Sexual & Reproductive Healthcare 15 (2018) 69–76

Contents lists available at ScienceDirect

Sexual & Reproductive Healthcare

journal homepage: www.elsevier.com/locate/srhc

Norwegian obstetricians' experiences of the use of ultrasound in pregnancy management. A qualitative study

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ARTICLE INFO

Keywords:
Ethics
Norway
Obstetrics
Pregnant women
Prenatal diagnosis
Ultrasonography
Qualitative research

ABSTRACT

Objective: To explore obstetricians' experiences and views of the use of obstetric ultrasound in clinical management of pregnancy.
Methods: A qualitative interview study was undertaken in 2015 with obstetricians (N = 20) in Norway as part of the CROss Country Ultrasound Study (CROCUS).
Results: Three categories developed during analyses. *'Differing opinions about ultrasound and prenatal diagnosis policies'* revealed divergent views in relation to Norwegian policies for ultrasound screening and prenatal diagnosis. Down syndrome screening was portrayed as a delicate and frequently debated issue, with increasing ethical challenges due to developments in prenatal diagnosis. *'Ultrasound's influence on the view of the fetus'* illuminated how ultrasound influenced obstetricians' views of the fetus as a 'patient' and a 'person'. They also saw ultrasound as strongly influencing expectant parents' views of the fetus, and described how ultrasound was sometimes used as a means of comforting women when complications occurred. *'The complexity of information and counselling'* revealed how obstetricians balanced the medical and social aspects of the ultrasound examination, and the difficulties of 'delivering bad news' and counselling in situations of uncertain findings.
Conclusion: This study highlights obstetricians' experiences and views of ultrasound and prenatal diagnosis in Norwegian maternity care and the challenges associated with the provision of these services, including counselling dilemmas and perceived differences in expectations between caregivers and expectant parents. There was notable diversity among these obstetricians in relation to their support of, and adherence to Norwegian regulations about the use of ultrasound, which indicates that the care pregnant women receive may vary accordingly.

Introduction

Obstetric ultrasound is considered routine practice in most industrialised countries [1]. The clinical applications include confirmation of pregnancy and determination of gestational age, localisation of the placenta, diagnosis of fetal abnormalities, investigation of the number of fetuses, estimation of amniotic fluid volume, assessment of fetal growth, evaluation of fetal position and the investigation of clinical complications such as vaginal bleeding [2,3]. Furthermore, Doppler ultrasound has an important role in the evaluation of fetal and placental circulation [4].

Ultrasound was introduced for routine use in developed parts of the world in the 1970–80s [5]. Nuchal translucency screening for Down syndrome came into practice in the early 1990s, and was later also combined with biochemical parameters, allowing for estimation of fetal risk for Trisomy 21 (Down syndrome), Trisomy 18 and Trisomy 13 [6], i.e. the Combined Ultrasound and Biochemical screening test (CUB). The developments in ultrasound technique and the introduction of three-dimensional images have led to an increasing use of ultrasound also for non-medical purposes. This includes 'entertainment

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https://doi.org/10.1016/j.srhc.2017.12.001
Received 25 January 2017; Received in revised form 27 November 2017; Accepted 6 December 2017

ultrasounds' and providing expectant parents with souvenir images of the fetus, or determining the sex without medical indication [7,8]. Routine ultrasound examinations have been described globally as very appealing to pregnant women and their partners, and most women accept the offer when available, even though women are often not fully aware of the full purpose of the examination, and its limitations [9].

Previous reports from the CROss-Country Ultrasound Study (CROCUS) have described ultrasound as an essential and valuable tool by obstetricians in low-, middle, and high-income countries [10–14]. However, its use has at times given rise to dilemmas in care, particularly when ultrasound findings are of uncertain significance [10,11]. Facilitating informed decision-making in situations of uncertainty has been described as "challenging" by obstetricians [15], and counselling has been described as a "balancing act" [11] because of the worry and anxiety expectant parents commonly experience when made aware that deviations have been found [9].

In Norway pregnant women are offered one routine ultrasound examination between the 17th and 19th week of pregnancy [16]. The primary aim of this examination is to determine gestational age. At this routine scan, the number of fetuses, placental position and fetal anatomy are also examined [16]. According to the Norwegian Directorate of Health, prenatal *diagnostic* ultrasound shall only be performed when there is an indication for prenatal diagnosis, and the offer should be made early in pregnancy [17].

Prenatal diagnosis is defined in the Biotechnology Act as examinations of fetal cells, the fetus or the pregnant woman with the purpose of obtaining information about fetal genetic traits or to detect or rule out disease or developmental anomalies [18]. Prenatal diagnosis includes the CUB-test where ultrasound forms part of the examination, or invasive procedures such as chorionic villus sampling or amniocentesis, examinations usually performed following a CUB-test indicating an increased risk for chromosomal abnormality. The indications for prenatal diagnosis are summarised in Box 1 [17,19].

Only five centres in Norway are approved to perform ultrasound as part of prenatal diagnosis [19], and the examination can only be performed following genetic counselling [17]. Termination of pregnancy in Norway is allowed up to 12 weeks of gestation, and after that, with permission from the Abortion Board up to 21 weeks + 6 days of gestation [20], which means that termination may be an available option following an adverse diagnosis at the routine ultrasound examination depending on the severity of the diagnosis. While virtually all pregnant women in Norway undergo the second trimester routine ultrasound examination, only 12% of pregnant women undergo CUB screening [21], and pregnant women cannot seek to undergo prenatal diagnosis outside of the public healthcare system. Routine ultrasound examinations and ultrasound as part of prenatal diagnosis are generally performed by midwives trained in ultrasound, while responsibility for follow-up of abnormal findings and management rests with the physician. The nature of work in obstetrics means that obstetricians frequently encounter difficult situations and complex decision-making. To date there is very little qualitative research undertaken where obstetricians' views and experiences of their challenging work have been in focus, particularly in relation to the use of ultrasound, and no previous study has addressed obstetricians' experiences of ultrasound during pregnancy in the Norwegian maternity care context. The purpose of this study was to explore obstetricians' experiences and views of the use of obstetric ultrasound in clinical management of pregnancy.

Methods

Study design

A qualitative study design was employed. Individual face-to-face interviews were undertaken with obstetricians working in maternity care (N = 20), in order to explore their experiences and views in relation to the study aim. The study was part of the CROss Country Ultrasound Study (CROCUS), which is an international research project with a focus on obstetricians' and midwives' experiences and views of the use of ultrasound in pregnancy management in low-, middle- and high-income countries. The countries participating in CROCUS are Australia, Norway, Sweden, Rwanda, Tanzania and Vietnam.

Recruitment and participant characteristics

Participants were recruited from five hospitals located in the central and southern parts of Norway. The hospitals were purposively selected to represent different characteristics in relation to level of care, annual number of births, and geographic location. Two were university hospitals and among the five Norwegian hospitals approved to perform ultrasound examinations as part of prenatal diagnosis. The remaining three were local hospitals of various sizes. The number of births at the hospitals ranged between 500 and 5100 annually. After ethical clearance, contacts were made via phone with each head of obstetrics and Gynecology. After consenting to the study to be undertaken, they also agreed to assist with recruitment of obstetricians. Participant information and consent forms were sent to the hospitals, and they were returned by mail or collected on site. Fifteen of the recruited obstetricians were female and five were male. Their ages ranged between 34 and 62 years (mean 47 years), and their work experience in obstetrics ranged between 6 months and 33 years (mean 15 years). Eighteen had specialist qualifications in obstetrics and gynecology and two were residents in obstetrics and gynecology. About one third of the obstetricians had work experience from other countries within and outside Europe. All participants had obstetric ultrasound training. More detailed information about the participants is presented in Table 1.

Data collection procedures

The interviews were conducted by IM (n = 17) and AÅ (n = 3) in one week in November/December 2015. All participants were provided with written and verbal information about the study, and written consent was obtained prior to the start of each interview. A set of key domains, used across all countries participating in CROCUS, was discussed during interviews. These included ultrasound's role in

Box 1
Indications for prenatal diagnosis according to the Directorate of Health, Norway.

- Pregnant women who are 38 years or older at the expected time of delivery
- Pregnant women in cases where the woman herself or her partner:
  - has previously had a child or a fetus with a serious disease or a developmental disorder (e.g. chromosome aberration)
  - is at an increased risk of serious illness in the fetus and this condition can be ascertained (e.g. certain hereditary diseases)
  - uses medications that can harm the fetus (e.g. antiepileptic medication)
- Pregnant women in whom suspicion of a developmental disorder has been raised by ultrasound examination
- In certain cases, pregnant women who are in a difficult life situation and who are convinced that they will be unable to cope with the extra strain involved in having a sick or disabled child

Table 1
Participant characteristics.

Hospital no.	Participant no.	Hospital level	Male/female	Mean age, years	Mean length of experience, years*
1.	1–4	Referral hospital/maternal-fetal medicine unit	3 females 1 male	46	14
2.	5–7	Local hospital	2 females 1 male	44	10
3.	8–11	Local hospital	2 females 2 males	50	18
4.	12–13	Local hospital	1 female 1 male	53	23
5.	14–20	Referral hospital/maternal-fetal medicine unit	7 females	45	13

* In obstetrics.

pregnancy management, in clinical situations where the interests of maternal and fetal health may conflict, in relation to the fetus as a 'person' and a 'patient', and also in relation to community views, professional roles and ethical aspects. The interviews were digitally recorded and lasted between 19 and 54 min (mean 31 min).

Data analysis

The interviews were transcribed verbatim and the initial analyses were performed by KE using qualitative content analysis [22]. This process involved: (I) reading through materials to get a sense of the content, (II) condensation of text through the identification of meaning units relating to the aim of the study, (III) abstraction and coding of meaning units, and (IV) grouping of content with shared meaning into categories. The process was iterative, i.e. involving continual checking between the interview text, meaning units, codes and categories. To facilitate this process, a colour scheme was used to ensure that each meaning unit or code could be linked to a particular interview. Recurrent topics were also discussed between the authors during the research process, from the time of data collection and throughout the data analysis. The preliminary categories were discussed back and forth between all authors, after which adjustments were made to the interpretation of data, labelling of categories and the presentation of results.

Ethical considerations

An application for ethics approval was submitted to the Regional Committee for Medical and Health Research Ethics in Norway, however, the research team were informed that ethics approval was not needed, as no patients were involved (reference 2013/662). All participation was voluntary and based on informed consent. To ensure confidentiality, characteristics of the participants are presented at a group level only. Ethics approvals for the CROCUS study have previously been separately obtained from Sweden, Australia, Vietnam, Tanzania and Rwanda.

Results

The analyses resulted in three categories based on three sub-categories each (Table 2).

Differing opinions about ultrasound and prenatal diagnosis policies

Widely divergent views on the 'one routine ultrasound only' approach

Widely divergent views were apparent in relation to the approach to pregnancy ultrasound in Norway with only one ultrasound examination in the second trimester routinely offered to pregnant women, and CUB screening only on specific indications. While some obstetricians expressed direct or implicit support for the current level of ultrasound use, or expressed trust in the authorities' regulations in relation to the use of ultrasound, others seemed dissatisfied with, or even expressed criticism over this approach. When probed about how many ultrasounds should be routinely performed in uncomplicated pregnancy, the answers ranged from one to five. The obstetricians who had work experience from other countries where ultrasounds were used more generously also stood out as more supportive of a larger number of scans.

> *'If the woman is completely healthy, I will do about three ultrasounds. I do a screening in the first trimester in week 12. I do a routine scan in week 18–19 and I would like to do one between 28 and 32 weeks. (#8, work experience outside Norway).*

Obstetricians who preferred more scans, i.e. ultrasound examinations outside the bounds of the current guideline of one routine ultrasound, particularly emphasised the need for a first trimester ultrasound to allow for early identification of pregnancy complications or high risk pregnancies including multiple pregnancy, severe malformations, or missed abortion.

> *'It's horrible when we discover acrani, limb body wall complex, serious malformations in week 18-19-20. I think that's unnecessary. I think we mainly should have ultrasound in week 12 because of the twins and the serious malformations.' (#14).*

Some obstetricians described how they carefully balanced the indications for ultrasound with the risk of performing unnecessary scans,

Table 2
Categories of Norwegian obstetricians' experiences and views in relation to the use of ultrasound in pregnancy management.

Categories	Sub-categories
I: Differing opinions about ultrasound and prenatal diagnosis policies	I:I Widely divergent views on the 'one routine ultrasound only' approach I:II CUB screening a debated topic in Norway I:III Increasing ethical challenges with developments in prenatal diagnosis
II: Ultrasound's influence on the view of the fetus	II:I The influence of visualisation on obstetricians' views of the fetus as a patient and person II:II Visualisation of the 'child to be' for expectant parents II:III Visualisation as comfort when adverse outcomes are expected
III: The complexity of information and counselling	III:I Balancing the medical and social aspects of the examination III:II Delivering bad news III:III Counselling challenges in situations of uncertain findings

while some portrayed themselves as more liberal in meeting maternal requests for ultrasounds that were not medically indicated, for example in situations of maternal worry about the pregnancy, or in situations where the obstetrician saw an ultrasound on maternal request as the fastest way to complete the consultation.

Physicians mentioned that ultrasounds with the aim of detecting or ruling out fetal anomalies were only to be undertaken at one of the five centres approved to perform ultrasound as part of prenatal diagnosis. However, one obstetrician raised the possibility of looking for such information if a woman requested it during a scan performed for other indications, for example in the investigation of vaginal bleeding. In the event of a suspected deviation, a referral was made to one of the University hospitals for further examination.

'You see it [nuchal translucency] occasionally and it partly depends on the woman asking for it, then I look for it. Even though it is prohibited, or how to put it. It should not be done really, but I still see it.' (#10).

The obstetricians who were supportive of the current level of use saw that there would be limited capacity to perform additional ultrasounds within the current system, they also voiced concern over the risk of performing unnecessary examinations. However, at the same time it was noted that a growing number of pregnant women turned to private providers to obtain ultrasound examinations, mainly for non-medical reasons such as the expectant parents' wish to 'see' the fetus.

There were also divergent views about whether CUB screening should be offered to all women, and providing women with a choice whether to continue the pregnancy or not in cases of severe abnormalities was emphasised as important by some.

'There is a big debate whether there should be a [routine] offer of a first trimester ultrasound examination. Personally I hope not, but it is linked to what I said in relation to the fetus' own worth, that one then focuses on looking for abnormalities, these are things that concern me in relation to that perspective.' (#7).

'We will never have a society without individuals who need support or who have different development or life trajectories. We can never reach that, so that's not a goal I have either. But I'm at the same time glad that we have the opportunity for women to decide themselves if they want to seek abortion or not.' (#4).

CUB screening a debated topic in Norway

The obstetricians repeatedly compared the frequency of ultrasound use in Norway with the frequency of use in other countries. Except for being described as a country with conservative use of pregnancy ultrasound, they also experienced Norway as differing from other countries in terms of how prenatal diagnosis was perceived in the community. Comparisons were often made with the situation in neighbouring Denmark where, in stark contrast to Norway, universal CUB screening for Down syndrome is offered.

'I see it as a cultural difference between the Nordic countries, and that Norway is in a unique position there… We don't have a screening program targeted at Down syndrome, we don't… It is not an explicit aim to eradicate Down syndrome as I see it [to be] in Denmark. There is a goal there that such children should not be born, and they say that out loud. However, it is not accepted to say that here in Norway.' (#4)

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Down syndrome screening was portrayed by some as a sensitive issue to talk about, and mention was made of CUB screening being frequently debated in media and political discussions.

'This [CUB screening] has become a political discussion in the media, it has been a big thing.' (#7)

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Increasing ethical challenges with developments in prenatal diagnosis

The obstetricians raised both hopes and fears in relation to the future of ultrasound in obstetrics and developments in prenatal diagnosis. While ultrasound was anticipated to become more important with knowledge about an increasing number of parameters to contributing to decision-making, they feared at the same time that developments in ultrasound and prenatal diagnosis would also bring new questions and challenges for maternity care.

'I think the more information we get about it [the fetus], the more choices we have, and the harder it becomes. There are probably some choices that will be impossible in a way. And then we have to deal with information about things that we would not have known if the technique were not where it is now. Maybe we open up a world which we should have been spared from… All technology that drives us forward also raises such questions.' (#9)

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Some obstetricians described entering an ethically challenging 'grey zone', in which minor abnormalities, or even traits in individuals potentially could be identified, laying the ground for selection and 'engineered babies'. Some described technical advancements as 'pushing the limits', and believed that information obtained could potentially put people in very difficult or even unbearable decision-making situations.

'And it will be a huge grey zone that surely will be very big in the future, where you can detect something that in itself is not a disease, but that is more a characteristic of an individual, and I think that actually becomes ethically very questionable.' (#1)

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Ultrasound's influence on the view of the fetus

The influence of visualisation on obstetricians' views of the fetus as a patient and person

A common view among the obstetricians was that the fetus becomes a patient when a diagnostic examination of the fetus is performed, and generally this is an ultrasound examination. Some perceived the fetus to be a patient the first time the obstetrician met the pregnant woman, some when the human features were visualised through ultrasound, and some saw viability as the crucial point in time when the fetus could be regarded as a patient.

"I would say that the fetus is a patient to the highest degree, as soon as we put the probe on, I would say the fetus is a patient because we are doing a diagnostic examination of the fetus.' (#1).

In general, obstetricians expressed views that the fetus becomes a 'person' at some stage during pregnancy. Although there were variations in opinions about at what stage, a common standpoint was that the fetus gained more personhood the further the gestation progressed, with viability depicted as an important milestone. The ultrasound examination was also mentioned as significant, because the fetal traits then became known to the obstetrician. Others had no particularly strong personal view, rather it was related to the expectant parents' views, and also whether the pregnancy was to continue or not.

'A person per se is probably when it has a chance to survive. That would be in gestational week 24–25…' (#10).

However, even though the obstetricians had different views in relation to if and when the fetus could be regarded as a patient and a person, the views were unanimous in regards to the health interest of the woman as always taking priority over that of the fetus.

'We have a principle in obstetrics in Norway that the mother takes precedence. That is our paramount principle.' (#14).

Visualisation of the 'child to be' for expectant parents

The obstetricians felt that ultrasound also had a significant impact on expectant parents' view of the fetus, and some described how expectant parents who underwent an early ultrasound could be 'caught by surprise' over how human the fetus already looked at the end of the first trimester.

'The experience is that many people are very surprised by what they see. How developed… they can see a human being, they look at 12 weeks and they can see that everything is there… (#1).

Visualisation was experienced as having the potential to increase emotional stress in those situations where the woman had seen repeated images of an apparently healthy fetus, but subsequently experienced a spontaneous abortion. The ultrasound image showing 'a whole human being with arms and legs' was also said sometimes to cause expectant parents to be shocked or upset if they had past experiences of a miscarriage or an abortion.

Visualisation as comfort when adverse outcomes are expected

Some obstetricians described the value of ultrasound when counselling parents in situations where complications had occurred. For example, in situations when abnormalities were identified, they could use ultrasound to visualise and put emphasis on positive aspects of fetal health and development.

'We always try to give them an image of something beautiful. We put emphasis on the good aspects. Especially if we find major abnormalities, we [first] have to ascertain the diagnosis, [but] we show the positive things as well. If there is a serious heart abnormality, we show them that there are beautiful hands and feet, that the kidneys look good, important with good kidneys and spine, such things.' (#14).

In cases where the prognosis was poor and the baby was expected to have little chance of survival at birth, spending time visualising the fetus and capturing images for the expectant parents to keep as a memory of the child they may lose was also described as important.

'We've had several with serious malformations, where we know that most likely the fetus or baby will die at birth. Severe skeletal dysplasia, Trisomi 18, Trisomi 13, who choose to continue the pregnancy. We spend a lot of time providing them with beautiful images, 3D images.' (#14).

'I try to get good images of the profile, especially if I know that there is something serious. Then they want a memory.' (#17).

The complexity of information and counselling

Balancing the medical and social aspects of the examination

The obstetricians reported that during the routine ultrasound examination in the second trimester, expectant parents in general expected to obtain information about, and reassurance of fetal wellbeing, to know the fetal sex, and also to obtain keepsake images of the fetus.

'Many are very interested in knowing the sex, that seems to be the main focus for many, but they wish to know that everything looks fine, that everything is normal.' (#7).

'Of course everyone wants an image.' (#20).

The obstetricians repeatedly mentioned having to balance and negotiate the medical and social aspects of the routine ultrasound examination. While in general, participants emphasised that producing images and finding out the sex were important aspects for expectant parents, these were not relevant from a medical perspective and outside the purpose of the examination.

'Yes, I think very often that those who come, especially for screening when they perhaps are more concerned about the sex… We're of course, a little more occupied with checking that everything looks fine… they often wish to bring a picture home. Trying to get an idea of what the child looks like… I want to see if the anatomy is normal, I am not so concerned about the facial features.' (#16).

Frustration was ventilated over the 'entertainment' aspect of ultrasound. A clear conflict of interest was described when the ultrasound operator's focus was on the clinical purpose of the examination, while at the same time the expectant parents' focus was perceived as being on getting good images and 'seeing the baby'.

Sometimes I have the sense that they perceive the ultrasound examination to be a show… We do not want the whole family to be present, we do not want to have children present. Sometimes they bring mother, mother-in-law, and their own children. This is a medical examination for us, it is our work context, we have a job to do. For many it's an opportunity to see the baby. And you have different interests now and then, what the target of the investigation is. They want to have a nice picture, they want to know the sex, they want their due date…….So it can almost be a conflict of interests...' (#14).

It was also explained that adverse findings could be a bigger shock for expectant parents when their expectation of the routine ultrasound examination was to get good images and to 'meet the baby', a situation framed as a pleasant family event rather than a medical examination.

'The shock may be even greater for many when we say "there is something that is not right." Because they are coming with the idea of that "now I'm going to see my baby," "now I'm going to get a nice picture" and this should be a cozy happening.' (#14).

However, the experience was different for those who worked at the University hospitals, where pregnant women came for further investigation once an abnormality had been found, and thus they already knew about potential complications.

Some obstetricians thought that expectant parents had unrealistic expectations in relation to ultrasound's capacity. Emphasising that the ultrasound cannot rule out all deviations was described as important in these consultations.

'And I think some have slightly exaggerated expectations of what ultrasound is able to do. I think they take it almost as a guarantee that they will get a healthy baby, when we find that everything looks normal on the ultrasound.' (#1).

Delivering bad news

One of the most difficult aspects of the obstetricians' work was portrayed as the moment when the probe was put on the pregnant woman's abdomen, and where the obstetrician instantly realised that there was going to be an adverse pregnancy outcome, such as in the cases of intrauterine death or severe abnormalities incompatible with life. The interviews highlighted that each ultrasound brought the potential for a negative discovery, and the immediacy of results meant that the ultrasound constituted a significant turning point in pregnancies where adverse discoveries were made.

If the pregnant woman had experienced reduced fetal movements or bleeding, then the obstetrician described it differently, because the woman was then a little prepared for something being wrong with the pregnancy. However, the instances where there were not prior warnings were portrayed as particularly difficult for the obstetricians to manage, as they were the sole carrier of the bad news.

'I dread the burden to convey a finding that is incompatible with life.' (#9).

One obstetrician working at one of the university hospitals and thus one of the referral centres disclosed recurrent feelings of having 'destroyed lives' by delivering bad news following ultrasound examinations:

'Sometimes you go home from work and think that now I have destroyed

many lives, that's ahhhh……. Again and again. The only thing you do is tell people that everything is just bad… All you do is tell people negative things and then you do not have a good day when you leave work.' (#14).

'Bringing the job home' after experiencing a 'tragic' event was commonly mentioned. While this was described as difficult, participants felt that this was a fairly normal response and showed that they were not cold-hearted.

'I often bring it home with me… it hurts me in a way, but it does not bother me so much that I cannot do other things. But there are many fates that are affected… It would be unnatural if you did not react afterwards in some of the situations we have.' (#2).

Counselling challenges in situations of uncertain findings

Situations where the findings of an ultrasound examination were of an uncertain nature, or where the prognosis of an abnormal finding was impossible for obstetricians to predict, were also described as among the most difficult aspects of obstetric practice.

'The most difficult with ultrasound examinations is when we have findings that we do not know the significance of. Or if you have findings where you know the prognosis is poor, but not how poor the prognosis is. Diaphragmatic hernia for instance is difficult, or corpus callosum agenesis, is also difficult, syndromes with different potential outcomes. I find it difficult to explain it.' (#17).

Noticing a deviation, without knowing what it would mean for the health and development of the child, but at the same time having an obligation to inform expectant parents about all findings, was described as a challenging part of an obstetrician's job. Being open about the uncertainty was seen however, as being the most constructive strategy in counselling.

'It's terrible not being able to give an answer. I find that the more open we are about it being difficult and that we may not be able to provide an answer, the easier it gets to communicate with them.' (#14).

The obstetricians explained that many patients turned to the Internet to find out more about a fetal condition. To avoid patients being wrongly informed, the obstetricians put a lot of emphasis on explaining the situation and clarifying expectant parents' misconceptions, also allowing for repetition of information. Some even gave out their private home phone numbers in complicated cases, so that the pregnant woman could obtain more and relevant information, whenever needed. The important role of team work was also emphasised, where relevant specialists would step in and assist in counselling and decision-making in relation to their area of expertise, and where social workers would provide additional support if needed.

'The woman has almost an open line to us, they even get our personal phone numbers. So she can call us anytime, if there are more questions' (#15).

It was also emphasised that findings from routine ultrasound examinations sometimes caused more harm than good, if deviations were found that subsequently turned out to be of no clinical relevance.

'I think that it is experienced as a crisis almost if something wrong is detected with a fetus… I think sometimes we give the patient a very worrying pregnancy with many examinations around anatomical changes that are perhaps not that big, or perhaps some temporarily discovered anatomical changes that will be of no importance to the child that will be born. I think it can be perceived as very how can I express it… that the pregnancy takes on a negative connotation.' (#18).

Uncertain ultrasound findings were also discussed in relation to abortion legislation, in which the gestational week was an important factor to consider in decision-making. Obstetricians described decision-making to be particularly tricky in situations where a more certain diagnosis would be possible as the fetus developed, but at the same time, where waiting for this development meant that the legal cut-off for termination of pregnancy would pass. It was mentioned that, in some instances, women travelled abroad to access abortion at a later gestation than would be allowed in Norway.

'We have a very strict abortion law in Norway. That is why some women go to Sweden (Termination on a woman's request is allowed before the expiry of the 18th week in Sweden, and between week 18 and 22 only following approval from the National Board of Health and Welfare.) if we know that we are a little pressed for time.' (#14)

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Discussion

The results of this study show considerable differences in attitudes towards the use of ultrasound among the participating obstetricians, and furthermore, that the Norwegian regulations about the use of ultrasound during pregnancy were not unanimously supported or adhered to. The findings furthermore highlight many challenging aspects of obstetric care, related in particular to differing expectations, adverse ultrasound findings and counselling.

Ultrasound is now one of the most debated and questioned medical technologies in Norway, however, interestingly, it took 20 years of clinical use before pregnancy ultrasound was considered to pose ethical issues [23]. CUB screening, which has an uptake of 12% in Norway compared to 95% and 92% in Denmark and Finland [21], and 33% in Sweden [24], has been widely discussed in Norwegian politics and media. The polarisation which has characterised the Norwegian debate, between the hope of clinical benefits and fear of the risk for increased fetal selection on the grounds of social acceptability, was also apparent in the present study [25–27].

The views of the participants who were supportive of more scans are in line with those of others who have argued that the routine use of ultrasound, including the second trimester routine ultrasound examination and first trimester CUB screening, can be an important autonomy enhancing strategy [28]. By getting information about the status of the fetus, the pregnant woman can make an informed decision about whether to undergo further invasive testing, and ultimately, whether or not to continue the pregnancy, in cases of severe abnormalities. However, others have voiced concerns that pregnant women may increasingly lose their freedom to choose *not* to undergo prenatal diagnosis, and the risk of 'routinisation' of such medical interventions [29]. Thus, 'routinisation' may have the opposite effect on pregnant women's autonomy, if they face subtle or overt pressure to conform to community expectations of undergoing ultrasound examinations and other tests in pregnancy [29]. A study conducted with pregnant women in Norway prior to their 18-week routine ultrasound revealed that while women had a strong desire to have an ultrasound, they also mentioned that social pressure to accept the offer of a scan exists [30]. In the light of this, unwanted consequences of routinisation of interventions are important to consider as new prenatal diagnostic technologies are introduced and rolled out in maternity care. In the context of a worldwide trend of growing demand for, and use of pregnancy ultrasounds, it also seems important to emphasise the position of the International Society of Ultrasound in Obstetrics and Gynecology (ISUOG) and the World Federation of Ultrasound in Medicine and Biology (WFUMB), who recommend that ultrasounds without medical benefit should be avoided due to some remaining uncertainty regarding the biological effects of energy exposure to the developing fetus. They also recommend against non-medical use of ultrasound when the purpose is merely to provide images of the fetus [8].

Some of the study participants raised concerns over entering an ethically challenging 'grey zone', the risk of 'engineered babies' and medico-technical advancements in maternity care as 'pushing the

limits'. Others have also called for a discussion about what limits to put on powerful new technology to prevent misuse, because fast evolving technology has the potential to transform our society by preventing the birth of individuals with certain disabilities, and by trait- or sex-selection [31]. Our study findings are also supported by our previous findings from Sweden and Australia, where midwives in particular voiced fears and ethical concerns over increasing 'selection' due to prenatal diagnosis, with lower acceptance of disability in the community as a consequence [32,33].

Our findings are consistent with previous literature where visualisation of the fetus has been described as influencing views of the fetus as a 'person' and a 'patient', and as influencing the establishment of maternal-fetal relationships [9,30,34]. Receiving a diagnosis of fetal anomaly after an ultrasound examination has been described as a traumatic experience for expectant parents [35] and while non-lethal fetal abnormalities may increase maternal-fetal attachment [36], women may find it difficult to become attached to the baby if the prognosis for survival of the baby is poor [35]. A novel aspect of this research, however, was the finding that obstetricians took the opportunity to use ultrasound to emphasise positive aspects of fetal health and development when abnormalities had been identified, and creating memories for expectant parents in situations where a poor outcome was expected. Others have also reported that the ultrasound operator can have an important role in facilitating understanding and providing precious time with the baby in these situations [37].

Our findings show how obstetricians have to negotiate the medical with the social aspects of the ultrasound examination, i.e. finding out the sex and obtaining good images. Previous studies have also indicated that the expectations of the routine ultrasound examination can differ considerably between expectant parents and caregivers, with the 'entertainment' aspects of ultrasound increasing in response to the demand from expectant parents [11,38,39].

However, as raised by the study participants, when prepared for a 'pleasant family event' rather than a medical examination, expectant parents may be less prepared in the advent of adverse findings [9,40]. A particularly problematic area is the identification of deviations for which the clinical relevance is unclear. While the physician are obliged to convey information obtained from an ultrasound, findings of uncertain nature have the potential to cause a great deal of worry and anxiety for expectant parents [9], something that poses dilemmas for counselling in care [41]. Delivering bad news following an ultrasound was described as one of the most challenging aspects of obstetric care by the participating obstetricians. While there is a growing number of studies reporting pregnant women's experiences [9,40], there is to date limited research into the challenges obstetricians face in this context. In a study from Australia, professionals working in fetal medicine settings also felt that their work was both personally and professionally challenging, and that it took a toll on their daily lives, including 'bringing work home', dreaming about patients, feelings of being 'weighted down' and 'burnt out'. Consistent with our findings here though, they also saw the emotional side of the work as 'unavoidable' and an 'acceptable consequence' [42]. One coping strategy used by physicians in this context has been described as a process of separating one's emotional response from the patient situation to alleviate moral distress post difficult clinical encounters or moral dilemmas [43]. Other coping strategies have been described to include both humour and crying, keeping healthy doctor-patient boundaries [43], and talking informally with colleagues, friends or family [44].

The discovery of fetal deviation occurs during the examination and there is little time for the clinician to prepare to deliver the negative news. Delivering bad news in a prenatal context can be challenging and requires compassion, emotional intelligence, sensitivity and commitment to support the expectant couple after the diagnosis has been revealed [45]. As the area of imaging technology and prenatal diagnosis is constantly evolving, many diagnoses that before were identified after birth are now being made prenatally [1], which reasonably means that obstetricians and other maternity care professionals are facing a parallel increase in management of such diagnoses.

Trustworthiness

Credibility was addressed in this study though recruitment of participants of different genders and ages, and from settings with different hospital and geographic characteristics. Furthermore, some of the interviewed obstetricians had obstetric work experience from other countries, which contributed contrasting reflections and views in relation to the use of ultrasound in Norway. Dependability was ensured by the use of a topic guide, which meant that the same topics were brought up for discussion in all interviews. The interviews were performed by two Swedish researchers, which did entail some risk of misinterpretations. However, the interviewers, an obstetrician (IM) and a midwife (AÅ) respectively, were both very familiar with the study context and also with the Norwegian setting (IM), which meant that they were able to ask relevant follow-up questions during interviews and facilitate the participants' expressing their views at length. We believe the findings of this study are transferable to similar hospital settings in Norway due to the purposive selection of hospitals of different sizes and geographical locations.

Conclusions and implications for practice

This study highlights obstetricians' experiences and views of ultrasound and prenatal diagnosis in Norwegian maternity care and the challenges associated with the provision of these services, including counselling dilemmas and differing expectations between caregivers and expectant parents. There was notable diversity among these obstetricians in relation to their support of, and adherence to Norwegian regulations about the use of ultrasound, which indicates that the care pregnant women receive may vary accordingly. Comprehensive information to expectant parents about the aim of the routine ultrasound examination is important to decrease the risk of misunderstanding and disappointment during the examination. It seems important to consider the views of pregnant women in further discussions of the level of provision of these services.

Authors' contributions

KE, AÅ, TAF, SH and IM designed the study, TAF recruited participants, and IM and AÅ performed the data collection. KE conducted the analyses with input from AÅ, TAF, SH, ED, RS and IM, and drafted the manuscript. All authors contributed to revising the manuscript and approved the final version.

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