



Resident consultant obstetrician presence on the labour ward versus other models of consultant cover: a systematic review of intrapartum outcomes

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Background Several key policy documents have advocated 24-hour consultant obstetrician presence on the labour ward as a means of improving the safety of birth. However, it is unclear what published evidence exists comparing the outcomes of intrapartum care with 24-hour consultant labour ward presence and other models of consultant cover.

Objectives To collate and critically appraise evidence of the effect of continuous resident consultant obstetrician cover on the labour ward on outcomes of intrapartum care compared with other models of consultant cover.

Search strategy Studies were included which quantitatively compared intrapartum outcomes for women and babies where continuous resident consultant obstetric cover was provided with other models of consultant cover.

Selection criteria Quantitative studies within healthcare systems with mixed obstetric-midwifery models of care.

Data collection and analysis Two researchers independently screened titles and full-text publications, extracted data and assessed the quality of included studies. Meta-analysis was performed using REVIEW MANAGER 5.3.

Main results About 1508 publications were screened resulting in two papers, three conference abstracts and one letter being included. All were single-site time-period comparison studies. The quality of studies overall was poor with significant risk of bias. The only significant finding in meta-analysis related to instrumental deliveries, which occurred more frequently when there was on-call consultant cover (unadjusted risk ratio 1.14; 95% CI 1.04–1.24).

Conclusion No reliable evidence of the effects of 24-hour resident consultant presence on the labour ward on intrapartum outcomes was identified.

Keywords Delivery, obstetric labour complications, obstetric/adverse effects, obstetrics/organisation and administration.

Tweetable abstract More robust research is needed to assess intrapartum outcomes with resident consultant labour ward presence.

Linked articles This article is commented on by WF Rayburn. To view this mini commentary visit <https://doi.org/10.1111/1471-0528.14685>. This article is also commented on by M Prior et al. To view this mini commentary visit <https://doi.org/10.1111/1471-0528.14686>.

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Introduction

Mixed obstetric-midwifery models of care allow for the benefits of midwifery care for low-risk women¹ while providing a safe birth setting for women with health problems or those who develop complications. Within these settings, a number of key policy documents have advocated 24-hour consultant obstetrician presence on the labour ward as a means of further improving the safety of birth.² Resident

consultant presence was initially advocated on the basis of observed improvements in care at night in other consultant-led services,³ on the basis of observed differences in perinatal outcomes at different times of day and night,^{4–8} and on the basis of the changing demographic and clinical characteristics of women giving birth.² The Royal College of Obstetricians and Gynaecologists (RCOG) concluded that increased consultant involvement would lead to better organisation and clinical decision-making¹ and that junior

doctors would benefit from consultant support and supervision throughout the 24-hour period.¹ A recent analysis⁹ reported a statistically significant increase in stillbirths of babies delivered at weekends compared with Tuesdays, which may relate to differences in staffing levels, including consultant obstetrician presence.

However, it is not clear what published evidence exists comparing the outcomes of intrapartum care with continuous resident consultant labour ward presence compared with other models of consultant presence.

The objective of this review was to collate and critically appraise evidence of the impact of continuous resident consultant obstetrician cover on labour ward on outcomes of intrapartum care compared with other models of consultant cover, focusing on settings which have mixed obstetric-midwifery models of maternity service provision.

Methods

Study inclusion criteria

Population, intervention and comparator group

This systematic review was carried out using a prespecified protocol, according to the MOOSE guidelines¹⁰ and with the help of a search technician. Studies were included which quantitatively compared the outcomes for women and babies where continuous resident consultant obstetric cover was provided and outcomes with other models of consultant cover. We included studies irrespective of women's individual risk status. Following the guidance from the Cochrane Effective Practice and Organisation of Care group (EPOC) randomised controlled trials (RCTs) including cluster RCTs (CRCTs), non-randomised controlled trials (NRCTs), controlled before-after studies (CBAs) and interrupted time-series (ITS) studies were considered appropriate for inclusion.

Outcome measures

Any measures of outcome of intrapartum care were included (see Supporting Information for relevant search terms).

Study exclusion criteria

Studies not meeting the inclusion criteria and studies from countries that do not have a mixed obstetrician-midwifery model of maternity care were excluded.

Search methods for identification of studies

Searches were conducted in English, but no language restrictions were set. No restrictions were set by date or publication type in the search for randomised controlled trials to be certain that any studies using this robust methodology were identified. For the less robust study

types (NRCT, CBA, ITS), we considered that the results of historical studies would not be relevant to modern obstetric practice, therefore the search was limited to research published after 1 January 2000.

Electronic searches

The following databases were searched from inception to present:

- Cochrane Database of Systematic Reviews
- Cochrane Pregnancy and Childbirth Group Trial Register
- Cumulative Index to Nursing and Allied Health (CINAHL) plus
- EMBASE
- Medline

The search strategy for Medline is shown in the Supporting Information and was adapted for other databases where necessary.

Searching other resources

The reference lists of all studies meeting the inclusion criteria were also searched, as well as key policy documents, and forward citations of studies meeting the inclusion criteria. Experts in the field were also asked about relevant literature.

Data collection and analysis

Selection of studies

Titles and abstracts returned from searches were screened independently by two of three researchers (JH, JKK, MK) and appraised in light of inclusion criteria. Where both reviewers independently determined that studies did not meet inclusion criteria, these were excluded, otherwise they proceeded to the next stage. Full records were obtained for studies meeting the inclusion criteria and those with insufficient information to assess inclusion criteria from the title and abstract. Two reviewers independently screened full-text articles to assess consistency with the inclusion criteria (JH, MK). Where there was disagreement, reviewers met to reach consensus. The full process for study screening and inclusion was recorded in accordance with current guidelines.¹¹

Data extraction and management

Data were extracted from papers using a piloted data extraction proforma developed for this review (Supporting Information Appendix S1). Two reviewers (JH, MK) independently extracted data from each included study. Where disagreement occurred, the reviewers met to reach consensus.

Data extracted included study details, methods, participants, intervention details (number of hours of consultant obstetrician presence provided), maternal and neonatal

outcomes, funding, author contact details and quality assessment of the study. Note that study designs involving comparison of outcomes during different time periods when there were different patterns of consultant cover within the same unit, including before-after studies as well as studies which compared outcomes on different days in the week when consultant obstetrician presence differed, are summarised as 'time-period comparison studies'.

Quality assessment of included studies

The quality of the included studies was assessed independently by two reviewers (JH, MK) using the risk of bias criteria recommended for EPOC reviews.¹²

The following items were appraised for each study:

- Was the allocation sequence adequately generated?
- Was the allocation adequately concealed?
- Were baseline outcome measurements similar?
- Were baseline characteristics similar?
- Were incomplete outcome data adequately addressed?
- Was knowledge of the allocated interventions adequately prevented during the study?
- Was the study adequately protected against contamination?
- Was the study free from selective outcome reporting?
- Was the study free from other risks of bias?

In addition, the comparability of exposed and non-exposed participants was assessed, as were the adequacy of statistical methods and adjustment for potential confounding factors.

Data synthesis

As the publications all used similar methods and examined similar outcomes, quantitative synthesis was undertaken. This was performed using REVIEW MANAGER 5.3,¹³ fitting random effects models. Where quantitative synthesis was not possible, narrative synthesis of studies was carried out, consistent with current guidelines.^{11,14} Measures of effect for each study are presented.

Ethics committee approval was not required.

Patient involvement

Patients were not involved in the design or conduct of this study.

Results

The results of the literature search and screening process are shown in Supporting Information Figure S1. After removal of duplicates, 1508 publications were identified and screened on title and abstract (where available). Four studies from other sources were also included, resulting in 14 publications after initial screening. The final review

included six publications which met the inclusion criteria, of which two were papers, three were conference abstracts and one was a letter. The reasons for exclusion are shown in Supporting Information Table S1 and summarised in Figure S1.

The six included publications are summarised in Table 1. All six studies were conducted in English hospitals between the years 2004 and 2015 and included between 486 and 5318 deliveries (although two^{15,16} did not state the study dates or number of deliveries). They were all based on time-period comparison of hospital records at single sites and compared resident obstetric consultant cover with on-call consultant cover (resident cover being provided by registrars). None of the studies was an RCT or CRCT. In five of the studies^{15,17–20} the focus of comparison was on night-time deliveries, as resident consultant cover was standard on day shifts. The sixth study¹⁶ compared outcomes before and after the introduction of 24-hour resident consultant cover. In three of the studies, night-time resident consultant cover was provided twice a week,^{15,18,19} in the others it was unspecified.^{17,20} Various maternal and neonatal outcomes were measured as indicated in Table 1.

The quality of the studies overall was poor. The risk of bias of included studies was judged to be unclear, medium or high on most criteria for all six studies (Table 2). In particular, none of the studies adjusted for potential confounding factors; there was clear potential for important differences between study groups which may have confounded the observed results.

The results of the individual studies are shown in Table 3. As all six studies used similar methods and included almost all deliveries, it was possible to conduct a limited meta-analysis, although two studies^{15,16} could not be included in the meta-analysis because no denominators were given. The risk ratios and Forest plots for each outcome reported in a comparable manner in two or more studies (spontaneous vaginal delivery, instrumental delivery, emergency caesarean section, and admission to neonatal unit) are shown in Figure 1. The results cluster around the line of no effect, all effect sizes were uncertain, subject to large degrees of heterogeneity, and none was statistically significantly different with one exception. Instrumental deliveries occurred significantly more frequently when there was on-call consultant cover compared with resident consultant presence with an unadjusted risk ratio of 1.14 (95% CI 1.04–1.24). There was significant heterogeneity among the study results for caesarean delivery. Two papers also reported results for postpartum haemorrhage (greater than 1500 ml in one,¹⁷ undefined in the other¹⁵) with opposing findings. Two studies reported perineal damage (3rd degree tears in one,¹⁸ 3rd or 4th degree tears in the other¹⁷); there was no statistically significant

Table 1. Summary of studies included

Author, date	Participants			Intervention	Comparisons	Outcomes		
	Year(s) and location study conducted	n	Exclusion criteria			Population representativeness assessed	Maternal outcomes assessed	Neonatal outcomes assessed
Siddiqui et al. (2008) ¹⁵ [conference abstract]	Jan 2004 to Nov 2006 at Nottingham City Hospital	Not stated	None stated	Implied that all deliveries included	Resident consultant cover 2 nights per week	Senior specialist registrar cover on other nights (with consultant on-call)	Mode of delivery, fetal blood sampling, postpartum haemorrhage	Apgar scores, neonatal unit admissions, cord pH
Ballal et al. (2012) ¹⁷ [conference abstract]	Years not stated but duration 18 months at Liverpool Women's Hospital	5287 births during consultant sessions, 2810 outside hours	Multiple births, elective caesareans and premature babies	No	90 hours consultant resident cover, unclear how distributed, periods of continuous cover	Consultant on call	Mode of delivery, 3rd/4th degree tears, postpartum haemorrhage >1500 ml, duration of 2nd stage	Cord pH, Apgar scores
Freites et al. (2012) ²⁰	Aug 2004 to Jul 2007 at Hull Royal Infirmary	5318 deliveries; 1226 resident consultant cover, 4092 on-call from home	Deliveries between 08.00 and 09.00 hours due to hand-over time	Not as such but maternal age, birthweight and gestational age all comparable	2 consultant obstetricians and 1 associated specialist elected to be resident in hospital for period of responsibility	7 consultant obstetricians + 2 associate specialists providing cover from home	Mode of delivery, maternal death	Birthweight, gestation, stillbirth, neonatal death, resuscitation, referral/admission to neonatal unit, Apgar scores
Tang et al. (2012) ¹⁸	Jul 2010 to Apr 2011 at York Teaching Hospital NHS Trust	486 deliveries; 248 on consultant resident shifts, 238 on registrar shifts	Excluded births between 09.00 and 20.00 hours	No	Resident nights 20.00 to 09.00 hours Mon & Tues	Registrar cover	Mode of delivery, 3rd degree tears, maternal death, trial in theatre	Admission to special care baby unit, neonatal deaths
Merrick & Rajesh (2013) ¹⁹ [conference abstract]	Jan-June 2012 at York District Hospital	488 deliveries; 243 on consultant shifts, 245 on registrar shifts	Multiple births	No	Resident nights 20.00 to 09.00 hours Mon & Tues	Registrar cover	Mode of delivery, maternal death, trial in theatre	Neonatal deaths, cord gases

Table 1. (Continued)

Author, date	Participants		Intervention	Comparisons	Outcomes			
	Year(s) and location study conducted	n			Exclusion criteria	Population representativeness assessed	Maternal outcomes assessed	Neonatal outcomes assessed
Ahmed et al. (2015) ¹⁶ [letter]	Unspecified; before and after introduction of 24/7 consultant cover in July 2014 at Heartlands Hospital, Birmingham	Unspecified	Unspecified	No	Continuous resident consultant cover	Unspecified	Instrument deliveries, caesarean sections	Stillbirths

difference between resident consultant presence and on-call consultant cover (Table 3). Ballal et al.¹⁷ reported that, in an unadjusted comparison, a prolonged second stage (>4 hours) was significantly more common in the resident consultant group.¹⁷

Discussion

Main findings

This systematic review identified only six studies which compared outcomes between resident consultant presence on the labour ward and on-call consultant cover. They were all based on time-period comparison of hospital records at a single site. All studies were of low quality with a high risk of bias, principally because they were all observational studies, either non-randomised trials or before-after studies, and no attempt was made to adjust for differences in the characteristics of the women delivering on the labour ward during the two time periods, which may have confounded the findings. Any results must therefore be treated with extreme caution. With this in mind, the only outcome which was reported in more than one study which was statistically significantly different between the two models of care was instrumental delivery. The risk of instrumental delivery was 14% higher in the on-call consultant group than in the resident consultant presence group. Only three other outcomes were reported in a consistent manner in more than one study: emergency caesarean delivery, spontaneous vaginal delivery and neonatal unit admission. There was no statistically significant difference in any of these outcomes when consultants were resident at night compared with non-resident models of care.

Strengths and limitations

The strength of this systematic review was its broad search strategy including all the major bibliographic databases from 2000 to present.

Limitations of the included studies related to possible differences in the characteristics of women delivering during the different care periods, which may impact on the observed differences. For example, there are possible differences in levels of experience between consultants who opted to be resident compared with those who opted to be on call,²⁰ and the possibility that more problematic procedures and planned deliveries of higher risk women were scheduled for days when a consultant would be resident through the night. These were not accounted for in any analysis or addressed by most of the authors. Tang et al.¹⁸ note that they were unable to obtain some of the case notes required to confirm poor outcomes; this may have resulted in a differential loss of cases with adverse outcomes. It is unclear in most studies whether there was any selective outcome reporting. Studies also did not provide details

Table 2. Risk of bias in studies included. Green indicates dimensions with a low risk of bias, orange indicates dimensions with a medium or unclear risk of bias, and red indicates dimensions with a high risk of bias

Risk of bias						
Author, date	Sample representativeness	Adequacy of exposure measurement	Attrition bias	Selective outcome reporting	Comparability of exposed/unexposed	Adjustment for confounders
Siddiqui et al. (2008) ¹⁵ [conference abstract]	Risk of bias unclear: probably all births included but not stated	Risk of bias unclear: not stated	Risk of bias unclear: no information	Risk of bias unclear: no information	Risk of bias medium: possible that more planned high risk births occur during resident consultant sessions	Risk of bias high: no adjustment
Ballal et al. (2012) ¹⁷ [conference abstract]	Risk of bias unclear: implied that all births included but possible short-fall	Risk of bias unclear: not enough information	Risk of bias unclear: not enough information	Risk of bias unclear: not enough information	Risk of bias medium: possible that more planned high risk births occur during resident consultant sessions	Risk of bias high: no adjustment
Freites et al. (2012) ²⁰	Risk of bias low: all night deliveries in time period	Risk of bias low: from hospital records	Risk of bias unclear: not stated	Risk of bias unclear: data from 2004 to 2007 but submitted in 2012	Risk of bias medium: relative levels of experience of 2 groups not stated; possible that more planned high risk births occur during resident consultant sessions	Risk of bias high: no adjustment
Tang et al. (2012) ¹⁸	Risk of bias unclear: implied all night deliveries in time period included	Risk of bias low: from medical notes	Risk of bias unclear: only 60/70 consultant resident notes and 60/88 registrar notes retrieved. Possible loss of 'interesting' cases	Risk of bias unclear: according to the Proforma in Appendix S1 there were data on a number of other outcomes which were not reported	Risk of bias medium: possible that more planned high risk births occur during resident consultant sessions	Risk of bias high: no adjustment
Merrick & Rajesh (2013) ¹⁹ [conference abstract]	Risk of bias unclear: implied that all night deliveries in time period included	Risk of bias low: from medical notes	Risk of bias unclear: not stated	Risk of bias unclear: information on other outcomes may have been collected	Risk of bias medium: possible that more planned high-risk births occur during resident consultant sessions	Risk of bias high: no adjustment
Ahmed et al. (2015) ¹⁶ [letter]	Risk of bias unclear: not assessed	Risk of bias unclear: not enough information	Risk of bias unclear: not stated	Risk of bias unclear: information on other outcomes may have been collected	Risk of bias medium: no information about relative levels of experience of staff prior to and after introduction of resident consultant cover	Risk of bias high: no adjustment

Full risk of bias assessment was not done as there were no RCTs/CRCTs.

Table 3. Results of studies included comparing resident consultant presence with other models of consultant cover

Siddiqui et al. (2008) ¹⁵	Continuous resident consultant cover		Other models of consultant cover		Unadjusted OR (95% CI)
	<i>n</i>	%	<i>n</i>	%	
Spontaneous vaginal delivery	NK	65	NK	50.9	<i>P</i> < 0.05
Forceps	NK	More	NK	Less	
Category 2 caesarean delivery	NK	More	NK	Less	
Category 1 caesarean delivery	NK	Less	NK	More	
Any caesarean delivery	NK	More	NK	Less	
Fetal blood sampling undertaken	NK	Less	NK	More	<i>P</i> < 0.05
Low Apgar (unspecified)	NK	7	NK	11	ns
Admission to neonatal unit	NK	3	NK	6	ns
Cord pH < 7.1	NK	4	NK	6	ns
Postpartum haemorrhage	NK	10	NK	14	<i>P</i> < 0.05

Ballal et al. (2012) ¹⁷	<i>n</i> (N = 5287)	%	<i>n</i> (N = 2810)	%	(re-calculated)
Emergency caesarean delivery	696	13.2	321	11.4	1.15 (1.00–1.32)
2nd stage caesarean delivery	54	1	56	2	0.51 (0.35–0.75)
Instrumental delivery	927	17.5	435	15.5	1.13 (1.00–1.28)
3rd/4th degree tears at instrumental delivery	29	5.5	14	4.9	1.10 (0.58–2.09)
Postpartum haemorrhage >1500 ml	97	1.8	11	0.4	4.69 (2.51–8.76)
2nd stage longer than 4 hours	159	3	47	1.7	1.80 (1.29–2.50)
Cord pH < 7	20	0.4	7	0.2	1.52 (0.64–3.60)
5 minutes Apgar < 6	64	1.21	24	0.85	1.42 (0.88–2.27)

Freites et al. (2012) ²⁰	<i>n</i> (N = 1226)	%	<i>n</i> (N = 4092)	%	
Rotational forceps	3	0.2	7	0.2	0.70 (0.18–2.71)
Non-rotational forceps	59	4.8	130	3.2	0.65 (0.47–0.89)
Any forceps	62	5.1	137	3.3	0.65 (0.48–0.88)
Rotational vacuum	4	0.3	7	0.2	0.52 (0.15–1.79)
Non-rotational vacuum	25	2	114	2.8	1.38 (0.89–2.13)
Total vacuum	29	2.3	121	3	1.26 (0.83–1.90)
Assisted vaginal delivery	91	7.4	258	6.3	0.84 (0.66–1.08)
Vaginal breech delivery	14	1.1	41	1	0.88 (0.48–1.61)
Caesarean delivery	171	13.9	592	14.5	1.04 (0.48–1.61)
Spontaneous vaginal delivery	950	77.5	3201	78.2	1.04 (0.90–1.21)
Maternal death	1	0.1	0	0	
Stillbirth	0	0	1	0.03	
Neonatal death	0	0	6	0.2	
Neonatal resuscitation required	176	14.4	615	15	1.06 (0.88–1.27)
Immediate referral to neonatal unit	71	5.9	241	6	1.02 (0.77–1.34)
Admission to neonatal unit	48	3.9	180	4.4	1.13 (0.82–1.56)
1 minute Apgar < 8	133	11.1	477	11.9	1.08 (0.88–1.32)
5 minutes Apgar < 8	15	1.3	56	1.4	1.12 (0.63–1.98)

Tang et al. (2012) ¹⁸	<i>n</i> (N = 248)	%	<i>n</i> (N = 238)	%	(calculated)
Spontaneous vaginal delivery	178	71.8	150	63	1.13 (0.86–1.51)
Emergency caesarean delivery	30	12.5	48	20.6	0.60 (0.37–0.98)
Assisted deliveries	40	16	40	16	0.96 (0.60–1.54)
Assisted deliveries in labour room	19/31	61	16/29	55	1.11 (0.48–2.56)
Unsuccessful trial of instrumental delivery	47	19	36	15	1.25 (0.78–2.00)

Table 3. (Continued)

Tang et al. (2012)¹⁸	<i>n</i> (N = 248)	%	<i>n</i> (N = 238)	%	(calculated)
3rd degree tears	8	3.3	4	1.7	1.92 (0.57–6.46)
Special care baby unit admission	7	3	19	8	0.35 (0.15–0.86)
Merrick & Rajesh (2013)¹⁹	<i>n</i> (N = 243)	%	<i>n</i> (N = 245)	%	(calculated)
Spontaneous vaginal delivery	160	66	167	68	0.97 (0.73–1.28)
Emergency caesarean delivery	37	15.2	47	19.2	0.79 (0.50–1.26)
Assisted deliveries	40	16.5	31	12.8	1.30 (0.79–2.15)
Assisted deliveries in labour room	30	73.2	12	35.3	2.52 (1.26–5.00)
Unsuccessful trial of instrumental delivery	1	9.1	3	13.6	0.34 (0.03–3.25)
Cord arterial pH < 7.20	13	20	25	34.2	0.52 (0.26–1.05)
Ahmed et al. (2015)¹⁶	<i>n</i>	%	<i>n</i>	%	
Instrumental delivery	NK	10.5	NK	10.6	
Caesarean delivery	NK	28.8	NK	28.6	
Stillbirth	NK	0.6	NK	0.5	

NK, not known.

concerning whether the consultant was resident in the hospital or specifically in the labour ward. The observed heterogeneity between study results may be explained by differences in some of these factors between studies. In addition, publication bias may have resulted in selective publication of studies reporting significant differences. It was not possible to investigate the extent of this given the low number of eligible studies identified.

Interpretation

A structured review published by the King's Fund in 2011 found a similar lack of evidence regarding the effects on intrapartum outcomes of implementing a policy of continuous consultant presence on labour ward.²¹ They considered the skill mix, experience and deployment of available staff to be of greater importance and more amenable to change, as the costs of continuous consultant presence are likely to be prohibitive.

Case studies from hospitals in the UK which have introduced, or have considered, continuous resident consultant labour ward presence highlighted a number of key factors to be taken into consideration in relation to this model of intrapartum care.²² Interviewees felt that such a model could only be introduced within existing budgets in large urban hospitals with a high number of deliveries and a high proportion of 'high-risk' women, as hospitals are remunerated more highly for care of women with more complex problems. Whether limited resources would be best used providing additional consultant or midwife cover at other times or in other areas in order

to improve outcomes is unclear. Those introducing resident consultant presence felt it important that any model is considered equitable by consultants, rather than new consultants taking resident night shifts and established consultants being on call from home. In addition, although junior staff generally considered that training and support was improved through continuous consultant presence,^{18,23} it was felt by interviewees that the step-up from a trainee to a consultant would become effectively much greater with continuous resident consultant presence, as trainees would never have had to act independently during their training without a consultant available to assist.

The Cochrane Effective Practice and Organisation of Care (EPOC) group remit is to undertake systematic reviews of educational, behavioural, financial, regulatory and organisational interventions designed to improve health professional practice and the organisation of health-care services. They note that randomised controlled trial (RCT) evidence is rarely available to evaluate health service interventions²⁴ but that cluster randomised controlled trials could provide the most robust evidence for assessing health system interventions. The most robust future research design to address this question would thus be a cluster RCT. In the absence of randomised controlled trial evidence, the EPOC group recommend inclusion of non-randomised trials, controlled before-after studies or interrupted time series analyses in reviews. In the context of services planning to introduce 24-hour resident consultant labour ward presence, the easiest study design to

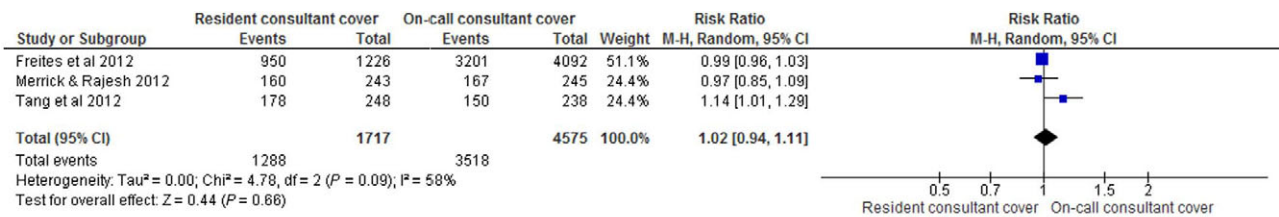
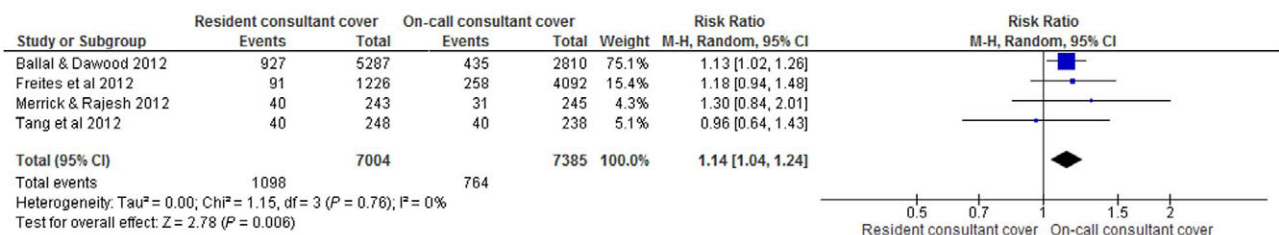
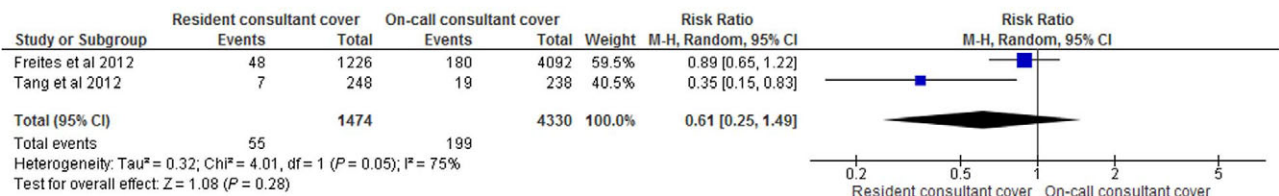
(a) Spontaneous vaginal delivery**(b) Instrumental delivery****(c) Emergency caesarean section****(d) Admission to neonatal unit**

Figure 1. Meta-analysis of main outcomes; unadjusted risk ratios comparing resident consultant presence with other models of consultant cover.

implement to evaluate the outcomes of the change would be an interrupted time-series study, in which outcomes are measured repeatedly both before and after the intervention, with at least three measures before and after the change,²⁴ and adjustment made for differences in the characteristics of women delivering in each time period.

Conclusion

This systematic review provides no clear evidence of different intrapartum outcomes and safety of care with a

model of 24-hour resident consultant presence on the labour ward compared with other models, as the quality of the available evidence identified was low. Further evaluation of outcomes following the introduction of resident consultant presence using robust study designs with adjustment for differences between groups and over time, and associated economic evaluation, needs to be undertaken to determine whether there are differences in intrapartum outcomes, and whether the provision of this model of obstetric care is the most effective use of available resources.

Disclosure of interests

None declared. Completed disclosure of interests form available to view online as supporting information.

Contribution to authorship

MK and JJK conceived the idea for and designed the study. The searches were run by JH. MK and JH screened the papers and extracted the relevant data. The analyses were run by JH. All authors drafted and revised the manuscript.

Details of ethics approval

Ethics approval was not required for this systematic review of existing literature.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Data extraction: continuous consultant obstetric cover – systematic review.

Figure S1. Flowchart of searches and screening.

Table S1. List of studies excluded at full text stage. ■

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