the data collected for mortality and morbidity meetings). The committee highlighted that any costs associated with collecting this data should be small and would lead to long term benefits by reducing adverse events, since effective monitoring and evaluation is fundamental to providing safe and effective care and so is a cost-effective use of resources.</p>
<p><b>Equalities considerations</b></p>	<p>Potential equality issues were considered throughout the committee's discussions. No specific equalities issues were highlighted in relation to the recommendations in this section of the guideline. However, the committee wanted to stress that recording, and regular reviewing of the staffing establishment is imperative to ensure that maternity services are identifying and meeting the needs of women, babies and their families using the services.</p>

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