An Analysis Of The Length Of Stay And The Effectiveness Of Treatment For Hip Fractured Patients In Japan

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EXTENDED ABSTRACT

The length of stay and the effectiveness of medical treatment are analyzed using the data from patients hospitalized for hip fractures in Japan. The influence of the Revision of the Medical Service Fee Schedule in April, 2002 is evaluated and factors which may affect the length of stay and the effectiveness of treatment (walking ability when leaving the hospital) are also analyzed. The length of stay is analyzed by the discrete-type proportional hazard model, and the effectiveness of treatment is analyzed by the ordered probit models.

1. INTRODUCTION

Since medical care expenses have expanded rapidly, shortening the average length of stay (ALOS) at the hospital by reducing the long-term hospitalization has become an important political issue. The requirement of the ALOS for general hospitals was shortened by the Revision of Medical Service Fee Schedule implemented in April, 2002. It was important to evaluate the influences of the Medical Care Payments Revision on the ALOS and effects of medical treatments for considering the future medical policies such as medical care payments.

The number of hip fracture patients has been increasing rapidly as the population ages in Japan (Orimo *et al*., 2000). The hip fracture is one of the major reasons for the elderly to be bedridden (Orimo, 1994). Hip factures are important problems and many studies such as cost-benefit analyses have been done in various countries. For details, see de Laet *et al*. (1996) Stromberg, Ohlen and Svensson (1997) and van Balen *et al*. (2002). Studies about the length of stay and the effectiveness of treatment have also been done by the various authors in Japan (for details, see Watanabe *et al*., 2003). However, the influence of the Revision of the Medical Service Fee Schedule in 2002 is not evaluated in these studies.

In this paper, the length of stay and the effectiveness of medical treatment are analyzed using the data of patients hospitalized for hip fractures (transcervical fractures). We evaluate the influence of the Revision of the Medical Service Fee Schedule in 2002 on the length of stay at the hospital and the effectiveness of treatment. We also analyze factors which may affect them. We use the data from 279 patients hospitalized for hip fractures and had artificial head replacement or oseteosynthesis operations performed from April, 2000 to January, 2003. The discrete-type proportional hazard model is used for the length of stay and the ordered probit model is used for the effectiveness of treatment.

2. MODEL

In this paper, we analyze the length of stay at the hospital (number of days staying at the hospital) and the effectiveness of treatment (walking ability when leaving the hospital). The discrete-type proportional hazard model is used for the length of stay, and the ordered probit model is used for the effectiveness of treatment. In this section, these models are explained.

2.1 Discrete-Type Proportional Hazard Model

To analyze the length of stay at the hospital correctly, it is not enough to compare the ALOSs of hospitals. It is necessary to consider different characteristics of the patients, such as age and sex, by hospitals. The length of stay is a discrete-type variable taking positive integers (1,2,3,…). Therefore, the analyses using ordinary methods such as the least squares methods are not proper for the length of stay and we analyze the length of stay by the discrete-type proportional hazard model. Let $h_i(t)$ be a conditional probability such that the i-th patient staying at the hospital on the t-th day will leave the hospital on that day. We call $h_i(t)$ as the leaving rate. (Although it is the same as the hazard rate of survival analysis models, we call it "leaving rate" to clarify the fact that the patient leaves the hospital.) For the i-th patient to leave hospital on the t-th day, it is necessary for the patient to stay until t-th day and leave on that day. Therefore, the probability of the i-th patient to leave the hospital on the t-th day is a function of $h_i(t)$ and given by

$$p_i(t) = \begin{cases} h_i(t) & t = 1, \\ [\prod_{s=1}^{t-1}\{1 - h_i(s)\}]h_i(t), & t \ge 2, \quad i = 1,2,...,n. \end{cases} \quad (1)$$

where n is the number of patients. To remove influences of a small number of patients who stay at the hospital over a long period of time, we choose T as the maximum number of days staying in the hospital. For patients staying more than T days, we just use the information such that they stay in the hospital more than T days. Let $p_i(T+1)$ be the probability such that the i-th patient stays in the hospital more than T days. $p_i(T+1)$ is given by

$$p_i(T+1) = \prod_{s=1}^{T}\{1 - h_i(s)\}. \quad (2)$$

Let x_i be a vector of explanatory variables which represent the characteristics of the i-th patient. As usual continuous proportional hazard models (Cox 1973), we assume that $h_i(t)$ is given by

$$h_i(t) = d_t \exp(x_i'\beta), \quad t = 1,2,3,....,T \quad (3)$$

Although d_t represents the "leaving rate" of the t-th day, a proper functional form is unknown. Hence, we do not assume a functional form as the usual continuous proportional hazard model, and estimate $d_1, d_2, ..., d_T$ individually. This means that the model is a non-parametric form regarding *t*. It is one of the advantages of the model since we do not assume any functional form.

Let t_i be the length of stay (number of days staying at the hospital) of the i-the patient. From equations (1)-(3), we get the likelihood function. By maximizing the likelihood function, we get the maximum likelihood estimator (MLE) $\hat{\beta}, \hat{d}_1, \hat{d}_2, ..., \hat{d}_T$. Note that x_i does not contain a constant term for the identification of the model. The program newly developed for this study is used to estimate the model. The program is written in the VBA and works on Excel. Variances of the estimator are calculated from the Hessian matrix.

2.1 Ordered Probit Model

The walking ability of the patient is measured on

4 different levels (1: unable to walk, 2: able to walk with some kind of help, 3: able to walk but less than 50m without help, 4: able to walk more than 50m without help). 4 levels are ordered but are not continuous variables. There are problems such as patients in Level 4 before injury cannot improve their walking levels. Thus it is necessary to treat the walking ability as qualitative data and the ordered probit model is used in this study.

Let y_i^* be the (continuous) variable representing the walking ability of the i-th patient. Suppose that y_i^* is given by

$$y_i^* = f(t_i, x_i, u_i), \quad i = 1,2,...,n, \tag{4}$$

where t_i is the length of stay and x_i is a vector of explanatory variables (the constant term is not included). u_i is an error term following the normal distribution with mean 0 and variance 1, respectively. y_i^* is not directly observed and only its level is observed.

Here as in many previous studies, $f(t_i, x_i, u_i)$ is given by

$$f(t_i, x_i, u_i) = \alpha \log(t_i - \mu) + x_i'\gamma + u_i, \tag{5}$$

where α is an unknown parameter and γ is a vector of unknown parameters. μ is chosen to be the minimum number of days staying at the hospital -1. The walking ability at leaving hospital y_i is a function of y_i^* and given by

$$y_i = \begin{cases} 1 & y_i^* \le \eta_1, \\ 2 & \eta_1 < y_i^* \le \eta_2, \\ 3 & \eta_2 < y_i^* \le \eta_3, \\ 4 & \eta_3 < y_i^*, \end{cases} \tag{6}$$

where η_1, η_2 and η_3 are unknown parameters. Let Φ be the distribution function of the standard normal distribution. From Equations (5) and (6), we get the likelihood function. We get the MLE, $\hat{\alpha}, \hat{\gamma}, \hat{\eta}_j, j = 1,2,3$ by maximizing the likelihood function. STATA (V7) is used to estimate the model.

3. DATA

3.1 Hospitals Surveyed

In this paper, we use the data from patients hospitalized in four general hospitals (A, B, C and D) in Japan. The patients were hospitalized for hip fractures and had artificial head replacement or oseteosynthesis operations performed from April, 2000 to November, 2001 and from June, 2002 to January, 2003. For evaluating the influence of the Revision of Medical Service Fee Schedule in 2002, we consider the hospitals where the data are available in the both periods. The remedies are thought to be different for 3 patients and some data is missing for 4 patients. Excluding these 7 patients, the data from 279 patients are used.

3.2 Length of Stay

The ALOSs are 46.3, 52.8, 43.5 and 39.2 days for Hospitals A, B, C and D. The standard deviations are 26.7, 14.0, 14.2 and 15.3. The skewness and kurtosis values are large except for Hospital B. Namely, the distributions are quite different from the normal distribution and the large skewness values imply that there are patents staying in the hospital for a long period of time.

3.3 Walking Ability

Four different levels are set for walking ability. The scores of 4, 3, 2 and 1 are given as the order of the walking ability. The walking abilities before injury and when leaving the hospital are reported. 4 patients were Level 1 before injury. Among these patients, 3 were Level 1 and 1 was Level 3 when leaving the hospital. 36 patients were Level 2 before injury. 23 were Level 1, 10 were Level 2, 1 was Level 3 and 2 were Level 4 when leaving the hospital. 43 patients were Level 3 before injury. 14 were Level 1, 18 were Level 2, 6 were Level 3, and 5 were Level 4. 196 patients, about 70% of all patients, were Level 4 level, before injury. 108(55) were "Level 4 to Level 4" and kept the same level when leaving the hospital. However, the walking ability of remaining 98 patients became lower; 29 were Level 1, 28 were Level 2, and 31 were Level 3.

3.4 Explanatory Variables

In this paper, as x_i, a vector of explanatory variables, we choose variables representing (i) influences of hospitals, (ii) the influence of the Revision of the Medical Service Fee Schedule in 2002, (iv) characteristics of patients and (v) indicators of medical treatment. The definitions and summaries of these variables are shown in Tables 4 and 5. *HOSPITAL_A*, *HOSPITAL_B* and *HOSPITAL_C* are 3 dummy variables representing the influences of hospitals. The base of these variables is Hospital D where the ALOS was the shortest. *F_YEAR_2002* is a dummy variable to evaluate the influence of the Revision of Medical Service Fee Schedule implemented in April, 2002.

The variables present the characteristics of patients are as follows: sex (*FEMALE*) age (*AGE*) presences of dementia, diabetes, cardiopathy and other diseases (*DEMENTIA*, *DIABETES*, *CARDIOPATHY*, *O_DISEASE*), walking ability before injury (*W_ABILITY_BEFORE*), experience of fracture (*FRACTURE*) presences of postoperative infection and complication (*INFECTION*, *COMPLICATION*), going back home or not after hospitalization (*NOT_HOME*) living alone or not (*L_ALONE*), recipient of daily life security or not (*D_L_SECURITY*), recipient of national health insurance or not (*N_H_INSUARANCE*) and recipient of elderly health insurance or not (*E_H_INSUARANCE*). (The base of health insurance is the insuarance managed by the government or associations.) In previous studies (Ichimura and Ishii, 2001 and Watanabe et al., 2003), *FEMALE*, *AGE*, *DEMENTIA*, *W_ABILITY_BEFORE* and *INFECTION* were variables affected recovery of walking ability. *DEMENTIA*, *DIABETES*, *CARDIOPATHY*, *O_DISEASE* and *FRACTURE* are variables representing basic health conditions of the patient. *INFECTION* and *COMPLICATION* represent a recovery progress of the patient after the operation. *NOT_HOME, L_ALONE, D_L_SECURITY, N_H_INSUARANCE* and *E_H_INSUARANCE* represent the basic living and economic conditions.

As indicators of medical treatment, type of operations (artificial head replacement or oseteosynthesis operations, ARTIFICIAL_HEAD) usage of cement (*CEMENT*) operational fee (*O_FEE*) are chosen. The operational fee is measured on 10,000 points.

4. RESULTS OF ESTIMATION

4.1 Length of Stay Equation

$x_i'\beta$ of Equation (3) is given by

$$\begin{aligned} x_i'\beta =\ & \beta_1 HOSPITAL\_A + \beta_2 HOSPITAL\_B \\ & + \beta_3\ HOSPITAL\_C + \beta_4\ F\_YEAR\_2002 \\ & + \beta_5\ AGE + \beta_6\ FEMALE + \beta_7 DEMENTIA \\ & + \beta_8 DIABETES + \beta_9 CARDIOPATHY \\ & + \beta_{10} O\_DISEASE + \beta_{11} FRACTURE \\ & + \beta_{12}\ INFECTION + \beta_{13}\ COMPLICATION \\ & + \beta_{14}\ W\_ABILITY\_BEFORE + \beta_{15}\ NOT\_HOME \\ & + \beta_{16}\ L\_ALONE + \beta_{17}\ D\_L\_SECURITY \\ & + \beta_{18}\ N\_H\_INSUARANCE \\ & + \beta_{19} E\_H\_INSUARANCE \\ & + \beta_{20}\ ARTIFICIAL\_HEAD + \beta_{21}\ CEMENT \\ & + \beta_{22}\ O\_FEE. \end{aligned} \tag{7}$$

Since we are estimating the leaving rate, a larger value of $x_i'\beta$ means a higher leaving rate and a shorter length of stay. Among these variables, expected signs of *DEMENTIA, DIABETES, CARDIOPATHY, O_DISEASE, FRACTURE, INFECTION* and *COMPLICATION* are negative. The coefficient of the *F_YEAR_2002* is expected to be positive if the revision shortened the length of stay. Therefore, the one-sided t-test is used for these variables and the two-sided t-test is used for the other variables.

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Table 1 shows the estimates of β. The estimate of *F_YEAR_2002* is 0.2859 and its t-value is 1.202. Although it is positive, it is not significant at the 5% level. (The p-value is 11.5%.) This means that the 2002 revision did not significantly make the length of stay shorter. The estimate of *CEMENT* is positive and significant at the 1% level. The estimates of *INFECTION* and *COMPLICATION* are both negative and significant at the 1% and 5% levels. Namely, although the usage of cement shortens the length of stay, the postoperative infection and postoperative complication make the length of stay longer. For other variables, estimates of *W_ABILITY_BEFORE, FEMALE, DEMENTIA, CARDIOPATHY, ARTIFICIAL_HEAD, D_L_SECURITY, N_H_INSUARANCE* and *E_H_INSUARANCE* are negative, and those of *AGE, DIABETES, O_DISEASE, FRACTURE, O_FEE* and *NOT_HOME* are positive. However, none of these variables are significant at the 5% level. The absolute t-values of 3 hospital dummies are 0.6623 0.6028 and 0.0896. The lengths of stay are not significantly different by hospitals.

Table 2 gives the estimation results of the leaving rates, $d_1, d_2, ..., d_T$. For the leaving rates, we estimated the leaving rates of 17-66 days to remove the influence of patents staying hospital for a long period of time. For the patients staying at the hospital more than 66 days, we just use the information that they stayed in the hospital more than 66 days. 260 left the hospital during 17- 66 days and 17 stayed more than 66 days. For reducing the number of parameters, we combine 2 days together and estimate the leaving rates of 17-18, 19-20, 21-22,…, 63-64, 65-66 days. Although there is a drop at 53-54 days, the leaving rate increases almost linearly during 17-66 days. From this fact, the Weibull distribution is considered to fit best among the distributions used in survival analysis. Although the Weibull distribution is a continuous distribution, we consider a discrete approximation.

Here, the hazard rate function of the Weibull distribution is given by

$$w(t) = \frac{a(t - \mu)^{a-1}}{b^a}. \tag{8}$$

Since $d_i \approx w(t_i) \cdot \Delta t, \Delta t = 2$ by the discrete approximation, we get

$$\log(d_i / 2) = c + (a-1)\log(t_i - \mu) + v_i. \tag{9}$$

Estimating a and c by the least squares method, we get

$\hat{a}$ =1.9270 (0.0864), $\hat{c}$ = -6.3003 (0.2676), $R^2 = 0.8334$.

The parameter b of the Weibull distribution can be obtained by

$$\log \tilde{b} = -(\hat{c} - \log \hat{a} + x_i'\hat{\beta}) / \hat{a} = (6.3003 - x_i\hat{\beta})/1.9270 \tag{10}$$

,

where the values of $\hat{\beta}$ are given in Table 6. Let $\Gamma(\cdot)$ be a gamma function. The expected value of the Weibull distribution is

$$\bar{t} = b\Gamma(1 + 1/a), \tag{11}$$

and the average length of stay (*ALOS*) becomes

$$ALOS = \bar{t} + \mu. \tag{12}$$

From this result, we can calculate the extra lengths of stay due to the postoperative infection and postoperative complication. Consider a patient who is staying at Hospital D, walking ability Level 4, female, age 79.8, having no diseases (such as dementia, diabetes and cardiopathy), never fractured before, not leaving alone, operational type is the artificial head replacement with cement, operational fee is 92,400 going back home, operated in fiscal year 2002 and the type of health insurance is managed by associations. Without postoperative infection and postoperative complication, $x_i'\hat{\beta} = 0.7879$, $\hat{b}$ =17.4713 and her *ALOS* is $\bar{t} + \mu$ = 16 + 19.70 =35.70 days from Equations (11) and (12). On the other hand, her *ALOS* is 50.18 days with postoperative infection and 44.63 days with postoperative complication. The *ALOS* becomes 14.5 days longer with postoperative infection and 8.9 days longer with postoperative complication. These results suggest the importance of their prevention from the view points of the length of stay at the hospital.

4.2 EFFECTIVENESS OF TREATMENT EQUATION

The effectiveness of treatment is analyzed by the ordered probit model. In addition to $\log(t_i - \mu)$, the same explanatory variables in the precious section are used and Equation (6) is given by

$$f(t_i, x_i, u_i) = \alpha \log(t_i - \mu) + \gamma_1 HOSPITAL\_A \quad (13)$$
$$+ \gamma_2\ HOSPITAL\_B + \gamma_3\ HOSPITAL\_C$$
$$+ \gamma_4\ F\_YEAR\_2002 + \gamma_5\ AGE + \gamma_6\ FEMALE$$
$$+ \gamma_7\ DEMENTIA + \gamma_8\ DIABETES$$
$$+ \gamma_9\ CARDIOPATHY + \gamma_{10}\ O\_DISEASE$$
$$+ \gamma_{11}\ FRACTURE + \gamma_{12}\ INFECTION$$
$$+ \gamma_{13}\ COMPLICATION$$
$$+ \gamma_{14}\ W\_ABILITY\_BEFORE$$
$$+ \gamma_{15}\ NOT\_HOME + \gamma_{16}\ L\_ALONE$$
$$+ \gamma_{17}\ D\_L\_SECURITY + \gamma_{18}\ N\_H\_INSUARANCE$$
$$+ \gamma_{19}\ E\_H\_INSUARANCE$$
$$+ \gamma_{20}\ ARTIFICIAL\_HEAD + \gamma_{21}\ CEMENT$$
$$+ \gamma_{22}\ O\_FEE + u_i .$$

The coefficients of $\log(t_i - \mu)$ and *W_ABILITY_BEFORE* are expected to be positive. The coefficients of *AGE*, *DEMENTIA*, *DIABETES*, *CARDIOPATHY*, *O_DISEASE*, *FRACTURE*, *INFECTION*, *COMPLICATION* and *L_ALONE* are expected to be negative. The one tailed t-test is done for these variables and the two tailed t-test is done for other variables. The results of the estimation are presented in Table 8. The estimate of $\log(t_i - \mu)$ is $\hat{\alpha} = 0.0302$ and t-value is 0.2632. The t-value is small and a significant relationship between the length of stay and the effectiveness of treatment is not admitted. *W_ABILITY_BEFORE* strongly affects the walking ability when leaving hospital as expected. The estimate and t-value are large values, 0.6114 and 5.4544, respectively. The estimate of *F_YEAR_2002* is -0.5632. The t-value is -2.0220 and significant at the 5% level. This suggests that the treatment became less effective in the fiscal year 2002 than before.

The estimates of *DEMENTIA*, *INFECTION*, *COMPLICATION*, *NOT_HOME* and *L_ALONE* are negative and significant (at the 1% level for *DEMENTIA*, *NOT_HOME* and *L_ALONE* and at the 5% level for other variables.) For the variables representing the treatment methods, estimates of *CEMENT* and *O_FEE* are positive but not significant at the 5% level. Although it is not significant, the estimate of *ARTIFICIAL_HEAD* becomes negative.

All other variables, they are not significant at the 5% level, however, the estimates of *AGE*, *DIABETES*, *N_H_INSURANCE*, *D_L_DUMMY* are negative. On the other hand, the estimates of *CARDIOPATHY*, *O_DESEASE*, *FRACTURE*, *E_H_INSUARENCE* are positive. *CARDIOPATHY*, *O_DESEASE* and *FRACTURE* have the opposite of the expected signs. For the dummy variables of hospitals (*HOSPITAL_A*, *HOSPITAL_B* and *HOSPITAL_C*), the estimate of *HOSPITAL_C* is positive and significant at the 5% level.

5. CONCLUSION

In this paper, we analyze the length of stay and the effectiveness of treatment (walking ability when leaving the hospital) using the data of 279 patients hospitalized for hip fractures from April, 2000 to January, 2003 in 4 general hospitals. The length of stay and the effectiveness of treatment are analyzed by the discrete-type proportional hazard and ordered probit models. The factors affecting the length of stay are: i) usage of cement, ii) postoperative infection and iii) postoperative complication. On the other hand, in addition to walking ability before injury, the factors affecting the effectiveness of treatment are: i) dementia, ii) postoperative infection, iii) postoperative complication iv) a place to go back to after hospitalization, v) residential condition, vi) fiscal year 2002 dummy and vii) Hospital C dummy. The 2002 revision did not significantly reduce the length of stay but it had a bad influence on the effectiveness of treatment. According to the fiscal year 2002 conspectus of social medical treatment survey by the Department of Statistics of the Ministry of the Health, Labor and Welfare, the fee (points) of rehabilitation declined by 23.1% per case and 19.8% per day from the previous year. It might be a major reason affected the effectiveness of treatment. There is a possibility that the rehabilitation was not sufficient after the 2002 revision. The improvement of the medical service fee system for effective rehabilitation is strongly suggested. Postoperative infection and postoperative complication make not only the length of stay longer but also the effectiveness of treatment worsens The importance of their prevention is strongly suggested for both reduction of medical cost and effectiveness of treatment.

Although a place to go back to after hospitalization is an important variable affecting the effectiveness of treatment, we cannot analyze the total length and the effectiveness of treatment including the period after hospitalization because of data availability limitation. For the effective usage of medical resources through early discharge, it is necessary to compare a case where a patient stays at the hospital for the entire treatment period with a case where the patient stays at home or another facility for a part of the treatment period and receives rehabilitation there. A significant relationship between the length of stay and the effectiveness of treatment is not admitted in this study. It may be related to the sample selection biases such as a patient recovering quicker tends to leave hospital earlier. There are significant differences in the effectiveness of treatment among hospitals. However, we cannot analyze characteristics of hospitals such as size, management, number of doctors per bed and location since the number of hospitals is just 4. For achieving both reduction of medical cost and effective treatment, it is necessary to collect more data and develop new models in the further study.

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Table 6 Length of Stay Equation Results
(Coefficients of the Explanatory Variables, β)

Variable	Estimate	Standard Error	t-value
Hospital_A	-0.1360	0.2054	-0.6623
Hospital_B	-0.1619	0.2686	-0.6028
Hospital_C	0.0655	0.1640	0.3994
F_YEAR_2002	0.2859	0.2378	1.2021
AGE	0.001512	0.009618	0.1572
FEMALE	-0.1446	0.1714	-0.8436
DEMENTIA	-0.0252	0.1505	-0.1676
DIABETES	0.0737	0.1942	0.3796
CARDIOPATHY	-0.0905	0.1639	-0.5523
O_DISEASE	0.0287	0.1342	0.2136
FRACTURE	0.1774	0.1422	1.2478
INFECTION	-0.5511	0.2209	-2.4941
COMPLICATION	-0.3741	0.1629	-2.2961
W_ABILITY _BEFORE	-0.1274	0.0874	-1.4573
NOT_HOME	0.2394	0.1483	1.6143
L_ALONE	-0.0519	0.1496	-0.3469
D_L_SECURITY	-0.3666	0.4404	-0.8324
N_H_ INSUARANCE	-0.0339	0.3793	-0.0895
E_H_ INSUARANCE	-0.0433	0.3442	-0.1257
ARTIFICIAL _HEAD	-0.3103	0.3239	-0.9580
CEMENT	0.6416	0.2073	3.0945
O_FEE	0.2106	0.3603	0.5845

Table 7 Length of Stay Equation Results
(Estimates of Leaving Rates, $d_1, d_2, ..., d_T$)

Length of Stay (days)	Leaving Rate	Standard Error	t-value
17-18	0.0126	0.0127	0.9925
19-20	0.0255	0.0235	1.0855
21-22	0.0479	0.0422	1.1338
23-24	0.0321	0.0293	1.0984
25-26	0.0486	0.0432	1.1267
27-28	0.0510	0.0452	1.1274
29-30	0.0539	0.0477	1.1295
31-32	0.1015	0.0873	1.1626
33-34	0.0954	0.0822	1.1600
35-36	0.1127	0.0968	1.1633
37-38	0.0938	0.0818	1.1465
39-40	0.1185	0.1026	1.1556
41-42	0.2164	0.1819	1.1900
43-44	0.1604	0.1377	1.1647
45-46	0.2232	0.1897	1.1768
47-48	0.1900	0.1638	1.1599
49-50	0.2933	0.2494	1.1762
51-52	0.1504	0.1367	1.0998
53-54	0.0564	0.0609	0.9267
55-56	0.1993	0.1787	1.1149
57-58	0.2338	0.2108	1.1090
59-60	0.2323	0.2128	1.0917
61-62	0.3703	0.3264	1.1344
63-64	0.3552	0.3226	1.1013
65-66	0.3504	0.3213	1.0904
LogL	-847.1649		

Table 8 Walking Ability Equation Results

Variable	Estimate	Standard Error	t-value
Hospital_A	0.3694	0.2467	1.4973
Hospital_B	0.6777	0.3521	1.9246
Hospital_C	0.4623	0.2120	2.1810
Log(t- μ *)*	0.0302	0.1147	0.2632
F_YEAR_2002	-0.5632	0.2785	-2.0220
AGE	-0.011126	0.010945	-1.0166
FEMALE	0.0201	0.2012	0.0999
DEMENTIA	-0.7888	0.1765	-4.4687
DIABETES	-0.1538	0.2272	-0.6770
CARDIOPATHY	0.2404	0.2051	1.1720
O_DISEASE	0.2694	0.1725	1.5617
FRACTURE	0.0169	0.1684	0.1004
INFECTION	-0.4154	0.1922	-2.1612
COMPLICATION	-0.4115	0.1961	-2.0986
W_ABILITY_ BEFORE	0.6114	0.1121	5.4544
NOT_HOME	-1.0980	0.1765	-6.2208
L_ALONE	-0.4241	0.1809	-2.3443
D_L_SECURITY	-0.3728	0.5428	-0.6868
N_H_ INSUARANCE	-0.0863	0.4807	-0.1795
E_H_ INSUARANCE	0.1444	0.4404	0.3280
ARTIFICIAL_ HEAD	-0.5419	0.3648	-1.4856
CEMENT	0.3286	0.2522	1.3029
O_FEE	0.3778	0.4154	0.9095
η_1	-0.5038	1.0131	-0.4973
η_2	0.4453	1.0174	0.4376
η_3	1.0748	1.0185	1.0553
LogL	-261.7924		