The Knowledge Translation of Early Cerebral Palsy (KiTE CP) study: Implementing Screening among a High-risk Prospective Cohort of Australian Infants

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Objective To describe the implementation of the international guidelines for the early diagnosis of cerebral palsy (CP) and engagement in the screening process in an Australian cohort of infants with neonatal risk factors for CP.

Study design Prospective cohort study of infants with neonatal risk factors recruited at <6 months corrected age from 11 sites in the states of Victoria, New South Wales, and Queensland, Australia. First, we implemented a multimodal knowledge translation strategy including barrier identification, technology integration, and special interest groups. Screening was implemented as follows: infants with clinical indications for neuroimaging underwent magnetic resonance imaging and/or cranial ultrasound. The Prechtl General Movements Assessment (GMA) was recorded clinically or using an app (Baby Moves). Infants with absent or abnormal fidgety movements on GMA videos were offered further assessment using the Hammersmith Infant Neurological Examination (HINE). Infants with atypical findings on 2/3 assessments met criteria for high risk of CP.

Results Of the 597 infants (56% male) recruited, 95% (n = 565) received neuroimaging, 90% (n = 537) had scorable GMA videos (2% unscorable/8% no video), and 25% (n = 149) HINE. Overall, 19% of the cohort (n = 114/597) met criteria for high risk of CP, 57% (340/597) had at least 2 normal assessments (of neuroimaging, GMA or HINE), and 24% (n = 143/597) had insufficient assessments.

Conclusions Early CP screening was implemented across participating sites using a multimodal knowledge translation strategy. Although the COVID-19 pandemic affected recruitment rates, there was high engagement in the screening process. Reasons for engagement in early screening from parents and clinicians warrant further contextualization and investigation. *(J Pediatr 2024;268:113949)*.

Cerebral palsy (CP) is the most common cause of childhood physical disability, occurring in approximately 1.4-2.1 children per 1000 live births in Australia.[1] Early diagnosis allows for timely referral for

AusACPDM	Australasian Academy of Cerebral Palsy and Developmental Medicine
CA	Corrected age
CP	Cerebral palsy
GMA	Prechtl General Movements Assessment
HINE	Hammersmith Infant Neurological Examination
KiTE CP	Knowledge Translation of Early Cerebral Palsy

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CP-specific intervention to harness brain plasticity and maximize function within the first 2 years of life while there is rapid neuromaturation.[2] In 2017, an expert panel recommended that high risk of CP should be used as an interim diagnosis where a certain diagnosis cannot be made, but allows for the infant to be referred for CP-specific early intervention.[3]

An early diagnosis of high risk of CP can be made before 5 months corrected age (CA) by combining findings from neonatal neuroimaging, the Prechtl General Movements Assessment (GMA) at 3-5 months CA, and the Hammersmith Infant Neurological Examination (HINE) from 3 months CA.[3] Implementation of early screening for CP in multisite settings is yet to be reported in Australia across multiple states. Additionally, despite increasing awareness among clinicians, implementation of early diagnosis guidelines into practice has been challenging.[4]

Acknowledging the existing gap between the research on early diagnosis of CP and its application in clinical practice, our team identified the need for a knowledge translation strategy to disseminate and implement the international clinical practice guidelines into health care settings that care for infants at risk of CP in Australia. Existing research supports knowledge translation methods that are tailored in response to identified barriers according to local settings. This includes multimodal approaches that afford opportunities for researcher-clinician interaction as well as supporting infrastructure, such as online or technology-assisted tools.[5-7] Use of a multimodal knowledge translation approach underpinned the design of the Knowledge Translation of Early Cerebral Palsy (KiTE CP) study.[5]

The overarching aim of the KiTE CP study is to increase the proportion of infants <6 months CA diagnosed with CP or high risk of CP.[8] This description of the first phase of the KiTE CP study reports the results of implementation of infant screening using the international guidelines for the early diagnosis of CP.

Methods

The KiTE CP study is embedded within a broader 4-phase research initiative developed with input from consumers and informed by extensive preparatory research (**Figure 1**, online; available at www.jpeds.com). In developing our knowledge translation strategies for phase 1, we were guided by the 5 key questions posed by Lavis et al to aid researchers and others in developing targeted knowledge translation activities (See **Table I**, online; available at www.jpeds.com for our responses to these key questions).[6]

To understand these obstacles and develop a knowledge translation strategy that addressed the needs of individual organizations and clinicians likely to implement the international clinical practice guidelines, the study team conducted a barriers analysis by polling 459 members of the Australasian Academy of Cerebral Palsy and Developmental Medicine (AusACPDM). The AusACPDM is a professional body aligned with the clinical and research interests of people with CP. The members of the AusACPDM identified multiple barriers to the implementation of early screening for CP, including lack of knowledge and clinical skills, lack of confidence, financial disincentives, and access to accredited training and education (**Table II**, online; available at www.jpeds.com). Identified barriers were met with a knowledge translation strategy (**Table II**, online; available at www.jpeds.com) to enhance clinical uptake of the current guidelines.[7]

Participants were recruited from neonatal or children's intensive care units, special care units, inpatient wards, and outpatient clinics across 11 sites in the states of Victoria, New South Wales, and Queensland (**Table III**, online; available at www.jpeds.com). These represent Australia's 3 most populous states, accounting for 78% of the total Australian population.[9] Infants were born after the first of July 2019 and had a maximum expected date of delivery of the 30th June 2021. We aimed to recruit 1000 infants, but due to disruptions caused by the COVID-19 pandemic, not all eligible families could be approached consecutively. Infants were included if they were born extremely preterm (<28 weeks of gestation) or delivered at any gestation with neonatal encephalopathy or other neurological risk factors such as congenital neurological malformations, seizures, or stroke, or if their neonatal medical history was otherwise complex (eg, bronchopulmonary dysplasia, severe neonatal sepsis, necrotizing enterocolitis, non-neurological congenital anomaly requiring surgery). Infants needed to be <6 months CA at the time of recruitment to be included in the study. Infants were excluded if they were born with lethal anomalies or congenital conditions known to affect neurodevelopment but are not associated with CP. Parents provided written informed consent to participate in the study.

Clinicians and/or researchers collected demographic data by surveying families at recruitment. Perinatal data relating to maternal factors and perinatal medical complications were collected by research clinicians and assistants from medical files, and neuroimaging findings were collected when available. All data were recorded in a Research Electronic Data Capture database.

Each site implemented the guidelines for the early diagnosis of CP or high risk of CP according to the local setting with support structures in place as per **Table II**, online; available at www.jpeds.com. Neuroimaging was collected if clinically indicated. GMA was offered to all participants (option A from Novak et al[3]). A standardized neurological examination (HINE) was encouraged if only 1 of the neuroimaging or GMA was available, or only 1 of the neuroimaging or GMA were abnormal, as per option B of Novak et al.[3] Individual sites may have conducted routine HINE assessments in addition to option A[3] but these data were not collected as this was outside the scope of the current study.

Radiology reports for clinically indicated brain neuroimaging, either magnetic resonance imaging and/or cranial ultrasound, were classified as "abnormal neuroimaging," or

"low risk for CP." Abnormal neuroimaging reports included moderate-severe white matter injury, grade 3-4 intraventricular hemorrhage, cystic periventricular leukomalacia, changes consistent with hypoxic-ischemic encephalopathy, or stroke. Other findings such as congenital brain malformations were also classified as "abnormal neuroimaging." Low risk for CP included infants who had findings of intraventricular hemorrhage grades I or II from cranial ultrasound.

At recruitment, clinicians and/or researchers assisted parents to install the Baby Moves app, which has been previously demonstrated to be acceptable, feasible and safe for use by parents.[10] For the current cohort, the Baby Moves app provided filming instructions and reminders at 12- and 14-weeks CA, and parents were allowed 13 days to record their child's video at these 2 time points. Although all sites offered participants the Baby Moves app, clinicians could also administer the GMA from a clinically filmed video if 1 was obtained as part of routine clinical practice.

Regular GMA scoring meetings were scheduled at each site to bring together trained clinician-assessors and researchers to score participant video recordings. These meetings aimed to build clinician reliability, confidence, and competence in scoring the GMA and strengthened the partnership between the researchers supporting clinicians to implement evidence-based assessments outlined in the international clinical guidelines. As a clinical study, assessors were not always blinded to clinical history. Assessors determined if fidgety movements were normal (present), abnormal (exaggerated with respect to speed and amplitude), or absent. Infants who had abnormal neuroimaging, and/or abnormal fidgety or absent fidgety movements at both the 12- and 14- week time points (or at any time point if only 1 video was recorded) were assessed using the HINE. The number of asymmetries for each item was also recorded as infants with unilateral CP may have a HINE score ≥57 but demonstrate functional differences between left and right sides.[3]

For infants with at least 2 atypical findings of: 1) abnormal neuroimaging; 2) absent or abnormal fidgety movements, or 3) a HINE score <57, parents were provided with feedback and counseling according to their recruitment hospital's clinical practice, and infants were referred for early intervention.

The Royal Children's Hospital (Melbourne) Human Research and Ethics Committee approved the ethics for this study (HREC/44 201/RCHM-2018), with agreed governance from all 11 associated sites.

Results

Figure 2 describes the flow of participants summarized for all 11 sites, and **Table III**, online (available at www.jpeds.com) provides the breakdown of recruitment numbers for each site. Five hundred and ninety-seven infants were recruited for the study from 1460 eligible infants. The recruitment rate varied between sites from 22% to 87%, with individual sites experiencing different barriers to recruitment. Due to recruitment and ethical approval disruptions during the COVID-19 pandemic, a convenience sample recruited over the defined period was accepted for the current study.

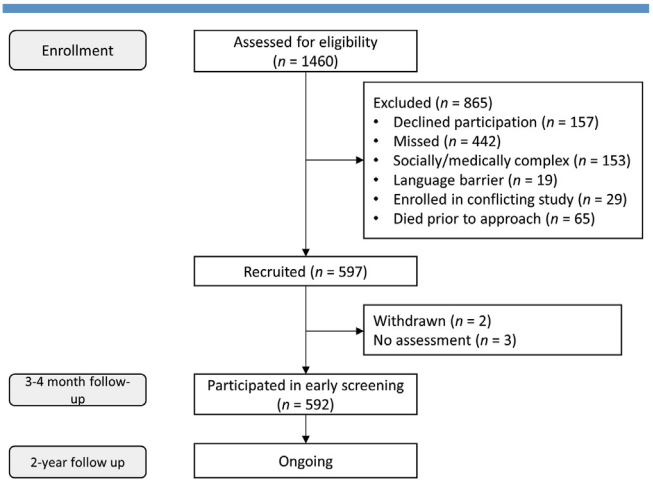


Figure 2. Flowchart of participants.

Baseline data show that the cohort was primarily born preterm. The distribution of maternal and birth characteristics was unremarkable (**Table IV**). **Figure 3** details the engagement in early screening for CP; 99% (n = 593) of the recruited 597 infants were assessed with at least one of neuroimaging, GMA, or the HINE; 95% (n = 565) had neuroimaging (magnetic resonance imaging or cranial ultrasound), 91% (n = 546) had a GMA, and 25% (n = 149) had a HINE. **Figure 3** details the atypical findings of: 1) abnormal neuroimaging; 2) absent or abnormal fidgety movements, or 3) a HINE score <57. Of the 546 infants with a GMA, 2% (9/546) were unscorable. Most parents submitted 2 videos (343), whilst 49 recorded 1 video only during the 12-week time point, and 58 recorded 1 video only during the 14-week time point. The average age for the 12-week time point video was 12.8 weeks (SD, 2.8) and for the 14-week time point, 14.7 weeks (SD, 2.8). However, 87 GMA were recorded between 12-16 weeks CA without an exact date of scoring supplied. These videos were recorded clinically without the Baby Moves app.

Normal fidgety movements were present in 75% (n = 403/537) of those who had a scorable GMA, 23% (n = 124/537) had absent fidgety movements and 2% (n = 10/537) abnormal fidgety movements. Among infants who had 2 videos recorded, 73% (252/343) had the same classification across 2 videos. Eight percent of infants (29/343) changed classification from absent/abnormal fidgety movements to normal fidgety movements and these infants were assigned a normal fidgety movement classification for CP screening. The remaining 62 infants either had 1 unscorable video or were scored clinically and assigned 1 score across 2 videos. In terms of GMA video capture, 65% (n = 385/597) of participant's parents used the Baby Moves app, 9% (n = 53/597) had a video recorded in a clinic setting, and 18% (n = 108/

Table IV. Participant characteristics

Characteristic	Mean (SD) or *n* (%)	Total (n)*
Gestational age in wks	30.9 (5.6)	
Birth weight (g)	1645 (1087)	
Preterm subgroups		
Extremely preterm <28 wks	254 (43%)	
Very preterm 28-31^{+6} wks	120 (20%)	
Moderate-late preterm 32-36^{+6} wks	80 (13%)	
Term	143 (24%)	
Birth weight *z* score ≤2 SD	72 (12%)	
Male	333 (56%)	
Multiple birth	144 (24%)	596
Maternal age at delivery (y)	31.9 (5.6)	549
Pre-eclampsia	61 (10%)	
Gestational diabetes	68 (11%)	
Antenatal corticosteroids	284 (48%)	
Antenatal magnesium sulfate	260 (44%)	596
Mode of delivery		
Vaginal	204 (34%)	
Cesarean	386 (65%)	
Unknown	7 (1%)	
NE	90 (15%)	586
Sarnat stage or severity of NE		
Stage 1 (mild)	17 (24%)	71
Stage 2 (moderate)	41 (58%)	
Stage 3 (severe)	13 (18%)	
Received therapeutic hypothermia	56 (65%)	86
Definite necrotizing enterocolitis†	30 (5%)	589
Seizures	105 (18%)	589
Bronchopulmonary dysplasia	258 (44%)	587
ROP needing laser or bevacizumab treatment	57 (10%)	593
Brain MRI	242 (41%)	590
Grade 3 or 4 IVH, unilateral or bilateral	37 (6%)	597
Cystic PVL	19 (3%)	554
Any surgery in the neonatal period	137 (23%)	594
Discharged on home oxygen	75 (13%)	573
Infant's living situation		
Child living with 2 parents	476 (91%)	524
Child living with 1 parent only	29 (6%)	
Other	19 (4%)	
Primary language spoken at home		
English	421 (80%)	525
Combined (English plus other language)	98 (19%)	
Other	6 (1%)	
Maternal education—completed high school	473 (91%)	520
Maternal career in full- or part-time employment prior to birth	422 (81%)	521
Household income below $1000 (AUD) per wk‡	70 (16%)	426
Family has other children living at home	258 (50%)	519

IVH, intraventricular hemorrhage; *MRI*, magnetic resonance imaging; *NE*, neonatal encephalopathy; *PVL*, periventricular leukomalacia; *ROP*, retinopathy of prematurity.
Data are mean (SD) for continuous data and *n* (%) for categorical data.
*Where $n \neq 597$.
†Definite necrotizing enterocolitis: x-ray changes, ≥5 days nil by mouth and/or triple antibiotics and/or surgery.
‡Below $1000AUD per wk represents an estimate of families with household income within the lowest quintile in Australia (below the mean income per week for second quintile 2019-20; $1081)[38].

597) had another method of recording videos for GMA (eg, viewed from parent's phone, manual secure file upload via Research Electronic Data Capture database survey link).

The mean HINE score across the KiTE CP cohort was 51.4 (SD, 11.1). A lower proportion of HINE scores were recorded for infants with normal fidgety movements as the HINE was only routinely completed for infants with an absent or abnormal fidgety GMA.

Table V describes the proportion of infants with 2 or 3 atypical findings including abnormal brain neuroimaging, absent or abnormal fidgety movements on the GMA, or HINE <57. According to early diagnosis guidelines, 19% of the cohort (n = 114/597) met criteria for a high risk of CP diagnosis.

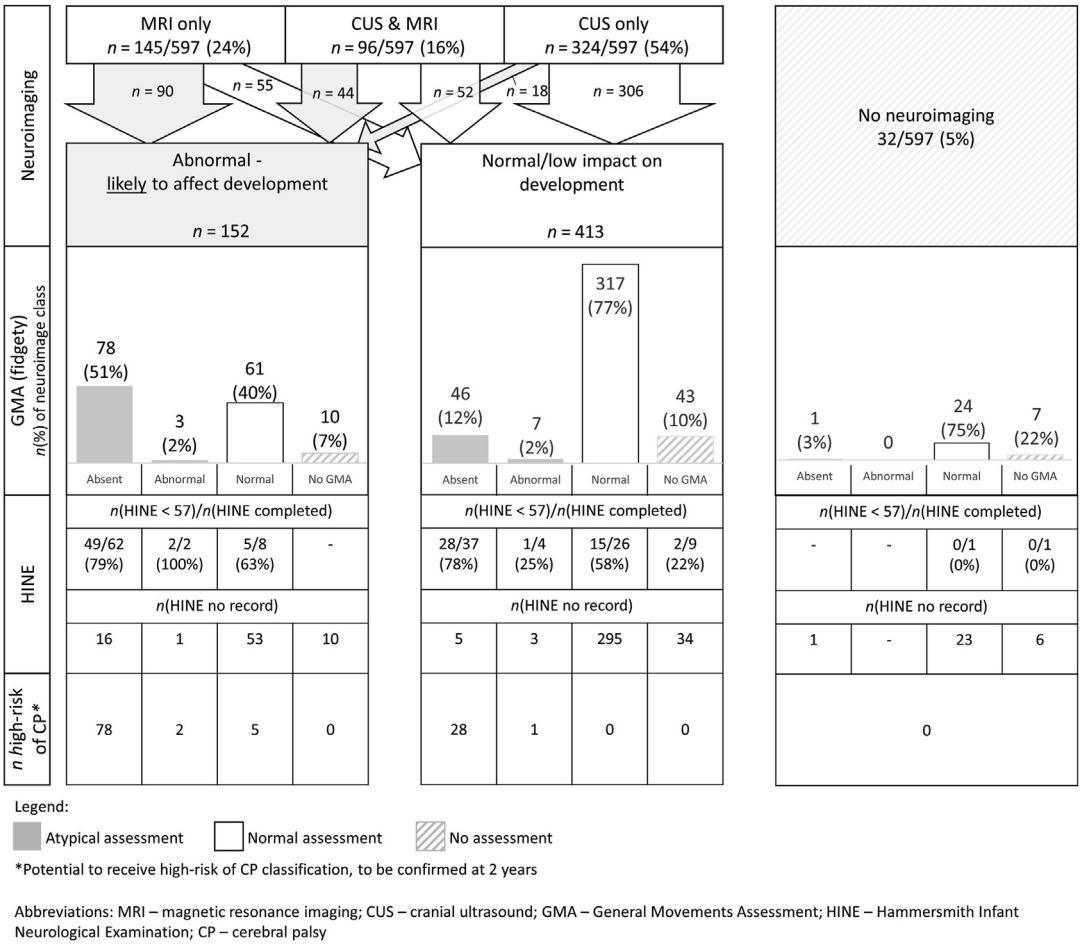
Discussion

This study demonstrated widespread adoption of early screening guidelines for infants with neonatal risk factors within Australia, across multiple sites and states. Early CP screening was implemented at a high rate, with 19% of infants meeting criteria for a high risk of CP diagnosis.

There are other promising reports of implementation of the international guidelines among neonatal follow-up services that have lowered the age of diagnosis after introduction of structured screening programs.[11-14] By implementing early screening guidelines in a US network, the number of follow-up clinic visits at 3-4 months increased, and the age of diagnosis decreased in 2 studies (18 months-13 months,[11] and 19.5 months-9.5 months,[13]). Although our study does not report changes in engagement over time, overall, a high rate of engagement was reflected in our results.

Within an Australian context, a single-site study noted an average age of 6.0 months for a CP or high risk of CP diagnosis for 53 participants, following which CP was confirmed in 40 of the participants at an average of 8.1 months.[15] As a result, the age of CP diagnosis at this single-site Australian study was much earlier than the previously reported national average age for CP diagnosis of 19 months.[16] In the current study, age of diagnosis will be reported with later outcomes; however, there is potential for some diagnoses to be given before 6 months CA.

Future reports from this study will address referral to CP-specific interventions, and the age and accuracy of CP diagnosis within this cohort. For adults with brain injury, stroke management guidelines recommend early intervention with intensive out-of-bed rehabilitation within 24-48 hours of stroke.[17] In comparison, infants and children commonly receive intervention months to years after the brain injury. This is largely because infants and children with CP often receive their diagnosis much later, with only 21% of children with CP identified before 6 months CA.[18] A key difference between adult and infant presentations of neurological injury is that adults show a noticeable immediate loss of function requiring rehabilitation. Whereas infants with brain injury are still developing their motor skills, making functional differences between those with and without brain injury harder to discern early in infancy, necessitating habilitation (learning movement as an infant develops, as opposed to re-learning movements already acquired). Visibility of altered function in infants is complicated by multifactorial causal pathways for the brain injuries responsible for CP and neuromaturation processes that occur with typical development.[19] Historically, a "wait and see" approach has delayed CP diagnoses,[16] hindering referral to early, targeted CP-specific intervention designed to maximize functional outcomes.[20,21] Although the rate of CP screening within this study is high,



Abbreviations: MRI – magnetic resonance imaging; CUS – cranial ultrasound; GMA – General Movements Assessment; HINE – Hammersmith Infant Neurological Examination; CP – cerebral palsy

Figure 3. Proportion of infants receiving neuroimaging, General Movements Assessment, and Hammersmith Infant Neurological Examination. *CP*, cerebral palsy; *CUS*, cranial ultrasound; *GMA*, General Movements Assessment; *HINE*, Hammersmith Infant Neurological Examination; *MRI*, magnetic resonance imaging.

subsequent referral to appropriate CP-specific interventions will need further investigation.

Within retrospective case-control studies, the predictive validity of combining brain neuroimaging, GMA and HINE yields excellent sensitivity and specificity for the prediction of CP (sensitivity 97.9%, specificity 99.2%).[22] There are few known studies that have tested prospectively the predictive validity of the combined assessments for the prediction of CP. Future results from our study will report the diagnostic accuracy of early CP screening combining the 3 recommended assessments.

Our study's implementation framework was its main strength. We provided minimum guidelines for each site to follow for the implementation of early CP screening. Each site was allowed to develop specific processes to suit their needs. For example, sites that already routinely recorded general movements did not need to use the Baby Moves app, and the communication of GMA results were tailored according to existing follow-up clinical schedules at each site. Each site was therefore supported to implement early screening for CP that worked best for their given situation, rather than imposing a stricter protocol that may not have addressed individual and nuanced barriers to implementation.

Individualized implementation, using each site's unique organizational structure and available resources, is supported

Table V. Outcome of screening assessments

High risk of CP*			
Absent/abnormal GMA	**Abnormal brain MRI/CUS**	**HINE <57**	***n* (%)**
X	x	X	51 (8.5%)
X	x	-	30 (5.0%)
X	-	X	28 (4.7%)
-	x	X	5 (0.8%)
Normal assessments†			340 (57.0%)
Insufficient screening			
Insufficient screening—only 1 assessment completed			71 (11.9%)
Insufficient screening—2 assessments completed, 1 abnormal			67 (11.2%)
No assessments			5 (0.8%)

CUS, cranial ultrasound; *MRI*, magnetic resonance imaging.
*High risk of CP requires 2/3 findings indicated.
†At least 2 normal screening assessments of GMA/neuroimaging/HINE. "-" indicate findings normal or not completed.

by knowledge translation literature to facilitate better success with implementing research findings.[5] Although there are existing reports of individual centers/states implementing the current guidelines for the early detection of CP, our study enhanced the generalizability of CP screening implementation in Australia.

The current cohort used the Baby Moves app, which enables parents to be actively involved in screening. More research studies are using parent-operated smartphone apps to assist with video-based data collection of infant spontaneous movements,[23,24] possibly reflecting real-world practice and acceptability of requests for parents to provide video data for GMA. Additionally, with pandemic-related restrictions on face-to-face assessments, there was increased need for families to be able to record their infant's general movements at home. Evidence suggests that providing mobile-based reminders for diagnostic testing improves the use of evidence-based tools and, therefore, improves the implementation of recommended screening guidelines.[25,26]

The current study is not without limitations. The current cohort was recruited during the COVID-19 pandemic, which severely constrained recruitment rates from the pool of eligible infants. Additionally, those who had substantial social issues (eg, child protection involvement, lower parental mental health) could not be recruited to the study. Findings may therefore not be representative of parents/families in these circumstances. Recruitment may also have been reduced due to unforeseen hesitancy from some clinical staff in implementing early screening for CP. As a result, the recruitment rate was variable, with 22%-87% of potentially eligible infants participating in the study. To investigate the barriers to recruitment or participation in early CP screening in detail, clinicians from the recruitment sites will be invited to participate in a qualitative study to explore the barriers and facilitators they face within their practice for implementing early screening for CP (phase 4).

Furthermore, the KiTE CP cohort focuses specifically on infants with "newborn-detectable risks for CP." That is, infants who have a medical reason that places them at a higher risk of CP. The historical rates of diagnosis are based on the whole Australian population, which includes infants who otherwise had an apparently unremarkable birth history. Although the study aims to reduce the age of diagnosis of CP, there is no direct comparison available of the average age of diagnosis among infants with "newborn-detectable risks for CP" in Australia. Those with "newborn-detectable risks for CP" represent approximately half of all CP diagnoses, yet less than a quarter of all CP cases receive their diagnosis before 6 months CA. There remains sufficient justification to report the age of diagnosis within the KiTE CP cohort with respect to available data within published reports.[18]

Two-year outcomes are to be reported following our initial findings. We will report data pertaining to interviews of KiTE CP participants and their developmental data. Although previous studies have explored preferences of screening and diagnosis timing with parents of children who have a CP diagnosis, there remains limited understanding of the experiences of all families whose child has early screening for CP, including those whose children do not receive a CP diagnosis. Further qualitative interviews will be conducted with participant-families and study site clinicians to explore the experiences and perspectives of early screening for CP in greater detail. ■

CRediT Authorship Contribution Statement

Amanda K.L. Kwong: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Formal analysis, Data curation. **Abbey L. Eeles:** Writing – review & editing, Project administration, Methodology, Investigation, Conceptualization. **Peter J. Anderson:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization. **Nadia Badawi:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization. **Roslyn N. Boyd:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization. **Kate L. Cameron:** Writing – review & editing, Project administration. **Jeanie L.Y. Cheong:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Data curation, Conceptualization. **Paul Colditz:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization. **Pieter Koorts:** Supervision, Investigation. **Cathryn Crowle:** Writing – review & editing, Investigation, Data curation. **Russell C. Dale:** Writing – review & editing, Investigation, Funding acquisition, Conceptualization. **Lex W. Doyle:** Writing – review & editing, Validation, Supervision, Investigation, Funding acquisition, Conceptualization. **Michael Fahey:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization. **Joanne George:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization. **Rod W. Hunt:** Writing – review & editing, Investigation, Funding acquisition, Conceptualization. **Lynda McNamara:** Writing – review & editing, Investigation, Funding acquisition, Conceptualization. **Catherine Morgan:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Iona Novak:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization. **Joy E. Olsen:** Writing – review & editing, Validation, Project administration, Investigation. **Nadia Reid:** Writing – review & editing, Investigation. **Ingrid Rieger:** Writing – review & editing, Supervision, Investigation, Funding acquisition, Conceptualization. **Koa Whittingham:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Alicia J. Spittle:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization.

Declaration of Competing Interest

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Please see extended study group for full list of Chief Investigators, Site Principal Investigators and staff of Partnership Project AP1152800. We would like to sincerely thank the parents and carers of infants who have generously participated in the KiTE CP cohort. We would also like to thank the site-based clinicians and researchers who assisted in recruitment and data collection for all participants.

Site Specific Governance has been approved for the QEDIN Network at Cairns: SSA/2018/QCAIRNS/35464; Child Health Queensland: SSA/18/QRCH/52; Metro North: SSA/18/QRBW/361; Sunshine Coast University Hospital: SSA/2019/QSC/35464 and the Townsville University Hospital: SSA/2019/QTHS/35464; Royal Brisbane Women's Hospital SSA/2020/QRBW/44201; The Children's Hospital at Westmead (2018/STE00569); Liverpool Hospital (2019/STE16260); John Hunter Children's Hospital (2019/STE16259); Royal Hospital for Women (2019/STE18222); Royal Prince Alfred Hospital (X19-0474); Sydney Children's Hospital (2019/STE16262); Royal Women's Hospital (19/05, SSA19/01); Monash Children's Hospital (RES-19-0000-078X); Royal Children's Hospital (SSA/44201/RCHM-2018).

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