Hip Dysplasia Screening in a Rural Health District

An analysis of practice with respect to hip dysplasia screening in the Hunter New England Local Health District

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Research Project

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ABBREVIATIONS

AAP	American Academy of Pediatrics	**CFN**	Child and Family Nurse
DDH	Developmental Dysplasia of the Hip	**GP**	General Practitioner
HNEH	Hunter New England Health	**LHD**	Local Health District
PHR	Personal Heath Record	**UHV**	Universal Home Visit (1-4 wks)

CLINICAL TERMS

True DDH – Any hip which left untreated would develop any kind of dysplasia [1]

Late DDH – For this study; DDH diagnosis after three months of age

Ortolani and Barlow tests – Screening tests for hip dysplasia, usually applied in infants less than three months of age.

Galeazzi sign – Test of perceived femoral length discrepancy.

Telescoping sign – Term to describe movement of the femoral head within acetabulum.

Graf IV Diagnosis Dislocated – The acetabulum is almost flat and the cartilaginous roof is markedly displaced [2]

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ABSTRACT

Introduction:

Screening processes for Developmental Dysplasia of the hip (DDH) are guided by tertiary hospital practice guidelines and prompts in the Personal Health Record (PHR). Infants in rural locations could be at increased risk of late presentation of DDH compared to their urban counterparts but the reasons for this have not been extensively studied. The patterns of DDH screening in a rural area are not known.

Aim:

To describe hip dysplasia screening practices in a local rural health district.

Method:

This cross-sectional study of DDH screening patterns and behaviours was conducted in rural NSW (postcodes 2350, 2360, 2370). Data was gained from the following four sources:

- Hospital Medical Record. Examined consecutive birth records for a three month time period to assess DDH birth screening rates.
- Community Health Record. Examined the number of infants who received a universal home visit (UHV), six-eight week, six month and 12 month check in an early childhood setting.
- Clinician survey to identify the DDH screening practices of clinicians within the local health district.
- Physiotherapy records at Tamworth and Armidale Hospitals to identify clients who presented for management of DDH (late or early).

Results:

At birth the majority of babies (91%, 179/196) had documented hip screening. Community health records show this dropped to 75% (587/788) at one-four weeks and 29% (227/588) at six-eight weeks. A survey of local clinicians (54% response rate; 49/91) revealed most (78%) screen for DDH and less than half (43%) use guidelines. Almost all (97%) clinicians reported screening for DDH at 6-8 weeks of age. Only 51% of clinicians reported having training for DDH screening and 80% would like further training. The rate of late DDH requiring management in 2012 was 0.87% (7/806) and the rate of late DDH requiring surgery was 0.25% (2/806).

Conclusion:

DDH screening practices are well established at birth in the rural area under study. There is a decline in attendance at CFN clinics after the UHV and reported variability in DDH screening practices beyond 8 weeks of age, which coincides with a lack of prompts in the PHR. Further training in DDH screening and hip screening prompts added to the PHR may improve rates of DDH screening beyond 8 weeks of age.

Keywords: Developmental dysplasia of the hip (DDH), screening, rural, paediatric

EXECUTIVE SUMMARY

Implications

This study has identified a knowledge gap between policy and practice with respect to screening for developmental dysplasia of the hip (DDH) in the local health district (LHD). Screening for DDH is a reasonably simple, low cost procedure to conduct in the primary health care setting. Difficulty occurs when the spectrum of DDH presentations and risk factors for DDH are poorly understood by clinicians and the clinical pathway is not well defined locally. The diverse nature of service delivery in a rural setting can make it difficult for policy makers to engage rural clinicians to access and keep up to date with policy changes.

The findings of this study are of concern for senior clinicians and policy makers because rural children could be at greater risk of a late presentation of DDH when compared to their urban counterparts. While late presentations of DDH are rare, they are characterised by dramatically poorer clinical outcomes for the child and family with marked costs to the health system.

Recommendations

A number of simple practice improvement strategies could be adopted to improve screening practices for DDH in the LHD:

1. Develop a local screening template for DDH to guide clinical practice and improve communication between clinicians.
2. Recommend to NSW Health that extra DDH screening checks be added to the PHR in accordance with the HNEH DDH protocol; or more simply when immunizations occur at four, six and 12 months of age.
3. Review current strategies for policy dissemination and education to clinicians outside the public hospital network to fully engage rural private practitioners.

Significant Findings

- Screening practices for DDH are well established at birth in the LHD.
- There is self-reported compliance with hip screening guidelines up to eight weeks of age by rural clinicians in the LHD.
- Beyond eight weeks of age, self–report by clinicians and child and family nurse (CFN) attendance data indicates a lack of serial screening for DDH. This coincides with an absence of formal reminders in the Personal Health Record (PHR).
- Clinicians who work outside the public hospital service report a decreased awareness of the clinical skills and knowledge associated with serial screening for DDH.
- Fewer than half of all clinicians surveyed report using guidelines.
- The rate of DDH managed by physiotherapy in the rural health district in 2012 was reported at 16/1000 live births and is consistent with previously reported findings where selective ultrasound screening is used.
- The rate of DDH managed late (3-6 months) was 8.7/1000 live births.
- A higher than expected rate (2.5/1000 live births) of late DDH required surgery.

Approach

These recommendations have been based on the findings of a comprehensive analysis of DDH screening practices throughout the LHD. The data was collected from three rural public hospitals and community health centres in the LHD, a retrospective observational study of hospital birth records, local physiotherapy records and the Community Health Information Management Enterprise (CHIME). Key groups of local clinicians who work with babies and children were also surveyed to understand their self-reported clinical practice.

Context

Screening for DDH in NSW is conducted by a number of health care professionals (general practitioners, child and family nurses, physiotherapists and paediatricians) all who have a range of clinical expertise and experience in conducting childhood checks.

Much research has been undertaken to identify the timings of examinations and the benefits of clinical screening programs, including selected versus general ultrasound imaging. Current clinical guidelines support routine serial screening programs and the use of selective ultrasound in a well-organized management pathway to minimise the risk of over diagnosis and the presentations of late DDH. Programs which are well organised and provide training and support for clinical staff have a lower report of late DDH.

Currently the focus of identification of infants at risk of DDH in the NSW PHR has been on the newborn, universal home visit (UHV) and six-eight week check and not again in a well-baby check until 18 months. Limited guidance is given in the current PHR to identify specific clinical features of concern for DDH. There is evidence in the literature to support the importance of detection before six months of age to minimise the need for surgical intervention and further disability.

INTRODUCTION

Screening guidelines and clinical assessments for Developmental Dysplasia of the Hip (DDH) have been well documented [3, 4]. Infant screening occurs at birth or soon after and is a primary health prevention measure. Following discharge from hospital infant screening continues in the community health and general practice settings. Infant screening guidelines for DDH are developed in tertiary hospitals where there are many resources, specialist clinics and well developed pathways for clinical review. Living in a rural community has been identified as a risk factor for a late presentation of DDH in Australia [5], but the reasons for this have not been extensively studied.

There is controversy in the literature [6-8] as to the value of screening for DDH because of the lack of good quality clinical trials which link screening and intervention to improved functional outcomes. The spectrum of DDH from frank dislocation to mild dysplasia makes comparison between clinical trials more difficult [7, 9]. Observational studies suggest that treatment complexity and cost is reduced through early detection and intervention [10, 11].

BACKGROUND

A literature search using the Clinical Information Access Portal (CIAP), PubMed and Medline databases was conducted using the search terms Developmental Dysplasia of the Hip (DDH), paediatric or pediatric, screening, and rural.

What is DDH?

Developmental dysplasia of the hip (DDH) represents a spectrum of anatomic abnormalities in which the femoral head and the acetabulum are aligned improperly or grow abnormally [7]. The term DDH is used to describe hips that are:

- Immature, as in acetabular dysplasia characterised by a shallow acetabulum;
- Unstable, where the femoral head moves within (subluxes) or out (dislocates);
- Subluxed, where the femoral head is displaced from its normal position but still makes contact with a portion of the acetabulum;
- Dislocated, where there is no articular contact between the femoral head and the acetabulum;
- Malformed, as in teratologic hip dysplasia and refers to more severe fixed dislocation [3, 12].

Previously the disorder was called congenital dysplasia of the hip (CDH) and was thought to be limited to the birth period [9]. A name change to DDH in recent years reflects a greater understanding of the developmental nature of the condition [12] but the pathophysiology and natural history of DDH is still poorly understood [6]. Hip dysplasia can occur in utero, perinatally or in infancy and childhood [3].

What is the incidence of DDH?

DDH is one of the most common childhood conditions reported in the literature. A wide variation of incidence is noted. Reports of 'true' DDH can be as low as five cases per 1000 live births [1, 10] and range from 1.5-20 per 1000 [8]. The wide variation can be understood when considering the diagnostic method used and the timing of evaluation; reported rates are higher with screening closer to birth, general ultrasound screening and better screening practices. A retrospective audit of birth records in Gippsland in 1998 found a rate of DDH at 6.4/1000 and in a prospective study a rate of 19.4/1000 live births [13]. This difference was attributed to improved screening practices.

What are the risk factors for DDH?

Risk factors for DDH have been well documented [3]. Risk factors such as breech positioning [14] and a positive family history [15] receive close attention from clinicians during the screening process. It has been proposed that breech delivery and a caesarean birth can often be protective against a late presentation of DDH [5] if they are identified at first referral [16].

Other risk factors such as female, first birth [17], birth weight (>four kg), oligohydramnios, post mature and positional deformities have also been found to be related to an increased incidence of DDH [18]. Less commonly swaddling [19], birth weight (< 2500g) and hospital discharge less than four days is also reported to be associated with late presentations of DDH [5].

Most infants with DDH have no identifiable risk factors [20]; an absence of perinatal risk factors places a greater reliance on a good clinical examination and serial screening for detection. Infants in rural locations

have also been shown to be at a greater risk of a late presentation of DDH [5, 21]. The screening and diagnosis of DDH in rural settings is sometimes problematic due to a lack of trained and experienced clinicians [22]. Populations are often more remote and specialist services are more difficult to access.

How do we define a late presentation of DDH?

There is inconsistent reporting of the age of 'late presentation' in the literature [23]. Some studies define a late presentation of DDH to be greater than one month of age [13] whilst other studies report late DDH after six months [16]. The definition often reflects the intervention or screening practice being evaluated by the research or literature. For the purposes of this study a late presentation of DDH is defined as greater than three months of age. A delay in diagnosis and treatment beyond this time can cause damage to the cartilaginous acetabulum [5] and result in more significant management including surgery [12].

How is DDH assessed and identified?

Repeat clinical examination of infant hips at well baby checks is referred to in the literature as "serial screening" for DDH [3]. In younger children the Ortolani or Barlow clinical tests are applied. These clinical assessments are less sensitive once an infant is older (>three months) due to factors such as strength, thigh bulk and size [8].

Limited hip abduction has been shown to be a more accurate measure in children older than three months [3, 7]. Asymmetry of skin creases, a leg length difference and a positive Galeazzi sign may alert the examiner to possible abnormalities in the hip joint mechanics but as a single predictive clinical measure their usefulness is sometimes debated in the literature [7]. Detection of bilateral hip dysplasia in the older child is more challenging [12]. A child will often present with a negative Galeazzi sign and symmetrical but limited hip abduction. If they are mobile there will be a waddling gait and a positive Trendelenburg.

Is there evidence for DDH screening?

Serial screening for DDH is recommended [3] despite an infant having a stable hip or negative hip screen at birth. Serial screening programs for DDH have been shown to be most effective with skilled examiners [6, 8, 24].

Selective ultrasound screening is the term used to describe the ultrasound of a neonate's hips when there are known risk factors for DDH such as breech birth [14]; a positive family history in a female birth [3] or to confirm a suspected clinical diagnosis. A failure to screen infants at birth and refer infants with risk factors has been suggested to contribute to a higher rate of late DDH [11].

General ultrasound screening is the term given to describe ultrasound screening of all infant hips applied in the period following birth. This practice is commonplace in some European countries; however controversy exists as to whether this approach is indicated because of the developmental nature of the condition and the risk of over diagnosis and over treatment in those hips that may spontaneously resolve [9]. Italian researchers [25] conducted a study of 8,896 newborns and proposed a two-step ultrasonography screening process (at one and four months). They concluded there was no single age when an ultrasound scan would detect all cases of DDH but recommend ultrasound as a non-invasive screening tool over radiology.

It has been argued that using a general ultrasound approach for DDH screening may be useful in areas where clinical expertise in DDH screening is limited [20]. South Australian researchers [26] proposed use of general anterior dynamic ultrasound screening as an option for screening of all regional infants. The pilot

results from this study suggest more research into this approach. A limitation of such an approach in rural areas would be access to ultrasound technology and trained ultrasound examiners, as this technology is not consistent throughout Australia despite recent reports.

A national review of diagnostic imaging services [27] reported that imaging services, per 100,000 people was largely consistent across Australia; however service numbers were decreased in per capita terms in large rural, other rural, remote centre and other remote areas according to AIHW classification [28]. This shortfall is reportedly driven by a reduced availability of doctors in rural and remote locations.

Two randomised controlled trials [24, 29] and one follow-up study [23] have not been able to demonstrate a significant difference between screening methodologies (clinical, selective and general ultrasound) in terms of late presenting DDH and improved long term functional outcomes. Despite these findings the Paediatric Orthopaedic Society of North America (POSNA) recommends that all health care providers follow the clinical practice guidelines as recommended by the American Academy of Pediatrics (AAP). They argue that to withhold screening because of a lack of high level evidence and to design clinical trials where screening is the independent variable would not be ethical [20].

Considering the evidence for this practice 'surveillance' may be a better term to use when describing screening for DDH as there is no cheap, reliable test that has high sensitivity and specificity which can be applied at any point along the assessment continuum and predict management and outcomes for all individuals [16].

Current Screening Management Practices

Hip screening programs exist in most major NSW maternity hospitals. At John Hunter Hospital maternity unit, the tertiary referral hospital for the LHD, routine clinical hip assessments are conducted by the resident medical officer or senior physiotherapist or midwives at birth. Following discharge from hospital, the current clinical guidelines [4] recommend that normal hips are reviewed at birth, six weeks, three, six, nine and 12 months. There is however, no guidance and reminder in the Personal Health Record (PHR) for this to occur beyond the six week check.

Similarly the AAP [3] recommends serial clinical screening at all periodic baby checks (newborn, one, two, four, six, nine and 12 months until walking). Infants with abnormal or suspicious hip examinations are referred to a paediatric orthopaedic specialist or paediatrician. Infants who have a significant risk factor such as a breech presentation are referred to a specialist for ongoing monitoring including ultrasound assessment. Limited guidance is given in the current PHR to identify specific clinical features of concern for DDH.

There is evidence in the literature to support detection of DDH before six months of age [12]. Factors associated with a late diagnosis of DDH have been attributed to the screening process itself [16, 21] and are shown to be different to those for an early diagnosis. Most studies report the incidence of pathology at birth or soon after. Only one study was found which reported screening rates in the postnatal period [22].This study reported an 84% screening rate for the one-four week visit and 60% for the six-eight month check. The presence of late DDH (detected after three months) and requiring operative procedures was reported as low in this population at 0.19 /1000 live births. The screening program in this study reported extensive training and support for child health staff.

Despite serial screening, early detection and conservative treatment; a small number of cases still require surgical intervention. This has been attributed to the timing of presentation (late versus early); organisation

of the screening program and the nature of the diagnosis. A recent study found a 10% failure rate with early splinting attributable to a Graf IV diagnosis [10]. There is approximately 1/5000 rate of late-onset dislocation that persists despite normal examinations and this is likely to be a late onset dislocation post walking rather than a 'missed hip' [20].

Local screening for DDH in the LHD includes routine screening at birth and in the community and referral is made to the general paediatricians for management with support from local paediatric physiotherapists. The closest orthopaedic specialist is in a neighbouring health district or tertiary hospital five hours drive away. Ultrasound services are available at each local hospital; however the majority of imaging studies are completed in Armidale.

What is known and unknown?

In NSW screening guidelines recommend screening at all well baby checks up until a child is walking and use of selective imaging. There is inconclusive evidence in the literature as to the benefits of general ultrasound screening for detection of DDH. The NSW PHR only includes DDH checks at birth, one-four weeks (UHV) and six-eight weeks. The risk factors for an early presentation of DDH have been well defined in the literature and form part of the routine clinical assessment at birth. Birth in a rural area has been identified as a possible risk factor for a late presentation of DDH but the reasons for this are not so well understood. Research suggests that a well-organised DDH screening program which includes extensive training for child health staff and a clear referral pathway is more successful in minimising late presentations of DDH. Presentations of DDH which are late often require more significant intervention and are a greater cost to the health system.

This study aimed to describe hip dysplasia screening practices in the local rural health district through an analysis of the following research questions.

Research Questions

1. To determine the rates of children screened for DDH at various ages.
2. To determine when and how screening occurs in our region of the LHD.
3. To determine what clinical assessments are used to screen children for DDH.
4. To identify the referral pathway and processes in place when a child presents with a positive clinical examination.
5. To identify the rates of DDH managed (late and early) in Physiotherapy during 2012.

METHOD

Design

This study was a cross-sectional study of DDH screening practices and self-reported behaviours from clinicians related to DDH detection and follow-up in rural NSW.

Setting

The study has been conducted in rural NSW within the HNEH LHD serviced by the maternity units of Inverell, Glen Innes and Armidale. Armidale has a population of 25,343 [30] and has a medium sized rural referral hospital serviced by three paediatricians. The hospital is a teaching hospital closely linked with the University of New England. Glen Innes has a population of 8,905 [31] and is serviced by a small rural hospital. Inverell has a population of 16,727 [32] and is serviced by a small to medium sized hospital. Hospital size is defined according to the National Health Performance Authority [33]. Paediatric outreach services from Armidale are offered to Glen Innes and Inverell Communities. Travel time by car; Inverell to Armidale is one and a half hours and Glen Innes to Armidale is one hour.

Participants and Data Collection tools

To answer the research questions data was gained from the following four sources:

1. The Hospital Medical Record (HMR)

A retrospective audit of birth records was selected (March 1- May 31, 2012). It was decided to select a convenience sample of consecutive records for a three month period. Total births for 2012 Armidale, Inverell and Glen Innes was 806 [34]. A total of 197 records were audited with one discarded for duplication by the researcher. De-identified data was recorded on the birth data collection sheet (Appendix 1). Documented evidence of a clinical hip screen was a medical record of hip examination. This included the newborn screening examination recorded in the PHR, paediatric consultation record or an entry by the clinician of a hip screen in the progress notes. Five unscreened records were excluded from follow-up analysis due to transfer (prematurity, respiratory distress). Follow-up was unknown or undefined for these infants.

2. The Community Health Information Management Enterprise (CHIME)

The CHIME database was accessed to identify the number of infants who received a UHV, six-eight week, six month and 12 month check in a child and family nurse clinic during 2013-2014 (May-April). The total number of births during this time period was defined by the number of referrals received in the CFN clinic for a UHV. All child and family health nurses who perform screening checks use this database to record clinic data. A request for information (Appendix 2) was sent to the CHIME help desk and a meeting was held with the CHIME database manager to discuss the scope of the project. It was originally planned to use data from 2012, however due to a transition from paper to electronic recording systems during 2012 a different time period was selected as stated above. Data were provided as a count of referrals and attendances during the specified time frame.

3. Clinician Survey

A significant number of infant screening checks occur in general medical practice. The practical difficulties associated with accessing this type of data from private clinicians made it more feasible to complete the

picture of screening practice within the rural communities through a survey. A survey (Appendix 3) was developed by the researcher to identify the practices of clinicians with respect to DDH screening within the local health district. Assistance of clinicians who work in the field of infant hip screening was sought to develop the survey. The survey was then piloted with senior physiotherapists who were not eligible to participate in the study. The survey was checked for clarity and 'readability' according to the checklist modified from Bell [35]. Accordingly minor changes were made prior to distribution.

The surveys were distributed in May-June 2014 and a total of 106 surveys were distributed to local doctors, child and family nurses, physiotherapists, paediatricians and a small number of practice nurses. All surveys were delivered to a key contact person at each location. The clinicians had the opportunity to contact the researcher via email and obtain further information about the survey or decline interest. A follow-up reminder call was conducted at week one to the key contact and for some practices in week two to remind practitioners to return the survey and minimise the risk of survey non-response bias. Surveys were either collected in person by the researcher or returned through the mail network in a reply paid envelope. A three week period was allowed for survey return.

4. Physiotherapy Audit

Clinician records at Tamworth and Armidale Hospitals were accessed to determine the timing and nature of physiotherapy presentation of clients from postcodes 2350, 2360, 2370 who required management of DDH (late or early) in 2012. Physiotherapists in Inverell and Glen Innes were contacted to identify any cases of DDH managed in those departments in 2012. No cases were identified in the time period and these departments were excluded from the study. De-identified data was recorded on the data collection sheet found in Appendix 4. Managed DDH included dysplasia (immature, subluxation, dislocation) and confirmed as clinically relevant on assessment, ultrasound or X-ray and required physiotherapy treatment. Hip dysplasia monitored from birth but not treated through physiotherapy was not included in this sample. Age of diagnosis was defined by a scan or clinical assessment finding which indicated management. All ages were recorded as actual ages and not the corrected age as in prematurity.

Data Analysis

The birth audit data was tabulated in Excel and analysed for descriptive and comparative statistics. Where there were small numbers of records in a category there were no comparative statistics completed. A chi-squared analysis and Fishers exact test was used to test for any significant differences between and within demographics and risk factors. The CHIME data was presented by the CHIME team as a report of count data only. Survey data was tabulated in Excel and then converted to SPSSX for further cross tabulation. The physiotherapy audit was tabulated in an Excel spreadsheet and analysed using descriptive statistics. Assistance for analysis was obtained from an experienced biostatistician attached to the Rural Research Capacity Building Program.

Ethical Approval

Ethical approval was received form the Hunter New England Human Research Ethics Committee on 21st February 2014 as a low and negligible risk project (14/02/19/5.11). NSW HREC Reference No: LNR/14/HNE/56: NSW SSA Reference No: LNRSSA/14/HNE/91

RESULTS

Birth Audit

The sample included 197 birth records from Armidale, Inverell and Glen Innes Hospitals during the period March 1-May 31, 2012. Data from the audit is displayed in Table 1. One record was discarded for duplication between two maternity units.

Table 1 - 2012 DDH Birth Audit: Risk factors and non- screened infants (n=196)

Demographic/Risk	category	n	%	Screened n=179 (91%)	Not screened n=17 (9%)	Screen vs not screen P value‡
Gender	female	98	50	92	6	0.310
	male	98	50	87	11	
Breech	y	10	5	6	4	0.006**
	n	186	95	173	13	
Family History	y	2	1	2	0	-
	n	194	99	194	0	
Gestation (wks)	>42	0	0	0	0	-
	<42	196	100	196	17	
Birth weight (kg)	>4	24	12	23	1	0.7
	<4	172	78	156	16	
Oligohydramnios	y	1	0.5	1	0	-
	n	195	99.5	195	0	
Parity$^{\alpha}$	=1	102	52	93	9	0.789
	>1	87	48	81	6	
Assoc. factors$^{\beta}$	y	8	4	6	2	0.145
	n	188	96	173	15	
Indigenous	y	24	12	21	3	0.566†
	n	164	84	150	14	
	n/s	8	4	8	0	-
Doc Follow-up	y			11	4††	0.008**
	n			168	8††	

‡ P values relate to Fishers exact test (two tailed P value)

** $p < 0.01$

† Chi square

†† n=12, 5 excluded due to transfer

α n =189; 7 parity not documented

β talipes, plagiocephaly, torticollis

The DDH screening rate at birth was 91% (179/196) and 9% (17/196) of records had no documentation associated with DDH screening. In the sample equal numbers of infants were male and female, 12% of infants identified as indigenous and 4% of infants did not identify indigenous status. These figures are reflective of the population composition of the region according to census data [36]. Small numbers of DDH risk factors were identified in the medical records and are shown in Table 1. There was only documented follow-up in 4/12 not screened records and the remainder (4.2%, 8/191) of records had no documented

screening or follow-up in place on discharge from hospital. There was evidence to suggest differences existed between the screened and not screened groups for breech deliveries ($p<0.006$) and documented follow-up ($p<0.008$).

CHIME Audit

All babies are referred to the child and family nurse (CFN) clinics for a universal home visit (UHV) at birth through the discharge process in maternity units. The number of referrals received in this study (0-5wks) for a UHV was 788. During the reporting period the majority (75%) of referred infants received a UHV. A significant drop-off in attendance for screening in CFN clinics is noted following the UHV and is shown in Table 2. Alternate infant follow-up occurs in GP clinics usually aligned to immunisations at two, four and six months. There is no data available on hip checks beyond eight weeks of age in CHIME. The data on infant checks at six and 12 months was collected to understand the attendance trends for well-baby checks in the CFN setting.

Table 2 - Well baby assessments: CFN clinics May 2013-April 2014 (n=788)

Well baby assessments	1-4 week (UHV)	6-8 week	6 month	12 month
(n)	587	227	166	40
%	75	29	21	5

Clinician Survey of DDH

One hundred and six surveys were circulated to general practitioners, paediatricians, child and family nurses and physiotherapists at local hospitals who work with children living in Armidale, Inverell and Glen Innes. At the time of the study there were 65 general practitioners in practice servicing these communities. The response return rate was calculated at 54% from the possible number of clinicians in the area who could respond (Table 3). General practitioners formed more than 50% of the sample. GP obstetricians were not identified separately for data analysis.

The majority (78%, 38/49) of respondents report screening for DDH and 22% reported not screening for DDH. Respondents were grouped according to profession and then maternity unit (Armidale, Inverell or Glen Innes). There was a greater survey response rate (78%, 38/49) in the Armidale area which reflects the larger number of births and clinicians in this centre. The majority (67%, 33/49) of respondents were experienced clinicians (>10years experience) reflective of rural practice (see Appendix 5).

Table 3 - Developmental Dysplasia of the Hip Practice Survey: Clinicians response (n=49)

Clinician	Response n	Response %	Possible n	Response rate %	Screen n (%)	Don't screen n (%)
GP+	25	51	65 δ	38	22	3
Paediatrician (Paed)	3	6	3	100	3	0
CFN	9	19	12	75	9	0
Physiotherapist (Physio)	7	14	7	100	4	3
‡MW/Group practice	5	10	5	100	0	5
Total	49	100	91	54	38(78)	11(22)

GP+ includes GP's, GP Obstetricians, Resident Medical Officers and GP Registrars

‡ Midwife/Group practice nurse

δ Medicare Local listing of General Practice clinicians 2014

Timing of screening

Screening practices appear to be dependent upon the role and designation of the clinicians in their workplace. Screening practice responses are displayed in Table 4. There appears to be almost universal agreement that screening in the community occurs at six-eight weeks and 100% of the paediatricians screen at birth. GP self-reported screening declines after six-eight weeks. Physiotherapists and child and family nurses report screening from 1-4 weeks to 12 months. Few clinicians screen at nine months and ages beyond 12 months.

Table 4 - Developmental Dysplasia of the Hip Practice Survey: Screening patterns of clinicians who screen (%) response (n=38)

	Response	Birth	1-4wks	6-8wks	3m	4m	6m	9m	12m	18m	4yrs
GP+ n=22	All + most of the time	50	45	95	23	32	41	5	14		
	Half the time		5		14	9		9	9	9	
	Less than half + never	50	50	5	63	59	59	86	77	91	100
Paed n=3	All + most of the time	100	67	100	67	67	67	33	67	33	33
	Half the time										
	Less than half + never		33		33	33	33	67	33	67	67
CFN n=9	All + most of the time	11	100	100	67	78	100	11	56	11	11
	Half the time							22	11		
	Less than half + never	89			33	22		66	33	89	89
Physio n=4	All + most of the time	25	100	100	100	75	75	75	50	25	25
	Halfthe time										
	Less than half + never	75				25	25	25	50	75	75

GP+ includes GP's, GP Obstetricians, Resident Medical Officers and GP Registrars
A fail to respond was counted as a never response.

Screening methods used by clinicians

There is variability across and within professions with respect to clinical assessment methods used to assess DDH (Table 5). There is most consistency reported when assessing children younger than three months of age; with 95 % of respondents using the Ortolani and Barlow tests. Other clinical signs/symptoms identified as being used included the telescoping sign, family history and reports of scoliosis in older children.

Table 5 - Developmental Dysplasia of the Hip Practice Survey: Assessment tools used during screening (%) response (n=38)

Yes	Ortolani &Barlow		Leg Length		Galeazzi sign		Uneven Creases		ROM		Gait
	<3mo	>3mo	<3mo	>3mo	<3mo	>3mo	<3mo	>3mo	<3mo	>3mo	>3mo
GP+ n=22	96	55	14	27	18	27	68	64	59	55	36
Paed n=3	100	67	33	67	33	67	100	100	67	100	100
CFN n=9	100	56	100	89	78	67	100	100	89	89	67
Physio n=4	75	25	100	75	50	75	75	100	75	100	50
Total	95	53	45	50	37	45	79	79	68	71	50

GP+ includes GP's, GP Obstetricians, Resident Medical Officers and GP Registrars

How do clinicians respond to a variety of clinical scenarios?

Clinicians were presented with five clinical scenarios and asked to respond with regard to management of suspected DDH. Their responses reflected their professional role and experience. The researcher has summarised the responses to the scenarios in Appendix 5. Greater variation is noted in scenarios with older children and with regards to the timing and use of imaging.

Practice guidelines; education and training needs of survey respondents

Only half (51%) of the respondents reported they had received training in DDH screening; 43% of clinicians surveyed use guidelines and of those who use guidelines these come from a variety of sources. The most commonly used guidelines cited were from HNEH DDH protocol (4).

Survey recommendations from clinicians; how to improve DDH screening processes?

The majority of clinician's (80%) reported they would like an education update on this subject. Other suggestions included:

- Access to a clear and well-defined screening pathway
- An education brochure for DDH checks to be included in the PHR
- Increased resources for paediatric hip ultrasounds; this was identified as an important factor to consider when improving service provision and planning in rural areas.

Physiotherapy Audit

There were 13 cases of DDH managed from postcodes 2350, 2360, 2370 in 2012; 12 cases were managed in Armidale and one case was managed in Tamworth. This provides a population incidence of managed DDH at 1.6% (13/806). The average age of diagnosis was 3.2 months with the age range being birth to six months. The documented risk factors for infants presenting with DDH are shown in Table 6. Predominance for female babies (85%, 11/13) followed by first births, breech and family history as the next most commonly reported risk factors. The majority of infants (11/13) had Pavlik harness management, only two of these required follow-up bracing. There were no reported complications from treatment.

Table 6 - Physiotherapy Chart Audit: Risk factors and management of DDH in 2012 (n=13)

Physiotherapy Audit	n	%	Risk factors	n	%
Average age of diagnosis (months)	3.2		female	11	85
Age range of diagnosis (months)	0-6		parity=1	7	54
Late presentation (>3months)	7	54	breech	6	46
Management			family Hx	6	46
harness	11	85	associated	4	30
brace	4	30	>4kg	1	8
surgery	2	15	post mature	0	0
			oligohydramnios	0	0

The audit revealed seven cases of DDH presented for management after three months of age (range four to six months). The incidence of late DDH for this study was 0.87% (7/806). No cases were diagnosed after six months, two cases (0.25%, 2/806) required surgery, casting and bracing and were managed following diagnosis in a tertiary hospital.

There was no clear pattern of contributing factors for a late presentation of DDH. A brief review of chart entries revealed a combination of factors including a delay in presenting for routine follow-up, and delays in presenting for an ultrasound following a breech birth. Further examination of these factors was outside the scope of this study.

DISCUSSION

This study has shown high levels of DDH screening at birth (91%) suggestive of a well- established practice in the LHD; this is not a common statistic reported in the literature so it is difficult to make a comparison. More commonly the incidence of DDH detected at birth is reported [13]. There was a small proportion (9%) of infants with no documented screening at birth in the medical file. It is important to present birth screening rates as a link has been made in some studies between a lack of documented screening at birth and the late presentation of DDH [11].

This study could not reveal reasons why children were not screened, apart from those five cases that were transferred to a tertiary centre at birth. Some infants may have been screened and the screening not documented, while others may have left the hospital prior to screening. Minimal differences were noted between the screened and not screened groups apart from a lack of documented follow-up in some of the breech and not screened records. These differences should be viewed with caution due to the small sample size. Further analysis could have occurred to consider any relationship between length of stay or other

'in-hospital factors' but this was outside the scope of this study.

Infant screening declines in the CFN setting after the UHV with only 75% of infants receiving a check at one-four weeks, 29% attended for the six-eight week check and only 21% attended for the six month check. This reported decline coincides with a lack of prompts in the PHR. In contrast other larger population studies have reported an 84% DDH screening rate for the one-four week visit and 60% for the six-eight month check [22].

The actual level of screening post birth in the community could not be accurately defined in this study due to the difficulty of extracting non-hospital data; self-report data from the survey indicates a decrease in screening practice after the six-eight week check in all settings. It is important to note there is no DDH check at six and 12 months in the PHR to support the practice of serial screening as suggested by the HNEH DDH guideline [4]. There is a review of gait at 18 months in the PHR.

The documented rate of managed DDH in the rural area under study was 1.6% or 16/1000 live births which is consistent with studies where clinical screening and selective ultrasound screening is current practice [8, 13]. As previously discussed there is controversy over general versus selective ultrasound screening in DDH diagnosis which ultimately impacts on the reported incidence in the community or cohort [9]. Rates of reported DDH are generally higher in European countries where general ultrasound screening is current practice. In this study cases of managed DDH were higher in female, first born, breech and babies with a positive family history following documented trends [22].

The rate of DDH diagnosed or managed late was 0.87% or 8.7 per 1000 live births. The rate of late DDH requiring surgical intervention was 0.25% or 2.5 per 1000 live births and this is higher than reported in previous Australian studies [5, 11, 22]. Caution is required in making a direct comparison with other studies due to the significantly smaller sample size and shorter reporting time period. There were also different definitions applied for the reporting of late DDH. These studies only reported late hips requiring surgery and excluded those hips which were dysplastic or subluxed in the rates of late DDH.

Clinicians reported variations in their knowledge and practice on the subject of DDH screening and the majority (80%) indicated they would like to know more, only 51% of clinicians reported previous training on the subject. Training and education for clinicians or access to experienced clinicians has been identified as an important component of any successful DDH screening program [16, 22]. Clinicians reported a high level of agreement for the use of the Ortolani and Barlow tests when screening children less than three months of age; there was less agreement with respect to assessment when screening older children. Less than half of the clinicians reported using guidelines.

Reasons for delayed physiotherapy management and late detection of DDH were outside the scope of this study and further investigation would be required. It is possible a lack of knowledge and training on the subject of DDH screening may have contributed to late detection as has been suggested in other studies [5]. Individual clinicians may have also been applying a period of supervision and repeat sonography prior to DDH management in accordance with guidelines [3]. It is unclear if there was any adverse effect on outcome apart from those two cases that were surgically managed from initial diagnosis.

Most countries recommend serial screening as accepted practice for DDH screening [3, 4, 16] and identify improvements in screening processes as a way of minimising late cases of DDH [16]. The reported decline in serial screening practices in CFN clinics and other non-hospital settings should be considered when examining the rates of late presenting DDH in the LHD. We do know that infants are more likely to be serially screened by nurses, physiotherapists and paediatricians in the community; in practice this represents a

smaller selection of the population when compared to those children who present to GP clinics for well-baby checks.

Previous studies suggest 'rurality' as a possible risk factor for a late diagnosis of DDH [5]. If this is the case extra attention should be focused on encouraging serial screening for DDH in rural areas to be in line with recommended practice and screening guidelines. Continued training and support for clinicians should be readily available in rural areas.

Strengths

This study was able to comprehensively describe DDH screening practices at birth and DDH screening behaviours in the defined rural area.

There was an acceptable survey return rate (54%, 49/91) with 51% (25/49) of the respondents being GP's. Traditionally GP's have been a difficult group to engage in research and this study provides some insight into practice outside the hospital setting.

The study has identified a clinician knowledge gap and need for training and education on this subject. Intervention aimed at education and training may improve screening processes and improve the detection rate and management of DDH in the LHD.

Limitations

This study used retrospective birth and physiotherapy clinic data. The researcher was not able to account for missing evidence of birth screening, apart from those records where the infant was retrieved at birth to a tertiary centre. When auditing the hospital medical records for risk factors there was no dedicated place to report family history for DDH; associated conditions were only reported if present and both of these risk factors may have been under-reported in the medical record. The birth data collected was for a consecutive three month period and whilst it was expected to be reflective of the whole year seasonal birth influences and hospital screening practices were not measured outside this time period.

There may have been a small error associated with establishing the base line number of infants referred to CFN clinics for a UHV as there is always some movement away from and towards a maternity centre following birth. In establishing the number of referrals in the 12 month period it was assumed the net difference was negligible within the defined LHD and referrals at birth were equal to infants born in the time period.

The birth and physiotherapy audits in this study reflected a different time period to the survey and CHIME data due to previously explained difficulties with extraction of the 2012 CHIME data. Inferred links about the relationship of late presentations of DDH in 2012 and a decline in reported screening practices in the CFN setting need to be made with caution. Similarly the survey data was collected prospectively.

Retrospective reporting of rates of infant screening in the community was limited to the CFN data only. Collection of data from the PHR was not possible as it was held with individuals and individual clinicians. Information about ongoing screening by GPs of the birth cohort was therefore unable to be collected apart from their self-reported survey data.

There was a chance of non-response bias in the representations made from survey data. A response rate of 54% was acceptable but it was difficult to ascertain the reasons for a lack of return from some clinicians.

Some reasons offered for a lack of return were that “the clinician did not see children”. No data was collected to account for a lack of return.

It was not possible to identify cases of DDH that may have been referred out of area or moved from the area post birth. This may have caused a small error associated with under-reporting of cases of diagnosed DDH (late and early). The smaller sample size of this study makes comparison with larger population based studies difficult.

CONCLUSION

This study has demonstrated that DDH screening practices are well established at birth in the rural area under study. Defining DDH screening practices beyond birth is difficult because of the diverse nature of clinical practice in rural areas. The results from the study suggest there is a decrease in reported screening for DDH beyond eight weeks of age. This coincides with an absence of formal reminders in the PHR at subsequent health checks.

The rate of DDH managed late in the rural area requires further investigation. Future research could explore the reasons for late diagnosis of DDH. The findings of this study may provide evidence to support requests from clinicians for education and training on the subject, especially with respect to referral and management pathways.

RECOMMENDATIONS

A number of simple practice improvement strategies could be adopted as a result of this study to improve DDH screening practice and minimise the risk of late diagnosed DDH in rural areas:

1. The PHR could be revised to include extra screening checks for DDH at three, six, nine and 12 months in accordance with the HNEH DDH protocol; or more simply include DDH screening when immunizations occur.
2. Clear and concise guidelines with respect to clinical assessment and local referral pathways could be added to the PHR to guide rural clinicians.
3. Education and training should be regularly available to rural clinicians to update and maintain their expertise in this area. Senior local clinicians should be involved in this process with tertiary clinician support to ensure the target audience is identified and engaged.

Conflict of Interest: The researcher reports no conflict of interest in this study.

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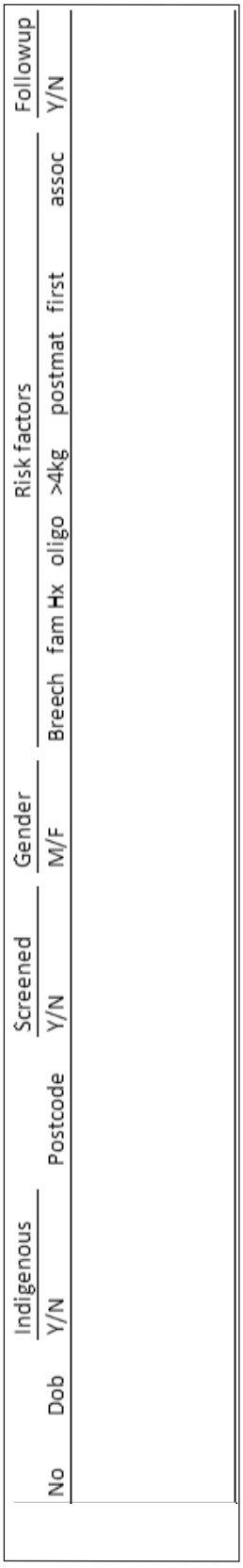
APPENDICES

Appendix 1 Birth Audit Data Collection



No	Dob	Indigenous Y/N	Postcode	Screened Y/N	Gender M/F	Risk factors Breech	fam Hx	oligo	>4kg	postmat	first	assoc	Followup Y/N

Appendix 2 CHIME Request for Data

Health
Hunter New England
Local Health District

Community Health Strategy- CHIME Support Team

PART A Report Request Outline:

Project Request Outline (fill in Part A and submit to: sue.buckman@hnehealth.nsw.gov.au)	
Manager Name	Wendy Mulligan
Unit/Service	Tablelands Cluster Community Health
Department	Physiotherapy
Contact person	Suzanne Wright
Contact Details	Suzanne.wright@hnehealth.nsw.gov.au
Date	13/01/2014

Introduction (Identification of problem)

What is the issue being addressed:
To understand DDH screening practices within a community health setting.

Situation

What is happening currently:
DDH screening happens at the UHV(1-4 weeks), 6-8 week chack and then opportunistically as parents present with infants. We are unsure of how many infants present to community health centres for routine hip screening.

Is data already being collated and if so how?
UHV (1-4 week check) is being reviewed by local health managers. DDH screening rates are not specifically known or reviewed at other ages/stages.

Background

Aim of report request (what do you want it to tell you?)
To identify the number of children screened through community health settings at 1-4 weeks, 6-8 weeks, 6 months and 12 months. There is no standard hip check identified beyond 6 weeks in the Personal Health Record.

Assessment

Please select 1 or more of the following reasons for data collection

☐ **NSW Ministry of Health**	☐ **Commonwealth**
☐ **Project outcomes**	**x Research**
☐ **LHD strategic plan objective**	☐ **Clinical Network and Stream Objective**
☐ **Cluster Manager request**	☐ **Line Manager request**
☐ **Quality Activity**	☐ **Direct Client Involvement**

Have you tried to access the data from other systems? ☐ **Yes X No**

Appendix 2 CHIME Request for Data (Cont)

Health
Hunter New England
Local Health District

For MoH, Commonwealth, research , LHD and Networks/ Stream reports please attach a copy of the reporting requirement or objective **Has Ethics Approval been xMade ☐Approved**
Assessment continued
For MoH, Commonwealth, research and Project: **What is the commencement date: Upon Ethics approval 19th February, 2014** **Is the funding linked to outcome reports? ☐ Yes X No** **When is the first report due? N/A** **In the application was creation of reports considered in the funding? ☐ Yes X No** **Are you able to fund the report creation? ☐ Yes X No**
Who will need access to the report **X Clinical Staff** **X Line managers** **☐ Cluster managers** **☐ Executive**
How often will the report be run? **☐ Monthly** **☐ Quarterly** **☐ weekly** **☐ Daily** **X One Off** **☐ Other _____**
What information is required from CHIME: X De-identified ☐ Client details ☐ Other_____
Name of applicant: Suzanne Wright
PART B - Initial consultation meeting (to be completed with CHIME staff)
Click here to enter text.

Appendix 3 DDH Survey

An analysis of practice with respect to hip dysplasia screening in the HNELHD (northern region)

Developmental Dysplasia of the Hip Practice Survey

Aim: To define screening practices for Developmental dysplasia of the hip (DDH) within our HNELHD (Armidale, Glen Innes and Inverell).

DDH represents a spectrum of anatomic abnormalities in which the femoral head and the acetabulum are aligned improperly or grow abnormally. The term DDH is used to describe hips that are unstable, subluxed, dislocated or have malformed acetabula.

1. **What is your area of clinical practice/specialty ?(please circle)**

Child and Family Health Nurse	General Practitioner (GP)
Clinical Practice Nurse	GP/Obstetrician
Physiotherapist	Paediatrician
Other _____	GP/Registrar

2. **Please state your clinical practice location by name, i.e Armidale**

_____

3. **How long have you worked clinically with children and families? (please circle)**

≤ 5years **5 to 10 years** **≥ 10years**

4. **Do you conduct childhood screening for DDH within your practice? Yes /No**
If the answer is no, thank you for your time and finish the survey now.

5. **In my clinical practice I routinely screen infants for DDH at the stated ages. Your response may depend on your work role/place(please tick)**

Age	All the time	Most of the time	Half of the time	Less than half	Never
Birth					
1-4 weeks					
6-8 weeks					
3 months					
4 months					
6 months					
9 months					
12 months					
18 months					
4 years					

Please add Comments if required_____

_____

Version 9:1/02/ 2014

Appendix 3 DDH Survey (Cont)

An analysis of practice with respect to hip dysplasia screening in the HNELHD (northern region)

6. In my clinical practice I use the following clinical tests/examination to screen for DDH ***younger than 3months of age*** **(please circle)**
   Ortolani/Barlow leg length galaezzi sign asymmetry of creases

   Range of Hip abduction Other, please specify_____

7. In my clinical practice I use the following clinical tests/examination to screen for DDH ***greater than or equal to 3months of age*** **(please circle)**

   Ortolani/Barlow leg length galaezzi sign asymmetry of creases gait

   Range of Hip Abduction Other, please specify_____

8. **In my clinical practice if I identify "clicky" or subluxable hips at <u>1-4 weeks</u> in an infant without identifiable risk factors. I would (you can tick more than one response)**

Action	All the time	Most of the time	Half of the time	Less than half of the time	Never	Not applicable
Refer to a GP						
Refer to Paediatrician						
Ultrasound						
Refer for (harness) management						
Monitor and review at 6 weeks						
Refer to a Paediatric orthopaedic specialist						
Other						

9. **In my clinical practice if I identify "clicky" or subluxable hips in an infant without risk factors at <u>one month to three months</u> I would (you can tick more than one response)**

Action	All the time	Most of the time	Half of the time	Less than half of the time	Never	Not applicable
Refer to a GP						
Refer to a Paediatrician						
Ultrasound						
Refer for (harness) management						
Monitor and review at 12 weeks						
Refer to a Paediatric orthopaedic specialist						
Other						

Version 9:1/02/ 2014

Appendix 3 DDH Survey (Cont)

An analysis of practice with respect to hip dysplasia screening in the HNELHD (northern region)

10. **In my clinical practice if I identify a leg length difference during a hip examination of an infant greater than 3 months of age and up to 6 months. I would (you can tick more than one)**

Action	All the time	Most of the time	Half of the time	Less than half Of the time	Never	Not applicable
Refer to a GP						
Refer to Paediatrician						
Ultrasound						
XRAY						
Refer for (Harness) Management						
Monitor						
Refer to a Paediatric orthopaedic specialist						
Other						

11. **In my clinical practice if I identify asymmetrical hip abduction or bilateral hip abduction less than 60 degrees in an infant greater than 6 months of age. I would (you can tick more than one)**

Action	All the time	Most of the time	Half of the time	Less than half of time	Never	Not applicable
Refer to a GP						
Refer to a Paediatrician						
Ultrasound						
XRAY						
Monitor						
Refer to a Paediatric orthopaedic specialist						
Other						

12. **In my clinical practice if I identify an abnormal walking pattern in a child greater than 12 months of age with a normal neuromuscular examination. I would (you can tick more than one)**

Action	All the time	Most of the time	Half of the time	Less than half	Never	Not applicable
Refer to a GP						
Refer to Paediatrician						
Ultrasound						
XRAY						
Monitor						
Refer to a Paediatric orthopaedic specialist						
Other						

Version 9:1/02/ 2014

Appendix 3 DDH Survey (Cont)

An analysis of practice with respect to hip dysplasia screening in the HNELHD (northern region)

13. **Have you experienced any difficulties with referrals to tertiary hospitals/hip clinics for patient follow-up? Yes/No please explain**

_____

_____

_____

_____

14. **Do you follow any practice guidelines with regard to screening for DDH? Yes/No please specify** _____

_____

_____

15. **From your clinical experience would you like to make any recommendations to policy makers that would assist with screening and management of DDH in rural areas?**

_____

_____

_____

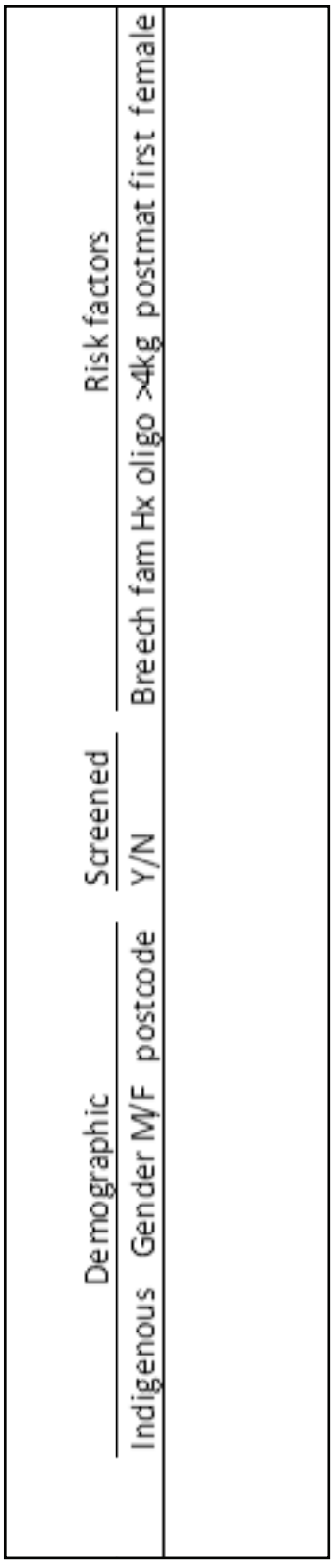
_____

16. **Have you received training in infant hip examination other than your initial professional qualification? (please circle) Yes/No**

17. **Would you like to receive an update on clinical practice/education for DDH in your town? (please circle) Yes/No**

Thank you for taking the time to complete this survey all responses will be confidential and feedback will be provided in the final report to all respondents.

Appendix 4 Data Collection Physiotherapy Audit



Appendix 5 Survey Responses: Questions 2, 8-12 [1]

Table 7 Developmental Dysplasia of the Hip Practice Survey: Summary location and experience of survey respondents n=49

Location	n	%
Armidale/Walcha/Uralla/Guyra	38	78
Glen Innes	6	12
Inverell	5	10
Experience		
< 5 yrs	9	18.4
5-10 yrs	7	14.3
>10 yrs	33	67.3

Table 8 Developmental Dysplasia of the Hip Practice Survey: Q8 Management 1-4 weeks of an infant with no risk factors and "clicky" hips (sum of all and most of time)

	Refer to GP	Refer to Paediatrician	U/S	Harness	Monitor R/v 6/52	Refer to Paed/Ortho
GP+ n=22	0/1	12/15	19/20	1/5	8/10	5/10
%	**0**	**80**	**95**	**20**	**80**	**50**
Paed n=3	0/0	0/0	2/3	1/2	2/2	0/2
%	**0**	**0**	**67**	**50**	**100**	**0**
CFN n=9	8/8	0/0	0/0	0/0	5/5	0/0
%	**100**	**0**	**0**	**0**	**100**	**0**
Physio n=4	4/4	2/2	0/0	0/0	0/0	0/0
%	**100**	**100**	**0**	**0**	**0**	**0**
Total	12/13	14/17	21/23	2/7	15/17	5/12
%	**92**	**82**	**91**	**29**	**88**	**42**

GP+ includes GP's, GP Obstetricians, Resident Medical Officers and GP Registrars

[1] Respondents did not have to provide an answer in each cell.

Table 9 Developmental Dysplasia of the Hip Practice Survey: Q9 Management 1-3 months of an infant with no risk factors and "clicky" hips (sum of all and most of time)

	Refer to GP	Refer to Paediatrician	U/S	Harness	Monitor and R/v 12/52	Refer to Paed Ortho
GP+ n=22	0/1	14/15	20/20	3/6	5/9	5/10
%	**0**	**93**	**100**	**50**	**56**	**50**
Paed n=3	0/0	0/0	3/3	1/2	2/2	0/2
%	**0**	**0**	**100**	**50**	**100**	**0**
CFN n=9	9/9	0	0/0	0/0	3/4	0/0
%	**100**	**0**	**0**	**0**	**75**	**0**
Physio n=4	4/4	0	0	0	0	0
%	**100**	**0**	**0**	**0**	**0**	**0**
Total n=38	13/14	14/15	23/23	4/8	10/15	5/12
%	**93**	**93**	**100**	**50**	**67**	**42**

GP+ includes GP's, GP Obstetricians, Resident Medical Officers and GP Registrars

Table 10 Developmental Dysplasia of the Hip Practice Survey: Q10 Management of an infant with a leg length difference noted in an infant 3-6 months (sum of all and most)

	Refer to GP	Refer to Paediatrician	U/S	Xray	Harness	Monitor	Refer to Paed/ Ortho
GP+ n=22	0/1	14/15	14/16	7/12	2/6	6/8	8/11
%	**0**	**93**	**88**	**58**	**33**	**75**	**73**
Paed n=3	0/0	0/0	3/3	2/2	0/1	1/2	1/2
%	**0**	**0**	**100**	**100**	**0**	**50**	**50**
CFN n=9	9/9	0/0	0/0	0/0	0/0	3/3	0/0
%	**100**	**0**	**0**	**0**	**0**	**100**	**0**
Physio n=4	4/4	1/1	0	0/0	0	0	0
%	**100**	**100**	**0**	**0**	**0**	**0**	**0**
Total n=38	13/14	15/16	17/19	9/14	2/7	10/13	9/13
%	**93**	**94**	**89**	**64**	**29**	**77**	**70**

GP+ includes GP's, GP Obstetricians, Resident Medical Officers and GP Registrars

Table 11 Developmental Dysplasia of the Hip Practice Survey: Q 11 Management of an infant > 6 months of age with asymmetrical hip abduction or bilateral hip abduction <60 degrees (sum of all and most of the time)

	Refer to GP	Refer to Paediatrician	U/S	Xray	Monitor	Refer to a Paed /Ortho
GP+ n=22	0/1	12/12	10/11	9/11	4/6	8/10
%	**0**	**100**	**90**	**82**	**67**	**80**
Paed n=3	0/0	0/0	0/2	3/3	1/2	2/2
%	**0**	**0**	**0**	**100**	**50**	**100**
CFN n=9	9/9	0/0	0/0	0/0	2/2	0/0
%	**100**	**0**	**0**	**0**	**100**	**0**
Physio n=4	4/4	0	0	0	0	0
%	**100**	**0**	**0**	**0**	**0**	**0**
Total n=38	13/14	12/12	10/13	12/14	7/10	10/12
%	**93**	**100**	**77**	**86**	**70**	**83**

GP+ includes GP's, GP Obstetricians, Resident Medical Officers and GP Registrars

Table 12 Developmental Dysplasia of the Hip Practice Survey: Q12 Management of an infant with an abnormal walking pattern >12 months of age. Normal neuromuscular examination (sum of all and most of the time)

	Refer to GP	Refer to Paediatrician	U/S	Xray	Monitor	Refer to Paed/Ortho
GP+ n=22	1/2	14/15	5/7	13/15	5/8	5/10
%	**50**	**93**	**71**	**87**	**63**	**50**
Paed n=3	0/0	0/0	0/2	3/3	2/2	1/2
%	**0**	**0**	**0**	**100**	**100**	**50**
CFN n=9	9/9	0/0	0/0	0/0	1/1	0/0
%	**100**	**0**	**0**	**0**	**100**	**0**
Physio n=4	4/4	0	0	0	1/1	0
%	**100**	**0**	**0**	**0**	**100**	**0**
Total n=38	14/15	14/15	5/9	16/18	9/12	6/12
%	**93**	**93**	**55**	**89**	**75**	**50**

GP+ includes GP's, GP Obstetricians, Resident Medical Officers and GP Registrars