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The Role of Public Health Nurses in the Detection of Developmental Dysplasia of the Hip

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Abstract

Aims

Our study aimed to quantify the role played by public health nurses (PHNs) in the detection of cases of developmental dysplasia of the hip (DDH) not identified by existing national screening processes.

Methods

We conducted a review of all children diagnosed with DDH in our centre over an 18-month period. Referral details and general clinical information were then analysed for all late diagnoses, defined as later than three months of age.

Results

339 infants were diagnosed with at least some degree of dysplasia over the study period, implying an annual incidence of 31.3 cases per 1,000 live births. 86 of these (25.4%) were late diagnoses. 67.9% of referrals of late cases originated with a PHN. A small subgroup of late diagnoses (n = 8) presented with frank hip dislocation.

Conclusion

The proportion of DDH diagnoses made after three months of age remains significant. Our findings suggest that PHN reviews in the first year of life constitute an important 'safety net' in expediting the diagnosis of DDH in babies not identified by existing national screening processes. Quality improvement and training interventions would be of value in further supporting this role.

Introduction

Developmental dysplasia of the hip (DDH) refers to a spectrum of abnormal development of the hip joint, ranging from mild dysplasia, detectable only on X-ray or ultrasound, to severe dysplasia manifesting as frank dislocation of the hip joint. DDH is an important cause of disability in children and young adults, and the most common reason for total hip replacement in individuals younger than 40 years of age[1].

Efforts have been made to separate children with 'true DDH' – requiring treatment – from those children with mild dysplasia who, left untreated, will develop normal hips[2]. It is believed that hip dysplasia affects 1-3% of Irish babies to some degree, with 1-2 in 1,000 babies affected by frank hip dislocation at birth[3]. Risk factors for DDH include female sex, breech position, a positive first-degree family history, and incorrect lower extremity swaddling[4,5].

Treatment varies from Pavlik harnessing to surgical reduction and osteotomy, depending on the age of the patient at presentation and degree of dysplasia. Most authors define late diagnosis of DDH as later than three months of age[6,7], with worse outcomes and greater need for surgical intervention seen among this cohort[7,8,9].

Current best practice recommends a whole-body clinical examination of all newborn infants within 72 hours of birth, to include the Ortolani[10] and Barlow[11] hip tests as well as assessment of leg length, thigh fold symmetry and degree of abduction. A second assessment should occur at approximately 6 weeks of age – the 'six-week check'. However, the reliability of the Barlow and Ortolani clinical tests appears to reduce beyond the neonatal period[12,13]. Current Irish guidelines recommend a screening ultrasound for babies with either abnormal clinical examination or positive risk factor status (namely, breech presentation or first-degree family history)[3].

After the neonatal period, all children in Ireland receive health checks from an assigned public health nurse (PHN), at 3 months and 7-9 months of age[14]. Variation exists between jurisdictions in this regard; for example, in Great Britain the four-month health visitor check is no longer routine[15,16], while in Northern Ireland it has been retained[17]. The breakdown of health problems identified by these visits has not received extensive research attention. Although others have alluded to an apparent role played by PHNs in identifying otherwise missed cases of hip dysplasia[17], the proportion is not known and to our knowledge has not been studied.

As such, the aim of our study was to assess the proportion of babies requiring treatment for DDH in our catchment area, not identified by the current perinatal screening apparatus, who were subsequently first identified at PHN screening.

Methods

We conducted a retrospective analysis of all children presenting to our centre who were diagnosed with DDH and born in the South-East region of Ireland within an eighteen-month period (born on or between 1st January 2018 to 30th June 2019). We defined our incidence of DDH to include all babies diagnosed clinically or via imaging with DDH during the study period who were either treated locally in abduction bracing or referred onward for tertiary care. Within this cohort, we then identified all cases of late DDH, defined as diagnosis made at or later than three months of age.

For functional purposes, our late-diagnosed patients were categorised into three groups (Fig. 1). All patients were 13 weeks of age or older at diagnosis and were not identified perinatally by clinical examination or screening ultrasound. Group 1 included patients presenting with frank clinical dislocation of one or both hips. Group 2 consisted of patients referred because of clinical concern and diagnosed sonographically with hip dysplasia warranting treatment – namely, receiving a Graf classification of IIb or greater in one or both hips[18]. Group 3 included those patients diagnosed with hip dysplasia by hip X-ray.

Details of the referral pathway, demographics and clinical information for these patients were sourced from hospital records and consultant notes. In each case, we identified the healthcare professional documented as having instigated the referral process. We estimated regional DDH incidence using a denominator of total annual live births registered in the South-East region of Ireland[19].

Results

Incidence

A total of 339 infants were diagnosed with DDH born during our 18-month study period, approximating an annual incidence of 226 cases per year. This figure includes all babies diagnosed with and treated for DDH in our centre, late or otherwise. It also includes 8 children referred onward to a tertiary centre for treatment having presented frankly dislocated. There were 7213 live births in the catchment area of our hospital in 2018, the latest year for which data are available[19]. This yields an overall estimated regional incidence of 31.3 cases of DDH per 1,000 live births during our study period.

Of these 339 diagnoses, 86 were late (25.4% of all diagnoses), producing an estimated annualised incidence of late-diagnosed DDH of 7.9 per 1000 live births. An overview of these cases is shown in Figure 1. 8 babies presented to clinic with frank hip dislocation, comprising Group 1. 10 babies were referred to clinic and diagnosed with hip dysplasia by way of an abnormal ultrasound with a Graf score of IIb or greater on at least one hip[18], comprising Group 2. 66 babies were referred to the hip clinic and diagnosed with hip dysplasia by way of hip X-ray, comprising Group 3. Lastly, the clinical records of two babies who received a late diagnosis were unavailable and so could not be classified, leaving a total of 84 babies to be analysed.

Among our 84 cases of late-diagnosed DDH, the mean age at diagnosis was 33.2 weeks (7.6 months), and the oldest was 78 weeks (18.0 months) old, the only child in the cohort diagnosed after 1 year of age. Of 84 infants, 67 (79.8%) were female, and 17 (20.2%) were male.

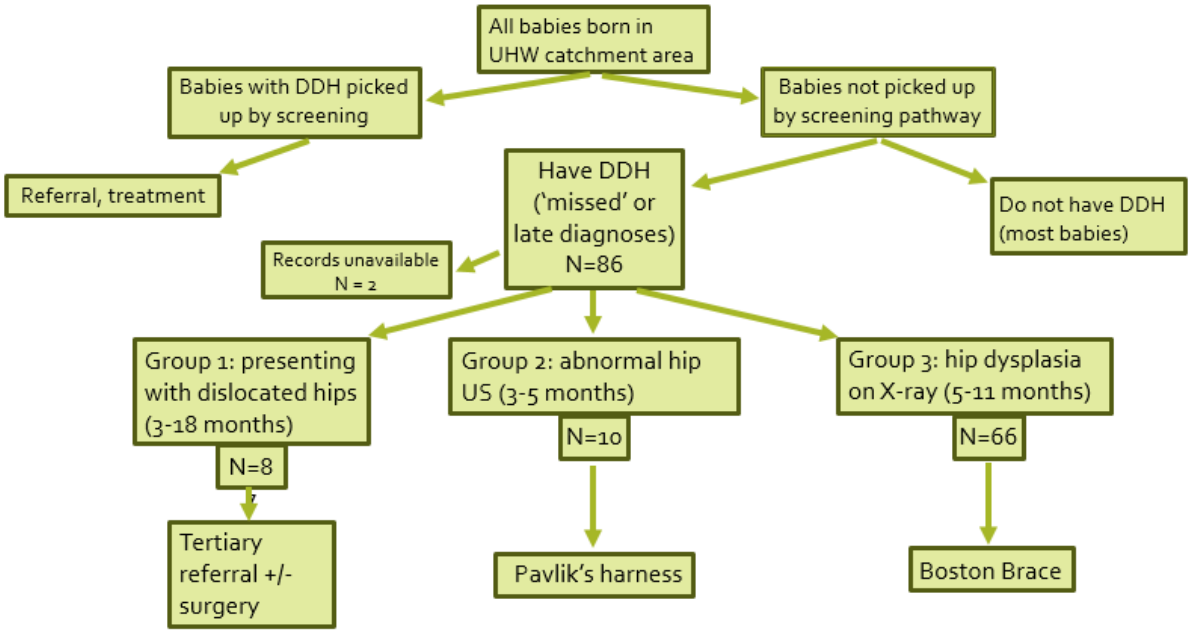

Figure 1: Overview of cases of late-diagnosed DDH.

Management Modality

Patients in Group 1 were referred once diagnosed to a paediatric orthopaedic specialist centre. Of the 8, 1 underwent open reduction and 5 underwent closed reduction; the management of the remaining 2 is pending at time of writing. Of the 10 patients in Group 2, 7 were treated with Pavlik harnessing and 3 with abduction bracing. All 66 patients in Group 3 were treated with abduction bracing.

Referral Pathway

An overview of the original referral pathways for our patient cohort is summarised in Table 1.

Table 1: Overview of referral origin of cases of late-diagnosed DDH.

	PHN	Physio	GP	Paediatric Clinic*	SMO	Parents	Outstanding Perinatal Appointment	Total
All late diagnoses	57	1	6	7	6	3	4	84
%	67.9	1.2	7.1	8.3	7.1	3.6	4.8	
Group 1	4	0	0	1	0	2	1	8
%	50	0	0	12.5	0	25	12.5	
Group 2	6	0	1	0	0	0	3	10
%	60	0	10	0	0	0	30	
Group 3	47	1	5	6	6	1	0	66
%	71.2	1.5	7.6	9.1	9.1	1.5	0	

*(PHN: public health nurse. SMO: senior medical officer.) *Of 7 referrals from other paediatric clinics, 6 originated from a consultant-led outpatient clinic and 1 from an advanced nurse practitioner-led (ANP) clinic.*

As shown, of the 84 cases of late-diagnosed DDH during the study period, 57 – or 67.9% – were first identified by way of review by a public health nurse. Other common origins of referral included paediatric outpatient clinics, the family GP, and physiotherapists. In 4 cases, patients had qualified for the national screening programme, due to either abnormal postnatal hip examination or positive risk factor status, yet diagnosis was delayed due to missed appointments, for example due to a family changing their address. All other patients came from the 'non-risk' population, with a negative risk factor status and screening examination, and were not screened perinatally.

Discussion

Our findings affirm that Irish public health nurses (PHNs) continue to play an indispensable role in the detection of DDH among babies not successfully identified by our current national screening apparatus. Of all 84 cases of late-diagnosed DDH analysed over the 18-month study period, 67.9% originated from a PHN referral. It is known that late diagnosis of DDH confers poorer long-term outcomes and increased need for operative intervention[7,8,9], though research detailing the contribution made by PHNs in identifying this health problem is scarce. Our data strongly suggest that interfaces with PHNs in the first year of life help to expedite these late diagnoses, thereby hopefully improving the outcome. Findings from colleagues in Northern Ireland support the continuation of a universal four-month health visitor check[17], a practice discontinued in the remainder of the United Kingdom[15].

In our study, we designated the first healthcare professional explicitly documented as having identified a clinical concern as the origin of each referral. Of note, PHNs in our region do not refer patients directly to our clinic, who arrive instead via a GP, senior medical officer (SMO) or other route.

As such, if a PHN developed a specific concern for DDH and, on that basis, referred that patient to a SMO who in turn referred to our service, the PHN was designated the origin of that referral. However, when several assessors are involved successively, and in the absence of exhaustive clinical documentation, it may be that this method either under- or over-estimates the role played by PHNs in various contexts. This constitutes a limitation to our study.

A second limitation relates to the difficulty in ascertaining the total number of PHN referrals with hip concerns to all healthcare professionals in our region, to include referrals who did not reach our clinic. Such a figure, incorporating both cases and non-cases of DDH, would enable an estimation of the positive predictive value of an individual PHN assessment in identifying eventual hip dysplasia. Further research in this regard would contribute usefully to the ongoing discussion of potential overtreatment and over-referral of DDH.

In addition, a fuller understanding of the specific clinical findings that improve the sensitivity and specificity of hip examination, by comparing the referrals of babies diagnosed with DDH and not, would be valuable in informing quality improvement and educational interventions. For example, hip crease asymmetry forms a common basis for referral despite being a consistently unreliable predictor of hip dysplasia[20,21]. Moreover, it is known that false-negative rates of the Barlow and Ortolani tests increase quickly beyond 6 weeks[13,], while limitation of hip abduction may not become clinically apparent until 3 months of age[17]. Thus, it may be that a 'window of risk' exists for infants, between the neonatal period and 3-month mark, when clinical assessment is at particular risk of failing to detect hip dysplasia[22].

Our study demonstrates a relatively high incidence of babies receiving treatment for DDH, at 31.3 cases per 1000 live births. We report an incidence of late-diagnosed DDH of 7.9 per 1000 live births. Encouragingly, only one child in our study cohort – and catchment area as a whole – was diagnosed with DDH at later than one year of life.

Estimates in the literature of DDH incidence vary widely, ranging from 4.4 to 518.5 per 1000 live births[2], contingent on method of detection, jurisdiction, and adherence to national screening protocols. Studies conducted in the era prior to universal clinical examination of newborns tended to report lower rates, of 1-2 per 1000 live births, with estimates of incidence tending to increase over time since then[7]. It may be that this change reflects a liberalising trend toward non-invasive treatment for milder degrees of dysplasia, by way of abduction bracing. Of note, a national standardised hip screening protocol has been issued in recent years in Ireland[3], after previous studies showed disparate levels of screening effectiveness[23].

One-quarter of all cases of DDH detected during our study period were late diagnoses. Of these 84 cases, the most numerous subgroup (Group 3, n=66) comprised those infants exhibiting radiographic evidence of hip dysplasia who were treated with bracing. The long-term clinical relevance of radiographic features of hip dysplasia of differing extents of severity is not fully known. In contrast, a smaller subgroup in our cohort (Group 1, n=8) represented cases of frank clinical dislocation requiring onward tertiary referral and potential need for operative reduction, who had not been detected in the perinatal period. It might be argued that the successful and prompt identification of this small but important subgroup of babies poses the single most salient challenge to policymakers seeking to strengthen our national hip screening apparatus.

In conclusion, the primary hypothesis of our study was that opportunistic reviews of infants by PHNs in the first year of life constitute an important 'safety net' in the detection of late cases of DDH. Our findings strongly support this claim. We contend that retention of universal PHN reviews in the first year of life is essential. Quality improvement measures and training interventions would be of value in further supporting this important role.

Declaration of Conflicts of Interest:
The authors have no conflicts of interest or sources of funding to declare.

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