National Selective Ultrasound Screening Programme for Developmental Dysplasia of the Hip in Infants

Implementation Pack

Table of Contents

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Glossary

Term	Definition
Developmental Dysplasia of the Hip	A continuum that includes an immature hip, a hip with mild acetabular dysplasia, a hip that is dislocatable, a hip that is subluxated, and a hip that is frankly dislocated
Dislocated Hip	A hip where there is complete loss of contact between the articular surface of the femoral head and the acetabulum (i.e. the developing 'ball' of the femur is not in the 'socket' part of the hip)
Subluxed Hip	A hip where there is incomplete contact between the articular surfaces of the femoral head and acetabulum
Dislocatable Hip	A hip where the developing 'ball' of the hip is within the acetabulum but becomes dislocated (comes out of the 'socket') with active manipulation
Unstable Hip	A hip where the hip can be subluxed or dislocated with active manipulation
Immature Hip	Mild acetabular dysplasia without dislocation or subluxation. The majority will resolve without treatment. Usually categorised as GRAF II on ultrasound

Introduction

Developmental dysplasia of the hips is an important cause of disability in children and young adults. It affects approximately 1-3% of babies to some degree, with 1-2 in 1,000 babies being affected by a frank dislocation at birth.

The usual course of the condition (the 'natural history') is not fully understood, despite many years of research going back to the 1950s. However, if DDH is detected before three months of age then there is evidence that less complex treatments can give good outcomes for most children compared to children who are detected after three months.

Up to 3 months of age DDH can be detected by a specific physical examination by a trained healthcare professional and confirmed by an ultrasound. After that there are physical signs that a professional can elicit but they are less specific. Also, ultrasound is less useful after 3 -4 months so confirmation requires an X-ray.

It is the recommendation of the National Clinical Programme for Paediatrics and Neonatology and the DDH Subgroup of the National Child Health Review Steering Group that a targeted ultrasound screening programme for infants in Ireland at risk of developmental dysplasia of the hip (DDH) is implemented. The ultrasound technique to be employed is the Graf method using a coronal standard section through the acetabulum. (Appendix 1)

The purpose of this document is to describe the standards that are required for targeted ultrasound screening for infants in Ireland in the form of an implementation pack. The implementation pack describes which babies should receive ultrasound screening for DDH, when and how this should happen along with the data that should be collected and the report format to follow. The pack also provides guidance on what steps to take following the ultrasound examination, be it positive or negative.

The following recommendations were developed by the DDH subgroup of the National Child Health Review Steering Group and are excerpts from that document as are relevant to the radiology department.

National Selective Ultrasound Screening Programme for DDH

Recommendation 5.1
The recommended risk factors for the Irish National DDH Screening programme to decide which babies require a screening ultrasound examination at six weeks are:

1. A first degree family history of DDH
   - A first degree relative is mother, father, brother, sister only
2. The baby has been a breech presentation.

This includes:

- Babies who are breech presentation at or after 36 weeks gestation, regardless of the presentation at birth or final mode of delivery
- In multiple births all babies should be screened if any one of the babies is a breech presentation

Recommendation 5.2
To establish family history, the Irish National DDH Screening programme should use the UK DDH screening programme question:

- "Is there anyone in the baby's close family, i.e. mother, father, brother or sister, who has had a hip problem that started when they were a baby or young child that needed treatment with a splint, harness or operation?"

Recommendation 5.3
Babies born at or before 36 weeks gestation who require a targeted ultrasound should have the date of that ultrasound adjusted for gestational age so that a baby is screened at T+6 weeks. There is no need to adjust for babies born above 36 weeks.

Recommendation 5.4
Babies who do not have risk factors (as per the national guidance) and have a negative clinical examination within 72 hours of birth do not require an ultrasound. They will have a second clinical screening examination at the six-week screening contact.

Recommendation 5.5
Babies who are positive for one or more risk factors and have a negative clinical examination within 72 hours of birth require an ultrasound at six weeks of age (adjusted for prematurity) (standard 4 weeks^{+0} – 6weeks $^{+6}$). They are entered into the National Selective Ultrasound Programme.

Recommendation 5.6
Babies who have a positive clinical examination within 72 hours of birth should have an ultrasound by the age of two weeks (2 weeks^{+0}), regardless of their risk factor status. Ideally the ultrasound should be done within 3 days with immediate harnessing if DDH (including dislocated and dislocatable hips) is confirmed.

Recommendation 5.7
There are some exceptions to note:

- In some cases the Consultant Paediatrician may make a clinical decision to defer hip screening if a child is medically unstable or has multiple complex needs. In such cases the Paediatrician should ensure that the baby receives hip screening appropriate to them when fit to undergo same
- Babies with congenital syndromes (e.g. Down's Syndrome) should be screened by a consultant paediatrician
- The paediatrician may not wish to do a physical examination on babies with Osteogenesis Imperfecta diagnosed at birth

Babies with a Positive Clinical Examination at the Neonatal Contact

The pathway following a positive clinical examination at neonatal screen is shown in appendix 2

Recommendation 6.1

Babies that have a positive clinical examination at birth should have:

- A consultation with an expert (paediatrician or orthopaedic consultant) within 2 weeks (2^{+0})
- An ultrasound and harness as soon as possible after identification but no later than two weeks (2^{+0} weeks) of age. Ideally the ultrasound should be done within 3 days with immediate harnessing if DDH (i.e. dislocated and dislocatable hips) is confirmed
- If available, a multidisciplinary hip clinic with Physiotherapy, Radiology and Paediatric input is preferred. This would need to be held at least once a week
- Immediate treatment (if required) as advised, usually by putting them in a Pavlik Harness
- Babies with a negative ultrasound at or before 2 weeks should have a further ultrasound at 6 weeks
- Further management under the care of the orthopaedic services

Recommendation 6.2

Babies with a positive clinical examination who have an early ultrasound that is negative must also have an ultrasound at 6 weeks.

Selective Ultrasound for Babies with a negative Clinical Examination and One or More Risk Factors

The pathway following the Six-Week Ultrasound Examination is included in appendix 3

Recommendation 7.1
Unless there are local protocols in place that define the pathway to services for ultrasound, babies who require an ultrasound as a result of their neonatal assessment should be referred to the radiology department in the hospital of birth (or intended hospital of birth if born outside hospital unit) for that ultrasound.

Recommendation 7.2
A negative ultrasound screen is:

- **GRAF I on an ultrasound done as per the standards**

Babies who have one or more risk factors and require a selective ultrasound and have a *negative* ultrasound screen at six weeks are returned to the universal child health programme**.**

Recommendation 7.3
A positive Ultrasound screen is:

- **Any result between GRAF IIb – GRAF IV on an ultrasound done as per the standards**

Babies who have one or more risk factors and require a selective ultrasound and have a *positive* ultrasound screen at six weeks require an urgent specialist opinion and are transferred into diagnostic and treatment services immediately as per local protocols. (Appendix 7)

Recommendation 7.4
Babies who have a GRAF IIa result on ultrasound done at or before 6 weeks as per the standards are categorised as 'Immature'.

These babies should be re-scanned to the same standards at 12 weeks of age

- At re-scan if the result is GRAF I then the baby has a negative screen result and can be returned to the Universal child health surveillance programme
- If the rescan shows no progress (i.e. still Graf IIa) then the baby should be treated as having a positive result and referred as per the local protocols
- If the re-scan is GRAF IIb-IV then the baby should be classified as a positive screen and should be referred according to the local protocols.

The implementation of the targeted ultrasound programme should allow capacity within the programme to ensure that this can be done.

Recommendation 7.5
All primary ultrasound examinations for DDH should be entered on NIMIS as "US HIPS SCREENING".
Any subsequent ultrasound imaging or follow-up scans should be entered as "US HIPS SURVEILLANCE". This will facilitate audit.

Recommendation 7.6
The Maternity Unit and the consultant that referred the baby should be informed of the result of the Ultrasound within 7 days. (Principles for communication are included in Appendix 7)

Recommendation 7.7
The parents should be informed of the result of the ultrasound and of what the next steps are. They should be given confirmatory information in writing[1]. (Appendix 4)

Recommendation 7.8
Radiology departments should follow their DNA policy for babies who do not attend. They should inform the referring clinician if a baby is to receive no more appointments.

Recommendation 7.10
The GP and the PHN should be sent a copy of the ultrasound result and confirmation of the actions taken.

Recommendation 7.11
People undertaking ultrasound screening as part of the Irish National DDH Screening programme should be trained and have competency signed off for ultrasound examination of hips. Sign off is recommended only after satisfactory completion of 200 directly supervised and 200 indirectly supervised examinations, as per current European Society of Paediatric Radiology (ESPR) guidelines.

Templates for radiology and radiography reports are included in appendices 5 & 6

[1] The responsibility to do this should be organised locally and included in local protocols. The referrer is generally the best person to do this. A sample letter is included in Appendix 4

Pathways for Babies after the Six-Week DDH Screening Contact

Recommendation 9.1
Babies who have a positive clinical examination at the six-week check need referral for further assessment urgently as per local protocols. In the absence of local protocols, babies should be referred to their hospital of birth. Babies should be seen within 2 weeks.

Recommendation 9.2
Babies with a risk factor (as per the national risk factors below) not identified at the neonatal examination but subsequently identified at the six-week screen and who have a negative clinical examination should be referred for urgent ultrasound. The ultrasound should be done within 2 weeks.

As per recommendation 5.1: The recommended risk factors for the Irish National DDH Screening programme to decide which babies require a screening ultrasound examination at six weeks are:

3. A first degree family history of DDH
   - A first degree relative is mother, father, brother, sister only
4. The baby has been a breech presentation.

This includes:

- Babies who are breech presentation at or after 36 weeks gestation, regardless of the presentation at birth or final mode of delivery
- In multiple births all babies should be screened if any one of the babies is a breech presentation

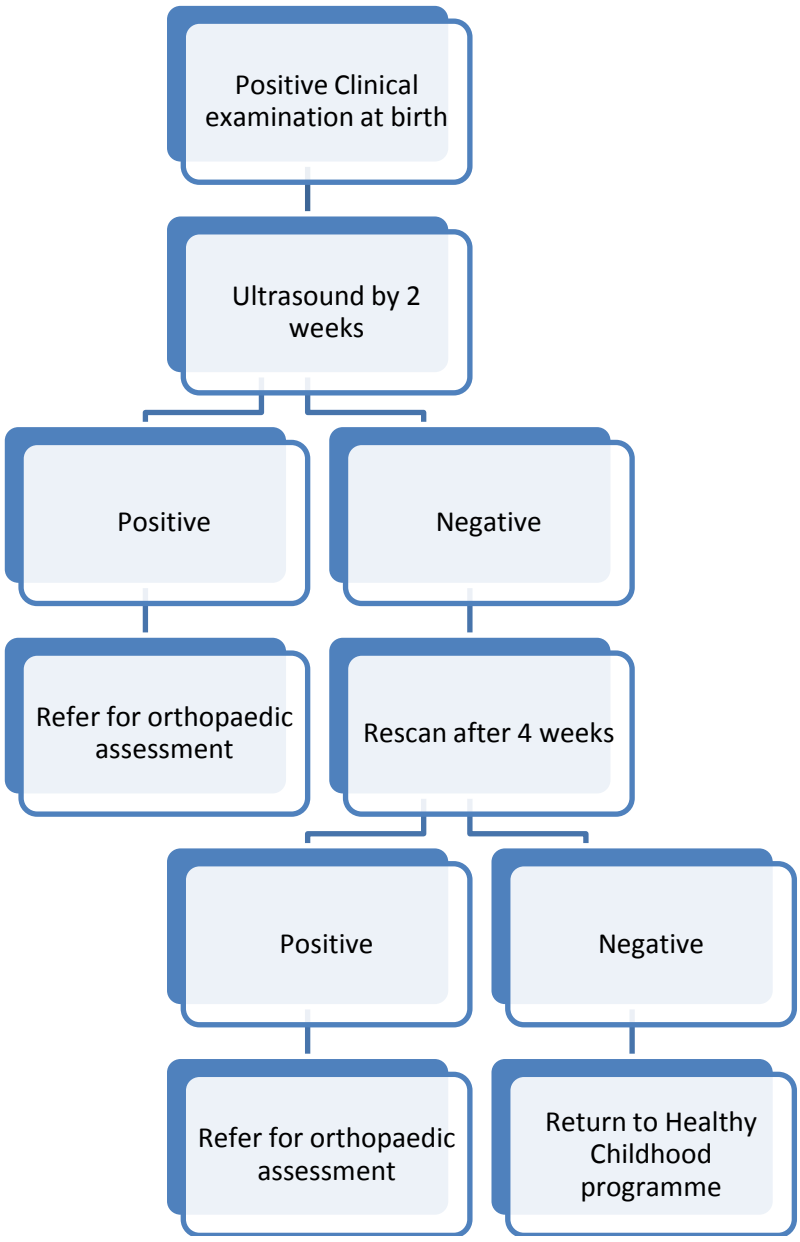
Appendix 1: Essential checklists according to Graf

An ultrasound image should not be considered diagnostic unless the following anatomical markers are identified and included. Even if only one structure is missing the sonogram is not diagnostic and must not be used.

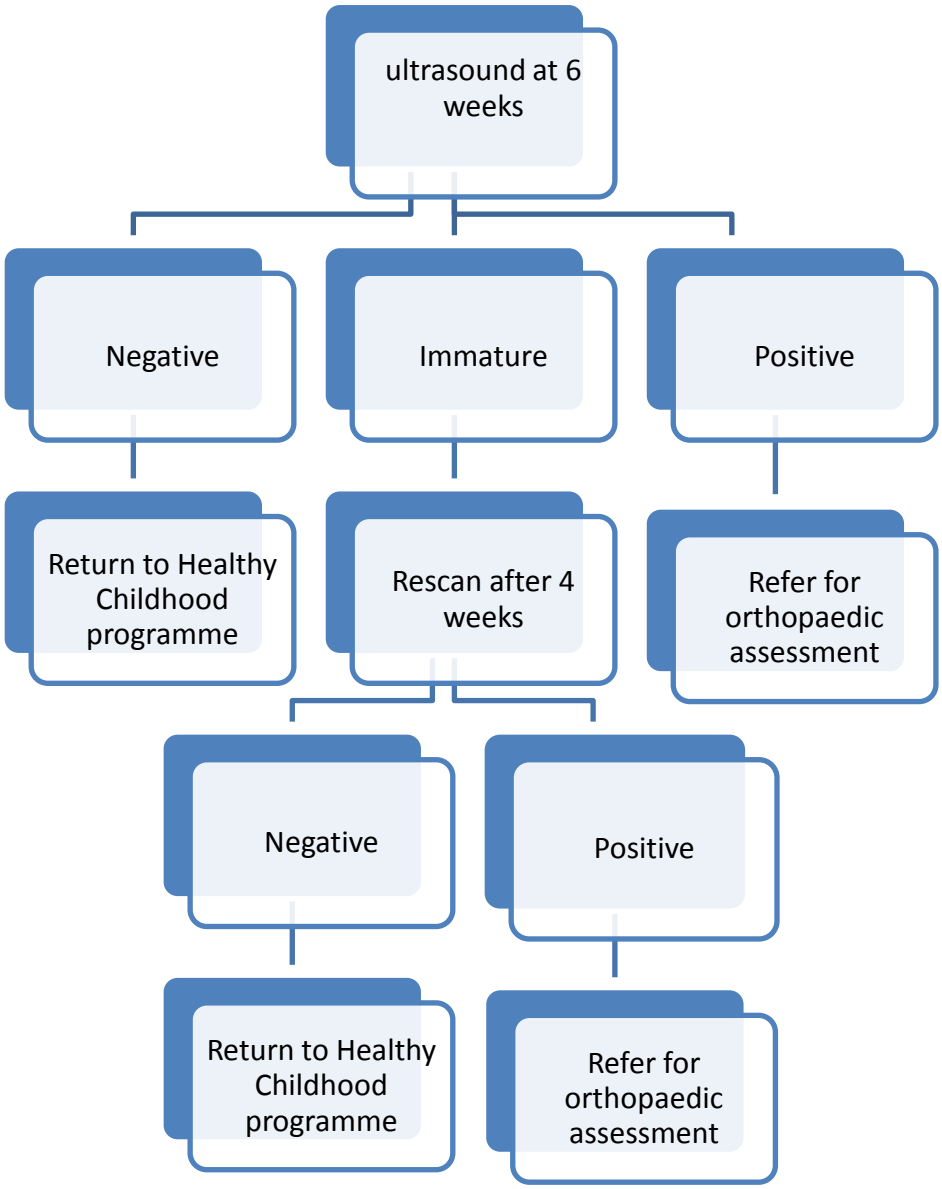
Anatomical Checklist
Chondro-osseous border
Femoral head
Synovial fold
Joint capsule
Acetabular labrum
Cartilage roof
Bony roof
Bony rim

Usability Checklist
Lower limb
Plane
Labrum

Appendix 2: Pathway following positive clinical examination at neonatal screen



Appendix 3: Pathway following Six-Week Ultrasound Examination



Appendix 4: Sample letter to parents

Dear Mrs. Test Patient,

Patient:

DOB:

Hospital ID:

Your baby underwent a recent hip ultrasound, as they had a risk factor for DDH at the time of delivery. I am pleased to inform you that the ultrasound has been reported as normal by our Consultant Radiologist.

On this basis, I am discharging your baby back to the care of your GP, to whom I have sent a copy of this letter.

Yours sincerely

Dr Consultant Neonatologist

Appendix 5: Radiologist's report template

***Corrected age at time of scanning:**

Stated gestational age at birth:

Sex: Male/Female

Clinical Indications:

1	Positive Clinical examination	2	Breech presentation	3	Positive 1st degree family history	4	Other

Right Hip

The femoral head is: Centred/Decentred

The bony roof is: Good/Adequate/Deficient/Poor

The bony rim is: Sharp/Rounded/Flattened

The cartilage roof is: Covering/Displaced

Alpha angle:

Beta angle:

Graf type:

Left Hip

The femoral head is: Centred/Decentred

The bony roof is: Good/Adequate/Deficient/Poor

The bony rim is: Sharp/Rounded/Flattened

The cartilage roof is: Covering/Displaced

Alpha angle:

Beta angle:

Graf type:

Referral for treatment required: Yes/No

Follow up scan required: Yes/No

*Infants born before 37 weeks gestation are corrected to 40 weeks gestation as standard.

Appendix 6: Radiographer's provisional report template

Infant Hip Ultrasound

Name_____ **Hospital No**_____

Date_____

	RIGHT	**LEFT**
Femoral head	Centred / Decentred	Centred / Decentred
Bony Roof	Good / Adequate / Deficient / Poor	Good / Adequate / Deficient / Poor
Bony Rim	Sharp / Rounded / Flattened	Sharp / Rounded / Flattened
Cartilage Roof	Covering / Displaced	Covering / Displaced
Alpha Angle		
Beta Angle		
Graf Type		

Referred to Orthopaedics	**Yes**	**No**

Appendix 7: Communication pathways

Information regarding babies referred for DDH screening can travel a number of pathways, e.g. from post natal to radiology, from the GP to radiology and from radiology to orthopaedics.
Local arrangements for these communication pathways will need to be drawn up in accordance with standards of best practice to include:

- There should be a clear, traceable and documented pathway between the referrer and the receiver.
- A designated person should take responsibility for checking that all babies' referrals are received by the intended recipient.
- This designated person should delegate his/her responsibilities when absent from work.
- Records should be kept by both the referrer and the receiver.
- The parents should be informed at the time of examination of the intended action and timelines expected.

These communication principles are not exhaustive. Local areas should consider their own needs for information flows and should pay particular attention to pathways that require referral /communication between separate institutions.

Appendix 8 – Key Performance Indicators

Suggested Indicators and audit measures for national and local monitoring of the National Screening Programme for DDH

	Suggested Indicator	Use		source
1 (a)	Number of babies who receive ultrasound within 2 weeks of birth due to positive neonatal clinical exam	Screening programme performance measure Should be 100%	National monitoring measure	NIMIS
1 (b)	Number of babies who receive ultrasound within 6 weeks of birth due to identification of one or more risk factors	Screening programme performance measure Should be 100%	National monitoring measure	NIMIS
1 (c)	Number of babies who receive ultrasound who do not have positive clinical exam or one or more risk factors as per the national clinical programme	Poor adherence to guidelines leading to over-referral for ultrasound	Local quality measure	NIMIS
2	Number of babies aged ≥ 7 weeks of age who receive their first ultrasound examination	Screening programme performance measure	Local quality measure	NIMIS
3 (a)	Number of babies who are identified with a positive ultrasound at 2 weeks who were referred due to a positive neonatal clinical examination	Numerator for positive predictive value	National monitoring measure	NIMIS
3 (b)	Number of babies who are identified with a positive ultrasound at 6 weeks who were referred due to identification of risk factors at the neonatal clinical exam	Measure of incidence of DDH	National monitoring measure	NIMIS
3 (c)	Number of babies who are identified with a positive ultrasound who were referred from the 6 week GP check	Measure of incidence of DDH	Local quality measure	NIMIS
4 (a)	Number of babies receiving an x-ray pelvis as their first radiological exam for DDH	Screening programme performance	Local quality measure	NIMIS

		measure		
4 (b)	Number of babies receiving an x-ray pelvis as their first radiological exam for DDH and it being positive	Screening programme performance measure	National monitoring measure	NIMIS
5	Number of babies with positive findings referred to orthopaedics	Screening programme performance measure	Local quality measure	NIMIS
6	Number of babies receiving follow-up ultrasound surveillance examinations	Measure of capacity to respond to DDH screening findings	Local quality measure	NIMIS
7	Number of babies who fail to attend for ultrasound	Screening programme performance measure	Local quality measure	NIMIS
8 (a)	Number of babies who started treatment aged ≤ 3 months	Screening programme performance measure	Local quality measure	
8 (b)	Number of babies who started treatment aged > 3 months of age	Screening programme performance measure	Local quality measure	