**TITLE:** **The Orpington Prognostic Scale: A predictive tool for discharge destination in stroke survivors admitted to a Hyper Acute Stroke Unit**

**Author names:** **SUSHMITA MOHAPATRA**

**BOT, MOTh, MSc MHSC**

**Clinical Lead Occupational Therapist**

**AMY JONES**

**BSc Hons Physiotherapy**

**Clinical Lead Physiotherapist**

**Address of Authors: Therapy Services, 4th Floor Ruskin Wing**

**Kings College Hospital**

**Denmark Hill, London SE5 9RS**

**Corresponding author: Sushmita Mohapatra**

**Therapy Services, 4th Floor Ruskin Wing**

**Kings College Hospital**

**Denmark Hill, London SE5 9RS**

**E mail: smohapatra@nhs.net**

**Word count: 3869**

**Key Words: Hyper acute stroke, prognostic tool, discharge destination, Cerebrovascular disease, Orpington prognostic scale, Rehabilitation, Stroke Unit**

**Conflict of interest: None**

**Abstract**

**Introduction:** An accurate assessment of the severity of impairment and prediction of prognosis following stroke is important for determining rehabilitation needs. This study investigates predictive ability of the Orpington Prognostic Scale (OPS) administered within 72 hours of stroke onset, in determining discharge destination post admission to a Hyper Acute Stroke Unit (HASU).

**Method:** Prospective analysis of OPS data collected from 219 patients with confirmed diagnosis of stroke admitted to King's College Hospital, HASU. OPS scores were recorded between 0-72hours of admission and compared to discharge destination at 72 hours. Baseline OPS scores were categorised into three groups for comparison of variables. Predictive ability of the tool and associations with other variables were analysed using logistic regression and multivariate analysis.

**Results:** Low OPS score (<3.2) had high positive predictive value (PPV 88.63%) for determining discharge home and high OPS score (>3.2) had high predictive ability (PPV 98.39%) for further inpatient management in specialist stroke or medical rehabilitation units. The OPS showed good predictive ability (Odds ratio 27.691 with 95% confidence interval 9.852 - 77.825) to determine outcome after admission to HASU independent of the age, gender, type and site of stroke, previous social support and co-morbidity.

**Conclusion:** OPS could be a valuable tool in predicting the discharge destination from a HASU by early identification of rehabilitation needs 72 hours after stroke following initial screening. OPS <3.2 are highly likely to go home with or without support/therapy, whereas OPS > 3.2 are highly likely to require further medical/therapy input in an inpatient setting.

**Word count: 251**

## INTRODUCTION

Accurate prediction of outcome in stroke is highly desirable in assisting with discharge planning, service provision and co-ordination of patient and caregivers' expectations[1,2,3]. Cost effectiveness and timely management of resources is an important factor in stroke care[4,5]. In the current National Health Service (NHS) in the United Kingdom it has become increasingly vital to optimise the allocation of resources whilst maintaining good patient care, especially in a hyper acute setting.

The OPS is a clinically derived tool, developed as a means to triage patients for rehabilitation[6]. It is quick to perform, requires no extensive training, shows association with the Barthel and demonstrates high inter-rater and test-retest reliability[4,6,7,8.] The OPS within the first 2 weeks after stroke was shown to strongly predict functional outcome, length of stay, mortality and final discharge deposition from inpatient rehabilitation units at different timeframes post stroke[3,6,9,10,11,12]. However it has been argued that the predictive accuracy of OPS for final discharge destination is limited due to the influence of variable service provisions[8]. The National Institute of Health Stroke Scale (NIHSS) is another tool used in the prediction of functional status post stroke. Whilst both tools have benefits the OPS is more easily administered and the predictive value is greater with respect to activities of daily living (ADL)[13,14]

OPS has been tested on people with ischemic strokes within 48 hours looking at dependency, death and upper limb recovery as outcomes at 6 months and 2 years[1,9]. However no studies have looked at the early use of the OPS in an hyper acute setting. The aim of this study therefore was to analysis the predictive ability of the OPS within 72 hours of symptom onset to predict discharge destination from HASU. Secondary objectives were to identify the influence of other co-variables and to establish the sensitivity and predictive value of OPS as a tool for HASU.

## METHODS

This prospective study was undertaken in 414 consecutive stroke survivors admitted to the HASU at King's College Hospital, London, UK over a 4 month period (January to May 2012). National Institute of Health Stroke Scale (NIHSS) and Orpington Prognostic Scale (OPS) are routinely obtained by the medical team and therapy team including Physiotherapy, Occupational Therapy and Speech and Language Therapy to establish stroke severity at admission and early impairment score on an initial therapy screen. In line with national standards therapy assessments are completed within 72 hours of admission, aiming to identify rehabilitation needs early and predict place of discharge from the HASU setting. Specialist care is planned and discharge facilitated with onward input where appropriate. The study was approved by the Therapy research governance committee and did not require any further ethical approval.

**Subjects**

All subjects with a new stroke diagnosis based on new clinical signs or imaging results were included in the study. Stroke was clinically defined according to the WHO as 'rapidly developing clinical signs of focal disturbance of cerebral function lasting more than 24 hours or leading to death, with no apparent cause other than vascular origin'. Subjects, both male and female, admitted with an ischemic, haemorrhagic or lacunar stroke were included in the study.

Subjects were excluded where: (1) reversed ischemic neurological deficits or complete resolution of symptoms within 3 days of onset e.g. Transient Ischemic Attack (TIA), (2) neurological deficits due to a cause other than acute ischemic infarct/haemorrhage such as migraine, metabolic or toxic exacerbation of pre-existing deficit, (3) survival less than 1 week, (4) symptom onset of > 72 hours, (5) Incomplete OPS secondary to language barriers (6) age <18 years and (7) missing data.

Data included baseline demographics, stroke characteristics (type and site of stroke), past medical history (co-morbidity), pre-existing social support system and living environment. The following assessments were completed by clinicians experienced in the administration of the tools.

1. NIHSS: 13 item assessment of neurological functional including level of consciousness, language, neglect, visual field loss, extra occular movement, motor strength, ataxia, dysarthria and sensory loss. It has score ranges from 0 to 42, with 42 indicating patient fully impaired.
2. OPS: composed of four functional domains; motor deficit in arm, proprioception, balance and cognition (Appendix 1). It is a clinically derived tool, developed as a means to triage patients for rehabilitation[6] The score of the OPS ranges from 1.6 to 6.8 with 1.6 being the best score and 6.8 being the worst[6,13]

The OPS was calculated by two therapists during initial therapy assessment of clinical and functional status. Both raters were experienced in using the OPS and inter-rater reliability was established in a pilot study. Maximum scores for cognition and proprioception were given if either test could not be completed due to severe cognitive and/or communication language difficulties, inability to follow commands, apraxia and/or low arousal states after 24 hours following stroke.

Existing level of social support was collected as this was indicative of functional independence in the community prior to the current admission. The existing social support system, as recorded in the medical documentation, was stratified into three categories:

a. No supervision or assistance: Subjects living alone in their own home or sheltered accommodation without support for daily living tasks.
b. Supervision only: Subjects living with family, friends or spouse. May receive minimal physical assistance for daily living tasks (mobility and self-care) and have assistance with domestic tasks.
c. Full assistance: Subjects living at home, sheltered accommodation, residential or nursing care home with full assistance for all ADLs provided by family or care assistants through social services or a care home environment.

**Statistical analysis**

Subjects were categorised into three OPS groups, "good" (1.6 - 2.8), "intermediate" (3.2 - 4.8) and "poor" (5.2 - 6.8) based on cut off values in the literature. Differences between the groups were tested using ANOVA. Pearson's correlation was used to examine relationships between age, NIHSS and OPS.

Sensitivity (SE), specificity (SP) and predictive values were calculated for OPS to determine its power in predicting discharge destination (home) or (specialist in-patient rehabilitation. Multivariate logistic regression models were used on the Statistical Product and Service Solution (SPSS) software to assess one or more predictors. NIHSS scores were converted into 'categorical variables' by putting into five groups: 1. (>20), 2. (15-19), 3. (11-14), 4. (6-10) and 5. (0-5), where a high score was suggestive of severe deficits. Simple regression model was used with stepwise forward analysis where one variable was entered at a time. Outcome was regressed with OPS independently and then adjusted for all other variables as potential confounders in the final model. Cut off was set at $p < 0.5$ level and goodness of fit calculated using Hosmer and Lemeshow Test. The predictive power of the models used was checked by Cox & Snell R Square test.

## RESULTS

Out of total 414 subjects, 195 were excluded from the study due to deficits incurred for reasons other than acute ischemic / hemorrhagic event (n=83), complete resolution of symptoms (n=68), survival less than a week (n=15), incomplete OPS due to unstable medical condition (n=21) and language barrier (n=7). One subject was excluded due to missing data. Final 219 subjects were analyzed for outcome and related variables. The mean age for the included data (M: F ratio; 93:74) and excluded data (M: F; 91:103) were 70.67 years (range 21 to 97) and 67.86 (19-96) respectively. The other variables were not comparable as the majority of the excluded subjects did not have new acute neurological symptoms.

81.72 % of the included population lived in the community without social care facilities prior to admission. The remaining 18.26 % required assistance either from family or care assistants arranged by social services or residential/ nursing care facilities.

**Table 1: Baseline demographic data and outcome**

| Variables | Total population *n=219* | **Good** (OPS <3.2) ***n=88*** | **Intermediate** (OPS 3.2-5.2) ***n=69*** | **Poor** (OPS >5.2) ***n=62*** | Difference between groups (ANOVA) |
|---|---|---|---|---|---|
| **Age** (Mean± SD) | 70.67±15.38 | 65.64 ±16.21 | 72.23± 14.25 | 76.06± 13.25 | .00* |
| **Sex** (n, %) Male | 20 (54.79) | 49 (55.68) | 43(62.32) | 29 (46.77) | .13 |
| Female | 99 (45.20) | 39 (44.32) | 26(37.68) | 33 (53.23) | |
| **Type of stroke** (n, %) | | | | | |
| Ischemic | 192(87.67) | 77 (87.50) | 59(85.51) | 56 (90.32) | .68 |
| Haemorrhagic | 27 (12.32) | 11 (12.50) | 10(14.49) | 6(9.68) | |
| **Side of stroke** † (n, %) | | | | | |
| Right | 94 (42.92) | 33 (37.50) | 36(52.17) | 24 (38.71) | .12 |
| Left | 122 (55.70) | 53 (60.23) | 33(47.83) | 37 (59.68) | |
| Bilateral | 3 (1.36) | 2 (2.27) | 0 | 1(1.61) | |
| **Co morbidity** (n, %) | | | | | |
| Previous stroke/TIA | 59 (26.94) | 22 (25) | 19(27.54) | 19 (30.65) | .40 |
| Other vascular factors | 134 (61.18) | 52(59.02) | 42(60.87) | 40(62.90) | |
| None /other | 26 (11.87) | 14(15.91) | 8(11.59) | 4 (6.45) | |
| **Pre-admission Support system (SSS)*** (n, %) | | | | | |
| No supervision or help | 78 (35.61) | 38 (43.18) | 20(28.99) | 20 (32.26) | .01* |
| Supervision only | 101 (46.11) | 41(46.91) | 37(53.62) | 19 (30.65) | |
| Full assistance | 40 (18.26) | 8 (9.09) | 12(17.39) | 20 (32.26) | |
| **Living Environment****(LE) (n, %) | | | | | |
| Home with stairs | 112 (51.14) | 57 (64.77) | 34 (49.28) | 22(35.48) | .00* |
| Home without stairs | 91 (41.55) | 27 (30.68) | 31 (44.93) | 34 (54.84) | |

| | | | | | |
|---|---|---|---|---|---|
| **OPS Score** *Median (IQR)*†† | 3.6 (2.4-5.2) | 2(1.6-2.4) | 3.6 (3.2- 4) | 6.4 (6-6.8) | |
| **NIHHSS score***** *Median (IQR)*†† | 6 (10) | 3(2-5) | 6(4-11) | 14 (11-19) | .00* |
| **Outcome (**n, %) | | | | | |
| Home (with or without support) | 104 (47.4) | 78(88.63) | 25(36.23) | 1(1.61) | .00* |
| Further in-patient rehabilitation | 115(52.51) | 10(11.36) | 44(63.76) | 61(98.38) | |
| *SSS missing<br>**LE missing<br>***NIHSS missing | 4<br>10<br>56(25.57 %) | 1<br>0<br>28(31.82%) | 0<br>4<br>17 (24.64%) | 3<br>6<br>13(20.97%) | *Correlation is significant at the 0.01 level (2-tailed). |

†MCA (146), ACA (11), PCA (36), Lacunar (23)

†† Inter quartile Range

### OPS Outcomes

There were significant differences between OPS scores for discharge destination. 78% of the population with a ‘good’ OPS score at base line were discharged home (with or without further support), 25% in the ‘intermediate’ group were discharged home and only 1% of those in the ‘poor’ category were discharged home ($p \leq 0.00$), 10% of the population in the ‘good’ group received further to in-patient rehabilitation, whereas 44% in the ‘intermediate’ group and 61% in the low score group ($p \leq 0.00$) received the above.

### Effects of age, gender and initial home situation

There were significant differences between the OPS groups for age; the “good” group was significantly ($p \leq 0.001$) younger than the ‘intermediate’ or ‘poor’ groups. Subjects in the ‘poor’ group had significantly more supported/modified living environment prior to admission compared with to the more independently functioning ‘good’ group. No subjects were from nursing care home in this group and five were from assisted for daily living. In contrast five in the “poor” group lived in care home facilities and nine had assistance in place. Similar trends were found in the outcome: 50% of the “good” group did not require any follow -up care and returned to their previous functional levels whereas, most people (23/25) that returned home from the “intermediate” and “poor” group (1/1) required follow-up support in the community on discharge. 98.38% of the “poor” group required further intervention in the in-patient setting at the end of the HASU stay.

There was strong a correlation between Age, NIHSS (r 0.537) and OPS (r 0.277) on Pearson’s correlation. Age was significantly ($p \leq 0.01$) related to co-morbidity (r -0.169), social situation (r -0.141), NIHSS (r -0.197) and OPS (r -0.282).

**Predictive ability of the OPS**

"Poor" OPS (>5.2) was strongly predictive (PPV 98.39%, specificity 99.05%) of further in-patient care and "good" OPS (<3.2) was for home. The sensitivity, specificity, positive and negative predictive values of OPS is summarised in table 2. The 'intermediate' group had a better predictive value and specificity for in-patient care as compared to home. The data when re-grouped, "low OPS" (scores <3.2) showed high likelihood of subjects going home and "high OPS" (scores >3.2) showed high likelihood (Specificity 80.15%, PPV 80%) of a subject requiring in-patient rehabilitation.

**Table 2: Comparison of the predictive value of OPS**

| | 'Good' OPS as predictive of Home (95% CI) | 'Intermediate' OPS as predictive of in- patient Rehabilitation (95% CI) | 'Poor' OPS as predictive of in- patient Rehabilitation (95% CI) |
|---|---|---|---|
| Sensitivity (SE) | 75 % (65.55 to 82.97) | 29.53% (22.35- 37.55) | 53.04 (43.51 to 62.41) |
| Specificity (SP) | 91.30 % (84.59 to 95.74) | 50.98% (36.60 to 65.24) | 99.04 % ( 94.74 to 99.84) |
| PPV (%) | 88.64 (80.09 to 94.40) | 63.77 (51.31 to 75.00) | 98.39 (91.30 to 99.73) |
| NPV (%) | 80.15 (72.29 to 86.60) | 19.85 (13.40 to 27.71) | 65.61 (57.61 to 72.99) |
| Positive likelihood ratio | 8.62 (4.72 to 15.76) | 0.60 (0.41 to 0.88) | 55.17 (7.79 to 390.90) |
| Negative likely hood ratio | 0.27 (0.20 to 0.38) | 1.38 (1.04 to 1.84) | 0.47 ( 0.39 to 0.58) |

PPV: Positive predictive Value, NPV: Negative Predictive Value

CI: Confidence Interval

Logistic regression tests identified OPS as the strongest predictor of outcome from HASU. The odds ratio for needing in-patient care at 72 hours of symptom onset for unit increase in OPS score were 27 times higher (95% CI; 9.85 to 77.83) than the odds ratio for going home. Although NIHSS and age were also significantly associated ($p \leq 0.001$) with outcomes as independent variables, significance was lost when adjusted for OPS in the final multivariate analysis. The high value for the Hosmer Lemeshow Test (p=0.509) confirms the model fits the data and the Cox and Snell R square test (p=0.481) demonstrates good predictive power of the models used.

## DISCUSSION

With the introduction of HASU's in the British National Health Services it has become increasingly important to predict early outcome to direct specialist resources to patients most likely to benefit. Although measuring the outcome of stroke is not simple[6], the predictive value of OPS within 48 hours has been established for functional outcomes and dependency[1,9]. Our study supports early OPS as a very strong predictor for further specialist care after 72 hours.

Our findings support previous studies[12,13,14] which compared NIHSS and OPS used in the first week after stroke. Both tools were useful in the estimation of functional status however the, predictive value of OPS was stronger[13,14]. Conversely other authors have found no advantage of using the OPS score after one week compared to the NIHSS within 24 hours[11], advocating use of the NIHSS over the OPS. Established prognostic factors[6,15] NIHSS and Age were strongly correlated to the outcomes, but both failed in the regression analysis when tested together with OPS, suggesting that the admission NIHSS could not be relied on for making discharge decisions from HASU.

Primarily the OPS has been a score for rehabilitation and targeting of therapy resources rather than a score of acute prognosis[6.] Although there is no data examining the use of the OPS as a predictive tool in the hyper-acute setting, its use at 48 hours[1,9] establishes the early use of OPS in an hyper acute environment. Patients with mild neurological impairment (OPS <3.2) achieved significantly better discharge outcomes than patients with moderate and severe neurological impairment (OPS>3.2)[2,4,6,7,13]. Our study establishes OPS as a predictive tool in HASU and supports these findings. Our findings are however in contrast with previous data showing limited predictive accuracy of OPS for both discharge destination and follow up services[8.] This could be attributed to the different healthcare services available in the United Kingdom.

The intermediate OPS group hosted the largest number of patients in previous studies [6]. In our study each group was well represented but the 'good' group, was slightly larger with minimal deficit and were able to mainly return home. This could be due to spontaneous recovery or impact of timely thrombolysis. The low sensitivity is explained by a small proportion of subjects being transferred for in-patient rehabilitation due to a number of factors including management of other medical conditions, pre-existing insufficiencies in social support requiring increased timeframes to arrange local resources for follow up care to facilitate discharge and early transfer to local facilities within 72 hours largely due to existing systems. In addition the literature supports patients with good OPS requiring scores may require further inpatient rehabilitation due to limited caregiver support, reduced safety awareness, visual and swallowing impairments leading to long term care needs[8].

In this study we were primarily concerned with evaluating the predictive ability of the OPS to determine discharge destination therefore subjects who died within 72 hours were excluded. Future studies may provide data concerning the mortality predictive ability of OPS; however larger sample sizes would be required to test this outcome rigorously.

OPS predicted (PPV 63.77%) the high likelihood of the 'intermediate' group requiring further inpatient rehabilitation as previously supported in the literature[6]. Twenty five out of 69 went home with further in the community, emphasising the need for careful attention to clinical signs and other related factors predicting outcome. Therefore this group could be managed in the community with allocation of appropriate resources to facilitate medical management and rehabilitation.

In contrast patients with 'poor' OPS (>5.2) were highly likely (PPV 98.39%) to require in-patient care for ongoing management and planning appropriate transfer of care to community resources. Although it is debatable whether these patients benefit from intensive therapy, they would attract further allocation of specialist resources for disability management, prevention of secondary complications as highlighted previously[1]. One subject in the 'poor' group went home at 72 hours, as resources were previously in place to support the level of disability and deficits. In addition patients with 'poor' OPS scores can now return home due to evolution of greater community support over time[8.] OPS could potentially fail to predict discharge where premorbid level of function is low and assistance is in place highlighting the need to assess social factors for planning discharge. All other subjects from nursing care facilities or with pre-existing support were appropriately stratified into the 'poor' group, adding to the predictive value of 'good' OPS. This could be attributed to the functional domain of OPS[4].

Unlike others[4, 6] we had good representation of both ischemic and hemorrhagic stroke types in all the three OPS groups. Although we had a high exclusion of subjects, this was very representative of the subjects presenting to HASU with a high proportion with resolved symptoms or other deficits not attributed to ischemic infarction/hemorrhage. OPS should be used for early stratification of patients with confirmed new stroke. These results cannot be generalized to all subjects admitted to HASU. Other factors such as co-morbidities which may have functional impact should be considered for planning a safe discharge from HASU. Seven subjects were excluded with incomplete OPS secondary to language barriers as previously reported[6] thus, affecting reliability of the tool. Future studies should consider the impact of language barriers and provide translation services at the earliest opportunity.

Logistic regression analysis used in the study was the most powerful statistical tool to demonstrate the sensitivity of OPS as a predictive tool in HASU. This adds strength to our study in addition to a good sample size reflecting the HASU population. Our study is limited by excluding subjects who were medically unstable within the first 72 hours of symptom onset that may have a higher OPS score. In addition, as a clinical tools OPS was poor at detecting functional impact secondary to lower limb ataxia, visual, sensory and co-ordination impairments. This necessitates consideration of other functional difficulties to predict discharge within this timeframe. OPS could fail in this cohort of patients.

Future studies should consider the association between OPS in HASU and the level of dependency and resources required in the community at 3 and 6 months post stroke. This would test the tool's early ability to predict longer term need of resources in the community. Pre-existing and current functional status using Modified Rankin Scale (MRS) could be valuable to use with OPS to predict outcome from HASU. A multicentre trial would be recommended to identify any other factors that may influence predictive ability.

**CONCLUSION:**

OPS is a clinically useful, prognostic aid in the hyper acute stroke setting. It is more powerful than the NIHSS, allows early stratification of two OPS groups (<3.2 and >3.2) to determine whether a patient could be managed in the community with or without follow up support or require further inpatient management in a specialist unit at the end of 72 hour OPS could be valuable in both research and regular clinical practice. Allocation of resources in the community for rehabilitation and support however, would require further clinical assessment and consideration of other medical and social variables.

**Acknowledgement**

The authors would like to acknowledge the assistance and valuable guidance of Prof Lalit Kalra, Stroke Consultant, Dr Salma Ayis, Statistician, Dr. Rachel Garrod, therapy research lead, Paran Govender, Director of Therapy Services and the Stroke Multi-disciplinary team at Kings College Hospital.

## REFERENCES:


1. Pittock SJ; Meldrum D; Ni Dhuill C; Hardiman O; Moroney JT :The Orpington Prognostic Scale within the first 48 hours of admission as a predictor of outcome in ischemic stroke; *Journal of Stroke & Cerebrovascular Diseases, July 2003, vol./is. 12/4(175-81),*

2. Hershkovitz A; Gottlieb D; Beloosesky Y; Brill S ; Assessing the potential for functional improvement of stroke patients attending a geriatric day hospital. *Archives of Gerontology & Geriatrics, September 2006, vol./is. 43/2(243-8),*

3. Studenski S; Duncan PW; Perera S; Reker D; Lai SM; Richards L :Daily functioning and quality of life in a randomized controlled trial of therapeutic exercise for sub-acute stroke survivors: *Stroke, August 2005, vol./is. 36/8(1764-70*

4. Kalra L; Crome P: The role of prognostic scores in targeting stroke rehabilitation in elderly patients: Journal of the American Geriatrics Society, April 1993, vol./is. 41/4(396-400)

5. Unsworth CA; Selection for rehabilitation: acute care discharge patterns for stroke and orthopaedic patients. International Journal of Rehabilitation Research, 01 June 2001, vo./is.24/2 (103-114)

6. Kalra L; Dale P; Crome P: Evaluation of a clinical score for prognostic stratification of elderly stroke patients: Age & Ageing, November 1994, vol. /is. 23/6(492-8),

7. Studenski SA; Wallace D; Duncan PW; Rymer M; Lai SM ;Predicting stroke recovery: three- and six-month rates of patient-centred functional outcomes based on the Orpington prognostic scale: *Journal of the American Geriatrics Society, March 2001, vol./is. 49/3(308-12),*

8. Rieck M; Moreland J: The Orpington Prognostic Scale for patients with stroke: reliability and pilot predictive data for discharge destination and therapeutic services: *Disability & Rehabilitation, December 2005, vol. /is. 27/23(1425-33),*

9. Meldrum D, Pittock SJ, Hardiman O, Ni Duill C, O'Regan M: Recovery of the upper limb post ischemic stroke and the predictive value of the Orpington Prognositic Score: *Clinical rehabilitation, September 2004, vol/is.18/6 (694-702)*

10. Shoemaker MJ; Mullins-MacRitchie M; Bennett J; Vryhof K; Boettcher I Predicting response to rehabilitation in elderly patients with stroke using the Orpington Prognostic Scale and selected clinical variables: *Journal of Geriatric Physical Therapy, 2006, vol./is. 29/2(69-73),*

11. Wright et al, 2004; CJ; Swinton LC; Green TL; Hill MD ; Predicting final disposition after stroke using the Orpington Prognostic Score: *Canadian Journal of Neurological Sciences, November 2004, vol./is. 31/4(494-8),*

12. Horgan NF; Cunningham CJ; Coakley D; Walsh JB; O'Neill D; O'Regan M; Finn AM; McCormack P: Validating the Orpington Prognostic Score in an Irish in-patient stroke population.*: Irish Medical Journal, June 2005, vol./is. 98/6(172, 174-5),*

13. Lai SM; Duncan PW; Keighley J: Prediction of functional outcome after stroke: comparison of the Orpington Prognostic Scale and the NIH Stroke Scale: *Stroke, September 1998, vol. /is. 29/9(1838-42)*

14. Celik C; Aksel J; Karaoglan B ;Comparison of the Orpington Prognostic Scale (OPS) and the National Institutes of Health Stroke Scale (NIHSS for the prediction of the functional status of patients with stroke.Citation: Disability & Rehabilitation, May 2006, vol./is. 28/10(609-12)

15. Prescott RJ, Garraway WM, Akhtar AJ. Predicting functional outcome following acute stroke using a standard clinical examination.Stroke 1982;31:428-434

16. Garraway WM, Akhtar AJ, Smith DL, Smith LE. The triage of stroke rehabilitation. Journal of Epidemiology and community health.1981;33:39-44