Women’s Views of Pregnancy Ultrasound: A Systematic Review

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ABSTRACT: Background: Ultrasound has become a routine part of care for pregnant women in most countries with developed health services. It is one of a range of techniques used in screening and diagnosis, but it differs from most others because of the direct access that it gives parents to images of the fetus. A review of women’s views of ultrasound was commissioned as part of a larger study of the clinical and economic aspects of routine antenatal ultrasound use. Methods: Studies of women’s views about antenatal screening and diagnosis were searched for on electronic databases. Studies about pregnancy ultrasound were then identified from this material. Further studies were found by contacting researchers, hand searches, and following up references. The searches were not intentionally limited by date or language. Studies that reported direct data from women about pregnancy ultrasound were then included in a structured review. Studies were not excluded on the basis of methodological quality unless they were impossible to understand. They were read by one author and tabulated. The review then addressed a series of questions in a nonquantitative way. Results: The structured review included 74 primary studies represented by 98 reports. Studies from 18 countries were included, and they employed methods ranging from qualitative interviewing to psychometric testing. The review included studies from the very early period of ultrasound use up to reports of research on contemporary practice. Ultrasound is very attractive to women and families. Women’s early concerns about the safety of ultrasound were rarely reported in more recent research. Women often lack information about the purposes for which an ultrasound scan is being done and the technical limitations of the procedure. The strong appeal of diagnostic ultrasound use may contribute to the fact that pregnant women are often unprepared for adverse findings. Conclusions: Despite the highly varied study designs and contexts for the research included, this review provided useful information about women’s views of pregnancy ultrasound. One key finding for clinicians was the need for all staff, women, and partners to be well informed about the specific purposes of ultrasound scans and what they can and cannot achieve. (BIRTH 29:4 December 2002)
ultrasound use in pregnancy. Because another recent review has explored the impact of ultrasound on psychological variables like anxiety or attachment to the baby, this topic is not addressed by the study reported here (2).

Good reasons exist for doing systematic reviews of people’s views of care. Trying to be inclusive, clear, and systematic in what is included in a review can give important new insights and limit the possibility of a biased selection of studies. There are ethical reasons, too; the effort already put into research by pregnant women, partners, and researchers should not be wasted. Methods for compiling the results of research about people’s views are just being developed, and no standard approach is yet available. Some recent reports include a synthesis of qualitative research about experiences of diabetes (3), using a technique called meta-ethnography (4); a review of cancer patients’ preferences about place of care (5), using methods for the review based on the recommendations of the English National Health Service Centre for Reviews and Dissemination (6); a review of studies about life in acute psychiatric wards in the United Kingdom, including study types ranging from participant observation to questionnaire surveys of patients (7); and a series of studies about health promotion for young people that used reviews of young people’s views alongside evidence of effectiveness (8). All these studies had in common a desire to find as much of the relevant research evidence as possible, within specified boundaries of time and space, and look at it systematically.

The review of women’s views of pregnancy ultrasound presented some particular challenges. Ultrasound is one of many methods used in pregnancy for screening and diagnosis. Some of its features may be special, for example, the chance to see the baby and the immediacy of the knowledge gained, but it is not unique and many questions we can ask about ultrasound can also be asked about other screening and diagnostic tests. The literature on these topics is extensive. The experience of antenatal ultrasound is likely to depend on several factors, such as the clinical objective of the scan and what women know about the purpose and likely outcomes. The setting for the scan, women’s interaction with staff, and the way that scan findings are passed on are also likely to have an impact. Both the technique itself and the way in which it is used have changed a great deal since ultrasound was introduced, and they continue to develop. Variation can be found between and within countries in how ultrasound is used. In addition to the inherent complexity of the subject, the review had to consider studies using a wide range of research approaches.

Methods

The review of studies of women’s views was commissioned as an addition to a project on the clinical and cost-effectiveness of routine pregnancy ultrasound. The research commissioners (the English National Health Service’s Health Technology Assessment agency) did not specify what they wanted from this extra review. The approach was developed by the lead author and then discussed and refined with the other authors.

The initial search strategy was designed to find material related to the views and experiences of women about antenatal screening and diagnosis of all types. The search of databases involved combining the terms shown in Fig. 1, and searching for material from 1981 onwards on Medline, CINAHL, EMBase, and BIDS-SSCI. It picked up approximately 200 publications, many of them providing general background. Studies that were likely to be about ultrasound were then identified from the abstracts. Studies of early miscarriage were excluded. Studies of the experiences of ultrasound by male partners of pregnant women were included.

All papers about ultrasound, and the wider reviews identified, were combed for additional relevant publications about women’s views and experiences of ultrasound. Many more were found this way, perhaps because literature about ultrasound has been published in such a wide range of journals. Forthcoming papers and work in progress were also found by contacting United Kingdom and French researchers to ask about new or key articles. The initial searches were carried out during 1998 and updated in 2002. Unpublished work and studies published in languages other than English are more likely to have been missed. Publications obtained were read by one author and sorted into three categories: relevant, background, and not relevant.

Fig. 1. Search terms.
The questions to ask of the material (listed in Results below) were developed by a process of reading and re-reading the articles. The questions chosen were, to some extent, individual to the team, and other reviewers might well come to this material with a different agenda. Papers were initially tabulated and categorized according to their relevance to the questions. They were not graded in terms of research quality, or removed from the review for reasons of poor quality, although many had problems of design and reporting.

**Results**

In all 74 studies were represented in the 98 reports identified. The studies ranged widely in terms of the questions addressed and the methods used. Table 1 shows the methods used; some studies used more than one method so the total is greater than the number of studies. Tables 2 and 3 show when and where the studies were done. Some studies did not say where they were done, and so we have guessed. Many did not give a date when the work was carried out, so we have used any information available to give a likely date (Table 2). This means that the dates in the table are probably later than they should be because some studies may have been a few years old when they were published.

The studies included in this review are shown in Table 4. The decision was made to keep studies in Table 4, even if they did not provide information directly relevant to the questions posed in the review, so that other researchers could locate the material more easily. Fifteen studies fell into this category; 3 were about opinions on the appropriate national policy about ultrasound screening (9–11), 1 was about fetal gender identification during ultrasound scans (12), and 12 were among the 22 studies assessing the psychological impact of ultrasound. In Table 4 we have tried to give information about the way that ultrasound was being used in each study. Several papers did not report this, however, which makes it difficult to look at women’s views of ultrasound in specific clinical contexts. Table 4 shows the review questions to which each study was relevant. Other background material, not included in Table 4, is cited and listed in the references.

The data have been used to address a series of questions:

- What do women know about reasons for using ultrasound and what a scan can do?
- What do women like or value about scans?
- What are women’s views about the way the scan was performed?
- What is the impact of the results?
- What might be the wider impact of ultrasound on society?

**What Do Women Know about Reasons for Using Ultrasound and What a Scan Can Do?**

A short personal account in the *British Medical Journal* (13) told of the experience of a British family doctor who received a nuchal translucency scan

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Table 1. Numbers of Studies Using Different Methods (Studies Can Use More Than One Method)

<table>
<thead>
<tr>
<th>Method</th>
<th>Self-administered Questionnaires</th>
<th>Psychometric Tests</th>
<th>Qualitative Interviews</th>
<th>Structured Interviews</th>
<th>Nonparticipant Observation</th>
<th>Randomized Trials</th>
<th>Other Trials</th>
<th>Other*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of studies</td>
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<td>20</td>
<td>21</td>
<td>10</td>
<td>7</td>
<td>8</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

* Willingness to pay, diaries, observation of mother/infant behavior.

Table 2. Estimated Date Work Was Carried Out for Studies Included in Review

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Number of studies</td>
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<td>14</td>
<td>22</td>
<td>23</td>
<td>12</td>
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Table 3. Countries Represented by Studies Included in Review

<table>
<thead>
<tr>
<th>Country</th>
<th>Scandinavia and Finland</th>
<th>United Kingdom</th>
<th>United States</th>
<th>France</th>
<th>Canada</th>
<th>Australia and New Zealand</th>
<th>Italy</th>
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<tbody>
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<td>17</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

* Austria, Belgium, Botswana, Croatia, Greece, Israel, Netherlands.
without being aware of its purpose. She was angry because she did not want to know if her fetus was likely to have Down syndrome. The rapid changes in the way that ultrasound is being used and the fact that policies differ among hospitals in the United Kingdom mean that a woman may well not know what is scan is intended to do unless she has been told. This lack of information can leave her vulnerable to a painful shock if the scan shows a problem when she was not aware that anomalies were being looked for. On the other hand, lack of information about what the scan can do may indicate that she believes that the absence of anomalies detected means that all is well.

Twenty-one studies in Table 4 are relevant to this question, although researchers addressed these issues from several angles. Most studies show some deficit in women’s knowledge of the purpose of their scan, and this tallies with studies of other aspects of prenatal screening and diagnosis (14,15). A commendably clearly reported study of women attending for routine scanning at one United Kingdom hospital found that few women were aware that one aim of the scan was to look for markers associated with Down syndrome (16). The paper describes in detail what the scans were intended to do, but many other papers fail to clarify the intent, which makes it hard to judge how well women have understood what the scan is for. One recent local study in England found that two-thirds of women who had recently had a scan including measurement of nuchal translucency thought that they had not been adequately prepared for the scan (17).

Two Swedish studies carried out in the 1990s of women coming for routine midtrimester scan, asked in different ways about women’s knowledge of what the scan was for (18–20). The women (and partners) in Uppsala (19,20) selected purposes for the scan that seemed to match well with those described by the authors, although the parents put more emphasis on the detection of malformations than the authors thought was appropriate, given the way the aims of scanning were described in the hospital information leaflet. In Lund women seemed less well informed, with 62 percent thinking that the scan was compulsory, and one-third saying that they were not given the information that the scan could detect malformations (18). A more recent Danish study of women’s knowledge about midtrimester ultrasound showed a high level of appropriate knowledge and high satisfaction with the scan (21).

A French study carried out in 1990 addressed a reported concern about women’s unrealistic expectations of ultrasound (22). Women were interviewed by telephone after the birth. Most were well informed about the purposes of mid trimester scans. Only 9 percent thought that if no anomaly was found on ultrasound, one could be sure that the fetus was normal. This view was more common, however, in women with the fewest years of education. In Santalaita et al’s study in Finland, education levels were also linked to knowledge about what the scan is for and what it can detect (23).

Gaps in the provision of information have been highlighted in some United Kingdom investigations. A study that observed routine antenatal consultations in six hospitals reported that information about fetal anomaly scanning was extremely limited, with approximately two-thirds of women receiving no information in the consultation about the purposes of scans (24). A survey of midwives and obstetricians carried out by the same team found gaps in staff knowledge about antenatal screening (25).

Researchers have tried to improve the information provided to women, although only one randomized trial has been identified (27). In a quasi-experimental study in Sweden (not included in Table 4 because it did not study women’s views), women at 7 clinics were given extra information about antenatal screening, and then their uptake of tests was compared with that of women in 10 control clinics (28). No women in either group declined ultrasound, but 1 percent (11 women) in the clinics with extra information chose to have only an early ultrasound and to avoid the mid trimester scan for detecting malformations. In a British study with historical controls, two surveys were carried out (16). In the second survey, women who were given extra written information about ultrasound scored better on some aspects of knowledge than the group without the information. In a trial of the offer of additional information (individually or in a group) about antenatal screening, the uptake of ultrasound was not affected by the intervention and was extremely high in all three groups (99%). Uptake of screening for cystic fibrosis was lower in the two intervention groups when compared with the control group. The groups offered extra information reported increased satisfaction with information received and improved knowledge when compared with the control group. Uptake of extra information was relatively low—61 percent for those offered individual sessions and 42 percent for classes (27).

Further investigations could be done to improve the understanding of staff attitudes to information giving about ultrasound (and other prenatal tests).
Good communication about these complex issues takes time, and requires considerable knowledge and confidence on the part of staff. Procedures that are seen as routine or no longer novel may not be perceived by staff as needing as much explanation as newer techniques. Explaining about ultrasound may be viewed as less important because it is considered noninvasive. Women, too, may put up barriers to obtaining detailed information about the possible outcome of a scan because of the strong attraction exerted by ultrasound, discussed below.

What Do Women Like or Value about Ultrasound Scans?

At the first scan I was only 11 weeks and didn’t feel very pregnant, but it was a marvellous sight seeing this tiny thing moving about and its heart beating. I felt pregnant then (29).

The face, and heart beating. The closest you can imagine to seeing or meeting your baby before you have him. You can “wave” to him. I would have them weekly if I could, and take friends to meet baby (30).

Table 4 contains 25 studies that provide some indication of what women like about ultrasound and a further 2 that explore what women would be willing to pay for it (31,32). Of the 25 studies, 11 gave in-depth accounts, which help to clarify what is attractive about ultrasound and also any fears that women may have (29,30,33–42).

Taken together, the 25 studies we found show that almost all the women included in these studies reacted highly positively to ultrasound. Some were unhappy about the way the scan was done (discussed in the next section). Some women get bad news during the scan and may regret having it; this is also the subject of another section. A very few women choose not to be scanned at all, or avoid scans that are intended to detect anomalies. One or two women are quoted in the studies we have reviewed who felt uncomfortable seeing the image of the fetus during the scan because they thought it intrusive, or because they were worried that they may feel too much for the fetus and then find it hard to cope if something went wrong (30,37,40). In a Canadian study, however, 99 percent of parents asked if a scan was “an intrusion into something very private that should have remained hidden” said that it was not (43).

Only 9 studies referred to fears or worries about ultrasound. In one early study from the United States, some women were afraid, before the scan, that it would be painful for them; in addition, one-half expressed the fear that it might harm the baby (37). A 1995 study from Botswana, the only study found from a poor country, reported that some women were afraid that the scan might hurt or kill them. Ultrasound was not being used routinely and was an innovation in maternity care there; women had been given little information about what to expect (41). A British study from the early 1980s found that over 85 percent of women reported the things they enjoyed about the scan, whereas 15 percent reported worries (29). Altogether, 77 percent of women in this study mentioned only enjoyable aspects and 4 percent only worries. The types of worries included fears of harm to the fetus, and concerns about what the scan might show. The enjoyable aspects were about seeing the baby or details of the baby and seeing movements. Women enjoyed the reassurance brought by the scan and feeling that their pregnancy had become more real to them. They also mentioned their partner’s presence and increased involvement with the baby (29).

In a Swedish study carried out in 1991, women interviewed before a scan had anxieties about what the scan might reveal, but only 2 percent feared that it might harm the baby (19,20). In Crang-Svalenius et al’s study, 4 percent were apprehensive that the scan might harm the baby (18). Few recent studies have reported fears about the effects of ultrasound on the baby, but that may be partly because few recent qualitative studies have explored women’s views. One exception is a study of Thai women in Australia, done in the mid-1990s, which found some fears of this kind among women who had received more than one scan. Other women in this study were very positive about the experience (38).

Four studies asked women to describe how they felt about a scan using a list of adjectives from which they had to pick one or more. Positive adjectives were far more likely to be chosen (18,19,20,44). In addition, two trials compared the reactions of women to scans where explanations were offered and a woman could see the screen (high feedback) with scans where only the operator saw the screen and the woman was told at the end of the scan that all was normal (low feedback). Women in the high-feedback groups were more likely to choose very positive adjectives to describe their feelings after the scan (45,46).

Only one study, a Swedish study of 10 women pregnant for the first time, asked women to talk in depth, before and after a scan, about their views about the unborn child (34). Ultrasound was reported by these women as having a considerable impact on them, and of increasing their awareness of bearing a child. One woman said in the interview after the scan:

It becomes obvious that it is actually in my belly, that it exists. I have realized more that it is my child that is lying in there. It made it more real, even if you won’t understand it until it comes out (34).
They were all positive about the experience of the scan, and liked the detailed explanation given to them at the time. They were relieved that no problems had been detected. Women in Black’s study (47), who were interviewed about the scan after they had lost a pregnancy through miscarriage or termination, also emphasised the powerful effect of the scan. One said:

I tried to protect myself from the eventuality of losing this baby. Even from the minute I knew I was pregnant it was almost like, OK I’m pregnant, so what? I didn’t really feel much joy because I was too anxious about having the test done, and when I saw the sonogram it was sort of a shock because, yes, there was a very vigorous heart beating and it was a baby there; and it just made me more keenly aware that I didn’t want to lose it... (47)

Summing up this section: what women like about the scan has been described by Clement et al as having three main elements: meeting the baby, sometimes with other family members; having a visual confirmation of the reality of pregnancy; and gaining reassurance about the well-being of the fetus (33). Ultrasound is different from other types of tests because it provides the first two of these alongside the third.

**What are Women’s Views about How the Scan is Performed?**

Before looking at some of the issues that women raised about the scan procedure itself, it is worth mentioning the findings of the 6 studies (of 17 relevant to this question) that reported direct observation of ultrasound clinics and scans (35,37,41,48–50). These, again, are highly time and context specific. Several authors emphasised the extent to which the mother’s experience was mediated through the person carrying out the scan. Because the image was difficult to recognize, the doctor or ultrasonographer needed to explain what was being seen. For example, in an early French study (48) the following exchange was observed:

**Doctor:** A single fetus, head down.
**Woman:** Oh, I can’t see anything.
**Doctor:** Yes, there. It’s the head.
**Woman:** Which side? I can’t see.
**Doctor:** Good. OK. BIP 4.4, cardiac activity noted, placenta in posterior position...
**Woman:** Is that the heart I can see?
**Doctor:** What? It’s the baby. Good, there is the stomach, umbilical vein...
**Woman:** It’s a shame. I saw nothing.

In another early study the women’s reactions are described in detail (37). At first most women were extremely tense (one thought she was going to be “opened up” for the procedure). The technician doing the scan reassured them with general phrases about the baby looking fine. During the phase of the scan where the dynamic image was shown, women’s attention became fixed on the screen. When they recognized some part of the baby their reactions were strong: “Oh, I see it!” The contribution of the technician was crucial to this recognition. In the account of the way scanning was carried out in a hospital in Botswana, the researchers observed that most women were unable to communicate with the person doing the scans due to lack of a common language, and only a few women saw the screen and had the images explained to them (41). The room was darkened for the scan, and women were unprepared for this and found it frightening.

In a Greek study conducted from 1990 to 1991 (35,50), more than 80 scans were observed in a large teaching hospital in Athens and a hospital in a small city. In general, the doctor did not speak during the scan except to say if the fetus was male or female and to read off the gestation from a chart. If the doctor did not say that the baby was all right, the woman usually asked (no malformations were detected in the scans she observed). Mitchell, who observed scans in Canada during 1995, put more emphasis on the social assumptions revealed in the ways that the sonographers talked about the fetus. One, for example, told a father not to say “fetus”: “Your fetus? Ugh! Don’t say that. It’s your baby” (50).

With the exception of the study in Botswana (41), we lack more recent observation studies of the way that ultrasound is being used. It would be helpful, for example, to know what explanations about the purposes of the scan are being given by the person doing the scan. This would complement the evidence referred to earlier about lack of information given in antenatal clinics about the purposes of ultrasound (24). It also would be useful to know more about how much women are told before the scan by the person doing it and how any problems detected during the scan are talked about. This is mentioned in Baillie’s interview study with women with potential problems detected at a scan. Some women in that study reported that they picked up a worried or serious reaction from the ultrasonographer before anything had been said about a problem (51,52).

Women need to know what to expect during the scan itself, although few women now would expect the scan to be painful (37,41). In Barton et al’s study of women referred for fetal echocardiography because of concerns or risk factors, some women found the long silent period at the start of the scan very unsettling, and the authors recommended that women be told that this does not mean that an anomaly has been found (53). In other studies women
have commented about the discomfort of a full bladder or uncomfortable couches (30,54). Women need to know about such practical aspects, and also be told who can accompany them (29).

The key issue for most women, however, is the part played by the person doing the scan. Women respond badly to unspoken tensions, muttered comments, lack of explanation, or dismissive answers (29,36,51,55,56). In this aspect of care, as in others, women appreciate being treated kindly and respectfully (57). Ultrasound creates extra tensions because of the immediate knowledge gained and the possibility of worrying news. It is likely that practice has changed over time, so that women are given more feedback now during the scan and sonographers are more aware of how women feel. However, no evidence is available about this fact.

In the early days of ultrasound, some user groups raised the problem of having to wait for the scan results to be given by a doctor (55,56,58). Other studies have tended not to mention this issue, which may be because scans were done by obstetricians in many studies, or because ultrasonographers now provide information about the outcome of the scan directly to women. Dissatisfaction with the lack of direct feedback was a feature of the Botswana study referred to earlier (41).

What Is the Impact of the Results?
From a woman’s point of view a scan can have the following outcomes:

- No adverse findings
- News, for example, twins, or finding out the sex of the baby
- Failure to see or measure what was intended, leading to further tests or scans
- A worrying finding leading to further tests or scans
- A clear bad outcome, such as a diagnosis of death or serious malformation

What is the likely impact of each of these outcomes? Nine studies were relevant to this question.

No Adverse Findings
Some women who are told that nothing bad has been found may still be worried by something they heard or saw during the scan (29,37). In addition, a proportion of women will experience a poor outcome of pregnancy and may think that the scan should have picked it up (38). A small number of genuine false-negatives will also happen, so that a baby with an anomaly may be born after a negative test result.

A recent general review of the impact of false-negatives in screening programs suggested that better information about the limitations of screening programs should be provided so that participation in screening is more fully informed (59). The authors point to evidence of gaps in public understanding of screening and limited perceptions of risk, and recommend the development and testing of better approaches to information-giving. A study of false-negative results after antenatal screening for Down syndrome showed a limited adverse impact on parental adjustment detected between 2 and 6 years after the birth, and emphasized the need for better information for parents about the limitations of screening tests (60).

News, for Example, Twins, or Finding Out the Sex of the Baby
Examples of individual women’s responses to news from scans, such as the presence of twins, or learning the baby’s sex, have been quoted in some studies. Women may be upset if the baby’s sex is revealed to them when they did not want to know it (33).

Failure To See or Measure What Was Intended
Scans that fail to obtain the necessary information can be difficult for women (30,33). They miss the hoped-for reassurance, and have to spend time on another visit. They may also be extremely anxious in case something that is wrong with the baby was the cause of the failed scan. For example, one woman said:

They could not see all the spine. It was not fully developed. We had to go back in two weeks to be checked. I was quite worried. It would have been shattering without my husband (30).

The findings of an audit of the use of ultrasound in Liverpool Women’s Hospital showed that 7.6 percent of women had a repeat anomaly scan, mostly because some aspect of the scan could not be completed (1).

A Worrying Finding
If the ultrasound finding indicates a possible problem, the woman is likely to find herself involved in extra tests and scans. For example, if her placenta appears low, she will be scanned again regularly. Some low placetas will resolve spontaneously, although the woman may still be anxious about her labor (30). An early paper reporting a short case series of false-positive results from ultrasound warned of the potential costs to the service and stress on women (61). A woman in Oakley’s New Zealand
study, who had a routine scan at 18 weeks’ gestation that indicated a kidney problem in the fetus, commented after the scan:

I regret having a scan. I preferred my baby the way things were (30).

The woman went on to have further scans, which did not confirm the presence of an anomaly, and the baby showed no kidney problems at 6 weeks.

A recent British study looked at the experiences of women who had had false-positive results from screening or from nuchal translucency scanning (51,52). Those who had a worrying finding were unprepared for adverse findings. Ultrasound was, for them, a high spot in pregnancy. One said:

We were thinking—brilliant! We’ll be able to know if it’s a boy or a girl and all things like that, not that anything would be wrong.

Parents in this study found it difficult to understand the idea that the scan finding indicated an increased risk rather than a definite finding, and also reported their confusion and difficulty in asking further questions. Some women were not fully reassured by the later test findings that ruled out the abnormality. They also experienced a more generalized anxiety—now that something had gone wrong with the pregnancy other disasters might follow.

A Bad Outcome

For a small number of women the scan leads to a clearcut bad outcome. Findings of fetal death in early pregnancy scans must be common, but little has been written about the impact on women, or the way the news is conveyed (62). Later in pregnancy ultrasound may detect serious malformations. The impact on women is likely to be similar whether ultrasound is involved or some other screening technique. They may be less prepared for untoward findings, however, when having a routine scan. The issues facing women in these situations have been considered in reviews about prenatal testing (14,63).

Only 5 studies about women’s experiences after the detection of malformations were identified (47,64–67). Three deal mainly with the pain and grief experienced by parents and the decision to have a termination, not with the process of ultrasound (64–66). Black’s paper, however, which examined the experiences of 105 women who had lost their fetus through miscarriage or termination for abnormality, provided evidence about their views of ultrasound (47). Women had received at least one scan, and an average of two by the time the pregnancy ended. Nearly one-half of the women (44%) said that seeing the fetus on ultrasound made it harder to cope with the loss. On the other hand, some women also talked about the paradoxical benefits of ultrasound in terms of giving the loss some reality for them, sometimes in terms of clear evidence that the pregnancy had ended (no heartbeat visible) and sometimes by providing an image of a person to mourn.

What Might Be the Wider Impact of Ultrasound on Society?

Writers and researchers have raised several issues about the potential wider impact of antenatal ultrasound.

A Psychoanalytical Approach

The French language literature refers to a concern arising from psychoanalytical theory about the possible adverse effect of ultrasound on a woman’s own image of the fetus. The ultrasound image, seen by the woman, is thought to interfere with the “child of the imagination” that she needs to develop in the course of her pregnancy (68,69). Of the 6 studies in Table 4 addressing these issues (34,43,55,68–71), 3 explicitly reject the theory on the basis of their findings (34,43,69). Well-designed comparisons of ultrasound with no ultrasound have not looked for an impact on the relationship between the parents and the baby, or at other aspects of psychological or psychoanalytical well-being in the short or long term.

Bonding and the “Pro-Life” Agenda

A survey of 50 sonographers working in an American city (72) suggested that their experience with ultrasound had made them feel less favorable to abortion, and all but 4 believed that ultrasound with feedback “strengthened maternal-fetal bonding.” Nine studies were identified that explicitly addressed the issue of bonding. The decision was made to omit from this review evidence for the psychological effects of ultrasound, and it is covered briefly in the Discussion. In Europe the possibility that ultrasound increases attachment to the fetus has been raised either as a general benefit or as a potential problem for parents who may have an anomaly diagnosed and then find it difficult to consider termination. The emphasis has tended to be different in the United States, and some writers have expressed concern that ultrasound is being used as part of an anti-abortion agenda (73). The use of ultrasound pictures in the anti-abortion film, The Silent Scream, is also discussed by Petchesky, who suggested that visual images of the fetus can strengthen the emphasis on the rights of the fetus as
an individual (73). This theme is also discussed by Mitchell and Georges, who contrast the North American individualisation of the fetus with a very different Greek perspective that emphasises the community or nation (50).

**Other Feminist Concerns**

Feminist writers and researchers have raised several interlocking issues about the impact of ultrasound. Mitchell, in her paper with Georges referred to in the previous section, described her impression of the scan as an opportunity for messages to be given to pregnant women about appropriate behavior and language (50). This fits in with the work cited earlier that showed how dependent the woman is on the interpretation of the person doing the scan (37,48).

Ann Oakley expressed the concern that ultrasound was a further way of reducing the importance of women's own knowledge about their bodies in favor of "objective" measures (74), and this is echoed by other writers (50,75). This "direct" access to the fetus and the use of images of the fetus detached from the mother's body are linked back to the individualization of the fetus and the political debates that have arisen when the rights of the fetus and the woman come into conflict (73). All these concerns have to be viewed in the light of the general popularity of ultrasound, and the lack of evidence of widespread unhappiness among those who experience it. These apparent dissonances are helpfully discussed by Petchesky in the concluding section of her article (73).

**Conclusions**

The most striking finding from this review is how very attractive women and partners find ultrasound during pregnancy, which may not surprise some readers. For the authors of this paper, however, the concerns of the childbirth movement about the safety of ultrasound, issues about medicalization, and the overlapping worries about routine and excessive use of this technology ahead of evidence of effectiveness may have predisposed to a somewhat negative expectation.

The attractiveness of ultrasound may be because, unlike other forms of prenatal screening, it provides people with early visual confirmation of pregnancy and contact with their unborn babies in addition to reassurance about fetal well-being. These features, however, may augment the potential for feelings of anxiety, shock, and disappointment when the scan shows a problem. Recent changes in the use of ultrasound may lead to more findings of uncertain clinical significance, and this is likely to have important psychological and social consequences for women.

Early studies reported that some women feared that ultrasound might harm the fetus. Concerns of this type are not a feature of later research, although this may be partly because researchers in more recent studies have not asked about fears. It is important to investigate women's experiences of the introduction of ultrasound into care in countries or regions where it has not been available.

Because a recent review had explored the psychological impact of ultrasound (2), this topic was not addressed in our review, although, for completeness, 22 relevant studies are included in Table 4. It is likely that the reductions in anxiety after a scan, reported in some studies, are mainly due to increased anxiety just before the scan rather than a real benefit of ultrasound. The Australian trial of a routine scan at first antenatal visit showed lower anxiety in women having the early scan, but the outcome was only measured at that visit, and so we do not know what the longer term impact might be (76). Evidence about ultrasound and attachment to the fetus or baby is inconclusive. Early suggestions of improved attachment to the baby after an ultrasound scan and women's comments in qualitative studies led to an assumption in much of the literature that this was a real effect. Prospective studies, however, showed a trend to increased attachment over the course of pregnancy. The only randomized trial to look at attachment showed no impact of high-feedback ultrasound on attachment (77). This outcome has not been assessed in trials comparing ultrasound with no ultrasound. Studies of pregnancy loss do raise the issue of whether the experience of having seen an ultrasound image has an impact on subsequent bereavement (47,78,79). There is no evidence from trials of an impact of ultrasound on smoking, or of high feedback on smoking and other aspects of health behavior.

Methodological issues were raised by this review. Ways of reviewing studies of people's views of care are not well established. Some issues under discussion include the need for quality criteria for inclusion in a review and the extent to which review questions can be pre-specified. Our review did not grade the studies using quality criteria, and studies were not rejected on the grounds of poor quality. In addition, the review question was not pre-specified in any detail and the material—the body of included studies—was treated in an exploratory and qualitative way to arrive at several themes. It would be interesting to find out if different methods would have led to different findings.
### Table 4. Studies Included in the Structured Review of Women’s Views of Ultrasound, Key to Review Questions

1. What do women know about reasons for using ultrasound and what a scan can do?
2. What do women like or value about scans?
3. What are women’s views about the way the scan was performed?
4. What is the impact of the results?
5. What might be the wider impact of ultrasound on society?

PsI. What is the psychological impact of ultrasound? Other (specified in table)

<table>
<thead>
<tr>
<th>Study</th>
<th>Year Carried Out</th>
<th>Country, Setting, Participants, Sample Size</th>
<th>Methods</th>
<th>Results</th>
<th>Comments and Relevance to Review Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen (1996) (80)</td>
<td>1995</td>
<td>UK, hospital clinics in Trent Region, 44 pregnant women</td>
<td>Self-administered questionnaire; no details of how or when. Women asked to select, from a list, reasons for use of ultrasound and rank them in order of importance.</td>
<td>95% of women selected “to see if the baby has any abnormality” as one of their four reasons. One-half ranked this as the most important reason.</td>
<td>Very little detail is given of methods or findings and sample very small Review question—1</td>
</tr>
<tr>
<td>Anderson (1995) (81)</td>
<td>1994</td>
<td>UK, West Midlands, maternity unit, 50 consecutive pregnant women</td>
<td>Aim was to find out about women’s views and knowledge to improve information provided; short self-completion questionnaire given at the clinic. Study of impact of being a “false positive” using psychometric tests at 3 points in time (after amniocentesis but before result; after result; at about 34 wk) and a qualitative interview at same time as second questionnaire.</td>
<td>Women’s answers about reasons for scan tallied fairly well with information leaflet sent out to them. They tended to underestimate scan’s ability to detect problems. Women were unprepared for adverse findings from scan. Many continued to be anxious even after amniocentesis found no anomaly.</td>
<td>Very small sample Review question—1</td>
</tr>
<tr>
<td>Baillie (1997)</td>
<td>1995–96</td>
<td>UK, Leeds, Pregnant women referred to fetal assessment unit for amniocentesis because of triple test results, or a suspicious ultrasound scan. Those with no problem detected on further testing; “false positives” formed the study sample (36 after triple test and 24 after ultrasound).</td>
<td>Study of impact of being a “false positive” using psychometric tests at 3 points in time (after amniocentesis but before result; after result; at about 34 wk) and a qualitative interview at same time as second questionnaire.</td>
<td>Women were unprepared for adverse findings from scan. Many continued to be anxious even after amniocentesis found no anomaly.</td>
<td>One of the few studies of impact of false positives Review questions—3, 4</td>
</tr>
<tr>
<td>Barton et al (1989)</td>
<td>Not later than 1988</td>
<td>UK, specialist center, probably in London (not stated), Cases: 24 women referred for fetal echocardiography because identified as at increased risk Controls: 26 women selected at random from antenatal clinics</td>
<td>Prospective interview study with cases and controls. All scanned, with immediate feedback. All interviewed before and after scan. Topics: knowledge, views, anxiety, experience of scan.</td>
<td>No abnormalities were detected. “High-risk” group more anxious before scan. State anxiety was lower in both groups after scan, with “high-risk” score falling further, to same level as controls. Similar finding for attitude to baby and baby’s health.</td>
<td>Early use of scanning to detect fetal abnormality Review question—PsI</td>
</tr>
<tr>
<td>Barton et al (1989)</td>
<td>Not later than 1988</td>
<td>UK, specialist center probably in London (not stated), Cases: 48 women referred for fetal echocardiography (as above); no controls</td>
<td>Prospective interview study—cases only. Pre-scan interview covered psychological and social issues and attitudes. Post-scan: experience of scan, level of information anxiety. Follow-up questionnaire at 2 wk (by mail)—satisfaction</td>
<td>No abnormalities were detected. State anxiety was lower after scan. Anxiety and changes in anxiety varied greatly within sample. Aspects of scan procedure were commented on.</td>
<td>Review questions—3, PsI</td>
</tr>
<tr>
<td>Berwick &amp; Weinstein (1985) (31)</td>
<td>Not later than 1984</td>
<td>USA, Harvard Community Health Plan, 43 women currently pregnant, all “considered normal”; 37 had ultrasound</td>
<td>Focus groups with 8 pregnant women who had ultrasound to discuss valued aspects of information from ultrasound.</td>
<td>Authors emphasise value attached to nondecisional information. Information on health and normality of baby was valued most highly.</td>
<td>Method used for economic analyses. How do findings relate to real choices? Ultrasound not named in questionnaire—scenarios</td>
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<tr>
<td>Study</td>
<td>Year(s)</td>
<td>Country</td>
<td>Sample</td>
<td>Methodology</td>
<td>Findings</td>
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<td>Black (1992) (47)</td>
<td>1985–88</td>
<td>USA</td>
<td>Women enrolled in national study of CVS and amniocentesis; they then had a miscarriage or termination for abnormality (approximately half and half). 121 women took part in one or both interviews. Study women were relatively well educated and affluent. Gestation at pregnancy loss: 7–27 wk. All women had a scan at 7–10 wk at entry to main study; many had further scans.</td>
<td>Questionnaire then developed to assess “willingness to pay.” Administered by interview. Analyzed quantitatively. Women were approached at 1 and 6 months after pregnancy loss. Partly structured telephone interviews were carried out and tape-recorded. Results from first interviews with 105 women; discusses the impact of the scan, positive and negative, in women’s own words. For 44%, seeing fetus at a scan made coping with the loss more difficult. One woman reports her thoughts about scan image during the termination. Other women found ultrasound images helpful; e.g., in providing confirmation that the fetus had died, or in giving the woman something more real to grieve for.</td>
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<td>Boyer &amp; Porret (1988, 1991) (69,82)</td>
<td>Not later than 1987</td>
<td>France, Grenoble</td>
<td>630 pregnant women in course of antenatal care</td>
<td>Semistructured interview study carried out before women’s second ultrasound at 20 wk. Comparison of transabdominal (TA) and transvaginal (TV) ultrasound using self-completion questionnaires. After TA scan (routine), women were asked if they would be willing to have a TV scan. 77% of women said that scan had helped them to imagine the baby; 43% said that they had dreamed more since having scan. All women had TA scan and 88% agreed to have TV scan. Some women found TA scan uncomfortable because of full bladder. Twice as many women reported mild discomfort with TV scans than with TA scans. Marked discomfort reported by 6 women with TA scans (all had full bladders) compared with 1 woman with TV scan. Focus on psychoanalytical concerns about parents’ image of fetus/baby.</td>
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<tr>
<td>Braithwaite &amp; Economides (1997) (54)</td>
<td>Not later than 1996</td>
<td>UK, London teaching hospital</td>
<td>160 pregnant women coming for routine dating scan at 12–13 wk</td>
<td>Comparison of transabdominal (TA) and transvaginal (TV) ultrasound using self-completion questionnaires. After TA scan (routine), women were asked if they would be willing to have a TV scan. 77% of women said that scan had helped them to imagine the baby; 43% said that they had dreamed more since having scan. All women had TA scan and 88% agreed to have TV scan. Some women found TA scan uncomfortable because of full bladder. Twice as many women reported mild discomfort with TV scans than with TA scans. Marked discomfort reported by 6 women with TA scans (all had full bladders) compared with 1 woman with TV scan. Focus on psychoanalytical concerns about parents’ image of fetus/baby.</td>
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<tr>
<td>Brown GF (1988) (83)</td>
<td>Not later than 1987</td>
<td>USA, Los Angeles</td>
<td>Couples attending antenatal appointment at office of 3 obstetricians in private practice</td>
<td>Quasi-experimental study. Some fathers saw image of baby; others attended visit but did not see scan. Completed range of psychological tests before and after woman’s scan on anxiety, stress, and attitudes to pregnancy. For those who witnessed scan, some questions on what they had seen. No information on level of feedback during scan. Slightly greater reduction in stress scores after procedure for fathers who saw scan.</td>
<td>No mention of why some fathers saw scan and not others, but implication is that fathers chose.</td>
</tr>
<tr>
<td>Brown S et al (1994) (84)</td>
<td>1989</td>
<td>Australia, Victoria</td>
<td>All women giving birth in the state over a fixed time period ($n = 790/1107$)</td>
<td>Questionnaire study of all aspects of maternity care. Postal survey sent out 6 months after birth. Over 70% of women rated ultrasound as one of the best aspects of their antenatal care.</td>
<td>Review question—2</td>
</tr>
<tr>
<td>Study</td>
<td>Year Carried Out</td>
<td>Country, Setting, Participants, Sample Size</td>
<td>Methods</td>
<td>Results</td>
<td>Comments and Relevance to Review Questions</td>
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<td>Cappa et al (1987)</td>
<td>Not later than 1987</td>
<td>Italy (location and sample size unknown) All primigravida</td>
<td>Interview study of two groups of pregnant women—one &quot;normal,&quot; other with &quot;pathological events&quot; in the first 3 months of pregnancy studied around first (10–16 wk) and second (25–30 wk) scans. Focus mainly qualitative.</td>
<td>This was a preliminary paper and suggested (authors' abstract) that women in higher risk group needed reassurance about health of fetus. Those with normal pregnancies were more interested in description of their child.</td>
<td>Review question—5</td>
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<tr>
<td>Caverzasi et al (1991)</td>
<td>1989</td>
<td>Italy, University hospital in Pavia 60 women having routine second trimester scan</td>
<td>From authors' abstract: aim was to look at relationship between woman and sonographer; questionnaire before scan, observation of scan, interview after scan with request to draw what she sees as her &quot;internal space&quot; and further questionnaire at unspecified point after scan.</td>
<td>From authors' abstract: &quot;ultrasound has a deep impact on the pregnant woman's images, affecting the elaboration of her 'imaginary child'.&quot;</td>
<td>Review question—5</td>
</tr>
<tr>
<td>Clement et al (1998)</td>
<td>1993–95</td>
<td>UK, South East London, 3 hospitals Subsample of 700 women who returned questionnaires and wrote something in response to at least one open question</td>
<td>Part of a trial of different schedules of antenatal visits. Data came from analysis of free-text written answers to questions about best and worst aspects of antenatal care in a postal questionnaire completed approximately 34 wk of pregnancy.</td>
<td>Ultrasound came 2nd among best things mentioned by women about their antenatal care. Women liked seeing the baby, liked confirmation that they were pregnant, and it reassured them that baby was well. They liked involving partner and family, and having a picture.</td>
<td>This chapter is mainly a review, with data from trial and women's comments to illustrate themes. Review questions—2, 4</td>
</tr>
<tr>
<td>Colucciello (1998)</td>
<td>Not later than 1998</td>
<td>USA, Midwest, maternal/fetal health clinics 50 pregnant women age 19 yr or younger</td>
<td>Self-completion questionnaire was given to women before and after an ultrasound scan, during a routine antenatal visit. Aim was to find out about their perception of the fetus</td>
<td>Differences in perception scores before and after the scan are reported, but no tables and directions of any differences are not given, except that young women had more accurate perception of babies' lie after the scan.</td>
<td>Numbers small; data not fully presented; significance of any changes in perceptions not discussed. Does the scan have any impact on how young women get on with their babies later? Review question—5 Review questions—PsI, 2</td>
</tr>
<tr>
<td>Cox et al (1987)</td>
<td>Not later than 1986</td>
<td>Canada, Vancouver 100 women with &quot;low and high-risk&quot; pregnancies (50 in each), 8–16 wk</td>
<td>Women randomly assigned to high or low information during the scan. Tests before scan and after to look at anxiety, etc.</td>
<td>High-information groups were much more likely to say they felt &quot;wonderful&quot; during scan. Anxiety fell further in the high-information group, post scan, but only for low-risk women.</td>
<td>Review question—5 Review questions—PsI, 2</td>
</tr>
<tr>
<td>Crang-Svalenius et al (1996)</td>
<td>Not later than 1995</td>
<td>Sweden, University Hospital, Lund 50 nulliparas, 50 multiparas Interviewed after routine scan at 17–18 wk Was scan mainly for dating?</td>
<td>Semistructured interview just after a scan, to ask about information, knowledge, and choices. Every 4th woman booked for an appointment was asked to take part, unless they had received fetal diagnosis or previous malformed fetus/baby. Interview by one person—a midwife/ultrasonographer.</td>
<td>One-third could not recall having been told that the scan could detect some types of malformation. 62% thought a scan was compulsory; 95% were satisfied with information during and after scan. 90% of women reported feeling better after scan than before.</td>
<td>Discussion raises the links between prior information and reactions in women who have a problem diagnosed. Review questions—1, 2</td>
</tr>
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Table 4. Continued
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<tr>
<th>Study</th>
<th>Year</th>
<th>Country</th>
<th>Population</th>
<th>Design</th>
<th>Findings</th>
<th>Review question</th>
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</thead>
<tbody>
<tr>
<td>Crowther et al (1999) (76)</td>
<td>1991–95</td>
<td>Australia, Adelaide</td>
<td>Women attending antenatal care before 17 wk of pregnancy</td>
<td>648 women randomized</td>
<td>Randomized controlled trial of ultrasound scan at first antenatal visit. Scan improved accuracy of gestational dating, and reduced proportion of women who reported feeling worried about their pregnancy at end of that first visit.</td>
<td>Review question—PsI</td>
</tr>
<tr>
<td>Detraux et al (1998) (67)</td>
<td>Not later than 1994</td>
<td>Belgium, 2 maternity units in Brussels, 2 in Liege</td>
<td>Study 1: 4 categories of women a. 26 pregnant, no abnormality or previous problem b. 17 pregnant with diagnosed fetal abnormality c. 30 mothers of normal baby d. 30 mothers of baby with malformation Study 2: 48/120 gynecologists approached Study 3: 11 mothers of child with cardiopathy</td>
<td>Three-part study: Study 1: Interviews with women (including some self-completion questionnaires) Study 2: Questionnaire study of gynecologists Study 3: Small interview study of women with a child who had cardiopathy diagnosed before birth (age 1–6 yr).</td>
<td>Findings relevant to ultrasound: Pregnant women who had an abnormality detected were less satisfied with scan and less likely to want further ultrasound examinations. Gynecologists discussed difficulties they faced in telling parents about problems detected with ultrasound.</td>
<td>Review question—4</td>
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<tr>
<td>Dixon (1994) (16)</td>
<td>Not later than 1994</td>
<td>UK, Leeds, St James's Hospital</td>
<td>Routine 18 wk scan performed for dating, placental site, soft markers, structural abnormalities</td>
<td>200 consecutive pregnant women attending 18 wk scan; 100 women attending scan who had been given information sheet at booking</td>
<td>Two surveys: 200 women interviewed briefly before scan by ultrasonographer to assess knowledge of purpose of scan. 100 women given information sheet at booking then interviewed before scan in same way as first group.</td>
<td>Highlights need for women to be aware of purpose of scan. One of the few papers that states, explicitly, what the scan is for in that setting. Review question—1</td>
</tr>
<tr>
<td>Draper et al (1984) (29)</td>
<td>1983</td>
<td>UK, Cambridge, hospital and community antenatal clinic</td>
<td>170 unslected pregnant women</td>
<td>Questionnaire and interview prospective study of antenatal care. Questionnaires given at 24 wk, 37 wk, and after birth. Different aspects of ultrasound covered in questionnaires.</td>
<td>Over 2/3 of women reported only enjoyable aspects of scan, and 4% reported only worrying aspects. Enjoyable aspects: seeing and feeling the baby and reassurance. Worries: the effect on the baby, and on concerns that followed from the scan. Comments on the way the scan was done are useful.</td>
<td>Review questions—1, 2</td>
</tr>
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<td>Dykes &amp; Stjernqvist (2001) (34)</td>
<td>Not later than 1999</td>
<td>Sweden, University Hospital, Lund</td>
<td>Women pregnant for first time, who had not received ultrasound before</td>
<td>12 women approached, 10 agreed</td>
<td>Aim was to provide insights into effect of ultrasound on women's thoughts about their unborn child. In-depth interviews 1 wk before and 1 wk after a woman's first scan at around 17 wk of pregnancy. Interviews were tape recorded and transcribed.</td>
<td>One of the few studies done before and after a scan that allows women to describe the impact on them, rather than using preset scales. Review questions—2, 5</td>
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<tr>
<td>Study</td>
<td>Year Carried Out</td>
<td>Country, Setting, Participants, Sample Size</td>
<td>Methods</td>
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<td>Comments and Relevance to Review Questions</td>
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<td>Esen &amp; Olajide (1997) (86)</td>
<td>Not later than 1996</td>
<td>UK, South Tyneside District General Hospital 154 pregnant women who declined serum screening</td>
<td>Questionnaire study of women who declined serum screening in pregnancy, having accepted an ultrasound.</td>
<td>Some women turned down serum screening because they would not consider a termination. For some the scan was preferred because it gave opportunity to see baby and because it was seen as more accurate. Thus even women who reported that they would not consider a termination may be willing to have a scan.</td>
<td>Very limited detail of what was done in this study. Review question—2</td>
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<td>Eurenius et al (1996, 1997) (19,20)</td>
<td>1991</td>
<td>Sweden, Uppsala University 393 unselected, consecutive women and their partners coming for a midtrimester scan Exclusion, no Swedish language Part 1 completed by 299 women and 255 men; part 2 by 271 women and 228 men</td>
<td>Questionnaires given to each woman and her partner. One before scan (while waiting) and one to be completed at home and returned. Questions included knowledge about purpose of scan, desire for information, smoking plans.</td>
<td>Paper 1 (1996): Smoking and ultrasound. Scan had little effect on proportion of men or women who thought that their ability to stop smoking was more than 50%. Paper 2: Details of views about purpose of scan and their expectations, including some differences between women’s and men’s views. Anxieties before scan related to baby’s health and possible malformations. Only 2% of women feared that scan might harm the baby. Feelings about scan were far more positive than negative for both women and men, when a series of adjectives were offered.</td>
<td>Review questions—1, 2, Psl</td>
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<tr>
<td>Field et al (1985) (87)</td>
<td>Not later than 1984</td>
<td>USA (presumed, not stated) 40 pregnant women referred for ultrasound assessment of gestational age</td>
<td>Women were randomly assigned to low- or high-feedback group (n = 20 each). Ultrasound performed 3 times in pregnancy. Assessment after each scan with psychological tests, a fetal activity schedule to complete at home for 30 min for 5 nights, and a record of sleep and dreams. Follow-up within 2 days of birth to look at infant behavior.</td>
<td>All results are presented as means, split between first-time mothers and others. Authors concluded that birthweight and Brazelton scores are better for babies of first-time mothers in high-feedback group, but very small numbers and large standard deviations make this less than convincing.</td>
<td>Review question—Psl</td>
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<td>Fleeman &amp; Dawson (1995) (88)</td>
<td>1994</td>
<td>UK, Liverpool Health Authority Women resident in the area gave birth during a fixed time period Questionnaires = 526/701 sent out</td>
<td>Postal questionnaire study of all aspects of maternity care 7–8 wk after birth.</td>
<td>In response to questions about information needs, 35–40% of women said they had wanted more information before, during, or after the scan. 96% reported that the scan had been a pleasant experience.</td>
<td>Review questions—1, 2</td>
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<td>French (2000) (89)</td>
<td>Not later than 1999</td>
<td>UK (unspecified maternity unit and primary care setting) Convenience sample of 10 first-time mothers, 8 had nuchal translucency (NT) scan, 1 declined, and 1 not done</td>
<td>Interview with mixture of structured and unstructured questions, with aim to investigate women's experiences of routinely offered, first trimester NT scans.</td>
<td>Women's knowledge of Down syndrome and of NT scanning varied greatly. There were misunderstandings about scan's ability to detect Down syndrome and about implications of results.</td>
<td>A small sample but useful in relation to this new area of practice. Review question—1</td>
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<tr>
<td>Author(s)</td>
<td>Year</td>
<td>Country/Setting</td>
<td>Study Design</td>
<td>Key Findings</td>
<td>Review Questions</td>
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<td>Garel &amp; Franc (1980) (48)</td>
<td>1978–89</td>
<td>France, large maternity hospital in Paris</td>
<td>Ultrasound exams were observed, and then women were interviewed. This paper reports results of analysis of observation data.</td>
<td>Women experience the scan “through” the doctor, who explains and interprets the image. Reactions are varied and complex.</td>
<td>An early and detailed look at how ultrasound was being used. Review questions—3, 5</td>
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<td>Georges (1996) (35)</td>
<td>1990–01</td>
<td>Greece, public hospital in a small city</td>
<td>Observation and interview study of antenatal care including ultrasound exams.</td>
<td>Results of this descriptive study are difficult to summarize, but it illustrates the way that ultrasound is used in different contexts, and the role it plays in doctor/woman relations.</td>
<td>Review questions—2, 3, 5</td>
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<td>Grace (1983) (90)</td>
<td>Not later than 1983</td>
<td>USA (presumed, not specified)</td>
<td>Comparison of mother’s behavior toward baby, in postnatal ward, between women who had received different numbers of ultrasound scans in pregnancy.</td>
<td>No association was found between numbers of scans and mother’s behavior toward the baby.</td>
<td>A very short report (a letter) of a study using inappropriate methods for the question being explored. Review questions—Psl, 5 Review question—other (views on gender of fetus)</td>
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<tr>
<td>Harrington et al (1996) (12)</td>
<td>Not later than 1996</td>
<td>UK, 1 (or more?) London hospitals</td>
<td>Questionnaire study, completed by sonographer just before scan, to find out whether woman wanted to know fetal gender.</td>
<td>Three-fourths of women wanted to know fetal gender. Gender was determined in 89% of fetuses. In 3% gender was incorrectly determined.</td>
<td>Review question—other (views on gender of fetus)</td>
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<tr>
<td>Heidrich &amp; Cranley (1989) (91)</td>
<td>Not later than 1988</td>
<td>USA (location and setting not given)</td>
<td>Assessment of maternal-fetal attachment before and after a scan or amniocentesis. Control group had no intervention. Data collection at (mean) 16 wk and (mean) 20 wk, using 2 psychometric scales.</td>
<td>Women who reported feeling fetal movements scored higher on the attachment scale, but direction of causation, if any, is unclear. No suggestion that attachment increased more between the two assessments in the ultrasound group.</td>
<td>Small numbers in subgroups; not a trial so findings difficult to interpret. Review questions—Psl, 5</td>
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<td>Hunfeld et al (1993) (66)</td>
<td>1990–91</td>
<td>Netherlands, Dijkzigt University Hospital, Rotterdam</td>
<td>Reactions to severe malformations diagnosed by ultrasound. In depth study with interviews 2–6 wk after diagnosis and then 3 months after birth.</td>
<td>Results are about grief and not about use of ultrasound to diagnose the malformation.</td>
<td>Review question—4</td>
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<td>Hyde (1986) (36)</td>
<td>1984</td>
<td>UK, 2 hospitals in Manchester, one (R) where scan at 16 wk routine; other (S) where scan only for clinical indications</td>
<td>Interviews carried out in hospital while women were waiting for a scan (Hospital R) or for an antenatal check (Hospital S).</td>
<td>Women’s views about ultrasound varied between the two hospitals, and seemed to reflect the way that ultrasound had been presented to them. Some women were unhappy about level of feedback during the scan.</td>
<td>Discussion raises issue of how findings should be told to women and by whom. Review questions—2, 3</td>
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<td>Janus &amp; Janus (1980) (92)</td>
<td>1979</td>
<td>USA, New York, Mount Sinai Hospital</td>
<td>Patients were given questionnaires before and after ultrasound.</td>
<td>Generally, patients were poorly informed about purpose of scan and the way that ultrasound works. 90% of pregnant women commented favorably on the experience.</td>
<td>Study included nonobstetric ultrasound. Review question—2</td>
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<tr>
<td>Study</td>
<td>Year Carried Out</td>
<td>Country, Setting, Participants, Sample Size</td>
<td>Methods</td>
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<td>Comments and Relevance to Review Questions</td>
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<td>Jørgensen et al (1985a) (64)</td>
<td>1984</td>
<td>Sweden, University Hospital, Lund Women who had termination after a diagnosis of major fetal malformation following routine scan at 17 wk; 10 women, 6–34 months after the termination</td>
<td>Semistructured interviews carried out either at home or in the department of obstetrics. Exploring diagnosis of severe malformation, decision to have abortion, and feelings since.</td>
<td>Discussion of difficult decision to have a termination and reactions felt afterwards, including fears that they had in some way caused the malformation. Five women had some reason to suspect a problem in the pregnancy, and 5 did not. Study did not find any difference in their reported reactions to the diagnosis.</td>
<td>Findings that relate to the specific features of ultrasound are not given. It would have been useful (for this review) to have known in detail about women's experiences of the scan and being told about the malformation. Review question—4</td>
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<td>Jørgensen et al (1985b) (65)</td>
<td>1984</td>
<td>Sweden, University Hospital, Lund Women who had a fetal malformation diagnosed late in pregnancy at the routine 32 wk scan; 14 women, 7–39 months after baby's birth; all babies were alive, and 1/2 were judged to be healthy at follow-up</td>
<td>Semistructured interviews, at home or in department of obstetrics, about pregnancy after diagnosis of malformation from ultrasound.</td>
<td>Three women were not told about the malformation during pregnancy, and had suspected that something was wrong. They were upset at the interview about not being told. Women reported that the remainder of the pregnancy was a great strain. Some had imagined very severe malformation and experienced some relief after the birth.</td>
<td>This study also deals with the type of consequences that can arise from other methods of identifying fetal anomalies. Review question—4</td>
<td></td>
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<tr>
<td>Jørgensen (1995) (9)</td>
<td>1988–89</td>
<td>Denmark, Sønderjylland, and catchment of Hvidovre Hospital 4553 pregnant women over 18 yr; 3667 analyzed (81%)</td>
<td>Self-completion questionnaires to be completed at appointment or returned by mail at 30 wk for those who had accepted AFP screening, or 16–18 wk for those (approximately 10%) who had declined it. Questions about routine offer of Amniocentesis/CVS and ultrasound.</td>
<td>Women who had declined AFP test were less favorable toward routine offer of ultrasound for detecting malformation. Where ultrasound was already routine, more women supported its routine use. Women were more likely to say that they themselves would accept screening than to recommend its routine offer.</td>
<td>Review question—other (should ultrasound be available in Denmark?)</td>
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<tr>
<td>Julian Reynier et al (1994) (22)</td>
<td>1990</td>
<td>France, Bouches-du-Rhône Representative sample of French-speaking women who had normal live-born baby 644 women approached, 514 interviewed</td>
<td>Telephone interviews mainly closed questions, ? in first few days/weeks after birth, to ask about reasons for use of ultrasound and what it can do.</td>
<td>93% said that midtrimester scan was to see if baby was normal. Only a small proportion (9%) thought that one could be sure of normal baby if no abnormalities seen with ultrasound. They were more likely to have a lower education level.</td>
<td>Review question—1</td>
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<td>Kemp &amp; Page (1987) (93)</td>
<td>Not later than 1986</td>
<td>USA location unknown 85 women, 53 with “normal” and 32 with “high-risk” pregnancies; all high-risk women had scan, 41/53 of normal</td>
<td>Questionnaire study with scales to measure attachment.</td>
<td>Prenatal attachment was not associated with anything that authors measured, including having had a scan.</td>
<td>Review questions—5, PSI</td>
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<tr>
<td>Kohn et al (1980) (49)</td>
<td>1978</td>
<td>USA, Pennsylvania hospital Women referred for obstetric ultrasound who had never seen a scan or x-ray image in this or any earlier pregnancy; possible fetal</td>
<td>Self-completion questionnaires before and after scan about views of baby. Scan was seen by the women and explained to them with opportunity for</td>
<td>Questionnaires are reprinted with numbers of responses for each item. Some changes are apparent after scan, e.g., in descriptions of the fetus as active, and perception</td>
<td>This early study responded to the new technology that provided real-time images. It recorded only immediate reactions to the scan.</td>
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death was reason for exclusion from study
discussion. Authors commented about women's questions during the scan and reactions of a few women in the longer term.
of space for the fetus. Women were particularly interested in seeing movement, and reported that seeing the heart beating was important to them. A few women were worried in case seeing the fetus made it more difficult if something went wrong. Authors reported on 3 women who they thought showed better attachment to the baby after the scan. All but 4 women said that they enjoyed seeing the baby.

Although the authors were careful in their conclusions, the work has been taken to show an impact of scanning on attachment more generally.

Review questions—2, 3, 5, PsI

Kovacevik (1993) (94)
Croatia, Zagreb
296 primigravidae referred for ultrasound
150 “risk” and 146 “no risk”

Quasi-randomized study? 146 were high feedback, 150 were low feedback, giving a 4-way split by risk status and feedback. Psychological test before and after scan. Fathers also included.

Anxiety and stress fell after the scan, as in other studies. It is not clear whether high feedback was associated with sharper falls in anxiety, etc.

Review question—PsI

Langer et al (1988) (95)
Ringler et al (1985) (96)
Fischl et al (1983) (97)

Austria, University of Vienna
60 women at 12-20 wk gestation
Scanned for first time this pregnancy and before fetal movements were felt

Questionnaires given before and after scan to assess women’s views of fetus and pregnancy.

Changes occurred in some of the ways that the fetus was described. After the scan the fetus was more likely to be described as active.

Review question—PsI

Larsen et al (2000) (21)
Denmark, Herlev University Hospital
500 consecutive, unselected, Danish-speaking women between 16-20 wk pregnant, attending for 2nd trimester scan; 493 completed questionnaire

Self-completion questionnaire to explore women’s knowledge and views about 2nd trimester ultrasound.

Women’s knowledge of scan’s purpose was generally good. Fewer than 1% reported that scan had made them feel less secure, 86% more secure, and 12% no difference. Overall reactions to the scan by women and partners was very positive.

Review questions—1, 2

Layng (1998) (17)
Not later than 1998
U.K., Berkshire
96 women within (?) one general practice who had recently received ultrasound scan to look at nuchal translucency; 68 responded

Postal questionnaire to ask about preparation for ultrasound test and knowledge of Down syndrome.

42/68 women replied that they thought that they had not been adequately prepared for the test. 24/62 rated their knowledge of Down syndrome as 3 or less on a scale of 1-10.

Small local study, but little work is available so far on use of ultrasound for Down syndrome screening. Report is brief.

Review question—1

Lydon & Dunkel-Schetter (1994) (98)
Not later than 1991
Nth. America probably (no place specified)
41 women, all had amniocentesis on grounds of maternal age, 14-20 wk Amniocentesis preceded by scan; no abnormalities detected

Interviews about commitment to baby at 4 time points: 1and 2, immediately before and after ultrasound and amniocentesis; 3, by phone 7-10 days later; 4, by phone 2-7 days after test result.

Number of fetal body parts reported by woman as having been seen at ultrasound is said to be predictive of woman’s expressed commitment at first phone interview.

Review questions—PsI, 5

Not later than 1988
Italy, Bologna
20 “low-risk” pregnant women had 3 scans, 1 in each trimester, same obstetrician

Series of psychological tests before and after each scan.

Anxiety fell after each scan. The pre-scan anxiety was rather similar for each trimester.

Review question—PsI
<table>
<thead>
<tr>
<th>Study</th>
<th>Year Carried Out</th>
<th>Country, Setting, Participants, Sample Size</th>
<th>Methods</th>
<th>Results</th>
<th>Comments and Relevance to Review Questions</th>
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<tr>
<td>Milne &amp; Rich (1981) (37)</td>
<td>Not later than 1981</td>
<td>USA, NE region, large university hospital 20 women, 20–35 wk pregnant; first experience of real-time scanning</td>
<td>Aim of scan was dating. Study used observation and interview. Women were accompanied by researcher, from the period before scan, during, and after. 16/20 were interviewed afterwards.</td>
<td>Detailed and illuminating data about how scans were done and how women reacted. Women were concerned that this novel procedure could harm their baby, and might be painful. Women’s pleasure at recognition of baby’s shape or movement is described.</td>
<td>An early study (probably carried out before 1981). Review questions—2, 3, 4</td>
</tr>
<tr>
<td>Mitchell &amp; Georges (1998) (50)</td>
<td>Not later than 1993</td>
<td>Canada (location not specified) 49 pregnant women expecting first baby and labeled as “low risk”</td>
<td>Observation of scans, “conversations” with caregivers, and interviews with 49 women (and some of their partners).</td>
<td>Results of this qualitative study are difficult to summarize, but touch on views of sonographers about women from different ethnic backgrounds. There are descriptions of the way the scan is “interpreted” for parents, and the way staff could be said to use the scan to put across messages about appropriate behavior.</td>
<td>This chapter also compares Mitchell’s findings with those of Georges (see entry in this table). Review questions—3, 5</td>
</tr>
<tr>
<td>Oakley (1997) (30)</td>
<td>1994–95</td>
<td>New Zealand, Dunedin 41 women, volunteer sample, pregnant (15–42 wk); all had received a scan, but main purpose unclear</td>
<td>Semistructured interviews performed mainly at home, after a scan.</td>
<td>Most thought they had received a scan because it was routine. Information given during scan varied greatly. Confusion over post-scan “results” for some women. Impact of uncertain or “worrying” scan results, and “false positives.”</td>
<td>Some verbatim accounts and detailed comments in this thesis are very useful. Review questions—1, 2, 3, 4</td>
</tr>
<tr>
<td>Puddifoot &amp; Johnson (1999) Johnson &amp; Puddifoot (1998) (78, 79)</td>
<td>Not later than 1998</td>
<td>England, NE England and West Midlands Men referred through health services; all were partners of women who had miscarried before 25 wk of pregnancy Paper 1, 323 men Paper 2, 158 men</td>
<td>Study of male partners of women who had miscarried, using self-completion questionnaires and psychological scales, within 8 wk of the miscarriage. Two reports from the same study.</td>
<td>Men reported levels of grief comparable with those in studies of women. Paper 1: Reports higher grief scores in men who had seen the fetus at a scan. Paper 2: Reports that vividness of men’s reported imagery about the fetus was positively associated with whether they had seen a scan, and to a lesser extent, whether they had planned to see a scan. Those who had neither seen one nor planned to had lowest scores.</td>
<td>The reports suggest that seeing scan images may affect the way that the fetus is imagined and may influence grief after loss. On the other hand, men’s predisposition toward the baby may affect both the choice to go to a scan and the grief. Tentative conclusions because of effect of collecting data retrospectively. Review question—5</td>
</tr>
<tr>
<td>Reading et al (1981, 1982a,b, 1984, 1988) Reading &amp; Cox (1983) Campbell et al (1982) (46, 77, 100–105)</td>
<td>Not later than 1981</td>
<td>UK, King’s College Hospital 129 “obstetrically normal” first-time mothers, 10–14 wk pregnant at entry to the study</td>
<td>67 women randomly allocated to “high feedback” (seeing the screen and having the image explained) and 62 to “low-feedback” groups. Anxiety and other measures were tested before and after scan, then with further scans at 16 wk, 32 wk, just after birth, and 3 months after birth.</td>
<td>The high-feedback group was more positive about the scan immediately afterwards. No differential impact on anxiety and no longer term effects were found, except that women in the high-feedback group were most likely to rate that first scan as the most important for them.</td>
<td>The longitudinal element of this study has also been used to look at change over time regardless of allocated group. Review questions—3, PsI</td>
</tr>
<tr>
<td>Study Reference</td>
<td>Year Range</td>
<td>Location</td>
<td>Participants</td>
<td>Procedure</td>
<td>Findings</td>
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<td>Reading &amp; Platt (1985) (106)</td>
<td>Not later than 1984</td>
<td>USA, Los Angeles</td>
<td>Women at “high-risk” in 3rd trimester</td>
<td>Women randomly allocated to one of four groups: 11 to high-feedback ultrasound; 8 to low-feedback ultrasound; 11 to fetal heart rate monitoring; 7 in control group shown a video of an ultrasound that they knew was not their own. Psychological assessment was done before and after procedure.</td>
<td>The very small numbers, and lack of detail about trial procedures and comparability, make it difficult to know what to make of this study. Anxiety fell for all women after the test, but appeared to fall more sharply for women in the high-feedback ultrasound group.</td>
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<tr>
<td>Rice &amp; Naksook (1999) (38)</td>
<td>1994–95</td>
<td>Australia, Melbourne</td>
<td>30 Thai women living in Melbourne; 17 had given birth in Australia only, 9 in both Thailand and Australia, and 4 in Thailand only</td>
<td>Qualitative interviews, in Thai, in woman’s home. This paper reports results on women’s views of ultrasound and other types of prenatal screening, and is part of a wider study.</td>
<td>Women showed general acceptance of ultrasound, with some expressing pleasure and excitement at the image of the fetus. Some women who had more than one scan worried about possible harmful effects on the baby. Women discussed links between screening and their religious/cultural views on acceptance of what life brings.</td>
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<td>Roberts (1986a, b) (55,56)</td>
<td>1983–94</td>
<td>UK</td>
<td>142 readers of <em>New Generation</em>, the magazine of National Childbirth Trust; volunteer sample</td>
<td>Women wrote in response to a short questionnaire published in magazine asking basic questions about their experience of ultrasound</td>
<td>Women showed general acceptance of ultrasound, with some expressing pleasure and excitement at the image of the fetus. Some women who had more than one scan worried about possible harmful effects on the baby. Women discussed links between screening and their religious/cultural views on acceptance of what life brings.</td>
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<td>Sandelowski (1994a, b) (39,40)</td>
<td>1987–93</td>
<td>USA (location unknown)</td>
<td>62 childbearing couples, 42 of whom had been infertile, and all had received at least one ultrasound scan</td>
<td>Interviews at several points during pregnancy. The study was designed to look at transition to parenthood, with a focus on infertility.</td>
<td>Contrasting reactions to ultrasound and amniocentesis (experienced by a subset). Described men’s views about ultrasound and women’s views about their partner’s reactions. Photos and videos. Ultrasound as a “first meeting with the baby.”</td>
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<td>Santalahti et al (1998) (23)</td>
<td>1993–94</td>
<td>Finland, Turku, Jyvaskyla &amp; Kuopio</td>
<td>Survey 1. Ultrasound survey (Turku): 497 pregnant women (most 15–22 wk pregnant) were offered questionnaire, 424 returned Survey 2. Serum screening survey (Jyvaskyla and Kuopio): 1035 pregnant women (all but 5 had received a scan) were offered questionnaire, 909 returned</td>
<td>Self-completion questionnaire about knowledge and views of prenatal screening, including ultrasound, were handed out at antenatal clinic visits. Two separate surveys.</td>
<td>Findings cover knowledge of tests and views about what they can detect. Education level was linked to knowledge. Women were less aware of potential for ultrasound to detect abnormalities.</td>
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<td>Skov (1991) (10)</td>
<td>1988</td>
<td>Denmark, Kolding Hospital</td>
<td>220 pregnant women</td>
<td>A survey about whether ultrasound should be available routinely in Denmark.</td>
<td>93% of respondents supported the routine offer of ultrasound to all pregnant women (from author’s abstract).</td>
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<td>Study</td>
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<td>Smith &amp; Marteau (1995) (24)</td>
<td>Not later than 1994</td>
<td>UK, 6 hospitals, 215 women, 28 midwives, and 9 obstetricians, Women were seeing a midwife at booking (10–12 wk) or an obstetrician at 16 wk</td>
<td>Observation study of routine antenatal visits to look at how serum screening and fetal anomaly scanning are mentioned/explained to women.</td>
<td>Information about serum screening was given more often than about fetal anomaly scanning. Purpose of anomaly scanning was less likely to be mentioned. Information about meaning of results and possible errors was given very rarely.</td>
<td>An important part of the picture of women's knowledge and choices. Review question—1</td>
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<tr>
<td>Sommerseth (1993) (107)</td>
<td>1990</td>
<td>Norway, 891 pregnant women in national representative sample</td>
<td>Questionnaire survey about information given to women in relation to routine scan at around 17 wk of pregnancy.</td>
<td>Just over one-half of respondents said that they were given no information about the scan; a substantial number thought that the scan was compulsory. The author argues for better information for women (from author’s abstract).</td>
<td>Review question—1</td>
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<td>Sparling et al (1988) (108)</td>
<td>Not later than 1988</td>
<td>USA, North Carolina, 108 pregnant women referred for ultrasound (“high risk”) Final sample = 80 in 3 risk strata (impaired = 16, questionable = 31, normal = 33)</td>
<td>Women were approached when attending for ultrasound between 20–32 wk and completed psychological and other questionnaires. Ultrasound session was observed. Further contacts with women in later pregnancy, just after birth, and at 3 months after. Interviews and observation of parental/child interaction carried out.</td>
<td>Differences between 3 “risk” groups were not detected in scores on anxiety, depression, and hostility (but numbers are very small). No differences in mother/child interaction detected.</td>
<td>Review question—PS1</td>
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<tr>
<td>Stephens et al (2000) (32)</td>
<td>Not later than 1999</td>
<td>USA, San Diego, California, Naval Medical Center, 137/150 low-risk women approached</td>
<td>Questionnaire study of pregnant women at entry to maternity care to assess reasons for wanting, or not wanting, an ultrasound scan.</td>
<td>98% wanted a scan; 37% would be prepared to pay for it if not prescribed. Reasons for wanting a scan included: to determine gender of fetus, to determine health and growth of fetus; for reassurance, etc.</td>
<td>Review questions—1, 2</td>
</tr>
<tr>
<td>Tautz et al (2000) (41)</td>
<td>1995</td>
<td>Botswana, Maun, 41 pregnant and newly delivered women who were referred for ultrasound for clinical indications in a setting where ultrasound was not routine Observation of 18 women’s ultrasound scans and interviews with 10 doctors and midwives</td>
<td>A qualitative study using interviews with patients and staff and observation of scans in a maternity hospital.</td>
<td>Selected points of interest from this detailed qualitative study included: women were poorly informed about purpose and potential of the scan and about how it would be done. They rarely shared a language with staff who carried it out, so they lacked information as scan was being done. Some were afraid of the process. Some overestimated what the scan could detect. There was a tendency to see the equipment as novel, a thing devised by “whites,” and to think that it</td>
<td>This is the only study found that looks at care in a poor country. It is also one of the few that includes observation of scans alongside interview. Review questions—1, 2, 3</td>
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<td>Study</td>
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<td>Time Frame</td>
<td>Methods and Findings</td>
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<td>Teichman et al (1991) (109)</td>
<td>Israel</td>
<td>Not later than 1990</td>
<td>197 primigravid “low-risk” women with no previous ultrasound (25-27 wk) All received a scan. The intervention appears to have involved giving or withholding information on gender of fetus. It is not clear how randomization worked since it appears that for the 3 groups, 100 were told fetal gender, 41 not given this information, and 56, who said in advance they would not want it. Anxiety and depression were assessed 10-14 days before scan, just after scan, and after birth. Anxiety (for all 197 women) was higher after the scan than before, and higher still just after the birth.</td>
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<td>A randomized controlled trial assessing impact of extra information about prenatal tests on uptake of tests, and on anxiety, satisfaction, and understanding. 3 groups: (1) control, (2) extra information given individually, (3) extra information given in a class. Postal questionnaires at 16-18 wk, 20 wk, 34 wk of pregnancy, and 6 wk post birth. The intervention did not affect the uptake of ultrasound or serum screening for Down syndrome. It lowered the uptake of screening for cystic fibrosis. Anxiety was lower in the group offered individual information (at 20 and 34 wk). 99% of women accepted offer of ultrasound.</td>
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<td>Thorpe et al (1993) (42)</td>
<td>UK (assume Bristol)</td>
<td>Not later than 1993</td>
<td>42 mothers approached for consent to do a cerebral ultrasound scan on their new baby (not because of any risk factor or indication) 30/42 agreed to scan of baby; all but 3 mothers had pregnancy ultrasound Qualitative interview study exploring women’s reactions to pregnancy ultrasound and to cerebral ultrasound for their newborn. Many women voiced concern about the safety of cerebral ultrasound for their new baby. Pregnancy ultrasound was categorized by some women as being about reassurance and the confirmation of normality. Women's comments also highlighted emotional appeal of pregnancy ultrasound.</td>
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<td>Tourette &amp; Bouhard (1986) (68)</td>
<td>France (location not given)</td>
<td>Not later than 1985</td>
<td>85 women at different gestations, 25 before ultrasound, 60 after 3 locations: hospital, private clinic of woman’s obstetrician, at a radiologist's clinic Questionnaire administered? It covers experience of ultrasound, knowledge of purpose, reactions to scan, information, presence of partner, etc. Women were generally well informed about purposes of ultrasound. Some aspects of scan, and communication with staff, caused concern.</td>
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<td>Tsoi &amp; Hunter (1987) Hunter et al (1987)</td>
<td>U.K. King’s College Hospital, London</td>
<td>Not later than 1985</td>
<td>30 pregnant women with raised AFP for ultrasound 30 control pregnant women for routine ultrasound Interview before and after scan to study anxiety and attitude to pregnancy. Postal questionnaire sent 4 wk after scan. AFP group were more anxious before scan. Anxiety fell for both groups after scan (no differences then, or at follow-up). Women in both groups reacted very positively to scan. Some wanted more information during and after scan. 1/3 of women dropped out between post-scan and follow-up assessments, so this may undermine reported finding of a rise in anxiety in both groups at follow-up.</td>
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<td>Tymstra et al (1991) (11)</td>
<td>Not later than 1990</td>
<td>Netherlands, University Hospital Groningen 185 women “a few months” after delivery; first baby for all women 127 returned questionnaires</td>
<td>Women were offered 4 scenarios in a postal questionnaire that covered: amniocentesis and CVS; ultrasound for treatable abnormalities; ultrasound for untreatable abnormalities; serum AFP. They were asked whether screening options should be offered to all women in Netherlands, and whether they themselves would accept such offer.</td>
<td>Women were most positive about use of ultrasound for detecting treatable abnormalities but even for CVS/amniocentesis, 36% said they would definitely wish to use it during their next pregnancy, if offered.</td>
<td>Review question—other (Should ultrasound be used for the detection of abnormalities?)</td>
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<tr>
<td>Valbo &amp; Blaas (1991) (112)</td>
<td>1989</td>
<td>Norway (location unspecified) 655 pregnant women</td>
<td>Alternate allocation trial of extra information about routine ultrasound. Women completed a questionnaire after the scan.</td>
<td>The results are difficult to interpret because some women were excluded from the analysis. Women who received extra written information seemed to be more satisfied with information than those who did not. Women were very positive about the scan, and about the information they received during it.</td>
<td>Review questions—1, 2</td>
</tr>
<tr>
<td>Villeneuve et al (1988) (43)</td>
<td>Not later than 1987</td>
<td>Canada, Montreal Women and partners attending for antenatal care Questionnaires returned by 154/207 women and 64/90 men</td>
<td>Direct observation (not reported here). Interviews with pregnant women and partners. Some seen more than once. Questionnaire distributed to women and men in clinic on selected days over a 3 wk period and returned by mail.</td>
<td>Some problems with seeing the image clearly were reported. Women said what they liked best about seeing image of baby. Fathers were as positive as mothers about scan.</td>
<td>Review questions—2, 3, 5</td>
</tr>
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<td>Whyynes (2002) (113)</td>
<td>1997–98</td>
<td>UK, Nottingham 706 unselected women booking for maternity care in a particular month invited to join diary project 397 returned diaries; 384 had entries relevant to ultrasound</td>
<td>Analysis of diary entries from a sample of pregnant women taking part in a wider study about maternity care.</td>
<td>Women’s reported reasons for the scan (against a checklist) were mainly realistic. Their feelings about scans were mainly very positive, with only around 6% negative feelings. For second and subsequent scans proportion of positive feelings fell somewhat. When invited to say what they would change about the scan, 7% made some comment, most commonly to suggest improvements in information giving.</td>
<td>Review questions—1, 2, 3</td>
</tr>
<tr>
<td>Wu &amp; Eichmann (1988) (114)</td>
<td>Not later than 1988</td>
<td>USA (presumed, no location given) 57 couples, recruited at 18 wk ultrasound scan, then 34 wk scan where those who asked were told fetal gender</td>
<td>Questionnaires at 18 and 37 wk. Self-completion, attachment scales. Also? a phone interview around same time (37 wk).</td>
<td>Attachment scores were lower (but what counts as low?) in parents who knew fetal gender, compared with those who did not. But their scores were already lower before they were told fetal gender.</td>
<td>Review question—PsI</td>
</tr>
</tbody>
</table>
The review process also raised some issues about the reporting of research. Conclusions from earlier studies were sometimes repeated in later work by other authors without checking if they were supported by the evidence in those papers. In many cases studies lacked key information about time, place, and type of ultrasound scan being done. Social and psychological studies of ultrasound are highly context-specific. The way in which the technology is used has changed over time, and varies between and within countries. Many studies do not provide much contextual information; thus, for example, it is not always possible to work out when the research was done. We need to be extremely cautious about putting together the results of studies in a review such as this, and also be aware that review findings may not be relevant in all settings or over time.

Implications of the findings of this review for clinical practice are that parents need good information about the purpose of the scan and its limitations. They are likely to have strong positive expectations of a scan, and may not have up-to-date knowledge of what the scan is designed to do. Parents need to know what to expect so that they can make informed decisions about care and so that they are well prepared for adverse findings. Providing parents with this sort of information is time consuming, and requires that all staff are well informed. In this respect, changes in the technology and in policies for its use can make it difficult to provide good care to pregnant women.

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References