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Supplementary file 1

Categories of work system elements and how they influence electronic fetal monitoring.

Work system component	**Influences on electronic fetal monitoring**	**Illustrative data extracts**
Persons	Recognising deterioration and making decisions depended on professionals' technical proficiency, including knowledge, skills and experience with electronic fetal monitoring, in face of inherent uncertainties about the ability of CTG to provide accurate information about the wellbeing of the fetus Characteristics of those in labour, including previous history, risk factors (including those emerging during the labour), and progress all had impacts on professional's decisions and actions	She [midwife] intimated that the challenge, really is in the interpretation of the CTG trace and to her, she thinks that everybody's interpretation seems to be different. [observations, Site 3]. [The Registrar] said the interpretation of CTGs is all about pattern recognition. You have to know the patterns and you know when you need to give more time and let the labour progress as normal or when actually you have to intervene and do something about it and get the baby out quickly. He said that predicting the future based on patterns is what they do… he said there are guidelines, and he gave me the mnemonic DR C BRAVADO…he was saying that when you're looking at a CTG you're not just looking at a snapshot, you're looking at a whole patient's journey. [observations, Site 1]
Tools and technology	Availability, usability, functionality of tools and technology related to electronic fetal monitoring Inherent uncertainties of CTG as a diagnostic test	"Well I suppose one of our issues is lack of monitors. So, as a ward, as an antenatal ward, we only have one monitor that works at the minute and we've been denied funding for any further. So, they're still going through that application process but that feels a bit ridiculous considering that we may have 13 patients requiring CTG monitoring." [Midwife, Site 1]

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		So these machines have a print of the trace and the screen just shows the heartrate, the number. One reason she prefers to look at the paper is that there are different presentations of the trace between the computer version and the print out, so the print has 9 grid boxes […] whereas the computer shows it with 10 grid boxes. So the trace itself looks different. And she was saying, you have to be careful because of that and that some people don't realise. [observations, Site 3]
Tasks	Content, cognitive and physical demands, and organisation of work tasks, activities, relationships, and responsibilities in relation to electronic fetal monitoring Task loads and how they were distributed across different professional groups	I saw the midwife from the assessment unit and she was saying they had been really busy that evening and said she'd had a horrendous day and it was too much for one person. [observations, Site 3] "Sometimes what has happened is there has been disagreement between the registrar and the midwife in interpreting the CTG. One would say it's a pathological CTG, for example the midwife would say it's a pathological CTG and needs action; whereas the registrar would say this is a suspicious trace, we can just continue on with conservative measures. In that case it would be brought to my attention and it's a matter of going through this trace again from the beginning, keeping in mind the patient's progress and risk factors for monitoring the baby, and looking through the trace to see what the best course of action could be." [Consultant obstetrician, Site 3] "I find… when I call the other midwife [for fresh eyes] I walk back to the room with them (…) and sometimes I find myself saying, 'Oh, the CTG has been absolutely lovely' or 'no concerns with the CTG' or something

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		like that, just as part of the picture of what's going on with the woman. Where probably the idea would be that I don't do that because they can decide for themselves." [Midwife, Site 2]
Organisation	How time, space and resources are managed in relation to electronic fetal monitoring Staffing and workload, including staff-patient ratios Monitoring and escalation processes and policies Teamwork, communication and collaboration Ability to speak up/psychological safety Training provision, quality of training and ability to attend Role modelling Purchasing and stocking decisions in relation to equipment	"It depends how concerned they are. (…) So, the routine would be to call the coordinator, the coordinator calls a tier two, and the tier two calls a tier three. But, regularly, you will see steps skipped out if they're more worried about it. So, the midwife in the room, if they're an experienced midwife, might feel (…) to call the coordinator, they're going to … call the registrar... which I think is reasonable." [Senior midwife, site 2] "There was no dedicated time for training. I think it's up to six hours. They used to give us time and now they're getting tight on time, so some things are going on and on. [Senior midwife, site 1] "It can be quite a struggle [to find someone to help with "fresh eyes"], and sometimes it's not always hourly, if there's only one person… And then again, that takes away from the whole fresh eyes thing, if you're the only person who's doing everybody's fresh eyes, it's the same two people that are looking at the CTG." [Midwife, site 1]
Internal environment	Physical environment, including layout of the labour ward and individual rooms	"What I find is the environment in that, the room is small, and trying to get the machine in is…we always seem to be tight for space. There is never enough space." [Senior midwife, Site 2] There's absolutely no corners, so you can very easily get a clear view of is there anyone in the corridor you can

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		grab for an opinion or something, oh and sorry, and so one side are the doors to all the rooms and on the other side is the entrance to the theatre. [observations, Site 1]
External environment	Macro-level policy, including guidance and policies on fetal monitoring and maternity care Funding decisions impacting on availability of resource Availability of suitably trained staff Design and supply of equipment External pressure to focus on specific quality indicators Local healthcare provision and local demand patterns	"I'd say in the last four years or so there are three or four stickers that have been changed, and the NICE guidelines have been changed. So, every time a new guideline comes in there's another big change for the whole unit to adopt or the staff to adopt a new system, going from one type of interpretation to the other type of interpretation. And again aligning our thinking to interpret differently when the next sticker comes. So, it takes really a while for people to adapt to a new system." [Consultant obstetrician, site 3] [The registrar] had explained earlier about the shift to training in physiological CTG and actually he said he thought this was driven by a desire to bring the c section rates down. [observations, site 3]