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Title: Clinical practice of health professionals working in early detection for infants with or at risk of cerebral palsy across New Zealand.

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'Abstract

Aim: A diagnosis of cerebral palsy (CP) can, and should, be made as early as possible. This work describes current clinical practice around the awareness and use of diagnostic tools for the detection of CP in New Zealand (NZ).

Methods: A purpose-developed survey distributed electronically to NZ clinicians working with young children with or at risk of CP.

Results: 159 clinicians (including paediatricians, physiotherapists and occupational therapists) participated in this cross-sectional study. Ninety-six percent were aware that a diagnosis of CP can be made by 12 months of age, with high levels of awareness of the use of Magnetic Resonance Imaging (94%), Prechtl's Qualitative Assessment of General Movements (GMs) (70%) and Hammersmith Infant Neurological Examination (HINE) (77%). Only 40% were aware of the HINE optimality scoring. Fifty-four clinicians provided a diagnosis of CP as part of their role: 48% never used the GMs or HINE to assess children <1year, and 57% never used the HINE for children between 1-2years. Clinicians not providing a diagnosis within their professional role (n=104) also indicated infrequent use of assessment tools with 74% and 54% never using the GM's or HINE (respectively) in their assessment of children at risk of CP. Barriers to use included lack of time and funding, lack of clear pathways and management support.

Conclusion: Despite high awareness, current use of international best practice tools in NZ clinical practice appears low. Multiple barriers are reported to the use of these tools, which need to be addressed to improve the timeliness of diagnosis.

Key words: Early diagnosis, diagnostic tools, Hammersmith Infant Neurological Examination, General movements assessment.

What is already known on this topic

1. International experts recommend that detection of high risk of CP can and should be made before 6 months of age
2. The combination of MRI, GMS and HINE provides a high level of accuracy (up to 97%) for the detection of babies at risk of developing CP

What this paper adds

1. Clinician awareness of the use of MRI, GMs and HINE as diagnostic tools for detection of high risk of CP is high
2. Use of these diagnostic tools for CP appears low across New Zealand
3. Knowledge to practice gaps can be attributed to barriers to change. Issues with 'time, workload, staffing and funding' are among the more commonly reported barriers to use in clinical practice.

Cerebral palsy (CP) is the most common physical disability in childhood[1], with multiple and varied neurologic impacts in early life leading to the clinical picture defined as CP. The neurologic injury is static, but the developmental consequences can be profound, with secondary impairments across multiple systems that span a lifetime. In the first years of life, brain plasticity is at its peak[2] and there is a significant opportunity for targeted early intervention with the potential to shape developmental trajectories from childhood through to adulthood[3].

Historically the age of receipt of a CP diagnosis is between 8-24 months[4], with the age at diagnosis varying depending on the clinical history and severity of impairment[4]. Strong evidence now confirms that a diagnosis of CP or high risk of CP can, and should be made before six months of age[3]. For early detection of CP before five months (corrected age, c.a.) a combination of Magnetic Resonance Imaging (MRI)[5], The Prechtl Qualitative Assessment of General Movements (GMs)[6] and history of risk factors is recommended (>95% accurate)[3]. When MRI and/or GM's are not available, the Hammersmith Infant Neurological Examination (HINE)[7] should also be used (suitable for infants 2-24 months[8]). For early detection of CP in an infant beyond five months c.a., the most accurate method is a combination of MRI and HINE (>90% accurate), with additional motor assessments such as the Developmental Assessment of Young Children (DAYC)[3]. The timely use of such assessment tools are now recommended as standard of care for young infants to facilitate the early and accurate detection of CP[3].

Despite these recommendations, only 13% of children in New Zealand (NZ) receive their diagnosis before six months, as indicated by data from the CP register (NZCPR), with 59% not receiving a diagnosis until after 12 months (unpublished report NZCPR 2018). Australia appears to have higher early detection rates with nearly a quarter of infants with CP having received their diagnosis before six months of age[9], yet both countries appear to have variability and inequalities in follow up and assessment tools used for infants at risk of CP[10, 11]. To effectively facilitate transition to earlier

detection of CP within NZ, we must first understand current clinical practice and potential barriers / enablers to implementation[12]. Common barriers and enablers to change in the health care sector typically include system type factors such as workload, lack of time and resources, but may also include more staff specific factors such as level of awareness, skill / ability, and attitudes / culture to change[13], or factors relating to the health service team in general such as team cooperation, leadership and support[14].

The primary objective of this study was to capture current practice of clinicians working young children with a diagnosis of, or who are considered to be at risk of CP across NZ with a focus on the awareness and use of clinical assessment tools for early detection and referral pathways (for diagnosis, management, and/or initiation of musculoskeletal surveillance). A secondary objective was to identify potential barriers and enablers, from the clinician's perspective, that may help facilitate this shift towards early detection of CP in NZ.

Materials and Methods

Study population

This cross-sectional study surveyed a convenience sample of clinicians working with young children (≤5 years) either with, or at risk of, CP in NZ. The survey was promoted between October 2018 and October 2019 via email and word of mouth across professional associations and networks in NZ, including: The Paediatric Society of NZ; The Australasian Academy of Cerebral Palsy and Developmental Medicine; The NZ Paediatric Orthopaedic Society; Requests to Clinical Directors of Level 2 and 3 Neonatal Units to pass on to their teams; Physiotherapy NZ Paediatric Special Interest Group; and clinicians enrolled to undertake clinical education workshops (on the use of HINE).

Study Instrument

Survey development was guided by Burns et al.,[15]. Initial items were generated based on the study's objectives, divided into three themes: 1) awareness and use of assessment tools for diagnosis/detection, 2) referral (diagnosis and management), and surveillance pathways, and 3) barriers and facilitators to change in practice. Items were developed with input from the investigators, external clinician consultation and through a review of the literature. Items were reduced (<25) to minimize surveyor burden[16], 'display logic' was included to customise the questions based on the respondents answers, and both multiple-answer and free-text responses were included. Following

further feedback from a review by local clinicians, changes were made to improve clarity, reduce redundancy, and ensure questions were prioritised for the research objectives.

Data collection

The survey invitation was electronically distributed using an online survey provider (Qualtrics©) via an anonymous link. Participants were advised that by completing the survey they were agreeing they consented to participate. This study was approved by the New Zealand Health and Disability Ethics Committee, Reference Number 18/NTB/169.

Data analysis and reporting

Frequencies and percentage data provided a descriptive analysis. Free text responses were collated and coded for content analysis[17]. All themes are summarised within the supplementary table, but only frequently reported content (occurring ≥4 times) are outlined within text.

Results

Participant characteristics

A total of 159 health professionals participated, the majority being physiotherapists, occupational therapists and paediatricians (Table 1). Participants were employed within the Hospital/Health services n=116 (77%), Private practice n=7 (5%), Hospital/Private practice n=9 (6%), University n=5 (3%), Non-Government Organisation n=4 (3%). Less than 2% worked within Schools, Government departments, Commercial/industrial organisation, or both Government department/Hospital. Twenty-two (15%) indicated they had 1-5 years' experience working in the field of paediatrics, n=52 (35%) had 6-14 years, and 75 (50%) 15+ years' experience.

Diagnosis, awareness and use of tools

Ninety-six percent (n=151) responded 'yes' when asked '*Were you aware that cerebral palsy can frequently be diagnosed by 12 months of age*?'. Ninety-four percent were familiar with the use of MRI (n=145), 70% (n=110) of the use of GMs, and 77% (n=122) of the HINE: 40% (n=49) were familiar with using the optimality scoring of the HINE.

Fifty-four participants (34%) indicated that they provide a diagnosis CP/detect high risk of CP. Responders providing a diagnosis were asked which tools they thought **should be used**, and, then, how often they used these tools **(frequency of use**). 'Clinical signs and symptoms' and MRI findings

were the most commonly recommended tools, followed by GMs and HINE for children under 1 year, the Bayley scales and HINE between 1-2 years, and the Bayley scales and DAYC for children over 2 years (Table 2). In regard to **frequency of use**, 'clinical signs and symptoms' were almost always used, followed by MRI, DAYC and GM's for children under 1 year; MRI and DAYC between 1-2 years; and MRI and DAYC for children over 2 years. About half the participants never used MRI, GMs or HINE with the most common response for both GMs (n=22) and HINE (n=23) being that they were not trained, and for MRI that it was out of scope of practice (n=7) (Table 3).

Whilst not all health professionals provide a diagnosis within their role, they can be involved in the assessments that lead to diagnosis. Participants not providing a diagnosis (n=104) were asked about their use of assessment tools for children / at risk of CP. 'Clinical signs and symptoms', referral to MRI, and the AIMS were mostly commonly 'almost always' used (Table 4). When asked if their workplace provided any standard guidelines/procedures for **referring** a child for diagnosis/detection of risk of CP, only n=24 (23%) indicated yes, with n=14/24 stating that they could be improved; n=52 (50%) indicated there were no guidelines/procedures, with n=26/52 using their own; and n=28 (27%) were unsure.

Referral pathways and musculoskeletal surveillance

For diagnosis: When asked of their usual referral pathway for diagnosis, n=44 listed a singular health profession/specialist for referral, n=31 listed two, and n=23 listed three specialists to refer to in combination. The most commonly referred to were Developmental Paediatrics n=54 (n=14 singular responses), General Paediatrics n=51 (n=17 singular responses), Paediatric Neurology n=28 (n=6 singular responses), Child Developmental Services n=23 (n=6 singular responses), and Paediatric Orthopaedics n=12.

For management: The majority (n=146, 98%) felt that standardised best practice clinical guidelines for management of CP would be useful across NZ. Over half (n=77) noted their workplace provided standard referral procedures/guidelines for CP specific management (e.g. spasticity management, therapy etc) following detection/diagnosis. However, of these, n=48 noted they could be improved. Twenty-two (15%) of the participant's workplaces did not have any procedures/guidelines, n=25 (17%) had their own, and n=26 (17%) were unsure.

For surveillance: 48% (n=68/142) indicated they used hip surveillance guidelines, 15% (n=21/142) used both Hip and Spine surveillance guidelines. Fifty-one percent either did not have any guidelines (n=22, 15%), did not know (n=31, 22%), or determined their own surveillance protocol (n=20, 14%).

Enablers and barriers

Enablers and barriers to implementing assessment tools and change of practice were categorised by System factors, Social factors, Health professional knowledge and perceptions, Clinical considerations, and Internal drive (see supplementary for full responses).

Most of the System Factor enablers were categorised by *'Quality Improvement' (*i.e. access to professional development)*, 'Peer Review'* (i.e. supervisors/colleagues sharing information) and *'Audit'* (i.e. review of caseloads, development of guidelines) (n=16). The provision of '*Time and Funding'* (for training/upskilling) was also a common enabler (n=13). Accordingly, '*Time, Workload and Staffing*' (n=25) was the most common barrier (relating both to undertaking training and for conducting assessments within clinic), as was '*Funding'* (n=19). Lack of, inconsistent or unclear '*Referral and Health pathways*' (n=12) was another common barrier.

"*Paediatricians do not have the time to conduct standardised assessments, even though some of us are trained in them,*"– ID 86

"*Serious lack of funding to attend courses …, trying to promote new evidence to colleagues when there is already significant pressure to keep up with high caseloads*."– ID 21

Under Social Factors '*Management / staff'* was commonly identified as both an enabler (n=19) and barrier (n=14); including management support (barrier and enabler), staff enthusiasm (enabler) and resistance for change (barrier). '*Multi-disciplinary teamwork'* was also both an enabler (n=8) and barrier (n=4) e.g. non/ collaborative teamwork (barrier and enabler), clinical champions (enabler), and poor communication between services (barrier).

"*Team and manager who are open to change and keen to follow evidence-based practice*."– ID 5

"'*Who is allowed to / responsible for diagnosing? We often know but no-one is talking to the families*" – ID 28

"*Not enough value is placed on all team members' advice / observations and opinions. Guidelines would be hugely helpful."* - ID 69

Health professional knowledge and perception factors relating to '*Health professional knowledge*' such as access to education/professional development and knowledge sharing were common enablers (n=16). Barriers (n=10) included knowledge / confidence in using tools, as well as perceived

minimal / negligible consequences of use of tools. '*Guidelines and clinical pathways*' were also noted as enablers (n=6) and barriers (n=6), with the development of guidelines and clinical pathways, and guidelines to accommodate for patient tailored care (enablers), but concern about the use of standard recommendations within diverse CP presentations and the potential for hindering patient-tailored care (barriers).

"*Attending relevant courses. Being given some funding to do this….peer supervision helps to identify where the holes in my learning are*." – ID 102

"*Children and families are individual … need to have flexibility within a guideline to accommodate and respect individual differences*." – ID 29

Only barriers were identified within Clinical Considerations. '*Case complexity and Inconsistency in practice*' (n=5) included varied opinions on best practice and increasing case complexity.

"*Differing opinions on best practice related to early diagnosis particularly in a context where diagnosis does not dictate access to services …instead a belief expressed that we need to give the family time*" – ID 12

"*Increasing complexity of cases being referred - reducing capacity for monitoring of 'at risk' infants."* – ID12

Internal drive was an enabling factor, with (n=17) responses noting change is self-driven/self-initiated.

"*We have to initiate things ourselves. Usually we have to run things ourselves too*." – ID 32

Discussion

In NZ, there is growing awareness of the possibility of early detection of CP and the recommended diagnostic tools, however the use of such tools appears to be varied and limited by several barriers. It appears that less than a quarter of the workplaces have pathways / guidance in place for referring a child for diagnosis, and only around half had clear pathways / guidance in place for referral for specialised management and/or surveillance. With growing evidence for the benefits of early diagnosis, management, and the well-established benefits of musculoskeletal surveillance (i.e preventing hip dislocation[18]) we must continue to facilitate the translation of evidence into clinical practice.

Of concern, findings from this study indicate that high percentages of health professionals never use the best practice tools of GMs (48-74%) or HINE (48-57%); instead more than 4 out of 5 clinicians in NZ are still most likely to rely on a combination of pattern recognition of 'clinical signs and symptoms' and / or MRI as their diagnostic paradigm for CP. The 'classic' neurologic signs of CP are dependent on ongoing myelination of the brain; for example spasticity is not always detectable before the age of 12 months and neurological signs can change in infants in the first two years of life[19]. Likewise, MRI, although popular, will be normal in approximately 10-12% of children with mild CP[20, 21]. A paradigm shift in pattern recognition needs to occur from typical 'late signs of CP to an understanding of the early signs'; for example, what does high risk of CP or activity limitation look like in a child of three months? Of the agreed upon clinical features recommended for use to detect CP, the 'youngest' clinical features all occur with movement/postures demonstrated beyond 4 months (i.e. *hands fisted (closed/clenched, persistent head lag and consistent asymmetry of posture and movements)*[22]. Coupled with early recognition of risk factors and clinical signs, more standardised use of the key screening and diagnostic tools by therapists as part of their referral onto the paediatrician for diagnosis, and the use and interpretation of the tools by paediatricians in a position to provide a diagnosis, is needed.

CP is but one of many paediatric conditions assessed and treated for by wider multi-disciplinary teams, introducing challenges to specialised knowledge, but also opportunities for a broader capture with developmental screening. Commonly used standardised screening tools in paediatric practice such as the AIMS, the Bayley scales, DAYC, and Ages and Stages Questionnaires, are each considered to have value in determining abnormal development in a general paediatric population across domains including motor, cognitive and social. Determining the most appropriate screening tool for paediatric practice is challenging, and dependent upon the population screened. In the right clinical settings, the use of GMs and / or HINE have a clear role in screening of neurological status in addition to providing CP specific information (and may be prioritised in high risk populations). However, using a more 'general' approach of screening developmental milestone trajectories in paediatric populations using the DAYC (for example, within community therapy settings) may inform the follow-up of high-risk infants for further CP-specific assessments[23]. Despite being outlined as a recommended tool along the early detection pathway for children after five months of age (89% predictive of CP)[3], over 50% of our responders indicated that they never used the DAYC, potentially highlighting missed opportunities of wider- community level, screening for infants at risk of CP.

Many system level factors such as lack of time, lack of service level support and funding issues are somewhat generic and unspecific to CP diagnosis[24]. However, NZ health professionals recognised value in, and a need for, clear referral pathways and guidance for diagnosis and early management of CP, such that 98% agreed that standardised best practice guidelines for CP would be useful across NZ. Further buy-in from health service teams and management can be facilitated with the help of clinical champions[25], and by continuing to improve knowledge base amongst the team. Institutional support at the operational level is also a factor that may be needed across NZ, with Byrne et al.,[26] noting that that operational changes (e.g. training, standardised flow sheets and checklists) assisted both business managers and clinical leaders in navigating change[26]. Providing a consensus approach for the diagnosis and early management of CP within the NZ setting will help to reduce potential variability and inequity in practice, with the goal to improve health outcomes for the child and their family. Importantly, we have no knowledge yet on any potential ethnic inequalities in terms of CP services between Māori and non- Māori, but in other areas inequalities have been shown (such as Māori less likely to access services and funding; higher rate of hospitalisation and social deprivation)[27, 28].

This study has several limitations. The generalisability of our findings may be limited geographically by low responses from some health districts. It is also possible that outcomes are biased by responders who are already relatively engaged with the evidence around early diagnosis of CP. Of note, no paediatric neurologists participated in the survey, despite being frequently included within the referral pathway. We were also unable to accurately calculate the response rate of the survey, as i) the number of health professionals working in NZ meeting the study criteria is unknown, and ii) the multi-channel recruitment method prevented us from tracking the number of professionals receiving the survey. In efforts to simplify the survey and minimise participant burden, the use of tools in children of different ages were broadly categorised by three age brackets through infancy, yet we acknowledge that tools such as the GM's are only applicable for infants <20 weeks. We also did not ask responders whether they would provide an interim 'at risk of CP' diagnosis as recommended by Novak et al.[3], in the circumstance when a diagnosis cannot be made with certainty. In the NZ healthcare system, the receipt of a diagnosis is not a requirement for funding or access to intervention. However, clarity around an 'at risk of CP' diagnosis is beneficial for families and for initiation of CP-specific intervention and surveillance pathways.

Conclusion

Findings from the survey highlight valuable insight into the awareness and use of clinical assessment tools associated with the diagnosis or early detection of infants with / at high risk of CP in NZ. Variable use of the GMs and HINE and an absence of a consensus approach for referral procedures may reflect the complexity health care across DHBs of NZ, but may signal health care inequity. Outcomes from the study indicate a need for improved dissemination and support for embedding the use of these tools within clinical practice.

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Table 1. Participant characteristics outlining profession, identified ethnicity, and district of employment. Participants indicated if, within their professional role, they provide a diagnosis of cerebral palsy/ detection of children at high risk of cerebral palsy ('Diagnose') or if they work with children with CP but do not provide a diagnosis ('Not Diagnose').

	Diagnose (n=54)	**Not diagnose** (n=104)	**Total** (n=158)
Profession			
Physiotherapist	13	53	66
Occupational Therapist	1	22	23
General Paediatrician	20	2	22
Visiting Neurodevelopmental Therapist	2	9	11
Neonatologist	10	0	10
Orthopaedic Surgeon	0	7	7
Developmental Paediatrician	4	1	5
Trainee Doctor	3	1	4
Speech Pathologist	0	4	4
General Practitioner	0	2	2
Paediatric Rehabilitation Consultant	0	1	1
Nurse Specialist	0	1	1
Early childhood nurse	1	0	1
Ethnicity			
New Zealand European	40	71	111
New Zealand European + Māori	3	2	5
Cook Island Māori	1	1	2
New Zealander	0	2	2
European	4	14	18
Australian	0	2	2
Middle Eastern/Latin American/African	0	1	1
South African	0	3	3
Middle Eastern/Latin American/African/ + American	0	1	1
South African + European	0	2	2
Turkey	1	0	1
Indian	3	2	5
Did Not Disclose	0	1	1
I prefer not to answer	0	1	1
Sinhalese	1	0	1
New Zealand European + Native American	0	1	1
American	1	0	1
DHB			
Northland	2	0	2
Waitemata	0	4	4
Auckland, Waitemata	1	1	2
Auckland	7	36	43
Counties Manukau	2	5	7
Bay of Plenty	2	4	6
Waikato	6	5	11
Tairawhiti	0	0	0
Lakes	1	2	3
Taranaki	7	2	9
Hawkes Bay	6	3	9
Whanganui	0	0	0
Mid Central	1	0	1
Hutt Valley	2	3	5
Wairarapa	2	0	2
Capital and Coast	3	8	11
Nelson-Marlborough	2	3	5
West coast	0	0	0
Canterbury	5	7	12
South Canterbury	0	2	2
Southern	4	18	22
Unsure/locum/blank	1	1	2

Table 2. Health professionals providing a diagnosis be used to assist you in determining a diagnosis of a child who is under 1 year of age, between 1-2, and over 2 years of age, presented by the number (percentage)

	Children under 1yr (n=53)	**Children between 1-2yr** (n=48)	**Children over 2 years** (n=38)
AIMS	18 (34%)	14 (29%)	5 (13%)
Bayley Scales	13 (25%)	23 (48%)	20 (53%)
Clinical signs & symptoms	46 (87%)	39 (81%)	35 (92%)
Cranial ultrasound	19 (36%)	6 (13%)	1 (3%)
DAYC	14 (26%)	15 (31%)	18 (47%)
Dubowitz	8 (15%)		
HINE	25 (47%)	19 (40%)	
MRI (refer to)	43 (81%)	40 (83%)	35 (92%)
MAI	12 (23%)	10 (21%)	
NSMDA	2 (4%)	5 (10%)	
GMs	31 (58%)		
TIMP	7 (13%)		
Touwen	0 (0%)	1 (2%)	1 (3%)

Other tools mentioned: PDMS-2 Schedule of growing skills, The Carolina Curriculum

Abbreviations: AIMS: Alberta Infant Motor Scale, Bayley Scales: Bayley Scales of Infant and Toddler Development, DAYC: Developmental Assessment of Young Children, Dubowitz: Dubowitz Neurological assessment, HINE: Hammersmith Infant Neurological Examination, MRI: Magnetic Resonance Imaging of the brain, MAI: Motor Assessment of Infants, NSMDA: Neuro Sensory Motor Development Assessment, GM: Prechtl's Qualitative Assessment of General Movements, TIMP: Test of Infant Motor Performance, Touwen: Touwen infant neurological examination

Table 3. Frequency of use of assessment tools for children with or at risk of cerebral palsy amongst (n=54 in total) health professionals providing a diagnosis.

	Children under 1 years (n=53)			**Children between 1-2 years** (n=48)			**Children over 2 years** (n=38)		
	Almost always	Some-times	Never	Almost always	Some-times	Never	Almost always	Some-times	Never
AIMS	6 (13%)	11 (23%)	31 (65%)	7 (15%)	19 (41%)	20 (43%)	0 (0%)	3 (8%)	35 (92%)
Bayley Scales	3 (6%)	15 (38%)	27 (56%)	7 (15%)	19 (41%)	20 (43%)	3 (8%)	18 (47%)	17 (45%)
Clin signs & symp	47 (98%)	0 (0%)	1 (2%)	42 (91%)	3 (7%)	1 (2%)	34 (89%)	2 (5%)	2 (5%)
CUS	9 (19%)	26 (54%)	13 (27%)	4 (9%)	11 (24%)	31 (67%)	1 (3%)	2 (5%)	35 (92%)
DAYC	17 (35%)	3 (6%)	28 (58%)	16 (35%)	5 (11%)	25% (54%)	14 (37%)	5 (13%)	19 (50%)
Dubowitz	2 (4%)	16 (33%)	30 (63%)						
HINE	7 (15%)	18 (38%)	23 (48%)	7 (15%)	13 (28%)	26 (57%)			
MRI (refer to)	22 (46%)	23 (48%)	3 (6%)	27 (59%)	15 (33%)	4 (9%)	21 (55%)	15 (39%)	2 (5%)
MAI	8 (17%)	7 (15%)	33 (69%)	6 (13%)	7 (15%)	33 (72%)			
NSMDA	3 (6%)	6 (13%)	39 (81%)	3 (7%)	7 (15%)	36 (78%)			
GMs	12 (25%)	13 (27%)	23 (48%)						
TIMP	3 (6%)	6 (13%)	39 (81%)						
Touwen	1 (2%)	3 (6%)	44 (92%)	0 (0%)	3 (7%)	43 (93%)	1 (3%)	1 (3%)	36 (95%)

Reasons for responding 'Never' for use of:

HINE	MRI (refer to)	GMs
Not trained n=23	Out of scope of practice n=7	Not trained n=22
Not familiar to me n=7	Would require anaesthesia n=1	Lack of resources n=6
Too time-consuming n=3		Not supported by workplace n=4
Unsure about its effectiveness n=2		Out of scope of practice n=2
Out of scope of practice n=2		Not familiar to me n=3
Not supported by workplace n=2		Too time-consuming n=2
Lack of resources n=1		Lack of staff n=1
Lack of staff n=1		
Not appropriate for the age group n=1		

Abbreviations: AIMS: Alberta Infant Motor Scale, Bayley Scales: Bayley Scales of Infant and Toddler Development, Clin signs & symp: Clinical signs and symptoms, CUS: Cranial Ultrasound, DAYC: Developmental Assessment of Young Children, Dubowitz: Dubowitz Neurological assessment, HINE: Hammersmith Infant Neurological Examination, MRI: Magnetic Resonance Imaging of the brain, MAI: Motor Assessment of Infants, NSMDA: Neuro Sensory Motor Development Assessment, GM: Prechtl's Qualitative Assessment of General Movements, TIMP: Test of Infant Motor Performance, Touwen: Touwen infant neurological examination

Table 4. Frequency of use of assessment tools for children with or at risk of cerebral palsy amongst (n=104 in total) health professionals not providing a diagnosis.

	Almost always n (%)	**Sometimes** n (%)	**Never** n (%)
AIMS	20 (19%)	29 (28%)	55 (53%)
Bayley Scales	13 (13%)	30 (29%)	61 (59%)
Clinical signs & symptoms	90 (87%)	12 (12%)	2 (2%)
Cranial ultrasound	6 (6%)	6 (6%)	92 (88%)
DAYC	17 (16%)	9 (9%)	78 (75%)
Dubowitz	3 (3%)	11 (11%)	90 (87%)
HINE	14 (13%)	37 (36%)	53 (51%)
MRI (refer to)	21 (20%)	24 (23%)	59 (57%)
MAI	13 (13%)	15 (14%)	76 (73%)
NSDA	15 (14%)	15 (14%)	84 (81%)
GMs	15 (14%)	15 (14%)	77 (74%)
TIMP	4 (4%)	4 (4%)	100 (96%)
Touwen	0 (0%)	0 (0%)	104 (100%)

Other tools mentioned: Gross Motor Function Measure, General observations of patterns and quality of movement, range of motion, Tardieu scale, New-born Assessment Tool, Movement ABC, Mather Mothers

Abbreviations: AIMS: Alberta Infant Motor Scale, Bayley Scales: Bayley Scales of Infant and Toddler Development, DAYC: Developmental Assessment of Young Children, Dubowitz: Dubowitz Neurological assessment, HINE: Hammersmith Infant Neurological Examination, MRI: Magnetic Resonance Imaging of the brain, MAI: Motor Assessment of Infants, NSDA: Neuro Sensory Motor Development Assessment, GM: Prechtl's Qualitative Assessment of General Movements, TIMP: Test of Infant Motor Performance, Touwen: Touwen infant neurological examination