



Enhancing Early Detection: An Innovative Screening Method for Cortical Visual Impairment

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Abstract

Background: Cortical visual impairment (CVI), which results from damage to neurologic pathways, is a leading cause for childhood blindness and low vision. Currently, identification of CVI is often delayed by years, prolonging time to therapeutic intervention. In 2015, NAVEG (Neonatal Assessment Vision European Grid) was suggested as an effective test to help identify infants at risk for developing CVI.¹

Objectives: Evaluate the feasibility of implementing NAVEG screening in at-risk neonates prior to NICU discharge and determine the capacity of NAVEG to predict CVI.

Methods: This ongoing cohort focuses on infants admitted to a level IV NICU. Neonates are screened for eligibility based on risk factors for CVI including prematurity or neurologic conditions. The non-invasive NAVEG screen is performed by trained physical and occupational therapists. Families of infants with abnormal results are provided additional resources for close monitoring. One-year follow-up will assess the degree of visual impairment.

Preliminary Results: There were 61 patients enrolled, of which 23 had abnormal NAVEG screen results, 29 were normal, and 9 were incomplete. 31 infants were less than 32 weeks gestation; the remainder of the enrolled infants qualified due to another neurologic risk factor. Of the three visual areas tested with the NAVEG screen, the motor visual component was the area most affected.

Introduction

- Cortical visual impairment (CVI), defined as vision loss resulting from damage to brain pathways that process vision, is the leading cause of childhood blindness and low vision in the United States.
- Currently, identification of CVI is often delayed by several years, and affected children may not receive therapeutic interventions early enough.
- In 2015, NAVEG (Neonatal Assessment Vision European Grid), was suggested as an effective test to help identify infants at risk for developing CVI.
- This study aims are as follows:
 - Evaluate the feasibility of implementing NAVEG screening in at-risk neonates prior to NICU discharge, and
 - Determine the capacity of the NAVEG screen to predict CVI.

Methods

- This is an ongoing cohort study of an anticipated 200 infants admitted to the level IV NICU at Riley Hospital in Indianapolis, IN.
- Neonates are screened for eligibility by identification of risk factors for CVI including prematurity of <32 weeks gestation at birth or other neurologic risk factors such as seizure, perinatal asphyxia, brain anomaly, intracranial hemorrhage, or stroke.
- Enrolled neonates undergo NAVEG screening, which is carried out by trained physical and occupational therapists.
- Those with abnormal results (a NAVEG score of ≥ 6) are referred for additional follow-up with Early Intervention, Ophthalmology, and Visually Impaired Preschool Services.

Novel NAVEG Screening Tool

The NAVEG screening tool consists of ocular visual, motor visual, and perceptual visual components.

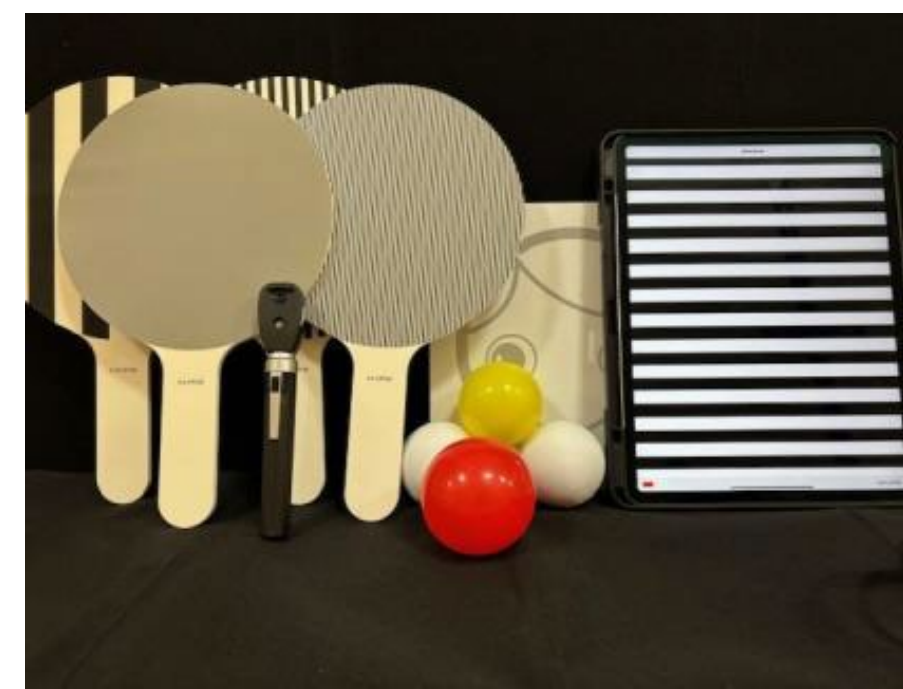


Figure 1: NAVEG screening kit

Score	Ocular Visual Component	
	Pupillary light reflex:	R L
	Red reflex	
	Eye Abnormalities (describe)	
	Fundus Abnormalities (describe)	
Motor Visual Component		
	Fixation: Bull's eye, face figure, or human face	
	Horizontal smooth pursuit	
	Vertical smooth pursuit	
	Saccadic movements:	R L
	Erratic eye movements	
	Sunsetting	
	Nystagmus:	H V
	Paroxysmal deviation	
	Strabismus	R L
Perceptual Visual Component		
	Contrast sensitivity: Heidi	100% 25%
	Visual acuity: Teller /Leah	2/270 or 4.0
	Visual field: Target	L R U D
	Optokinetic nystagmus	L R U D
Total Score		

Table 1: NAVEG screening components

Preliminary Results

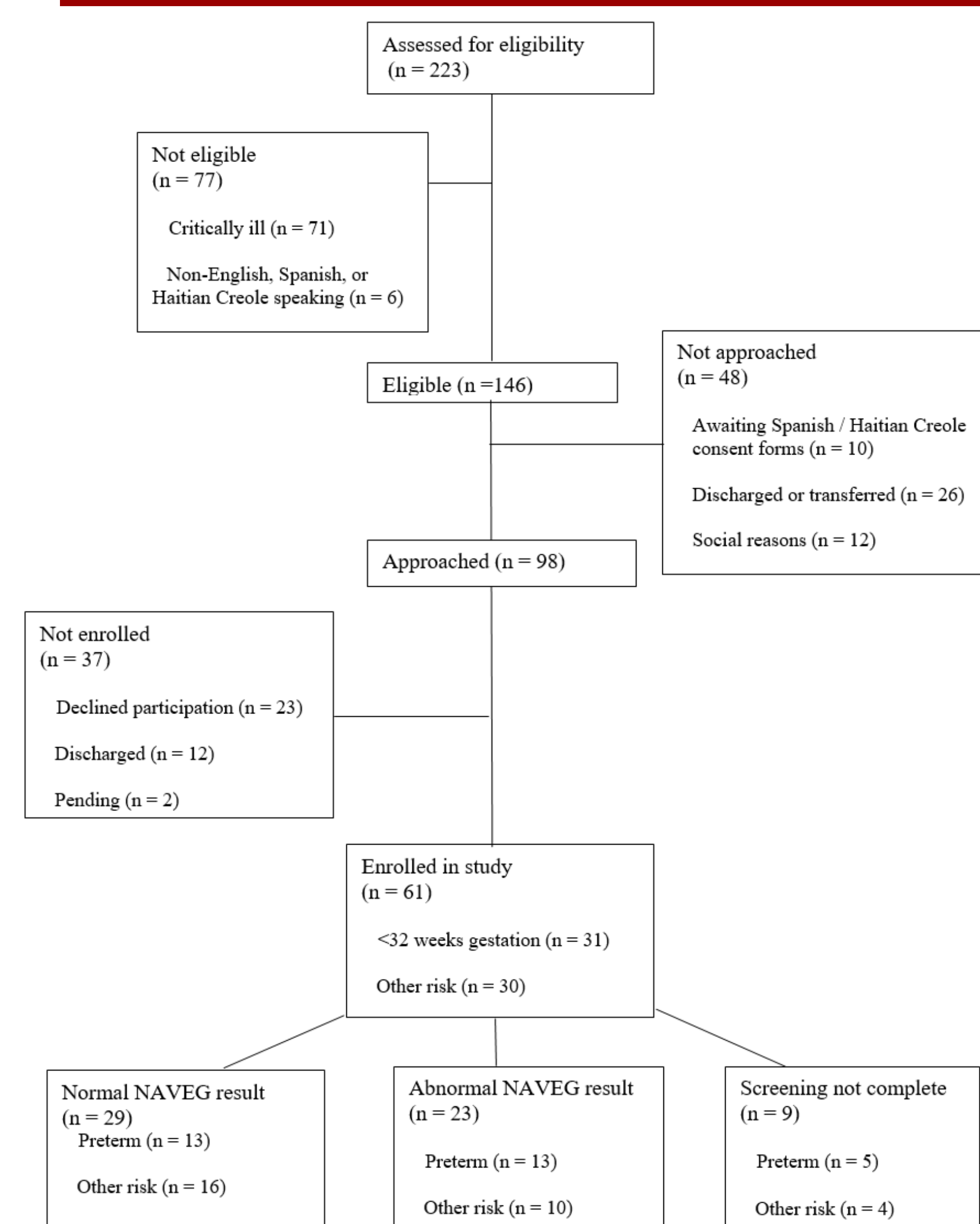


Figure 2: Flowchart of eligible and screened study infants

	< 32 ⁰ weeks gestation group (n=31)	≥32 ⁰ weeks and neurologic risk group (n=30)
Gestational age at birth (weeks)		
Median, IQR	27 (25-28)	38 (36-39)
Male	n=23 (74%)	n=17 (57%)
Birth weight (g)		
Median, IQR	965 (735-1250)	3228 (2530-3709)
Race / Ethnicity		
Black	n=9 (29%)	n=8 (27%)
White	n=17 (55%)	n=19 (63%)
Hispanic	n=5 (16%)	n=2 (7%)
Other	n=1 (3%)	n=2 (7%)
Neurologic risks present		
Stroke	n=9 (29%)	n=2 (7%)
Intracranial hemorrhage		n=8 (27%)
Moderate/severe HIE		n=15 (50%)
Brain malformation		n=5 (17%)
Confirmed seizures		n=7 (23%)
Gestational age at time of testing (weeks)		
Median, IQR	43 (40-47)	41 (39-42)
English as primary language	n=24 (77%)	n=30 (100%)
Imaging study performed		
Head ultrasound	n=30 (97%)	n=22 (73%)
Brain MRI	n=17 (55%)	n=30 (100%)
Head CT		n=3 (10%)
NAVEG score ¹		
Median, IQR	8 (3-13)	2 (1-12)

1. NAVEG score of 6 and over is considered an abnormal result.

Table 2: Infant demographics and baseline characteristics

Of the three visual areas assessed with the NAVEG screen, the motor visual component was the area most affected.

Conclusions

- Our high enrollment rate indicates that the study design, recruitment strategies, and eligibility criteria are well aligned with the target population.
- The implementation of the NAVEG screening tool proved to be feasible, well-received by healthcare providers, and smoothly executed with readily available resources.
- The outcomes of this study have potential to change the way CVI is identified and improve outcomes for at-risk neonates.

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- The Visually Impaired Preschool Services Team

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