

# From the Medical School ...

## Debriefing women after a Caesarean section: attitudes and experiences of doctors, midwives, and patients

Zoe Tomaszewski; Alison Sambrook, MRCOG

This is the second of two articles, the first being published in the previous issue of the *MBMJ*

The results from this survey are reassuring. The majority of our women felt we provided either good or excellent debriefing discussion following Caesarean section.

It is understandable that women would prefer to speak to the operating surgeon about their experience. What is clear is that, with the increased introduction of shift-based working for doctors, continuity of care and seeing the surgeon who operated for debrief is often not feasible.

We should be mindful as a profession not to leave the discussion to the most junior member of the team without appropriate training. Poor experience around the time of birth can have lasting effects for both mothers and their partners.

An interesting finding was that women were not especially concerned about information on future pregnancies at the time of this survey. Maybe they feel that a future pregnancy is definitely not on their 'to do list' at the time they were surveyed? Would we get a different response six months later?

Alison Sambrook

Zoe wrote this article as a fifth-year student at Lancaster Medical School.

### INTRODUCTION

In the UK, roughly a quarter of women deliver by Caesarean section (CS),<sup>(1)</sup> and these women are at risk of developing postnatal depression and post-traumatic stress reactions.<sup>(2-6)</sup> Postnatal debriefing has been suggested as a tool to reduce negative outcomes from *all* births and although there is little evidence that it improves depression, anxiety or post-traumatic stress disorder,<sup>(7-9)</sup> studies show it improves maternal confidence for future pregnancies and that women welcome the opportunity to speak to a knowledgeable person about the birth.<sup>(10-12)</sup>

Research exploring the attitudes of midwives and doctors towards debriefing is lacking. Only two relevant studies were identified in the literature, both looking at midwives' views on debriefing after *all* births. One small questionnaire-based study found that 43% of midwives believed debriefing was helpful after traumatic deliveries and 12% felt it was helpful to some women.<sup>(13)</sup> Three quarters of midwives were comfortable conducting debriefing sessions. Reported reasons for not debriefing included: time; debrief not requested; and inappropriate referrals. A small focus group of midwives

identified several themes that should be included in a postnatal debrief: the opportunity to talk about the birth; ensuring the woman had a clear narrative of events; answering questions; and minimising feelings of guilt.<sup>(14)</sup>

There is currently no universal model for the provision of postnatal debriefing services in the UK;<sup>(15)</sup> however, NICE guidelines recommend that after a CS women should be given the chance to speak with staff regarding the reason for their CS and be provided with verbal and printed information about birth options for future pregnancies.<sup>(16)</sup> Standard operating procedures require that debriefing is carried out after a CS and the University Hospitals of Morecambe Bay (UHMB) has a *pro forma* for this purpose, a copy of which must be given to the woman.<sup>(17)</sup> However, a recent audit which was reported in a previous issue of the *MBMJ* found that the process of debriefing was inadequately undertaken in the trust and that use of the standard debriefing *pro formas* was poor.<sup>(18)</sup>

This study had two main aims: to investigate the experience of both staff and patients with respect to debriefing after a CS; and to investigate what staff and patients feel are the important themes to cover during a debrief. The findings would not only be helpful when planning service improvements, but will also add to the sparse literature on debriefing after a CS.

### METHOD

A cross-sectional research design was applied. Data was collected over a seven-week period as part of a student placement in obstetrics and gynaecology. Two original questionnaires (see Appendices A and B) were designed in order to explore the experiences and attitudes of staff and patients towards debriefing after a CS. To maximise responses, the questionnaires consisted of mainly simple nominal or dichotomous questions which would be quick to complete. Questionnaires were completed anonymously. The patient part of the study was approved by the audit office at Royal Lancaster Infirmary (RLI) and was conducted as a quality improvement exercise.

#### Participants and procedure

An opportunistic sample was utilised and participants were recruited through direct enrolment and via email (staff only). Participants included doctors and midwives working in the obstetrics and gynaecology departments in UHMB, and women who had a CS at RLI.

#### Experiences of debriefing

Questions asked staff about training, whether they had ever debriefed a woman after a CS, where they documented this, whether they had provided information leaflets or directed her to relevant websites, and when they would not debrief a

woman after a CS. Questions asked patients whether they had been debriefed after their CS, how satisfied they were with this, whether they had received information leaflets or been directed to websites, who they would prefer to give the debrief, and how they would like the information.

### Attitudes towards debriefing

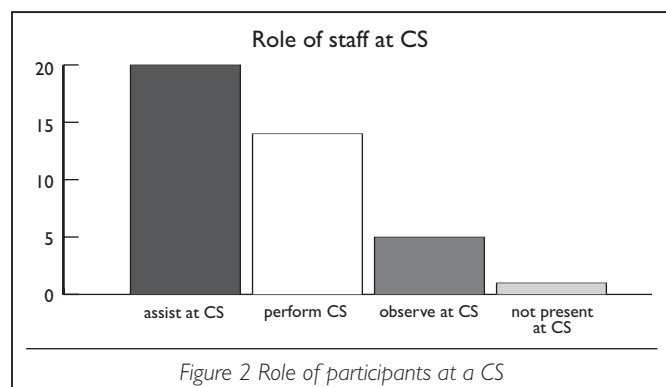
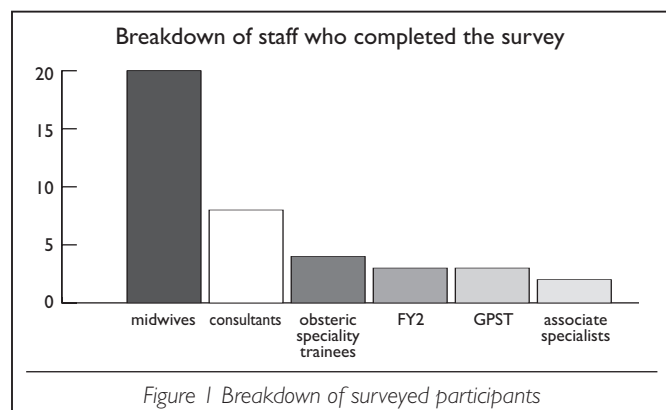
Staff were asked how important and beneficial they thought debriefing was using a five-point rating scale. They were also asked who they thought was responsible for providing the debrief, when it should be done, and how many sessions were appropriate.

Nine topics, which had been decided through discussion with a consultant obstetrician and should include all the potential areas for discussion after a CS, were presented. Staff and patients were asked to rate these in order of importance (from one to nine) for including in the debrief discussion.

## RESULTS AND DISCUSSION

### Participants

Questionnaires were completed by 20 midwives, 20 doctors, and 20 patients. The breakdown of staff roles can be seen in figure 1. Of the staff, 14 were surgeons who performed CS (35%) with the remainder assisting, observing, or not attending CS (see figure 2).



### Staff and patient experiences of debriefing

In this study, 17 of the 20 women surveyed (85%) said they had been debriefed after their CS. A summary of their experiences can be seen in table 1. The three women who had not had a debrief said that they would have liked one. This suggests that staff still need reminding to conduct these discussions with their patients. Nevertheless, the results are very encouraging after the recent audit showed little evidence of debriefing taking

Question	Results			
Who had spoken to them about their CS?	doctor and a midwife 65% (11 / 17)	doctor only 29% (5 / 17)	midwife only 6% (1 / 17)	
How would you rate this discussion?	poor 0% (0 / 17)	adequate 18% (3 / 17)	good 59% (10 / 17)	excellent 24% (4 / 17)
Did they give you any information leaflets?	yes 41% (7 / 17)	no 59% (10 / 17)		
Did they direct you to any websites about CS?	yes 12% (2 / 17)	no 88% (15 / 17)		

Table 1 A summary showing the percentage of women giving each response to the questions relating to their experience of debriefing after CS

place. The recommendations from the audit were to remind all staff to debrief their women after CS and to include the debrief *pro forma* on the hospital electronic patient records. It is difficult to make a direct comparison with the previous audit data as this study assessed debriefing services by asking patient's directly if they had been debriefed, rather than searching their records for documented evidence of debriefing. Therefore, there may be a mismatch between actual practice and what is documented in the notes. It would still be worthwhile re-auditing patient records to see if use of debrief *pro formas* has improved since the initial audit. All the same, the current study has shown that debriefing services are now not as poor as found in the previous audit, and this may be due to the recommendations put in place by that audit, which would highlight the value of audit in improving our practice.

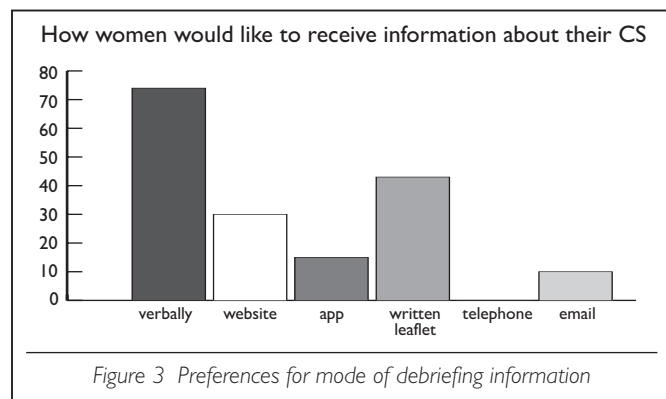
Table 2 shows staff experiences of debriefing women after CS. The majority of staff had debriefed a woman after CS at some point and the two doctors who had never debriefed a woman were both FY2 doctors who would not usually be responsible for talking to women after CS. Half the doctors and only one midwife had been trained to debrief after CS. Untrained staff included consultants and associate specialists, therefore results were not just influenced by the junior doctors who do not usually get such training. Despite the lack of training the majority of staff had, at some point, debriefed a woman after CS. This raises the question of whether training is in fact necessary.

Percentage of staff who ...	Doctors	Midwives	Total
... had received training on how to debrief a woman after a CS	50% (10 / 20)	5% (1 / 20)	28% (11 / 40)
... had ever debriefed a woman after a CS	90% (18 / 20)	90% (18 / 20)	90% (36 / 40)
... had debriefed a woman when there were not present at the CS	75% (15 / 20)	65% (13 / 20)	70% (28 / 40)
... had given women information leaflets during the debriefing	11% (2 / 18)	33% (6 / 18)	22% (8 / 36)
... had directed women to relevant websites during the debriefing, eg about future pregnancies after CS	11% (2 / 18)	33% (6 / 18)	22% (8 / 36)

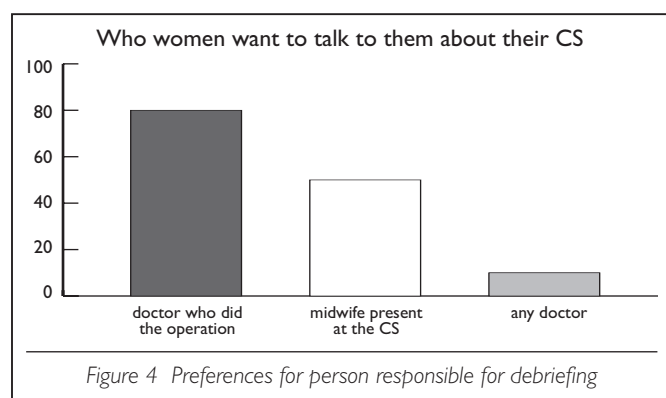
Table 2 The experiences of staff debriefing women after a CS

The results also show substandard use of resources. Less than half the women received information leaflets and fewer were directed to relevant websites, for example about future births after CS. Only a few members of staff said that they used these when debriefing a patient. In some instances, this may have been due to lack of information leaflets on the wards, but

directing patients to websites, such as the Royal College of Obstetricians and Gynaecologists (RCOG), should have been quick and easy to do. This is important as NICE guidelines state that women should be given printed information about birth options for future pregnancies and this is clearly not being done well in the hospital trust. The women surveyed said that they would prefer to receive information verbally, as an information leaflet or through a website (see figure 3), and these methods would be easy to implement.



The majority of women had been spoken to by both a doctor and a midwife. This is useful as they could provide different viewpoints of the operation, for example the surgeon would be better placed to speak about complications and the midwife could explain what happened to the baby. The majority of women said they would rather be debriefed by the surgeon (see figure 4) and would rather be spoken to either when they first wake up or 1-2 days after the CS (see figure 5). This could be very difficult to accommodate due to shift changes and the short length of stay in hospital for most women after their CS. Indeed, 70% of staff said that they had debriefed a woman when they were not present at the CS, showing that this is common practice.



Documentation of debriefing occurred in a variety of places (see figure 6) and there was no difference between midwives and doctors regarding this. Only eleven members of staff (28%) said they used the trust's debrief *pro forma*, and hopefully the move to put it on the hospital's electronic record system will improve their use.

The reasons doctors gave for not debriefing women included: time constraints; not attending the CS; concerns they could not answer questions; and not being trained to offer a debrief (see

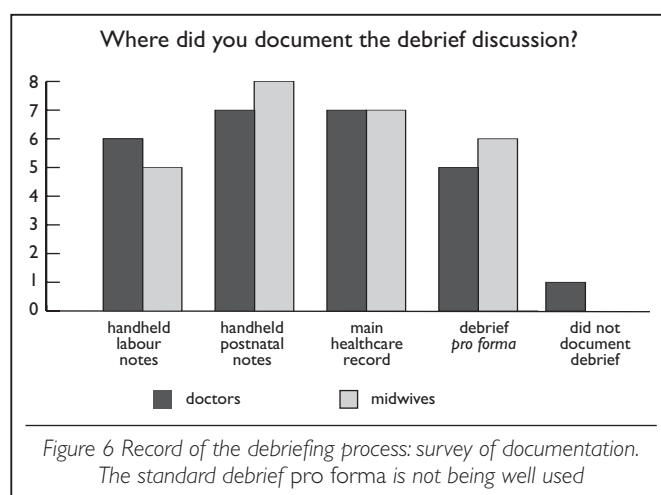
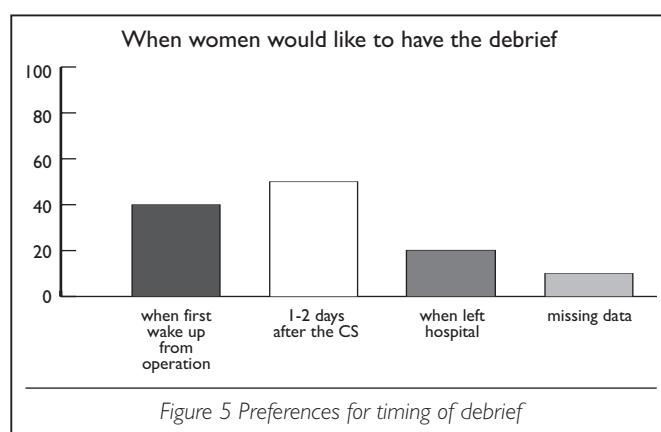
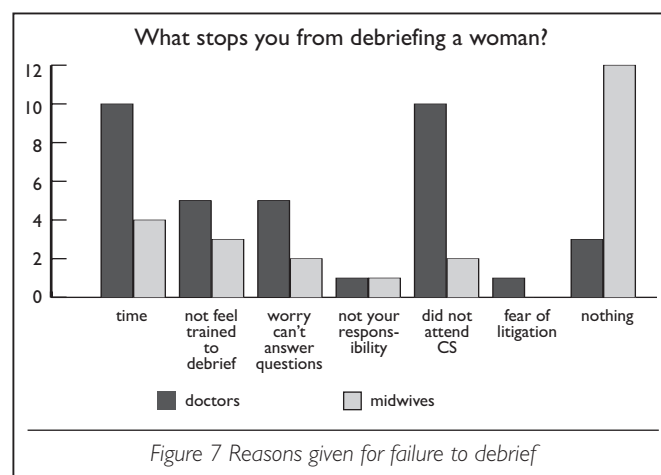


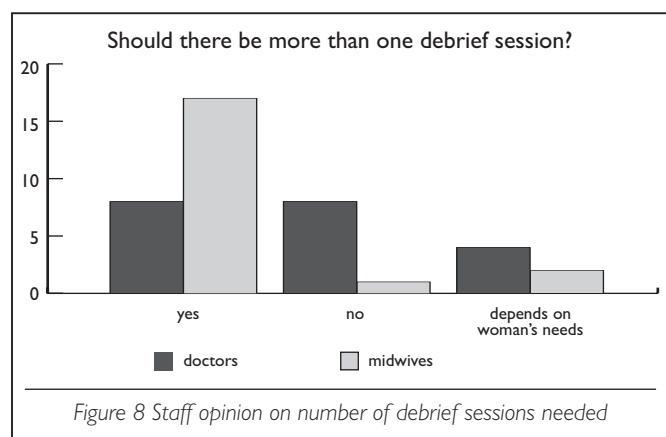
figure 7). The latter two reasons were only given by the non-specialty trained doctors and would be the expected response by this group. Fewer midwives said that anything stopped them from debriefing women; this may be as they have more opportunity to speak with the woman after delivery.



### Staff attitudes towards debriefing

Thirty (75%) participants felt surgeons were solely responsible for debriefing after CS; the remainder felt it was the joint responsibility of both surgeon and midwife. The majority of respondents (88%) felt it was 'very important' to debrief a patient and 75% felt that it was 'very beneficial' to a woman to be debriefed. No participants rated debriefing as 'not important' or 'not beneficial'.

Twice as many midwives than doctors said that more than one debrief session should be offered (see figure 8). However, several members of staff said that the number of sessions depends on how satisfied the woman is with what happened. Although all staff stated that debriefs should be done before the woman leaves the hospital, several midwives commented that they may need follow-up sessions in the community or clinic. Therefore, the appropriate amount of debriefing should be decided on an individual basis.



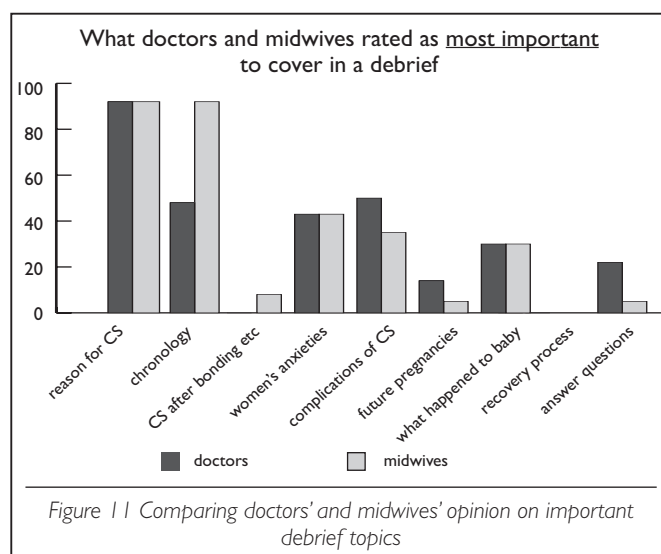
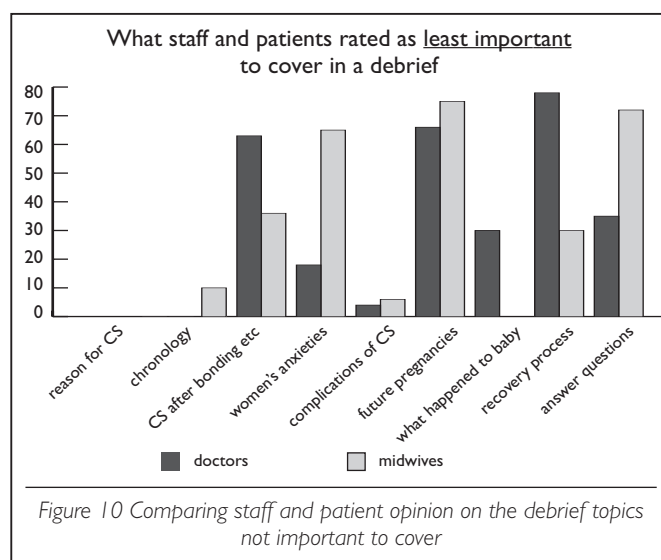
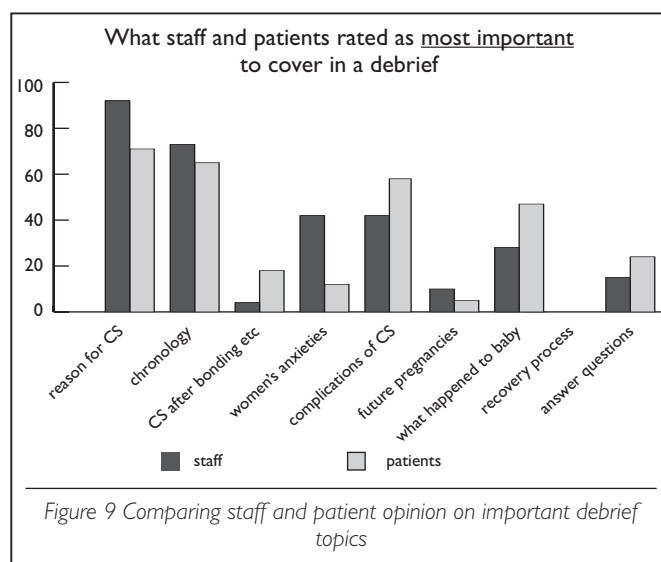
#### What should be included in a debrief discussion?

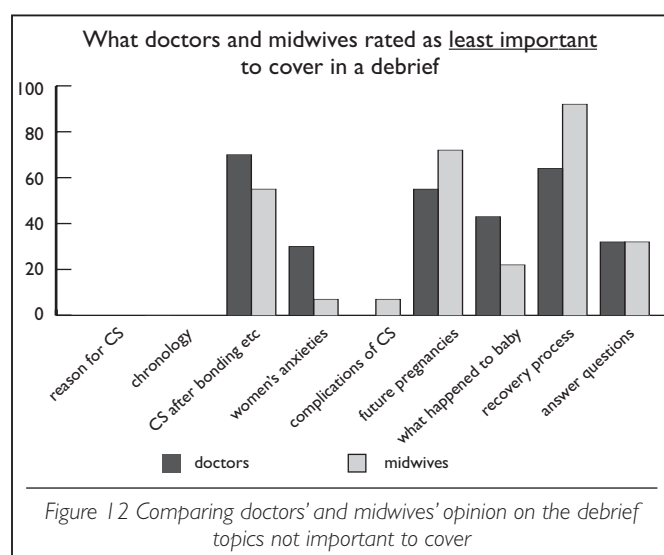
The question asking participants to rank nine topics (see box below) in order of importance for inclusion in a debrief was only completed fully by 14 doctors, 14 midwives, and 17 patients. The percentage of respondents ranking each topic in the top three and the percentage ranking each topic in the bottom three can be seen in figures 9 to 14. These figures compare the different groups of participants and gives a breakdown of which areas participants felt were the most and the least important to be covered in a debrief.

#### The topics which participants were asked to rate in order of importance

- explain the reason for the CS
- explain what happened, when, and why (chronology of events)
- explain whether the CS will affect bonding, breastfeeding, or being able to hold the baby
- explore the woman's anxieties, feelings and thoughts surrounding the CS
- inform the woman of any complications during the operation
- give information on how this CS will affect future pregnancies and what the birth options are
- explain what happened to the baby during and after delivery (eg what time they were born, whether they cried straight away, whether they needed any help with breathing)
- explain how long it will take to recover after the operation
- answer any questions the woman or her partner has

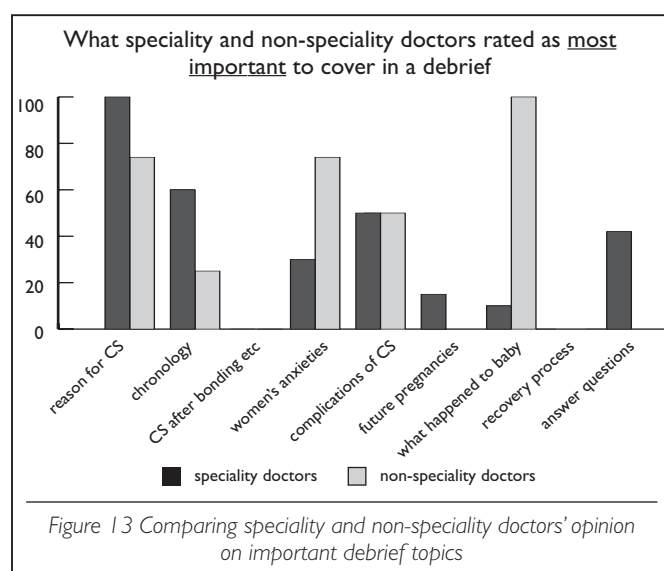
Overall, there was agreement between the doctors, midwives and patients that the most important topic to cover during a debrief discussion was *explaining the reason for the CS*, and *explaining the chronology of events* was the second most important topic. *Informing the woman of any complications* was ranked as the third most important topic by the doctors and patients, but was not ranked this highly by the midwives.





Many commented that it was difficult to rank the topics as all were equally important. However, from the responses gained it gives a good insight into what they believe are the most and least important things to be included in a debrief. This is relevant as time constraints may mean that staff discuss only the subjects they think are most important.

The themes staff ranked as less important to cover during a debrief included *giving information on future pregnancies*, the *effect of the CS on bonding, breastfeeding and holding the baby*, the *recovery process*, and *answering the woman's questions*. Despite the recommendations by NICE about the use of the debrief for advice on future pregnancies, non-specialty doctors and patients themselves were not so persuaded. Indeed, many women commented that thinking about future pregnancies was the last thing on their minds at that time. Although it is important to inform women about the impact of their CS on prospective pregnancies, is it necessary to have this discussion immediately after the operation? If women are not ready, or not interested in hearing this information, one would wonder whether it would be retained. Perhaps it would be more appropriate to have this information given by the midwife or general practitioner at a later stage, for example at the six-week check.

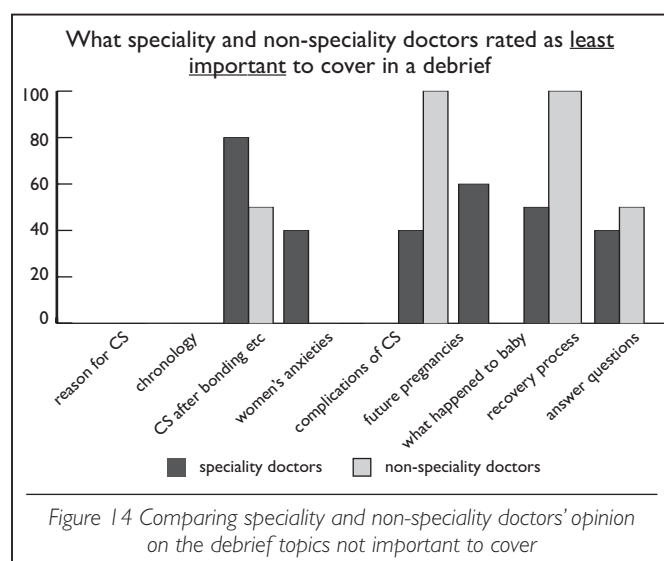


Interestingly, the non-speciality doctors placed more emphasis on *exploring the woman's anxieties* compared to the speciality-trained doctors. This may be as FY2s and GPSTs have had more recent training in communication skills and the importance of establishing the concerns of the patient. Indeed, although overall the topic *what happened to the baby during and after delivery* was ranked quite low among staff, all junior doctors placed this in the top three topics that should be included in a debrief. The women also ranked this topic quite highly, suggesting that this is an area that staff should consider included in their debrief discussion.

## RECOMMENDATIONS

This research has highlighted several areas which could be changed in order to improve debriefing services in the trust. (See box on next page for summary.) All women should be offered the opportunity to speak to a doctor and a midwife about their CS and where possible to speak to the surgeon who performed the CS. As the latter can be difficult to achieve, a short debrief by the surgeon while the woman is in recovery may be acceptable with a follow up debrief 1-2 days later by a different member of staff if necessary. Staff should use the debrief *pro formas* to guide and document debrief discussions and all women should be discharged with a copy.

It may be worthwhile amending the debrief *pro forma* to ensure that the important areas are covered during the debrief discussion, including information on birth options for future pregnancies, which is part of the NICE guidelines. Although, as women did not feel that getting this advice was important during the debrief discussion, perhaps NICE need to amend their guidelines and advise that this information is provided at a later stage. The NICE guidelines for CS state that information on future pregnancies should be given while they are in hospital but can be provided at a later date if the woman prefers. This recommendation was born from the *Guideline Development Group* discussions rather than from empirical





### Recommendations to improve debriefing services in the trust

- remind staff to:
  - debrief all women after a CS
  - use the debrief *pro forma* to guide and document discussions and give a copy to the patient
  - offer women information leaflets and direct them to appropriate websites
- revise the provision of leaflets on the postnatal ward
- revise the content of the leaflets to include helpful websites
- ensure that the following areas are covered in a debrief:
  - the reason for the CS
  - chronology of events in the CS
  - explain any complications of the operation
  - what happened to the baby during and after delivery (eg what time they were born, whether they cried straight away, whether they needed any help with breathing)
  - the effect of the CS on future pregnancies and deliveries (NICE recommendations)

evidence. It would be useful to conduct a larger-scale study to investigate women's preferences for this information in the immediate aftermath of a CS, which could be fed back to NICE.

Staff should be prompted to offer all women information leaflets after their operation and direct them to helpful websites about CS, such as the RCOG website about birth after previous CS or the NHS website on recovering after a CS. These websites could also be incorporated into the leaflet.

## CONCLUSIONS

There are several limitations to this study. Firstly, the sample size was relatively small. This was due to the research being done as part of a student placement, therefore, time to collect data was limited. It is also important to note that only four fully completed ranking questions from non-specialty trained doctors were available; therefore, it is difficult to make any conclusions regarding the differences between the specialty and non-specialty doctors. Secondly, as an opportunistic sample was used for ease of collecting data, perhaps only those with positive views on debriefing completed the survey producing biased results. Thirdly, the majority of staff questioned said they had not received any training on debriefing; however, perhaps staff thought the question was asking about 'formal training' and as it is often done informally this may account for the findings here. Rewording the question may yield different results. Finally, this study did not specifically look at the attitudes of the woman's partner towards debriefing after the CS. This is important as many partners are present during the operation and could be affected by the events surrounding the delivery. Future work could investigate what the partners' needs are with respect to debriefing after CS.

In conclusion, this is the first piece of research that investigates doctors', midwives' and patients' experiences and attitudes around debriefing women after a CS. The research was conducted to investigate the apparent absence of debriefing in the hospital trust and it has shown that in reality almost all women are being debriefed and that they are very satisfied with these discussions. There was generally some consensus between what doctors, midwives and patients thought were important topics to include in a debrief. Recommendations have been put forward to help improve debriefing services in the trust.

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## APPENDIX A

### STAFF QUESTIONNAIRE

1. Are you a...
 

<input type="checkbox"/> Consultant	<input type="checkbox"/> Associate Specialist	<input type="checkbox"/> Obstetric Speciality Trainee
<input type="checkbox"/> Midwife	<input type="checkbox"/> other (please state) _____	
  2. What is your role during a Caesarean section?
 

<input type="checkbox"/> perform CS	<input type="checkbox"/> assist at CS	<input type="checkbox"/> observe at CS	<input type="checkbox"/> not present at CS
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  3. Who do you think is responsible for debriefing a woman after a CS?
 

<input type="checkbox"/> surgeon carrying out the CS	<input type="checkbox"/> midwife looking after the woman
<input type="checkbox"/> other (please state) _____	
  4. How important do you think it is to debrief a woman after a CS? (1 not important; 5 very important)  
 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_
  5. How beneficial to a woman do you think it is to be debriefed after a CS? (1 not beneficial; 5 very beneficial)  
 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_
  6. Please rank the following 9 points in order of how important you think it is to cover them during a debrief  
*(1 most important; 9 least important- please only use each number once):*
    - explain the reason for the Caesarean section
    - explain what happened, when, and why (chronology of events)
    - explain whether the Caesarean will affect bonding, breastfeeding, or being able to hold the baby
    - explore the woman's anxieties, feelings and thoughts surrounding the Caesarean section
    - inform the woman of any complications during the operation
    - give information on how this Caesarean will affect future pregnancies and what the birth options are
    - explain what happened to the baby during and after delivery (eg what time they were born, whether they cried straight away, whether they needed any help with breathing)
    - explain how long it will take to recover after the operation
    - answer any questions the woman or her partner has
  7. Do you think there should be more than 1 debrief session?
 

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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  8. Do you think the debrief should be done before the woman leaves the hospital?
 

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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  9. What stops you from debriefing a patient? (please tick all that apply)
 

<input type="checkbox"/> time
<input type="checkbox"/> do not feel appropriately trained to do so
<input type="checkbox"/> worry you will be unable to answer the woman's questions
<input type="checkbox"/> do not think that it is your responsibility to debrief after CS
<input type="checkbox"/> did not attend the CS
<input type="checkbox"/> fear of litigation
<input type="checkbox"/> do not think that debriefing is important
<input type="checkbox"/> concern that talking about the CS may upset the woman
<input type="checkbox"/> other (please state) _____
  10. Have you had any training on how to debrief a woman after a CS?
 

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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  11. Have you ever debriefed a woman after a CS?
 

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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  12. Have you ever had to debrief a woman when you were not present at the CS?
 

<input type="checkbox"/> Yes	<input type="checkbox"/> ? No
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- If you have debriefed a lady after a CS...**
13. Where did you document this discussion?
 

<input type="checkbox"/> yellow labour notes	<input type="checkbox"/> main healthcare record	<input type="checkbox"/> did not document in the notes
<input type="checkbox"/> debrief <i>pro forma</i>	<input type="checkbox"/> purple postnatal notes	
  14. Did you give the woman any information leaflets during the debrief?
 

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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  15. Did you direct the woman to any websites e.g. about future pregnancies after a CS?
 

<input type="checkbox"/> Yes	<input type="checkbox"/> No
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## APPENDIX B

### **PATIENT QUESTIONNAIRE**

1. Has anyone talked to you about your Caesarean section?  
☐ yes ☐ no
2. Who was this?  
☐ a doctor ☐ a midwife ☐ other \_\_\_\_\_
3. How would you rate this discussion?  
☐ poor ☐ adequate ☐ good ☐ excellent
4. Did they give you any information leaflets?  
☐ yes ☐ no
5. Did they direct you to any websites about Caesarean sections?  
☐ yes ☐ no
6. If no one has spoken to you about the Caesarean section, would you liked to have had a member of staff talk to you about your Caesarean section?  
☐ yes ☐ no
7. Who would you rather talked to you about the Caesarean section?  
☐ the doctor who did the operation ☐ the midwife there at the caesarean  
☐ any doctor ☐ any midwife  
☐ other person \_\_\_\_\_
8. When would you like someone to talk to you about the Caesarean section?  
☐ when you first wake up from the operation  
☐ 1-2 days after the operation  
☐ when you are back at home
9. If someone were to give you some information about your Caesarean section, how would you like it?  
☐ verbally ☐ directed to a website ☐ through an app  
☐ written leaflets ☐ over the telephone ☐ by email
10. These are some of the things that we could talk about after you have had a Caesarean section.  
Please rank them in order of how important it would be for you for these things to be covered  
(1 most important; 9 least important- please only use each number once):
  - talk about the reason for the Caesarean section
  - talk about what happened, when, and why (chronology of events)
  - explain whether the Caesarean will affect bonding, breastfeeding, or being able to hold the baby
  - explore the woman's anxieties, feelings and thoughts surrounding the Caesarean section
  - inform the woman of any complications during the operation
  - give information on how this Caesarean will affect future pregnancies and what the birth options are
  - explain what happened to the baby during and after delivery (e.g. what time they were born, whether they cried straight away, whether they needed any help with breathing)
  - explain how long it will take to recover after the operation
  - answer any questions the woman or her partner has



# Kingella kingae: a review

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Iain wrote this article during his second-year studies at Lancaster Medical School last year.

## INTRODUCTION

Over the last 20 years *Kingella kingae* (*K kingae*) has been recorded in several regions, including Israel, Western Europe and northern America.<sup>(1)</sup> It was previously thought not to be a significant cause of disease in humans, but newer detection and diagnostic techniques have demonstrated its association with a variety of conditions. It is included in the HACEK group (*Haemophilus spp.*, *Actinobacillus actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corrodens* and *Kingella kingae*) of gram negative, slow-growing fastidious bacteria that cause endocarditis.<sup>(2)</sup> It is an emerging pathogen that has been linked to osteomyelitis in children.<sup>(3)</sup>

Common investigations for osteoarticular infections are usually investigated with techniques such as radioisotope scanning (involving compounds such as technetium-99, gallium-67 and indium-111), magnetic resonance imaging (MRI), X-ray and laboratory tests.<sup>(3)</sup> The laboratory tests involve analysis of erythrocyte sedimentation rate (ESR), white cell count and blood culture. Due to the difficulty in identifying organisms by culture, antibiotic choice is based on local sensitivities. *K kingae* itself has been best identified using polymerase chain reaction (PCR) analysis since 1998, and this is currently the gold standard for detection.<sup>(4)</sup>

The aim of this review is to gain an understanding of this relatively new pathogen and to review methods by which it can be identified. The method of research was to critically analyse literature from a database, using specific search criteria.

## MICROBIOLOGY

*K kingae* is a gram negative, slow-growing fastidious bacterium. It has been described as appearing under the microscope in pairs, or short chains, with tapered ends. It is occasionally misidentified as gram positive because it is liable to resist decolourisation. It is difficult to culture, requiring specialist media.<sup>(5)</sup> When colonies are grown, they produce marked impressions on agar surfaces, leaving identifiable patches upon removal. It produces spreading-corroding growth, which is indicative of long 'type IV pili',<sup>(6)</sup> and smooth colony growth, which indicates a variant colony. *K kingae* is an acid-producing bacterium, which uses only glucose and maltose as substrates. It has been described commonly in literature as non-motile, oxidase positive and exhibiting negative catalase urease reactions.<sup>(7)</sup>

## EPIDEMIOLOGY

A 1995 study examined Israeli paediatric services to demonstrate the incidence of invasive *K kingae* infections.<sup>(8)</sup> All southern Israeli children are born in and receive care at one facility; therefore, the incidence could be calculated from this population. Invasive infections were defined by being able to isolate the organism from normally sterile bodily fluids. Patients were surveyed during a 15-year period, from 1998 to 2001. Seventy-four cases of invasive infection were recorded, 50 being male and 24 being female. Seventy-three patients were below the age of 48 months, while one was a 21-year-old adult. The most common site of infection was the skeletal system, accounting for 48 patients (65%). Occult bacteremia was seen in 22 patients (30%), lower respiratory tract infections in three patients (4%) and endocarditis in the adult patient (1%).

*K kingae*'s seasonal distribution has been noted as similar across several isolated populations. With the Israeli study illustrating 29.4% of cases occurring between January and June, and 70.6% occurring from July to December. Asymptomatic colonisation of the upper respiratory tract is common, and this appears to be the first stage of infection.<sup>(6)</sup> The posterior pharynx is believed to be the area where colonisation begins, and it is the epithelial cells located here that are susceptible to adherence by the pathogen reference.

### Pathophysiology

Bacterial factors that allow adherence to cells, colonisation and seeding, are not completely understood, but an important factor seems to be *type IV pili*. *K kingae* has been observed adhering to a variety of cells in the respiratory tract and synovial joints; cells adhered to include Chang cells, Hep-2 (human larynx) and SW982 cells (human synovial). Some researchers have concluded that the fibres expressed by *K kingae* are, in fact, *type IV pili*, and these are required for adherence. Genes in the cluster *K kingae pilA2-pilA2-fimB* were all found to be transcribed.<sup>(6)</sup>

Patients with *K kingae* infections usually present with respiratory tract also, among other symptoms concurrent with viral pathology around the oropharyngeal region, suggesting damage to the mucosa helps facilitate invasion into the bloodstream. A haemolysin toxin, capable of lysing epithelial cells, is produced by *K kingae*.<sup>(9)</sup> When *K kingae* is able to remain in the bloodstream it can then disseminate into bones, joints or the epicardium.<sup>(1)</sup>

It is usually the long bones that are affected by *K kingae*. Patients are usually known to endure symptoms for a longer duration than those with septic arthritis (9.2+/-9.4 vs 3.2+/-3 days respectively). That being said, chronic conditions involving the bacteria remain uncommon. The long bones that are usually affected include the femur, tibia, ulna, fibula, humerus and radius.<sup>(10-12)</sup>