Department of Health Northern Ireland

Regional Review of Imaging

Obstetric Imaging

CONTENTS

1. Executive Summary

1.1. In December 2013 the Department of Health (DoH) wrote to the Chief Executives of the HSC organisations to inform them that the Department would commence a review of imaging services during 2014/15, the outcome of which will set the context for future service provision.

1.2. In early 2014 the DoH established the membership and structure of the imaging review project board. The terms of reference for the review were agreed by the project board and approved by the Minister of Health. The project board agreed a number of work streams representing all aspects of imaging. An overarching workforce group, a capital and revenue investment group, and an independent expert advisory group were also established by the DoH.

1.3. The work streams were tasked by the DoH to review their specialised services and report to the DoH using the following headings:

- Current service: where we are – report/analysis of the current service configuration, demand/capacity, capital resource, workforce etc.
- Optimal service: where we would like to be - paper outlining what an optimised service would look like, including taking account of regional approach, professional role expansion etc.
- Gap analysis; what we need to get us there.
- Blue sky/horizon planning; future proofing and strategic planning.

1.4. Obstetric imaging was identified by the project board as one of the specialised services work streams. In November 2014 an obstetric work stream consisting of obstetric ultrasound leads within each Trust, lead radiographer/sonographers, midwives and representatives from Royal College of Obstetricians and Gynaecologists (RCOG), Northern Ireland Medical and Dental Training Agency (NIMDTA) and Queens University Belfast (QUB) was established. Terms of Reference (Appendix 1) for the obstetric work stream were developed, regionally circulated for consultation and agreed.

1.5. This report sets out the findings and conclusions of the obstetric work stream against the four areas identified by the DoH. The recommendations should ensure that provision of obstetric imaging meets the demands of a maternity population with increasing complex needs whilst ensuring a high standard of care. The recommendations also support the implementation of the DHSSPS Strategy for Maternity Care in Northern Ireland 2012[1].

1.6. The obstetric imaging report and recommendations forms part of the overall DoH Imaging review work and Regional Imaging Strategy.

1.7. Summary of Recommendations

1. **One regional electronic system for obstetric imaging management that includes image capture, storage, reporting and review.**
   The system should link with other services to allow for seamless management of maternity cases, including referral to and input from fetal medicine services; fetal cardiology services; paediatric renal services; and specialist paediatric services. The system should link with the NI electronic care record system and the Northern Ireland Maternity System (NIMATS).

2. **A service model for the provision of obstetric imaging.**
   This service model should be in line with National Institute of Clinical Excellence guidelines and relevant professional standards. This will ensure that women receive the right care, at the right time, in the right place provided by the right professional. The service model will support the implementation of the DHSSPS Strategy for Maternity Care in Northern Ireland 2012[1].

3. **Robust governance and quality assurance arrangements for Obstetric Imaging.**
   Audit of first and third trimester scans should be routine and performed on an annual basis. Trusts should audit their detection rates and screen positive/negative rates for the fetal anomaly scan. The data will contribute to the development of a regional detection rate for each condition looked for at the fetal anomaly scan. There should be a 'rolling programme' for regular updating of scan machines in keeping with agreed national standards[2,3]. A Quality Assurance and scientific support programme for ultrasound imaging equipment in line with that proposed in the Medical Physics section of the Radiology Workstream Paper 3 and in section 2.3.2 of the Regional Medical Physics Service Support for HSC Imaging Services should be implemented.

4. **A regional obstetric imaging group to oversee and drive forwards the implementation of these recommendations.**
   Once established this group will be responsible for the development of the service model for obstetric imaging. Representatives from obstetrics, midwifery, radiography and the wider radiology IT system should be included in this subgroup, as well as the NI RCOG deanery ultrasound coordinator for ultrasound training, Queens University Belfast School of Midwifery and the Northern Ireland Medical and Dental Training Agency (NIMDTA).

2. Introduction

2.1. In December 2013 the then Department of Health, Social Services and Public Safety (DHSSPS now Department of Health) wrote to the Chief Executives of the Health and Social Care (HSC) organisations to inform them that the DoH would commence a review of imaging services during 2014/15, the outcome of which would set the context for future service provision.

2.2. In early 2014 the DoH established the membership and structure of the review project board and tasked the project board with the following objectives:

2.3. To evaluate and make recommendations on the configuration of imaging services over next 10 years; taking account of advancements in technology, demographics and demand, and developments in clinical and professional practice and national and international best practice.

2.4. To make recommendations to ensure that patients receive timely radiological investigation with prompt reporting to enable accurate diagnosis and treatment.

2.5. The DoH project board set out the overarching terms of reference for the imaging review which were approved by the Minister of Health

2.6. The DoH identified specialised service work stream areas and appointed leads for each work stream subgroup with the project board.

2.7. The project board also established an independent expert advisory group; an overarching workforce group; and a capital and revenue investment group to inform the work of the imaging review.

2.8. Information and communications technology was integral to the work of all groups.

2.9. The work streams were asked to produce their own terms of reference and each asked to make recommendations for the future of their specialist imaging services. It was agreed by the DoH project board that the individual work streams would approach the work by addressing the following four areas:

- Current service: where we are – report/analysis of the current service configuration, demand/capacity, capital resource, workforce etc.
- Optimal service: where we would like to be - paper outlining what an optimised service would look like, including taking account of regional approach, professional role expansion etc.
- Gap analysis; what we need to get us there.
- Blue sky/horizon planning; future proofing and strategic planning.

2.10. Obstetric imaging was identified by the DoH as one of the specialised services work streams.

3. Maternity Services

3.1. There are approximately 24,500 babies born each year in Northern Ireland. Prospective parents are partners with Health and Social Care (HSC) staff in maternity care. They must be given the right information about how they can help themselves and their baby to stay healthy before and during pregnancy, and in the postnatal period. Early assessment in pregnancy and informed choice of location of birth of the baby, relevant to individual needs, are of crucial importance.

3.2. Continuity of care is important. For women with straightforward pregnancies, the midwife will lead maternity care. For those with more complex conditions, the consultant obstetrician will lead care, with a greater presence of the consultant and senior doctors on the labour ward.

3.3. 'A Strategy for Maternity Care in Northern Ireland 2012-2018'[1] is being implemented. The aim of this strategy is to provide high-quality, safe, sustainable and appropriate maternity services to ensure the best outcome for women and babies in Northern Ireland.

3.4. There are 22 objectives within the strategy which cover a range of areas from antenatal to postnatal care. At this point in the life of the strategy there has already been progress made in many of these areas, such as:

3.4.1. Development of a core care pathway that indicates the care every woman should receive during her pregnancy including ultrasound scans.

3.4.2. A regional pathway has been agreed for the provision of early pregnancy services

3.4.3. Adoption of the "Saving Babies Lives" risk algorithm which indicates which women require serial scanning in the third trimester

3.4.4. Development of a service model with associated funding for multiple pregnancy clinics in each Trust

3.5. Obstetric imaging or ultrasound scanning is one key aspect of the wider range of maternity services that women in Northern Ireland will access during their pregnancy

4. Obstetric Imaging

4.1. Obstetric imaging is predominately carried out through the medium of ultrasound. Therefore obstetric imaging referred to throughout this paper is related to the provision, use and practice of ultrasound scanning. Where other modalities are referred to they will be specifically named.

4.2. In November 2014 an obstetric work stream consisting of obstetric medical ultrasound leads within each Trust, lead radiographer/sonographers, midwives and representatives from Royal College of Obstetricians and Gynaecologists (RCOG), Northern Ireland Medical and Dental Training Agency (NIMDTA) and Queens University Belfast (QUB) was established. Terms of Reference (Appendix A) for the obstetric work stream were developed, regionally circulated for consultation and agreed.

4.3. In considering the provision and configuration of obstetric imaging there are a number of factors which set it apart from other imaging services:

- Obstetric imaging is performed by obstetricians at all levels of training: midwife sonographers; radiographer/sonographers; fetal medicine specialists; paediatric cardiologists providing fetal ultrasound and General Practitioners (GP).

- Obstetric imaging takes place in outpatient settings; inpatient wards; fetal medicine departments; Day/Emergency Obstetric Units and admission wards; delivery suites and theatres; and early pregnancy assessment clinics. Ultrasound may also be performed outside maternity settings in emergency departments, community clinics and GP surgeries, and hospital radiology departments.

- The ultrasound training, competencies and qualifications of each professional group is different and variable.

4.4. In NI the majority of scans are performed by all levels of obstetric medical staff with radiographers/sonographers largely restricted to performing the fetal anomaly scan. Of the small number of midwives who do scan the majority are restricted to 1st and 3rd trimester scanning. This is a different model of care to rest of UK in that it is a medically led service. In England and the other UK countries the bulk of obstetric scans are performed by sonographers/radiographers and midwife sonographers, whilst obstetricians perform the least number of scans and they tend to be within more specialised areas of obstetrics.

4.5. There are a number of areas which are not within the scope of the obstetric workstream: namely: uro-gynae, benign gynae, infertility, sub-fertility and gynae oncology.

4.6. This review is also limited to the provision of obstetric imaging within Health and Social Care (HSC) Trusts and does not consider obstetric imaging in private facilities or GP services. A letter was sent from the HSC Board in 2014 to all NI GPs regarding

provision of antenatal ultrasound and the need to ensure appropriate clinical governance, up to date training and scanning equipment, and indemnity provision.

5. Methodology

5.1. In November 2014 a questionnaire (Appendix C) about service provision was sent to the obstetric ultrasound leads in all five Trusts. The questionnaires were returned from separate maternity units in some Trusts or as an overall Trust response. Questionnaires were completed with input from obstetricians, midwives and radiographers/sonographers. The aim of the questionnaire was to assess existing obstetric ultrasound provision and identify gaps in service provision to inform the development of recommendations. A questionnaire on obstetric ultrasound training for doctors working in obstetrics was circulated through the NIMDTA.

5.2. A number of meetings were also undertaken with Trusts to discuss provision of early pregnancy scanning; 1st trimester scanning; fetal anomaly scanning; fetal cardiac scanning; 3rd trimester scanning; referrals to specialised fetal and paediatric services; radiographer/sonographer roles; and training of doctors. Meetings were also held with the Business Service Organisation (BSO) regarding electronic reporting, image storage and IT links for obstetric imaging.

5.3. The committee of the Northern Ireland Obstetric Ultrasound Forum (NIOUF) was also consulted as representatives of the obstetric ultrasound professional community. NIOUF aims to provide a regional resource through the sharing of knowledge, expertise, service development, and innovation that will promote, influence and enhance best practice and consistency in the fields of obstetric ultrasound. It also aims to influence current and future strategic policy that is relevant to obstetric ultrasound provision.

6. Current service

6.1. Information for current services has been derived from the questionnaires referred to in section 5.

6.2. The use of ultrasound has become an integral part of antenatal care in Northern Ireland with the majority of women receiving more than two scans during their pregnancy. The National Institute of Clinical Excellence (NICE) Antenatal Care clinical guidelines CG62[4] recommends that all pregnant women are offered two routine scans during their pregnancy, one at booking and then at 18+0 to 20+6 weeks gestation for fetal anomaly. NICE does not recommend any further scans for those women with a straightforward pregnancy. Responses to the questionnaire indicated that a large number of women in Northern Ireland with a straightforward pregnancy receive scans for no clinical indication with the result that a scan at each antenatal hospital appointment has become the expected norm.

6.3. Due to the increasing incidence of conditions such as diabetes, obesity and hypertension, a significant number of women require closer surveillance thereby increasing the demand for specific obstetric scanning.

6.4. Booking Scan

6.4.1. In some areas this scan was referred to as the dating scan. In this paper it will be referred to as the booking scan as defined by NICE[4].

6.4.2. There is variation in delivery of the booking scan terms of:

- where and when (pre booking/ post booking) the scan is provided,
- the professionals who perform the scan,
- the quality of the booking scans.

6.4.3. There is variance from the NICE guidelines in dating the pregnancy at the booking scan with some Trusts not 'dating' the gestation of the pregnancy until the fetal anomaly scan.

6.4.4. The majority of scans are not electronically captured either in the form of an image or report. For the Units that have electronic capture this is stored only on the scan machine. A hard copy image may be printed and inserted into the maternity hand held record (MHHR). One unit has developed a formal booking report for completion and inclusion into the MHHR.

6.5. Fetal Anomaly Scan

6.5.1. Sonographers perform the fetal anomaly (FA) scan in all Trusts.

6.5.2. The FA scan is performed mainly in keeping with the UK National Screening Committee's Fetal Anomaly Screening Programme (FASP) Standards[5].

6.5.3. Some Trusts stated they were unable to meet the 30 minute appointment slot recommended by the FASP Standards for the 18 - 20+6 week anomaly scan. Resource constraints for sessions or lack of staff were identified as the reason.

6.5.4. A significant number of scans are repeated when not all fetal structures have been clearly visualised on the first scan. This is in keeping with the FASP standards. The repeat scan rate was significantly lower (4.3% and 5%) in the two areas with a 30 minute appointment than in areas where the allocated time was shorter (repeat scan rate 10% - 15%).

6.5.5. There are a number of sonographers working in Trusts in NI who are competent to provide obstetric scanning but are not currently working in the speciality due to financial and resource constraints. Obstetric radiographers/sonographers who report on the scans they perform can qualify for a higher pay band. Internal pressure in Trusts to deploy reporting radiographers to other departments has also restricted the number of sonographers available to work within obstetrics. The small number of sonographers working in obstetric scanning increases the risk of repetitive strain injury for those working in that area.

6.5.6. Many sonographers do not feel competent in completing the cardiac component of the fetal anomaly scan. Difficulty in provision of, and access to, up-to-date fetal cardiac training was cited as the reason. The FASP has recently recommended additional fetal cardiac views should be sought, for which sonographers will require further training to enable them to meet this recommendation.

6.5.7. The detection rates for serious fetal cardiac anomalies in NI[6] is lower than England and Wales and does not meet the FASP Standard for detection rate of ≥ 50% for serious cardiac anomalies occurring in isolation.

6.6. Third trimester scans

6.6.1. Third trimester ultrasound scanning is often done for no clinical indication, which is at variance with NICE guidelines[4].

6.6.2. There is variation between Trusts on what gestation third trimester ultrasound scans are performed.

6.6.3. Third trimester scans are mostly done by obstetricians with varying ultrasound skills. A small number of sonographers perform third trimester scans in a few maternity units when it is clinically indicated.

6.6.4. Findings from third trimester scan results are written into the MHHR. No report or images are stored electronically unless they are performed in fetal medicine departments.

6.6.5. A regional multiple pregnancy pathway has been developed as a result of a review of the management of multiple pregnancies in NI Trusts. Trusts have been encouraged (together with associated funding) to develop the role of obstetric sonographers in monitoring multiple pregnancies but this has only been taken forward to a limited extent in a few maternity units.

6.7. Fetal Medicine service

6.7.1. Three Trusts have a fetal medicine service (one regional maternity unit and two peripheral maternity units). The regional fetal medicine service is a Monday to Friday service whilst the peripheral services are provided twice a week.

6.7.2. All Trusts refer into the regional fetal medicine service. Some Trusts reported delays in referrals being seen by the regional fetal medicine team.

6.7.3. There is no unified electronic system that allows easy sharing of images between Trusts to support referrals to fetal medicine, fetal cardiology or paediatric services.

6.7.4. There is no regional referral pathway for fetal cardiac/ renal anomaly and subsequent paediatric follow up. Both specialised paediatric services state they receive inappropriate and needless referrals, which add to an already over capacity workload, require triaging and creates unnecessary anxiety for women and their families.

6.7.5. At a regional epilepsy in pregnancy workshop held in July 2015 it was highlighted that pregnant women on antiepileptic drugs should have a fetal echo-cardiograph in addition to the fetal anomaly scan, because of the increased risk of congenital malformations. However the fetal echo service has to ration referrals for fetal echo to only those women who are on certain antiepileptic drugs, and may have to reduce referrals still further, as the fetal echo service currently has limited capacity.

6.8. Early Pregnancy scanning

6.8.1. All Trusts have an ‘Early Pregnancy Service’.

6.8.2. There is a variation in the level of ultrasound scanning capacity and skill between services especially for trans-vaginal scanning. Local training has been commissioned to increase the capacity and skill available within the service.

6.8.3. Three Trusts have a service led by nurses or midwives who have attended specific trans-vaginal scanning training, mainly in the UK.

6.8.4. Information derived from meetings indicates that a number of junior doctors are providing a scanning service out of hours including making a diagnosis of miscarriage or ectopic pregnancy. There is variation in experience and skills of these junior doctors performing this task.

6.9. Audit and Quality Assurance

6.9.1. There is limited auditing of obstetric scans with wide variation between Units. Audit of first trimester and third trimester scanning is haphazard or absent. Audit of anomaly scans is currently not possible in many units. No Trust is able to provide detection rates for the conditions looked for at the anomaly scan. Quality assurance of obstetric scanning is not possible at present.

6.9.2. There is no lead professional responsible for the provision of ultrasound in each Trust.

6.10. Scan operators, training and machines

6.10.1. Obstetric scanning in NI conforms to a medical model of scanning which is different to provision of obstetric ultrasound services in the rest of the U.K. Doctors perform the majority of obstetric scanning while some midwives perform some booking and third trimester growth scans. One Trust has a few midwife sonographers providing specialised scanning. Radiographers/sonographers perform the anomaly scan with a few also providing third trimester scans in a couple of Units.

6.10.2. Trusts are currently considering their provision of booking scans in response to the DHSSPS Strategy for Maternity Care in Northern Ireland 2012[1] which recommends “appropriate access to booking scans in community and non-acute settings”. These scans however must be still carried out by appropriately trained professionals with appropriate equipment.

6.10.3. The radiographers/sonographers are the only disciplines who work to scanning protocols. There are no Trust protocols for midwives or obstetricians specifically covering provision of scanning.

6.10.4. The training and qualifications for each discipline is very different. All radiographers/sonographers in NI have completed a post graduate obstetric scanning course which is accredited by the Consortium for the Accreditation of Sonographic Education (CASE). Midwives who scan have completed the QUB Scanning Course which is a double Level 3 module. There is variation in the level of training of medical staff. At present it is accepted practice that all doctors who practice in obstetrics should scan and this may range from local 'hands on' training for junior doctors up to those who work within fetal medicine. A small number of obstetricians

have the Royal College of Obstetricians and Gynaecologists (RCOG) intermediate or advanced ultrasound modules and sub-speciality training.

6.10.5. A 2015 ultrasound training survey was undertaken with the 100 obstetric and gynaecology trainees in Northern Ireland with 44 of these trainees responding. When asked 100% of those who responded believed that all obstetric trainees (ST3 - ST7) who plan to practice in obstetrics should have completed the RCOG Ultrasound Scanning intermediate level course. Of these respondents 6 had attended the RCOG intermediate course and 2 the RCOG advanced course. Trans-vaginal scanning was considered a gap in training with 100% of responders stating formal training was necessary while 92% thought each hospital should have a designated person responsible for the supervision of ultrasound training.

6.10.6. The workforce subgroup of the Imaging Review undertook a workforce survey of all imaging staff. The number of ultrasound trained radiographers was quantified, though this was not identified as obstetric or non-obstetric. Therefore further and significantly more detailed work is required to assist with decision making or future planning.

6.10.7. Consideration is being given to improving access to CASE accredited post graduate ultrasound training (including obstetric ultrasound) as well as additional local short programmes to up-skill in sub-speciality competencies including fetal cardiac scanning and specialised antenatal dopplers.

6.11. IT and Imaging storage and retrieval.

The use of obstetric ultrasound is embedded in the provision of maternity care and becoming more important in the specialised management of a number of pregnancy conditions. The lack of a regional IT system that allows image management, audit and quality assurance impedes the utilisation and quality of this investigative tool.

6.11.1. The current arrangements for the provision of IT and electronic capturing and noting/reporting of images for obstetric scans are detailed in Appendix D.

6.11.2. There is wide variation in what, where and how images are captured and stored. Apart from a set number of images from the fetal anomaly scan there is little capture of images or electronic reporting.

6.11.3. Images and reports stored are not linked to the maternity IT system NIMATS.

6.11.4. Results from scans can be written in the MHHR. The majority of scans have no image saved. Occasionally a hard copy may be inserted into the

MHHR though women can remove these. The hard copy images deteriorate over time.

6.12. Summary of Findings

6.12.1. The expected date of delivery is not determined at booking in certain Trusts as some Trusts do not 'date' the gestation of the pregnancy until the fetal anomaly scan. This is not in keeping with NICE guidelines[4].

6.12.2. The fetal anomaly scan does not meet the FASP standards of 30 minute appointments in a number of Trusts. Repeat scans rates are lower in areas which have 30 minute appointments.

6.12.3. Many sonographers do not feel competent in completing the cardiac component of the fetal anomaly scan.

6.12.4. Sonographers are the only professionals who work to protocols for scanning.

6.12.5. Third trimester scanning for no clinical indication is a common and accepted practice in many units.

6.12.6. The increasing incidence of obesity, diabetes and maternal age has placed increasing demands for specific obstetric scans.

6.12.7. Electronic storage of data or images is mainly absent for booking, third trimester scans and early pregnancy units, and variable for the anomaly scans and fetal medicine.

6.12.8. While there is some recourse to electronic storage locally using Viewpoint, there is no common recourse to a regional electronic system (such as NIPACS).

6.12.9. Audit of first trimester and third trimester scanning is haphazard or absent. Audit of anomaly scans is currently not possible in many units. No Trust is able to provide detection rates for the conditions looked for at the anomaly scan. Quality assurance of obstetric scanning is not possible at present.

6.12.10. There is a wide variation in the training and experience of scan operators performing the different types of scans.

6.12.11. There is no lead professional responsible for the provision of obstetric ultrasound in each Trust.

7. Optimal Service Provision

7.1. Based on the fact finding results above, taking into account current practices across Trusts and developments in clinical and professional practice and national and international best practice, the key elements of optimal service provision are as follows:

7.2. The provision of a uniform obstetric imaging IT system across all maternity services that links to the regional imaging system. This would allow:

7.2.1. Storage of images electronically and generation of a computer report for all scans performed.

7.2.2. The report and images to be stored together allowing for optimum case management, minimising the possibility of patient harm from reviewing images in the absence of a report.

7.2.3. Image access/transfer between maternity services and specialist services. This would support continuity of care and optimal case management, reduce the number of unnecessary referrals and ensure women who require early assessment.

7.2.4. Are appropriately seen while enabling more women to be managed closer to home. Needless maternal anxiety through unnecessary referral would be reduced.

7.2.5. Regular audit and production of fetal anomaly detection rates. The development of a quality assurance programme for obstetric ultrasound.

7.3. Provision of an optimal obstetric ultrasound service implies reliance on individuals able to perform specific tasks to a high standard. This includes booking scans, anomaly scans, third trimester growth scans, the diagnosis of miscarriage/ ectopic pregnancy as well as management of specific high risk conditions with specialised scans. This will require:

7.3.1. All scan operators to be appropriately trained in line with recommendations from recognised national bodies[2, 3, 7] and supported to maintain skills and update on a regular basis.

7.3.2. Regional training and updating for sonographers performing the cardiac component of the fetal anomaly scan to ensure the scan is in keeping with the National Screening Committee FASP guidelines[5]. Improving the antenatal detection of congenital cardiac anomalies will allow for appropriate discussion with parents and planning of the timing and place of delivery to ensure optimal management of the infant.

7.4. Trusts should be able to audit their fetal anomaly scans and provide their screen positive and detection rates for fetal anomalies.

7.5. Auditing of ultrasound practitioner accuracy and provide a conduit through which substandard practice can be highlighted and addressed and quality improved.

7.6. Development of a quality assurance programme for obstetric ultrasound.

7.7. Maternity services should follow guidelines from NICE as well as work to recommended best practice from Royal College clinical guidelines some of which incorporate the use of obstetric scanning. The implementation of the Strategy for Maternity Care in Northern Ireland, 2012[1] and the Transforming Your Care programme[8] also gives direction to the provision of obstetric imaging with an emphasis on providing services closer to home.

7.7.1. The expanding management of a number of complex pregnancy conditions includes the use of ultrasound for screening, diagnosis and monitoring of certain conditions and requires the provision of a high level scanning service. Scan operators require support for, and provision of, robust training to meet those requirements, for example, sonographers monitoring multiple pregnancies, the use of Doppler in monitoring high risk pregnancies.

7.7.2. There is a need for access to the booking scan in community and non-acute hospital settings. Midwives will require appropriate training and support to perform the booking scan and IT links need established for storage and reporting of booking scan images.

7.8. There is limited availability of fetal magnetic resonance (FMR) imaging. FMR is not a commissioned service in NI. Currently some neurological FMR is carried out on a case by case basis, in other cases patients are referred elsewhere, such as Sheffield. No fetal body FMR takes place in NI. NI falls behind the other UK countries and Europe in having access to this service. MRI is being increasingly used for the assessment of fetal brain and pulmonary pathology. It is also used as an adjunct to ultrasound for the assessment of placenta accreta. Although clear evidence for its benefit is uncertain at present, as evidence evolves, so too must service development.

7.9. Adequate provision of fetal echo-cardiography services that meet with NICE guidelines[4].

7.10. The availability of tele-imaging links with specialist services, for example, fetal cardiology, for the management of fetal cardiac anomaly cases. This also supports and enhances ultrasound training.

8. Gap Analysis

8.1. The lack of a regional electronic system that records images and reports has a detrimental impact on the ability to optimally manage obstetric cases. To address this gap all ultrasound machines should be linked into a regional IT system that captures images and links them to the relevant scan report. At present Viewpoint standalone software is used on a number of machines in some Trusts but this is not uniform to all Trusts or even on all machines within Trusts. Viewpoint can be connected into the main NI radiology system NIPACS. To support referrals and provide optimal case management a uniform regional IT system should be in place for obstetric imaging. This would also enable clinical auditing; performance management of the anomaly scans; and allow for quality assurance.

8.2. The service, as it currently stands, is inadequate to address the increasing demand for specialised obstetric scanning, for example: the increasing number of women with complex needs; increasing number of obese patients and increasing diabetic population. Some of the activity required because of this increased demand could be offset by ensuring that current scanning capacity is utilised for scanning only the women who require it in line with national guidance.

8.3. There is recognised variation in the competencies/skills of those performing specific scans.

8.3.1. In order to meet the Strategy for Maternity Care direction for booking scans an agreed training programme for midwives will require implementation.

8.3.2. Early pregnancy scanning varies with some Trusts providing specialised training for trans-vaginal scanning for those professionals working in early pregnancy services. A regional agreement on the level of expertise for early pregnancy scanning is required. The RCOG draft guidelines for the Diagnosis and Management of Ectopic Pregnancy (Green-top Guideline No.21) (joint with the Association of Early pregnancy Units)[9] recommends that all clinicians diagnosing ectopic pregnancies should have completed the RCOG course 'Intermediate ultrasound for early pregnancy complications'.

8.3.3. Radiographers/sonographers require up to date training around the cardiac component of the fetal anomaly scan to comply with the FASP standards including the introduction of the three vessel and trachea view. **This should be a priority.**

8.4. There is a lack of policies/protocols for scanning, with the exception being the provision of the fetal anomaly scan performed by radiographers/sonographers. All professionals performing obstetric ultrasound should do so to agreed protocols[2, 3]. A regional approach would ensure equity of service for women.

9. Horizon Scanning

9.1. The use of Doppler in obstetric scanning is developing and becoming increasingly recommended. All units should be in a position to respond to change in the event NICE adopts:

9.1.1. Current RCOG guidelines on the management of the small for gestational age fetus[10] that require skills in Doppler of the uterine artery, middle cerebral artery and ductus venosus.

9.1.2. Draft RCOG guideline No 51[11] on the Management of Monochorionic Twin Pregnancy that require skills in middle cerebral artery Doppler[11].

9.1.3. Use of first trimester uterine artery Doppler in combination with serum markers to screen for the pregnancy at risk of an adverse outcome[12].

9.2. The medical model of obstetric led ultrasound imaging is dependent on doctors having adequate scanning skills to provide all aspects of obstetric scanning. Obstetricians who train outside NI may not have undertaken obstetric ultrasound training to possess the requisite scanning skills. There is a need to ensure the adequate provision of a high standard scanning service for these circumstances.

9.3. Consideration should be given towards radiographer/sonographers or midwives with specialist scanning skills providing certain ultrasound services.

9.4. The availability of trans-vaginal scanning simulators for training purposes greatly enhance training opportunities and support the maintenance of skills. This is especially pertinent should the RCOG Green-top Guideline 21 Diagnosis and management of Ectopic Pregnancy be published[9]. There are now 2 simulators available within Trusts in NI.

9.5. Consideration should be given towards the delivery of a comprehensive fetal MRI service.

10. RECOMMENDATIONS

10.1. **One regional electronic system for obstetric imaging.**

This system provides image capture, reporting and storage. The system should link with other services to allow for seamless management of maternity cases including referral to and input from fetal medicine services; fetal cardiology services; paediatric renal services; specialist paediatric services. The system should be able to link with the rollout of the NI electronic care record and link with the Northern Ireland Maternity System.

10.2. **Development of a service model for the provision of obstetric imaging.**

The development of a service model for obstetric scanning in line with NICE and best practice guidelines will ensure that women who are attending maternity services get the right care, at the right time, by the right professionals and in the right place. The service model will support the implementation of the DHSSPS Strategy for Maternity Care in Northern Ireland; 2012[1].

In particular the Service Model will have consideration towards the following.

10.2.1. Arranging service provision such that a 'core group' of individuals trained to a specified level can undertake independent and competent performance of a specific type of scan. For example, a Trust develops a 'core group' of individuals that perform booking scans, and another 'core group' that performs third trimester growth/assessment scans. Such 'core groups' could be made up of permanent midwifery and/or radiography/sonography staff and/or consultant obstetricians/ associate specialists, instead of rotating junior doctors performing scans with variable experience. Junior doctors, once they have achieved the required competency in scanning, would support the 'core group'. The core groups would also support the training of doctors.

10.2.2. A regional approach to the standard of practice required for each level of scanning and support towards training and supervision.

10.2.3. Establishment of Quality Assurance processes for obstetric ultrasound.

10.2.4. Confirmation of gestational age in the first trimester at the booking scans in keeping with NICE guidelines. This recommendation is a priority.

10.2.5. Implementation of the Fetal Anomaly Screening Program (FASP) standards[5] including 30 minutes for singleton pregnancy anomaly scans and 45 minutes for twin pregnancies. This recommendation is a priority.

10.2.6. Radiographers/sonographers require up to date training around the cardiac component of the fetal anomaly scan to comply with NICE guidelines and the FASP standards including the outflow tracts and introduction of the three vessels and trachea view. This recommendation is a priority.

10.2.7. Provision of information for pregnant women and their families about the use of obstetric ultrasound. The information should cover the benefits and limitations of ultrasound scans, reasons for offering it and when women should expect an offer of a scan.

10.3. **A regional obstetric imaging group to oversee and drive forward the implementation of the obstetric imaging review recommendations.**

A regional obstetric imaging group will provide multidisciplinary support to take forward the recommendations from the imaging review, in particular the development of the service model for obstetric imaging. Once established this group will be responsible for the development of the service model for obstetric imaging. Representatives from obstetrics, midwifery, radiography and the wider radiology IT system should be included in this subgroup, as well as the NI RCOG deanery ultrasound coordinator for ultrasound training, Queens University Belfast School of Midwifery and the Northern Ireland Medical and Dental Training Agency (NIMDTA). The obstetric imaging group may be a subgroup of the Maternity Strategy Implementation Group. The chair of this subgroup would represent obstetric imaging on the Maternity Strategy Implementation Group and on the regional radiology network group.

This group should be responsible for:

10.3.1. Ensuring regional uniformity in the quality and provision of obstetric imaging services to meet with the obstetric imaging service model,

10.3.2. Responses to changes within obstetric ultrasound, for example, changes to the management of twins, changes to the management of IUGR; increasing use of Doppler as a screening tool,

10.3.3. Developing regional referral pathways for fetal medicine, fetal cardiac and paediatric renal services.

10.3.4. Ensuring the recommendations related to obstetric scanning from learning letters are implemented and supported

10.3.5. Agreeing the competencies required for doctors and midwives performing obstetric ultrasound and supporting the provision of standardised, reproducible and supervised training opportunities in the field of obstetric ultrasound.

10.4. **Quality Assurance of Obstetric Imaging**

10.4.1. Audit of first and third trimester scans should be routine and performed on an annual basis. For those involved in early pregnancy scanning or third trimester growth scans, yearly audit in the form of submission of images to an independent third party could be considered and developed regionally.

An example of such a strategy can be found at: https://fetalmedicine.org/nuchal-translucency-scan.

10.4.2. Trusts should audit their detection rates and screen positive/negative rates for the fetal anomaly scan. The data can contribute to the development of a regional detection rate for each condition looked for at the fetal anomaly scan.

10.4.3. Regular updating of scan machines in keeping with agreed national standards[2, 3]. There should be a 'rolling programme' for replacement in each Trust. There should be annual quality assurance checks on machines. A Quality Assurance and scientific support programme for ultrasound imaging equipment in line with that proposed in the Medical Physics section of the Radiology Workstream Paper 3 and in section 2.3.2 of the Regional Medical Physics Service Support for HSC Imaging Services should be implemented.

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Glossary

ANC	Antenatal Clinic
BHSCT	Belfast Health and Social Care Trust
BSO	Business Service Organisation
CASE	Consortium for the Accreditation of Sonographic Education
DHSSPS	Department of Health and Social Services and Public Safety
DoH	Department of Health
ECR	Electronic care record
FA	Fetal anomaly
FASP	Fetal Anomaly Screening Programme
FMR	Fetal magnetic resonance
GP	General Practitioner
HSC	Health and Social Care
IUGR	Intrauterine growth restriction
MHHR	Maternity hand held record
NICE	National Institute of Clinical Excellence
NIMATS	Northern Ireland Maternity System
NIMDTA	Northern Ireland Medical and Dental Training Agency
NIOUF	Northern Ireland Obstetric Ultrasound Forum
NHSCT	Northern Health and Social Care Trust
NSC	National Screening Committee
NIPACS	Northern Ireland picture archiving and communication system
PHA	Public Health Agency
QUB	Queens University Belfast
RIS	Radiology information system
RCOG	Royal College of Obstetricians and Gynaecologist
SEHSCT	South Eastern Health and Social Care Trust
SHSCT	Southern Health and Social Care Trust
VP	Viewpoint
WHSCT	Western Health and Social Care Trust

Appendix A

Terms of Reference

Evaluate current service provision in relation to:

- the varied settings in which obstetric ultrasound scans(USS) are provided;
- the varied USS technology that is currently used in obstetric imaging across N Ireland;
- the range of professionals performing obstetric imaging;
- the number of staff trained to deliver USS;
- the frequency and reasons for providing obstetric USS;
- minimum skills and competencies required to deliver USS;
- the role of non-ionising radiation imaging modalities in obstetric imaging;
- current constraints affecting obstetric imaging service delivery.

To make recommendations whilst taking into account:

- advancements in technology;
- demographics and demand;
- developments in clinical and professional practice;
- national guidelines;
- recommended best practice.

Continue to support the 'as low as reasonably achievable' (ALARA) principle and follow the Ionising Radiation (Medical Exposure) Regulations (IR (ME) R) with all exams being justified and imaging protocols optimised.

To make recommendations for future service provision taking into account the configuration of maternity services and the implementation of DHSS Maternity Strategy 2012 - 2018[4].

To make recommendations to decrease inappropriate patient investigations.

To make recommendations that ensure services are underpinned by effective governance and quality assurance mechanisms.

To make recommendations regarding the workforce needs of future service models having regard to:

- immediate, medium term and long term service provision;
- implementation of DHSS Maternity Strategy;
- equity of imaging screening protocols/services throughout Northern Ireland;
- Local undergraduate and post graduate training provision.

To make recommendations regarding the most efficient and effective use of available resources:

- including the provision of imaging within fetal medicine services;
- the best use of workforce of resources;

- and ensuring region wide service resilience with appropriate escalation arrangements.

To make recommendations regarding the necessary investment in imaging technologies to meet service configuration including:

- the replacement of existing imaging technologies and the introduction of new technologies;
- US images networked into hospital radiology systems and appropriate archiving of images (NI PACS and other storage systems) to include audit facilities;
- the imaging and communication technology platform underpinning imaging services;
- and joint obstetric teams between Trusts within Northern Ireland and with fetal medicine specialist centers outside of the Province.

Appendix B

Membership of work stream

Belfast Health and Social Care Trust	
Dr Priscilla Devaseelan	Consultant Obstetrician
Dr Stephen Ong	Consultant Obstetrician
Helen Rice	Midwife Sonographer
Kerry Bell	Radiographer/Sonographer superintendent
Northern Health and Social Care Trust	
Dr Laura Doherty	Consultant Obstetrician
Dr Laura McMorran	Consultant Obstetrician
Laura Frazer	Radiographer/Sonographer superintendent
South Eastern Health and Social Care Trust	
Dr John Manderson	Fetal Medicine Consultant
Dr Clare Hardy	Consultant Obstetrician
Roz Mackin	Midwife Sonographer
Southern Health and Social Care Trust	
Richard De-Courcy Wheeler	Consultant Obstetrician
Josephine O'Connor	Radiographer/Sonographer superintendent
Joanne McGlade	Lead Midwife
Western Health and Social Care Trust	
Dr Jackie Cartmill	Fetal Medicine Consultant
Dr Kevin Glackin	Consultant Obstetrician
Teresa Killeen	Radiographer/Sonographer
Maureen Millar	Lead Midwife
NIMDTA	
Dr Mary Murnaghan	Consultant Obstetrician
Obstetric Trainee representatives	
Dr Kelly Ann Eastwood	
Dr Catriona Monaghan	
Public Health Agency	
Jackie McGeagh	Regional Antenatal Screening Coordinator
Dr Fiona Kennedy	Public Health Consultant
Denise Boulter	Midwife Consultant
RCOG Dean of Ultrasound	Dr Inez Cooke
Queens University	
Clare Hughes	Midwifery Lecturer
Royal College of Obstetricians (Northern Ireland)	
Dr Robin Ashe	Consultant Obstetrician

Appendix C

IMAGING REVIEW; FACT FINDING QUESTIONNAIRE; Obstetric ultrasound

Name of Trust_____

CURRENT SERVICE PROVISION

1. *First trimester booking scan (gestational age, multiple pregnancy)*

If practice varies between areas within your Trust please repeat the information for each area

1.1. When is your booking scan performed:

		proportion%
Pre booking history in the hospital	Yes/No	
Post booking history in the hospital	Yes/No	
Pre booking history in the community	Yes/No	
Post booking history in the community	Yes/No	
At a different appointment?	Yes/No	

If yes to last question please give details

_____

1.2. Where are booking scans provided:

		proportion%
At a consultant booking clinic	Yes/No	
At a midwife hospital booking clinic	Yes/No	
At a community booking clinic	Yes/No	

Other (please specify)

_____

1.3. Who does your first trimester booking scan?

	Proportion (%) *(If estimated put E after)*	Is it part of consultant led booking clinic?	Midwife clinic?	State type of training If no training put none
Midwife				
Sonographer/ Radiographer				
Specialist Registrar *				
SHO				
Staff grade				
Cons Obstetrician				
Other *(specify)*				

**State all grades who undertake booking scans e.g. ST 2*

1.4. Is the booking scan used to fix EDC? Yes/ No

1.5. If No when/how is the EDC fixed? _____

1.6. Is there a plan/drive in your Trust to change when/where booking scans are provided? Yes/No

1.7. If yes is this in response to the Maternity Strategy? Yes/No

1.8. If your Trust has any issues around the booking scans at present please provide details

_____

2. Detailed anomaly scan

2.1. Who does your detailed anomaly scan?

	proportion (%) *(If estimated put E after)*
Midwife	
Sonographer/ Radiographer	
Non career grade SHO	

Specialist Registrar Sp R 1-2	
Specialist Registrar SPR 3 and above	
Staff grade	
Consultant Obstetrician	
Other	

2.2. Is the detailed anomaly scan performed in accordance with the National Screening Committee Fetal Anomaly Screening Programme standards? Yes/ No

2.3. If scan is partially in accordance please state the areas where performance does not comply with the FASP standards

_____

_____

2.4. Time allocated to the booking USS for:

singletons_____

twins/multiples_____

2.5. What is the proportion of 'repeat scans' where all anatomy was not visualised and the patient was brought back another day?

_____% (put E after if estimated)

2.6. What happens if a repeat scan is unsuccessful?

_____

2.7. What are the main reasons for repeats?

_____

_____

2.8. Is the detailed anatomy scan used to date the pregnancy? Yes/ No

2.9. If there is a discrepancy of dates between the booking scan and the detailed scan, which scan do you go by? (please circle)

The booking scan/ the detailed scan/ a combination of both

2.10. If the EDC is changed how many days discrepancy must there be?

_____

3. *Third trimester scans*

3.1. Who does your third trimester growth scans?

	proportion (%) *(If estimated put E after)*
Midwife	
Sonographer/ Radiographer	
Non career grade SHO	
Specialist Registrar Sp R 1-2	
Specialist Registrar SPR 3 and above	
Staff grade	
Consultant Obstetrician	
Other	

3.2. Of the above staff, who are trained to perform a third trimester growth scan

	Trained
Midwife	
Sonographer/ Radiographer	
Non career grade SHO	
Specialist Registrar Sp R 1-2	
Specialist Registrar SPR 3 and above	
Staff grade	
Consultant Obstetrician	
Other	

3.3. Does your unit routinely carry out growth scans on apparently normal pregnant women (i.e. no obvious clinical indication)? Yes/ No

3.4. If you answered 'Yes' to 3.3. indicate at what gestation this is performed:

_____weeks_____ weeks_____weeks

3.5. Does your Trust have a policy for third trimester growth scans? Yes/No

If Yes:

3.5.1. Does the policy cover when growth scans should be performed? Yes/No

3.5.2. Who should perform the growth scan? Yes/No

3.5.3. What actions should be taken when a problem is identified? Yes/No

4. *Non routine (emergency) scans*

4.1. Who does your non routine scans?

	proportion (%)*(If estimated put E after)*
Midwife	
Sonographer/ Radiographer	
Non career grade SHO	
Specialist Registrar Sp R 1-2	
Specialist Registrar SPR 3 and above	
Staff grade	
Consultant Obstetrician	
Other	

4.2. Where these non-routine are scans done?

	Tick all that apply
A & E	
Day Obstetric Unit/Admission ward	
Labour ward	
A/N and P/N wards	
Early pregnancy problem clinic	
Gynae ward	
Other *(please specify)*	

5. *Early pregnancy unit*

5.1. Do you have an early pregnancy problem unit (for the diagnosis of miscarriage)?

Yes/ No

5.2. Who makes the diagnosis of a miscarriage?

	proportion (%)*(If estimated put E after)*
Midwife	
Gynae Nurse	
Sonographer/ Radiographer	
Non career grade SHO	
Specialist Registrar Sp R 1-2	
Specialist Registrar SPR 3 and above	
Staff grade	
Consultant Obstetrician	
Other *(please specify)*	

5.3. Of the above staff, who are trained to make the diagnosis of a miscarriage?

	Trained
Midwife	
Gynae Nurse	
Sonographer/ Radiographer	
Non career grade SHO	
Specialist Registrar Sp R 1-2	
Specialist Registrar SPR 3 and above	
Staff grade	
Consultant Obstetrician	
Other	

6. *Fetal Medicine*

6.1. Do you have a Fetal Medicine service? Yes/ No

6.2. How frequently is this service available?

Once per week/ twice per week/ three times per week

Other_____

6.3. Do you refer women to the Regional Fetal Medicine service? Yes/No

6.4. Do you experience delays when referring to the Regional Fetal Medicine service? Yes/ No

If yes give details

_____

_____

6.5. Do you refer to any other Fetal Medicine Service? Yes/No

If yes give details

_____

_____

6.6. Have you any issues around fetal medicine provision? Yes/No

If yes give details

_____

_____

7. <u>Other Imaging modalities</u>

7.1. Does your Trust refer women to other radiology services? Yes/No

7.1.1. If Yes where are they referred to?

_____

7.1.2. What are the reasons for referral?

_____

_____

7.1.3. If No to 7.1. would you like to refer? Yes/No

7.1.4. If Yes to 7.1.3. above what are the reasons for none referral?

_____

_____

8. *Audit*

8.1. Does your unit audit its results?

8.1.1. Booking scans Yes/ No

8.1.2. Anomaly scans Yes/ No

8.1.3. Growth scans Yes/ No

8.2. If Yes what is covered in the audits?

8.2.1. Booking scans_____

8.2.2. Anomaly scans_____

8.2.3. Third trimester scans _____

8.3. If No to any of the above are there any reasons?

8.3.1. Booking scans_____ _____

8.3.2. Anomaly scans_____ _____

8.3.3. Third trimester scans _____ _____

8.4. How often are audits performed?

	Frequency *(if not regularly then state month of last audit)*
Booking scans	
Anomaly scans	
Third trimester scans	
Other audits(specify)	

9. Machines

9.1. What are

the ages of your machines

	proportion (%)
≤ 5 years	
5 plus years to 10 years	
More than 10 years	

9.2. Are your machines serviced in line with the makers specifications? Yes/No

9.2.1. If No to 9.2. what are the reasons?_____

9.3. If any of your machines are more than 5 years old is there a plan to replace them?

Yes/No

9.4. If No what are the reasons?_____

10. *Image storage*

10.1. What scan images are stored and how are they stored?

Type of scan	Method of storage				
	electronic	hard copy	both	none	Other (specify)
Booking					
Anomaly					
3rd trimester					

10.2. If no images are stored - how are scans recorded?

_____

10.3. If stored electronically, indicate software used

_____

_____

10.4. Does this software link with NIPACS (NI Picture archiving system)?

Yes/No

10.5. Does the software link with other Units/Trusts? Yes/No

10.5.1. If Yes please give details

10.6. Can images from other Units/Trusts be accessed? Yes/No

10.7. If No to 10.6. would this be useful? Yes/No

10.7.1. If Yes to 10.7. how would this be useful?

11. Information for women

11.1. Is written information given to patients about scanning in pregnancy:

11.1.1. General information about scanning Yes/No

11.1.2. Anomaly scan only Yes/No

11.2. Is this information available in other languages? Yes/ No

11.3. Is this information available in other formats? Yes/ No

11.4. Is written consent obtained prior to the anomaly scan? Yes/No

11.5. Who is responsible for gaining consent?

11.6. Is gaining anomaly USS consent part of your protocols? Yes/No

12. Staffing and clerical support

12.1. Is your unit understaffed to perform scans at:

12.1.1. Booking Yes/ No

12.1.2. Detailed anomaly Yes/ No

12.1.3. Growth scans Yes/ No

12.2. If Yes to any above please give details

12.3. In relation to growth scans, if your unit stopped doing scans on women with an apparent normal pregnancy (i.e. no clinical indication), would you still be understaffed?

Yes/ No/ Not applicable

12.4. Do you have adequate clerical support for Obstetric ultrasound services?

Yes/ No

12.4.1. If No to 12.4. please give details _____

_____

13. Training

13.1. Concerning Junior doctors

Does your Unit provide additional ultrasound training (recognised training for career doctors is currently the basic ultrasound course taken at ST1-2 level)

Yes/ No.

If yes, please give description of the training

_____

13.2. How many Midwives (who do obstetric scanning) are trained (e.g. the ultrasound module from Queen's University or equivalent)?

_____

13.2.1. How many are scanning at present?

_____

13.2.2. Do they have updating if they spend time away from scanning and return?

Yes/No

13.2.3. If Yes to above please give details

_____

_____

13:3 Concerning Radiographers

How many radiographers are trained to provide the Anomaly/ 20 week scan?

_____

13:3:1 How many (%) have received update/ training on fetal cardiac views in the last 5 years?

Have you any other issues with obstetric imaging services you wish to highlight for the review?

Please consult with all maternity staff involved in scanning and provide joint response.

Any further comments you would like to make

Please provide the details of staff involved in completing the questionnaire.

NAME	POSITION HELD

Appendix D

Imaging Review

Information technology and software provision for obstetric imaging

1. Introduction

The software and IT used within obstetric ultrasound services varies both between and within Trusts. Historically there has been a fragmented and partial introduction of IT support to obstetric imaging across NI with the result that many images are not captured and reports not recorded within Trusts. There are some areas which have moved to implement image storage and management but again these have remained largely separate specialised areas e.g. fetal medicine, fetal anomaly scanning and some early pregnancy services. Some images are taken and filed as hard copies in the Maternity Hand Held Record (MHHR). The copies are light sensitive and deteriorate over time and as these are popular with pregnant women some may be removed from the MHHR. Currently there is no connection for obstetric ultrasound services to the Northern Ireland Maternity System (NIMATS).

2. BACKGROUND

2.1. The Northern Ireland Picture Archiving and Communications System (NIPACS) consists of PACS and RIS.

2.2. A Picture Archiving and Communication System (PACS) is a computerised system designed to manage medical images acquired as part of the examination process via digital modalities. A PACS provides the facility for the storage, distribution and electronic display of the acquired images to support clinical diagnostics, improve clinical pathway planning and enhance patient care.

2.3. A Radiology Information System (RIS) is a computerised information system designed to manage the administrative functions of patient pathway in terms of demographics, procedures, appointments and other relevant patient information.

2.4. Currently in order for images to be uploaded onto NIPACS, the ultrasound request needs to be registered onto RIS. Only sonographers working within radiology can access and register patients onto RIS. The development highlighted in 2.10 below would remove this requirement. Women's ultrasound requests are not registered onto RIS until they have their fetal anomaly scan (FA) appointment with the sonographers who perform the FA scan. The sonographers register women and upload the FA images onto NIPACS. The exception is the Ulster Maternity Unit and BHSCT where the obstetric scanners are not linked to NIPACS.

2.5. Sectra is the current vendor supplying RIS and PACS for NIPACS used in all Trusts in NI: NHSCT; SESHCT; SHSCT; WHSCT; and BHSCT with exclusion of the Royal Victoria Hospital (RVH) and Belfast City Hospital (BCH) sites.

2.6. Philips is the vendor who provides RIS/PACS used in BHSCT on the RVH site excluding Royal Jubilee Maternity Hospital (RJMH) which is not connected into any system.

2.7. Images stored on NIPACS can be viewed from any Trust or via the Electronic Care Record (ECR). There is a planned link between Philips (BHSCT) and ECR in near future.

2.8. Viewpoint (VP) is a standalone IT software package used in obstetrics which enables reporting and management of images. It is set up differently within the Trusts who have VP (BHSCT; SEHSCT; and WHSCT), and the management of images vary, depending on the supplier used, the version originally installed and type of licence procured. Not all obstetric USS machines in each Trust have a VP package. Table 1 sets out where NIPACS and VP are connected in each Trust

2.9. The maternity units in Causeway, Mid-Ulster, Moyle and Braidvalley (NHSCT); the Downe and Lagan Valley sites (SEHSCT), and all maternity units in SHSCT do not have VP and in the other Trusts VP is a standalone package. The exception is RJMH where images stored on VP can be accessed between areas that have VP installed. There is some ability to audit images stored on VP depending on the version installed and licence procured.

2.10. There may be the capability to interface VP with NIPACS dependent on the version installed etc but this is not implanted on any site. This requires integration to be set up between the 2 systems. Theoretically ultrasound modalities used in obstetric scanning can be linked into NIPACS. This has a cost for each machine - depending on whether it is DICOM compatible and enabled (either at time of machine purchase or later - which costs more as it requires further work). Connection between VP and NIPACS would need to include integration between Sectra Connectivity Hub and the local patient administrative system (PAS) to facilitate a work list to VP to manage data quality etc. This will require a revenue stream. In the SHSCT the IT department have very specific requirements for adding systems to their network as a windows based operating system has a risk of being hacked. This is liable to rule out linking a lot of existing scanners unless new.

2.11. There are a variety (age, capabilities and make) of machines used for obstetric scanning by Trusts depending on where the scanner is situated and what the main purpose of the machine is. Two Trusts have machines over 10 years old while all Trusts have machines 5-10 years old as well as machines under 5 years old.

2.12. Belfast Trust has access to NIPACS via ECR to view fetal anomaly scans performed by other Trusts if the woman is referred to Belfast for follow up. As other pregnancy scans are not stored in NIPACS they cannot be viewed by the regional fetal medicine unit if the woman is referred from another Trust.

2.13. Images stored in VP from RMJH and Mater are not available outside of Belfast Trust.

3. Booking scans

3.1. All women have a booking scan for viability, dating and multiplicity when they first attend maternity services.

3.2. One Trust (BHSCT) stores the images on VP while the remaining four Trusts record the scan either by a handwritten record or a hard copy image stored in the MHHR.

3.3. One unit (Altnagelvin, WHSCT) has a standardised booking report which is completed and stored in the MHHR together with a zoomed scan picture of measurement.

3.4. It is not possible to upload the booking scan onto NIPACS currently as machines are not linked and women have to be registered onto RIS for this to happen. Future integration highlighted previously would resolve this problem.

4. Anomaly Scans

4.1. Anomaly scans are performed by sonographers and the report and images are stored on NIPACS with exceptions of BHSCT; and Ulster site (SEHSCT), who only store images on VP.

4.2. Where images are captured onto NIPACS they can be viewed by anyone who has access to NIPACS across the Trusts.

4.3. In BHSCT the FA scan images are saved and stored on VP.

4.4. In NHSCT; Causeway, Mid Ulster, Moyle and Braid Valley site the images of the FA scan and any repeat scans are stored on NIPACS. Moyle and Braidvalley store a scanned copy of the report as an image on NIPACS. On the other sites the only FA scan report is a hard copy filed in the MHHR.

4.5. In SEHSCT; Lagan Valley and Downe sites store the images onto NIPACS. On the Ulster site they are stored on VP and a copy of the report is uploaded onto NIPACS. In the Ulster VP has not been updated since installation (>12 years ago) and crashes regularly. In this situation the FA scan report is handwritten and results and images are not captured electronically.

4.6. Across SHSCT in Craigavon, Daisy Hill, Armagh and South Tyrone the images are captured directly into NIPACS. The FA report is entered into RIS and is available on NIPACS.

4.7. In WHSCT; Altnagelvin, SWAH and TCH images are stored to NIPACS. The fetal anomaly report in SWAH is inputted into RIS and available through NIPACS. In Altnagelvin the report is stored in VP and can only be electronically viewed via VP software. A paper report is filed in the MHHR. A dual sending of images has been implemented and sends to VP and NIPACS which allows images to be available on NIPACS. A 'canned report' on NIPACS (to complete the process for Sectra/RIS) states that the FA report is available on VP by contacting the fetal medicine

department. This causes issues when the paper report is missing from the MHHR and it is required 'out of hours' i.e. when the fetal medicine department is closed. Occasionally extra FA scan clinics are booked on the fetal medicine scan machine which means the scan images from those clinics will not be available for viewing on NIPACS.

5. Third trimester scans

5.1. These scans are performed in a number of locations within maternity services and for a number of reasons.

5.2. The majority of scans performed in the third trimester do not have electronic capture of images or reports. Records of the scan are recorded manually in the MHHR mainly without hard copy images.

Table 1 The provision of NIPACS and Viewpoint within Maternity Services

Management of images	BHSCT	NHSCT	SEHSCT	SHSCT	WHSCT
NIPACS	Not connected within the maternity Units. Those with access to NIPACS can view images stored on NIPACS from other Trusts.	Connected for fetal anomaly in Causeway, Mid Ulster, Moyle and Braidvalley only	Connected for anomaly scans in LVH and Downe. Fetal anomaly scan report in Ulster copied onto NIPACS	Connected for fetal anomaly scan only	Connected for fetal anomaly scan images in SWAH and some in Altnagelvin when completed in radiology. Canned fetal anomaly report and fetal anomaly images stored in Altnagelvin if fetal medicine scanner used.
Viewpoint	Connected for anomaly scans, fetal medicine and early pregnancy scans. Some images accessed across areas.	Available in Antrim for fetal anomaly only	Connected for fetal medicine. Some connectivity for anomaly scans in UHD	No viewpoint in Trust	At Altnagelvin Viewpoint is connected for fetal medicine, 20 week scan, fetal assessment, early pregnancy and multiple birth clinics. Images are stored in Viewpoint. SWAH has recently purchased Viewpoint.
Manual in MHHR	All other scans	All other scans	All other scans	All other scans	All other scans