

Development and Validation of Predictive Model for Post-Cerebral Palsy Recovery

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Abstract— Background: It is found that 10% of the global population has some form of disability from different causes; in India, it is 3.8% of the population. Nearly 15-20% of physically disabled children are affected by Cerebral Palsy. In India, the estimated incidence is around 3/1000 live births. Cerebral palsy is the most common motor disability in childhood. **Predictive modelling:** is a procedure that utilizes data and statistics to predict outcomes through the use of data models. Most commonly it is used to identify the event one wants to forecast or predict in the future. Predictive modeling can be exercised for this type of unknown future event. Early specific forecasting of recovery may be helpful to set realistic goals, to plan proper discharge policy, and requirement of home adjustment and also social support. For the same, there is a need to develop a new scale for the assessment of sensory and motor disability among children with cerebral palsy.

Participant Information and Method: Self-developed 30 questionnaire “Cerebral Palsy Recovery Predictor – GFMS Model Score” was developed by the researcher which included questions regarding the sensory and motor function among cerebral palsy patients. Gross Motor Function Classification System (Assessed by physical examination) was matched with Gross Motor Function Classification System Model Score (Predicted by model). By matching actual & model scores Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value and overall accuracy was calculated.

The model was verified by 6 paediatric physiotherapy out of which 3 were Clinical therapist and 3 were academicians with post graduate degree in masters in paediatric physiotherapy with minimum of 5 years of experience out of which 3 were Clinical therapist and 3 were academicians. Once the suggestion was received from all the physiotherapist, modification in the scale were made as per the suggestions and the scale was resented for the validation and final scale was produced for use.

Result: Predictive Model for the Assessment of Sensory and Motor Functions is a newly developed with good validity to assess the sensory and motor functions among children with cerebral palsy.

Conclusion: Predictive Model for the Assessment of Sensory and Motor Functions is a set of questionnaires with good validity to assess the sensory and motor functions among children with cerebral palsy and can be used to assess the sensory and motor dysfunctions among children with disabilities following cerebral palsy.

Index Terms: Cerebral Palsy, Gross motor functional scale, Predictive model, Sensory and Motor functions.

I. INTRODUCTION

It is found that 10% of the global population has some form of disability from different causes; in India, it is 3.8% of the population. Nearly 15-20% of physically disabled children are affected by Cerebral Palsy. In India, the estimated incidence is around 3/1000 live births. Cerebral palsy is the most common motor disability in childhood. Because of the developing nature of Indian health care in semi-urban and rural areas and the lack of technology used in these areas. Early specific forecasting of recovery may be helpful to set realistic goals, to plan proper discharge policy, and requirement of home adjustment and also social support. For the same, association should be found between different predictive factors and recovery in cerebral palsy subjects to develop and test a predictive model for post-cerebral palsy recovery.

A. Predictive modeling:

Predictive modelling: is a procedure that utilizes data and

statistics to predict outcomes through the use of data models. Most commonly it is used to identify the event one wants to forecast or predict in the future. Predictive modeling can be exercised for this type of unknown future event. Predictive modeling is also known as Predictive Analytics, Predictive Analysis, and Machine learning. In medical science, a predictive model is used to describe the risk of developing a disease or to forecast recovery. These prediction models are prepared in health care so that they can enable the prevention of that disease or early treatment. Predictive analytics tools are powered by several different models and algorithms that can be practiced in a wide range of medical cases.

B. Need of the Study:

In this fast-growing world of health science at present, there are very few predictive models that predict disease progression and recovery of any medical condition. The era of evidence-based practice and clinical reasoning is emerging in the health sector. Health insurance coverage also needs some objective data for the prediction of the recovery of

different medical conditions. So, it becomes very important that there should be some objective criteria to predict recovery after any neurological condition.

Hence there is a need to develop an effective model questionnaire for the assessment of children with cerebral palsy and to prove its validity so that it can be used for assessment and as an outcome tool to assess the effect of the treatment

II. OBJECTIVES:

1. To develop a new Predictive Model for the Assessment of Sensory and Motor Functions in children with cerebral palsy
2. To validate the newly developed Predictive Model for the Assessment of Sensory and Motor Functions in children with cerebral palsy

III. METHODOLOGY:

Self-developed 30 questionnaire "Cerebral Palsy Recovery Predictor – GFMS Model Score" was developed by the researcher which included questions regarding the sensory and motor function among cerebral palsy patients. Gross Motor Function Classification System (Assessed by physical examination) was matched with Gross Motor Function Classification System Model Score (Predicted by model). By matching actual & model scores Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value and overall accuracy was calculated.

The model was verified by 6 paediatric physiotherapy out of which 3 were Clinical therapist and 3 were academicians with post graduate degree in masters in paediatric physiotherapy (MPT Paediatrics) with minimum of 5 years of experience out of which 3 were Clinical therapist (MPT Paediatrics) and 3 were academicians (MPT Paediatrics). Once the suggestion was received from all the physiotherapist, modification in the scale were made as per the suggestions and the scale was resent for the validation and final scale was produced for use.

Once the model was modified and refined as per the suggestions, total 20 participants with cerebral palsy and 20 participants without cerebral palsy were assessed using this predictive model. The assessment was done by the same physiotherapist who approve the final model (3 Clinical therapist (MPT Paediatrics) and 3 academicians (MPT Paediatrics) and results analysed.

IV. ANALYSES:

Data were collected from 20 healthy male and female subjects ranging in age from 6 months to 12 years, and from 20 male and female patients with cerebral palsy. Data from the 20 healthy participants were used to establish internal consistency reliabilities, based on Cronbach's alpha (α) coefficients, for the sensory and motor functions. The final form of the instrument, consisting of 30 reliable

items/questions from the normal group analysis, was tested for internal consistency reliability in the patient group. Pearson correlations were used to establish the concurrent validity of the final Predictive model.

V. RESULTS:

Validity. Pearson correlations were used to establish concurrent validity of the final predictive model with both the motor and sensory assessment. Correlations > 0.30 ($p < 0.01$) were considered significant for establishing validity.

VI. CONCLUSION:

Therefore, results of this study suggest that Predictive Model for the Assessment of Sensory and Motor Functions is a set of questionnaires with good validity to assess the sensory and motor functions among children with cerebral palsy and can be used to assess the sensory and motor dysfunctions among children with disabilities following cerebral palsy.

VII. DISCUSSION:

It is accepted practice to use standardized tools in assessing disease status and some of these tools, like the Predictive Model for the Assessment of Sensory and Motor Functions, have gained universal acceptance. Employing established instruments, with well-demonstrated validity, reliability and sensitivity. Health professionals for research and clinical practice can use the Predictive Model for the Assessment of Sensory and Motor Functions, because it is a system for accurate description of children's gross sensory and motor function. It has been reported to have a major effect on the health care of children with CP. We undertook the development of a Predictive Model for the Assessment of Sensory and Motor Functions with the expectation that the tool will be more widely used, particularly by therapists involved in the treatment of children with CP.

Our aim was to to develop an effective model questionnaire for the assessment of children with cerebral palsy and to prove its validity so that it can be used for assessment and as an outcome tool to assess the effect of the treatment incorporate functional grading into the clinical description of patients with CP because this is necessary for clinical documentation and has become necessary with the application of newer has become necessary with the application of newer spasticity management techniques in the CP clinic. Application of this tool is not time-consuming; more-over, it can be evaluated retrospectively. These are additional elements that rendered it attractive for wide-spread use in our country.

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