Clinical Prediction Rule for Developmental Delay at 3 Years of Age among Very Low Birth Weight Infants

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Background and Aims

Very low birth weight infants (VLBWI) are at high-risk of neurodevelopmental impairment. Early developmental intervention has been recognized to prevent motor and cognitive impairment. Although we can anticipate that severe brain injuries cause sequelae, we have no useful prediction rule include enough perinatal predictors for developmental delay among VLBWI without severe brain injuries. The aims of this study are to develop and validate clinical prediction rule for developmental delay among VLBWI without severe brain injuries at the time of NICU discharge.

Methods

Design: Retrospective cohort study.

Setting: The multicenter NICU in Japan.

Participants: Among 10,195 VLBWI during 2003-2010, a prediction rule was derived identifying infants with developmental delay. Validation was internal among 3,581 VLBWI during 2011-2012. Infants with grade III or IV intraventricular hemorrhage (IVH), cystic periventricular leukomalacia, posthemorrhagic hydrocephalus or hypoxic-ischemic encephalopathy were excluded.

Main outcome: Developmental delay at 3 years of age defined by an overall developmental quotient <70 as measured by Kyoto Scale of Psychological Development test. Discrimination was assessed by the area under the receiver operating characteristic curves (AUC).

Figure. Discrimination of prediction model. **Left.** AUC of the model in derivation set was 0.72. **Right.** AUC of the model in validation set was 0.71.

Conclusion

Among VLBWI without neonatal severe brain injuries, clinical prediction rule for developmental delay may be useful for early developmental intervention.

Results

The prevalence of developmental delay in derivation and validation set were 13% and 15%, respectively. We developed a clinical prediction rule included 10 predictors; gestational age (GA), gender, small for gestational age (SGA), severe bronchopulmonary dysplasia (BPD), inflammation consist of necrotizing enterocolitis (NEC), focal intestinal perforation (FIP) or sepsis, Apgar score at 5 min, grade I or II IVH, symptomatic patent ductus arteriosus (PDA), severe retinopathy of prematurity (ROP) and adrenal insufficiency of prematurity. AUC of the model in derivation and validation set were 0.72 and 0.71, respectively.

Table. Score of 10 predictors for developmental delay

Predictors	Category	Score	P	95% CI
GA	30w≤	0	-	
	28-29w	1	0.295	-0.091 0.301
	26-27w	3	0	0.241 0.656
	24-25w	6	0	0.621 1.099
	22-23w	9	0	1.076 1.709
Sex	Male	6	0	0.734 0.995
SGA	+	3	0	0.341 0.649
Adrenal insufficiency	+	1	0.143	-0.051 0.355
Severe BPD	-	0	-	
	+ /HOT-	1	0.091	-0.024 0.326
	+ /HOT+	7	0	0.775 1.237
ROP needed treatment	+	2	0.001	0.125 0.452
IVH	+	2	0.007	0.076 0.471
Apgar score at 5min	7-10	0		
	4-6	1	0.012	0.044 0.355
	0-3	2	0.050	0.000 0.571
NEC/FIP /Sepsis	+	5	0	0.497 0.883
Symptomatic PDA	-	0		
	Indomethacin+ /surgery-	1	0.143	-0.036 0.251
	Indomethacin+ /surgery+	2	0.015	0.060 0.545

Reference: Spittle A, Orton J, Anderson PJ, et al. Cochrane Database Syst Rev 2015:Cd005495.