4 Results

4.1 Descriptive statistics

4.1.1 General description of the sample

613 female and 258 male dementia patients were admitted to EGZB from January 2003 to December 2004 due to different acute medical conditions. The prevalence of dementia in EGZB during these two years was 18.97%. The socio-demographic data, cognitive and functional measures of this sample are given in Table1. The average age (mean±SD) was 82.0±8.2 years, the median age was 83.0 years, the range of age was 51 years. The male patients aged 78.14±8.6 years, female patients aged 83.62±7.4 years. 67.7% (n= 590) cases were 80 years and older. 12.3% (n=107) were institutionalized. 47.2% (n=411) lived alone. 45.6% (n=397) were spouseless. 26.3% (n=229) of 871 dementia cases were characterized by Alzheimer's disease (AD), 34.0% (n=296) by vascular dementia (VD), 39.7% (n=346) by dementia syndromes (DS). The mean MMSE was 16.83±5.6; the median MMSE was 17. 56.3% (n=379) of the cases were moderate to severe dementia patients with MMSE scores < 18. The MMSE score ranged from 0 to 29. The mean Barthel Index was 45.47±31.2. The median BI score was 45. 59.1% (n=507) of the cases were dependent in basic ADL with BI score below 55. 79.2% (n=472) showed a moderate to severe walking problem with a TUG score over 20 seconds. 78.1% (n=473) cases were at higher risk of falls with a Tinetti-Total score below 18. The mean comorbidity reached 11.54±4.2. The median comorbidity was 11. 96.1% (n=831) cases suffered from more than five medical conditions and 53.5% (n=466) cases suffered from more than ten medical conditions. The mean medications number of prescribed was 6.8±3.1, 62.5% (n=544) were on polypharmacy (taking more than five medications daily, and more than two weeks). The mean hospital stay duration was 19.7±11.4 days. The median hospital stay duration was 18 days. 16.6% (n=145) cases were immobility, 28.7% (n=250) were urine-incontinent, 15.7% (n=131) were stool- incontinent, 13.5% (n=118) had decubitus, 13.2% (n=115) were diagnosed gait disorder, 37% (n=322) suffered from fractures. The six most common coexisting diseases among patients with dementia in this sample were heart disease, hypertension, stroke, fracture, diabetes, and renal failure. The comorbidity distribution of AD, VD and DS subgroups is given in Table 2. The distributions of Barthel

Index Score, MMSE Score, TUG, Tinetti-Total score, Age and Comorbidity in this sample are given in Figure3-8.

Table 1. The general description of patients with dementia in EGZB (n=871)

	Mean/n	SD/%		Mean/n	SD/%
Age	82.00	8.2	MMSE Score	16.83	5.5
Female	83.62	7.4	Barthel Index	45.47	31.2
Male	78.14	8.6	Timed ” up & go”	27.25	16.3
Gender, female (n), %	613	70.4%	Tinetti-Balance	5.32	4.1
Institutionalized (n), %	107	12.3%	Tinetti-Gait	5.73	4.9
Living alone (n), %	411	47.2%	Tinetti-Total	10.99	8.5
Spouseless (n), %	397	45.6%	GDS	5.32	3.4
AD (n), %	229	26.3%	Comorbidity	11.54	4.2
VD (n), %	296	34.0%	Medication use	6.8	3.1
DS (n), %	346	39.7%	Hospital stay duration	19.7	11.4

Table 2: Distribution of coexisting medical conditions of AD, VD and DS subgroups

Cases (%)	AD 229 (26.3%)	VD 296 (34.0%)	DS 346 (39.7%)	Total cases 871 (100%)	P value
Heart disease	141 (61.6%)	197 (66.6%)	227 (65.6%)	565 (64.9%)	0.462
Hypertension	137 (59.8%)	215 (72.6%)	199 (57.5%)	551 (63.3%)	0.000***
Fracture	106 (46.3%)	97 (32.8%)	119 (34.4%)	322 (37.0%)	0.003**
Stroke	42 (18.3%)	182 (61.5%)	80 (23.1%)	304 (34.9%)	0.000***
Diabetes	52 (22.7%)	108 (36.5%)	102 (29.5%)	262 (30.1%)	0.003**
Renal failure	41 (17.9%)	77 (26.0%)	94 (27.2%)	212 (24.3%)	0.029*
U-incontinent ★	54 (23.6%)	99 (33.4%)	97 (28.0%)	250 (28.7%)	0.044*
Falls	58 (25.3%)	58 (19.6%)	43 (12.4%)	159 (18.3%)	0.000***
Hyperlipaemia	35 (15.3%)	74 (25.0%)	43 (12.4%)	152 (17.5%)	0.000***
Immobility	36 (15.7%)	37 (12.5%)	72 (20.8%)	145(16.6%)	0.017*
S-incontinent ▲	22 (9.6%)	49 (16.6%)	60 (17.3%)	131 (15.0%)	0.027*
Hearing disorder	29 (12.7%)	39 (13.2%)	57 (16.5%)	125 (14.4%)	0.344
Osteoporosis	39 (17.0%)	32 (10.8%)	47 (13.6%)	118 (13.5%)	0.119
Decubitus	20 (8.7%)	46 (15.5%)	52 (15.0%)	118 (13.5%)	0.045*
Gait disorder	29 (12.7%)	57 (19.3%)	29 (8.4%)	115 (13.2%)	0.000***
Depression	21 (9.2%)	39 (13.2%)	36 (10.4%)	96 (11.0%)	0.311
COPD	9 (3.9%)	25 (8.4%)	34(9.8%)	68 (7.8%)	0.032*
Visual disorder	17 (7.4%)	25 (8.4%)	22 (6.4%)	64 (7.3%)	0.599
Aphasia	5 (2.2%)	33 (11.1%)	12 (3.5%)	50 (5.7%)	0.000***
PD	12 (5.2%)	11 (3.7%)	13 (3.8%)	36 (4.1%)	0.618

★: Urinary. ▲: Stool. Crosstabs Chi-SquareTest. *** $P \leq 0.001$ ** $P \leq 0.01$ * $P \leq 0.05$

Figure 3. Distribution of BI

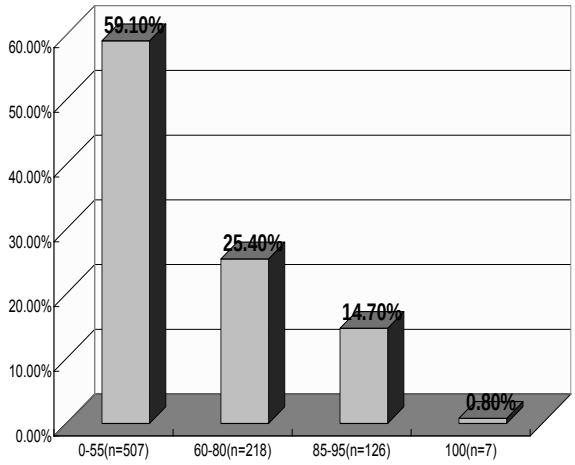


Figure 4. Distribution of MMSE

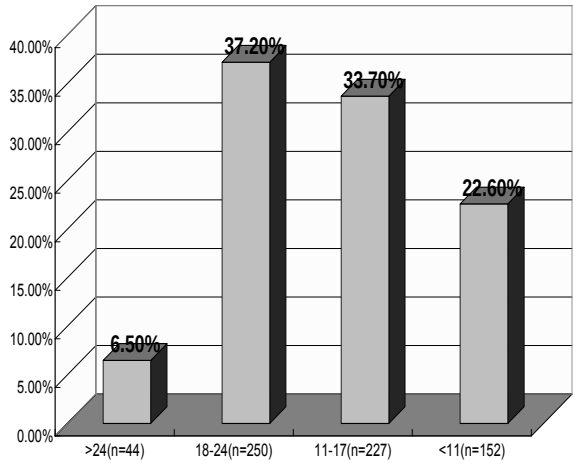


Figure 5. Distribution of Age

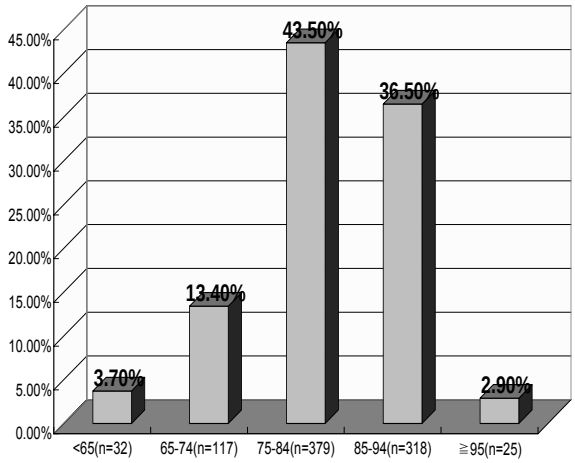


Figure 6. Distribution of Comorbidity

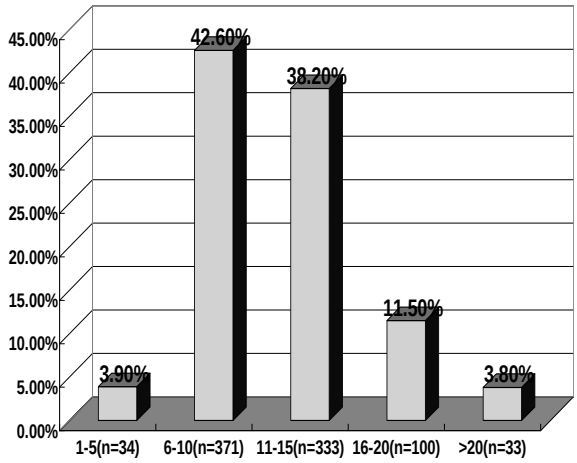


Figure 7. Distribution of TUG

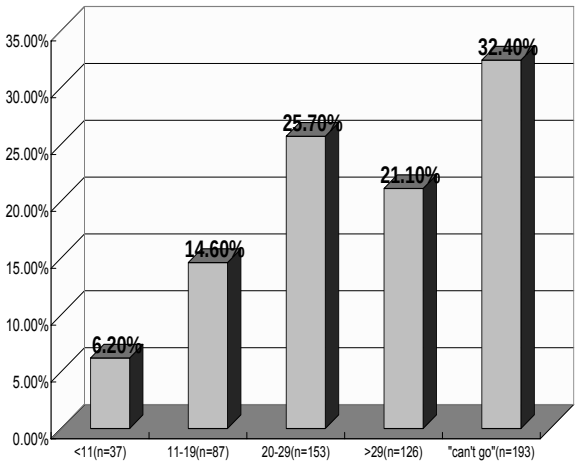
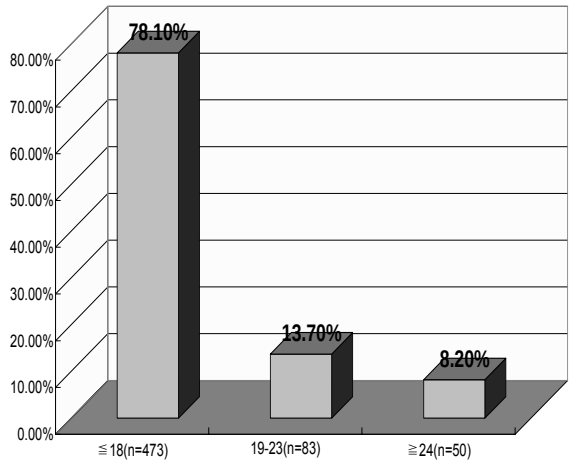


Figure 8. Distribution of Tinetti-Total



4.1.2 Dementia subtype group

Socio-demographic, cognitive, and functional data of these groups are shown in Table 3. Analysis of variance (One-way ANOVA) was used to compare interval variables and Chi-Square Test was used to compare nominal variables across the subgroups. The results showed that VD cases were younger than AD and DS cases. Comparing with AD and DS, VD suffered from more comorbidity; accordingly, VD had more medication use and stayed longer in the hospital. Cognitive function: VD subgroup was better than AD and DS subgroups. And basic ADL (BI): AD had a higher score of BI than VD and DS. Mobility: The original TUG was not statistically significant, while in analysis by TUG category, AD was better than VD and DS. All AD patients had better scores than VD and DS patients in Tinetti-Balance, Tinetti-Gait and Tinetti-Total. It is worth to note that DS subgroup was the worst in all functional measures including MMSE, BI, TUG, Tinetti-Balance and Tinneti-Gait and at the highest risk of falls with the lowest score of Tinetti-Total. Additionally, the percentage of female patients was remarkably higher in AD subgroup than in VD and DS subgroups. A higher percentage of patients living at institutions were found in the DS subgroup. A higher percentage of VD had a spouse. The number of those living alone in this group was not statistically significant.

Table 3. Socio-demographic data, cognitive and functional measures of dementia subtype groups

	AD 229 (26.3%)	VD 296 (34.0%)	DS 346 (39.7%)	Total cases 871 (100%)	p value
Age (mean±SD)	83.71 (7.0)	79.18 (8.2)	83.27 (8.3)	82.00 (8.2)	0.000***
Gender (female %) †	181 (79.0%)	179 (60.5%)	253 (73.1%)	613 (70.4%)	0.000***
Have spouse (n, %) †	47 (20.5%)	91 (30.7%)	69 (19.9%)	207 (23.8%)	0.002**
Institutionalized†	26 (11.4 %)	23 (7.8 %)	58 (16.8%)	107 (12.3%)	0.002**
Living alone†	117 (51.1 %)	132 (44.6 %)	162 (46.8%)	411 (47.2%)	0.330
Comorbidity	10.65 (4.0)	12.61 (4.3)	11.21 (4.2)	11.54 (4.2)	0.000***
Medication use	6.29(2.7)	7.35 (3.4)	6.68 (3.0)	6.80 (3.1)	0.000***
Hospital stay duration	18.52(10.2)	20.98 (12.2)	19.38 (11.3)	19.70 (11.4)	0.038*
MMSE category	2.78 (0.9)	2.59 (0.9)	2.82 (0.9)	2.72 (0.9)	0.016*
Barthel Index	54.16 (28.8)	44.72 (30.9)	40.33(31.9)	45.47 (31.2)	0.000***
TUG category	3.34 (1.2)	3.63 (1.2)	3.73 (1.3)	3.59 (1.3)	0.007**
Tinetti-Balance	6.36 (4.3)	5.44 (4.0)	4.47(3.9)	5.32 (4.1)	0.000***
Tinetti-Gait	6.98 (4.6)	5.80 (4.7)	4.77(5.1)	5.73 (4.9)	0.000***
Tinetti-Total	13.29(8.4)	11.20 (8.3)	9.19(8.5)	10.99(8.5)	0.000***
GDS	5.04 (3.3)	5.64 (3.5)	5.17 (3.2)	5.32 (3.4)	0.337

One-way ANOVA mean±SD. †: Corsstabs Chi-Square Test. *** $p \leq 0.001$ ** $p \leq 0.01$ * $p \leq 0.05$

4.1.3 MMSE group

Of 871 dementia cases, 673 (77.3%) cases had a valid MMSE score, 44 cases with MMSE score more than 24 were classified as a subgroup having a very mild cognitive impairment. The diagnosis of dementia in this subgroup of patients was confirmed by the neuro-psychologist at the time of present study by reviewing the medical records including further cognitive assessments (CERAD) with reference to the formal education level. 250 cases with MMSE score of 18-24 were classified as having a mild cognitive impairment. 227 cases with MMSE score of 11-17 were classified as having a moderate cognitive impairment. 152 cases with MMSE score less than 11 were classified as a severe dementia (this subgroup included 66 severe dementia cases that were too severe dementia to assess). Of 673 cases, 56.3% (n=379) patients had moderate to severe dementia with a MMSE score less than 18, the mean MMSE was 16.83±5.6, the MMSE range was 0-29, median MMSE was 17. Socio-demographic data and functional measures in this group are listed in Table 4. Similar analysis of variance (one-way

ANOVA) and nonparametric Mann-Whitney U Test were performed to analyze the data in this group. Table 4 showed that with the decline of MMSE score, basic ADL (BI score) decreased sharply. And TUG was not statistically significant when original TUG was used in the analysis, whereas, when the TUG category was used, with the decline of MMSE score TUG category increased. As expected, both Tinetti-Balance and Tinetti-Gait scores decreased with the decline of MMSE score. And the risk of falls, Tinetti-Total decreased too with the decline of MMSE score. Both age and percentage of female patients increased with the decline in MMSE score. Severe cognitive impairment subgroup had the highest percentage of institutionalized patients and the lowest percentage of those living alone. No linear relationship between medication use and MMSE score was observed in the present study. Comorbidity, hospital duration and Geriatric Depression Score were not statistically significant in this group.

Table 4.Socio-demographic data and functional measures of MMSE group

Cases (%)	MMSE1 (>24) 44 (6.5%)	MMSE2 (18-24) 250 (37.1%)	MMSE3 (11-17) 227 (33.7%)	MMSE4 (<11) 152 (22.6%)	Total 673 (100%)	P value
Age	79.73 (6.9)	80.66 (8.1)	81.97(7.9)	83.57 (7.7)	81.70 (7.9)	0.001***
Gender (Female %) †	24 (54.5%)	167 (66.8%)	162 (71.4%)	112 (73.7%)	465 (69.1%)	0.020**
Institutionalized†	4 (9.1%)	12 (4.8%)	22 (9.7%)	33 (21.7%)	71 (10.5)	0.000***
Living alone†	23 (52.3%)	146 (58.4%)	123 (54.2%)	51 (33.6%)	342 (51.0%)	0.000***
Comorbidity	12.20 (4.9)	11.82 (4.3)	11.87 (4.2)	10.93 (4.1)	11.66 (4.3)	0.112
Medication use	7.35 (4.5)	6.75 (3.0)	7.03 (3.3)	6.17 (2.9)	6.75 (3.2)	0.044*
Hospital duration	19.68 (11.6)	20.37 (10.3)	21.32 (10.6)	19.04 (10.2)	20.35 (10.5)	0.212
GDS	5.09 (2.6)	5.20 (3.4)	5.74(3.5)	3.43 (3.2)	5.31 (3.4)	0.226
TUG Category	2.89 (1.1)	3.20(1.1)	3.40(1.2)	4.28 (1.1)	3.49 (1.2)	0.000***
Tinetti-Balance	6.97 (4.3)	6.72 (3.9)	6.00 (4.1)	3.77 (3.7)	5.88 (4.1)	0.000***
Tinetti-Gait	8.11 (4.4)	7.60 (4.3)	6.47 (4.8)	3.35(4.5)	6.38 (4.8)	0.000***
Tinetti-Total	14.70 (8.2)	14.23 (7.7)	12.44 (8.3)	7.21 (7.8)	12.20 (8.4)	0.000***
Barthel Index	67.39 (24.0)	62.37 (24.5)	52.70 (27.7)	26.38 (26.4)	51.29 (29.6)	0.000***

One-way ANOVA mean±SD. † : Nonparametric Mann-Whitney U Test. *** $P \leq 0.001$ ** P≤ 0.01 * $P \leq 0.05$

4.1.4 Barthel Index group

Of 871 cases, 858 (98.5%) cases were assessed by BI. Of these, 59.1% (n=507) showed basic ADL dependency with a BI score < 55. 25.4% (n=218) showed partial dependency (BI 60-80), 14.7% (n=126) need some help to be independent (BI 85-95) and 0.8% (n=7) was independent (BI 100). A total of 95.8% (n=794) were dependent in bathing (with a task score of 0), 59% (n=491) were dependent in climbing stairs, 45% (n=378) were dependent in bladder control, 40.9% (n=339) were dependent in bowels control, 35.6% (n=295) were dependent in mobility, 35.5% (n=294) were dependent in toilet use, 34.1% (n=283) were dependent in grooming, 34.1% (n=283) were dependent in dressing, 20.9% (n=172) were dependent in transfer, 18.9% (n=157) were dependent in feeding. Barthel Index tasks score is given in Table 6. Socio-demographic data and functional measures of BI group are shown in Table 5. Interval scale was analyzed by analysis of variance and nominal scale was analyzed by nonparametric Mann-Whitney U Test. It is clear that with increasing BI, the MMSE category and TUG category decreased, whereas Tinetti-Balance, Tinetti-Gait, Tinetti-Total increased. With the increasing BI, age and comorbidity and the hospital stay duration decreased. The percentage of females was higher in dependent and partially dependent subgroups. Institutionalized patients were considerably higher in the dependent subgroup. The percentage of those living alone was higher in partial dependent subgroup and the lowest was in the dependent subgroup. Medication use and GDS were not statistically significant in this group.

Table 5. Socio-demographic data and functional measures of Barthel Index group

	BI-1 (0-55)	BI-2 (60-80)	BI-3 (85-95)	BI-4 (100)	Total	p value
Cases (%)	507 (59.1%)	218 (25.4%)	126 (14.7%)	7 (0.8%)	858 (100%)	
Age	82.55 (8.4)	82.27 (7.4)	79.57 (7.9)	77.43 (7.2)	82.00 (8.2)	0.001
Gender (female %) †	356 (70.2%)	156 (71.6%)	88 (69.8%)	4 (57.1%)	604 (70.4%)	0.004
Institutionalized†	82 (16.2%)	18 (8.3%)	6 (4.8%)	0 (0%)	106 (12.2%)	0.000
Living alone†	199 (39.3%)	130 (59.6%)	73 (57.9%)	4 (57.1%)	406 (47.3%)	0.000
Comorbidity	12.02 (4.2)	11.39 (4.2)	10.10 (4.2)	10.00 (4.8)	11.56 (4.2 4)	0.000
Medication use	6.88 (2.9)	6.81 (3.4)	6.54 (3.4)	6.00 (3.7)	6.81 (3.1)	0.638
Hospital stay duration	20.96 (12.5)	19.36 (9.4)	16.83 (8.1)	15.14 (7.2)	19.90 (11.3)	0.001
MMSE category	3.03 (0.9)	2.44 (0.8)	2.33 (0.7)	2.29 (1.1)	2.72 (0.9)	0.000
GDS	5.40 (3.5)	5.30 (3.3)	5.29 (3.4)	4.25 (4.7)	5.32 (3.4)	0.924
TUG category	4.29 (1.0)	3.10 (1.0)	2.75 (1.1)	1.86 (1.2)	3.59 (1.3)	0.000
Tinetti-Balance	3.18 (3.1)	7.10 (3.1)	9.38 (3.9)	11.67 (4.1)	5.29 (4.1)	0.000
Tinetti-Gait	3.06 (4.3)	8.54 (3.2)	9.93 (3.3)	11.17 (2.8)	5.71 (4.9)	0.000
Tinetti-Total	6.27 (6.9)	15.46 (5.5)	19.31 (6.7)	22.83 (6.7)	10.94 (8.5)	0.000

One way ANOVA mean (SD). † : Nonparametric Mann-Whitney U Test. *** $P \leq 0.001$ ** $P \leq 0.01$ * $P \leq 0.05$

BI-1: BI scored 0-55 (dependent). BI-3: BI scored 85-95 (need some help to be independent).

BI-2: BI scored 60-80 (partial dependent). BI- 4: BI scored 100 (independent).

Table 6. Distribution of Basic ADL Tasks (Barthel Index Task Scores)

Score:	0	5	10	15
BI Tasks: (n/%)				
Eating	157 (18.9%)	335 (40.4%)	173 (20.9%)	189 (22.8%)
Transfer	173 (20.9%)	197 (23.8%)	270 (32.6%)	
Grooming	283 (34.1%)	546 (65.9%)		
Toilet use	294 (35.5%)	301 (36.3%)	234 (28.2%)	
Bathing	794 (95.8%)	35 (4.2%)		
Mobility	295 (35.6%)	108 (13.0%)	285 (34.4%)	141 (17.0%)
Climbing stairs	491 (59.2%)	277 (33.4%)	61 (7.4%)	
Dressing	283 (34.1%)	329 (39.7%)	217 (26.2%)	
Bowels control	339 (40.9%)	125 (15.1%)	365 (44.0%)	
Bladder control	378 (45.6%)	173 (20.9%)	278 (33.5%)	

4.1.5 The group of Timed“up and go”

A total of 596 (68.4%) cases have a valid TUG. Of 596 cases, 6.2% (n=37) can walk normally (TUG less than 11), 14.6% (n=87) walk with mild problem (TUG 11-19), 25.7% (n=153) walk with moderate problem (TUG 20-29), 21.1% (n=126) had severe walking problem (TUG more than 29) and 32.4% (n=193) were classified as “unable to walk” subgroup (not possible to test). Socio-demographic data and functional measures of this group are shown in Table 7. One way ANOVA and Nonparametric Mann-Whitney U Test were used to analyze the data. The results showed that with the increasing time needed to complete TUG (TUG duration), BI score decreased and comorbidity increased. With the increasing of TUG duration, MMSE category increased too, but with the exception of the subgroup with moderate walking problem (the subgroup with moderate walking problem showed a relative low MMSE category). As expected, with the increasing of TUG duration, Tinetti-gait and Tinetti-balance and Tinetti-Total decreased. Although age was not statistically significant in this group, it was observed that with the increasing of TUG duration, there seems to be a slight increase in age. There were a higher percentage of those living alone in the subgroup with a moderate walking problem.

The “unable to walk” subgroup had a higher percentage of institutionalized cases. Gender, medication use, hospital stay duration, and GDS in this group were not statistically significant.

Table 7. Socio-demographic data and functional measures of TUG group

	TUG1 (<11)	TUG2 (11-19)	TUG3 (20-29)	TUG4 (>29)	TUG5 (unable to walk)	Total	P Value
Cases (%)	37 (6.2%)	87 (14.6%)	153 (25.7%)	126 (21.1%)	(193 (32.4%)	(596 (100%)	
Age	80.27 (7.4)	81.77 (7.5)	81.90 (7.6)	82.13 (8.2)	82.00 (9.4)	81.86 (8.3)	0.816
Gender (female %) †	29 (78.4%)	57(65.5%)	114 (74.5%)	89 (70.6%)	133 (68.9%)	422 (70.8%)	0.559
Institutionalized†	3 (8.1%)	8 (9.2%)	10 (6.5%)	11(8.7%)	32 (16.6%)	64 (10.7%)	0.008**
Living alone†	19 (51.4%)	51(58.6%)	105 (68.6%)	59 (46.8%)	67 (34.7%)	301(50.5%)	0.000***
Comorbidity	8.78 (2.8)	10.61 (3.7)	11.12 (4.2)	11.65 (4.0)	12.27 (4.4)	11.39 (4.2)	0.000***
Medication use	5.92 (3.0)	6.25 (3.1)	6.71 (3.0)	7.16 (3.7)	6.87 (3.0)	6.74 (3.2)	0.139
Hospital stay duration	15.59 (6.0)	19.02 (9.4)	18.52 (9.3)	20.71(10.5)	19.24 (11.2)	19.11 (10.1)	0.084
MMSE category	2.44 (0.8)	2.50 (0.8)	2.40 (0.8)	2.57 (0.8)	3.31 (0.8)	2.71 (0.9)	0.000***
GDS	4.53 (2.4)	4.44 (3.3)	5.34 (3.2)	5.67 (3.5)	5.74 (3.4)	5.26 (3.3)	0.190
Barthel Index	75.54(25.3)	73.46 (16.7)	68.72 (19.6)	58.40 (21.8)	21.51(24.8)	52.31 (31.0)	0.000***
Tinneti-Balance	10.15 (3.5)	9.96 (3.6)	7.95 (2.9)	5.50 (2.5)	1.72 (2.2)	6.30 (4.1)	0.000***
Tinetti-Gait	10.88 (2.2)	10.19 (3.1)	9.47 (2.5)	7.85 (2.6)	0.74 (2.3)	7.18 (4.5)	0.000***
Tinetti-Total	20.97 (5.6)	19.96 (6.1)	17.28 (4.8)	13.34 (4.2)	2.61 (4.3)	13.41 (8.2)	0.000***

One way ANOVA mean (SD), † : Nonparametric Mann-Whitney U Test *** $P \leq 0.001$ ** $P \leq 0.01$ * $P \leq 0.05$

* : TUG5---“unable to walk” subgroup (including immobility, hemiplegia, and severe dementia cases).

4.1.6 The group of Tinetti-Total

Tinetti-total score is the sum of Tinetti-Balance and Tinetti-Gait scores. The summed scores of less than 18, 19-23, and more than 24 defined the subgroups high, moderate and low risk of falls, respectively. A total of 606 (69.6%) cases with valid Tinetti-Total score, in which 78.1% (n=473) cases showed a high risk of falls, 13.7% (n=83) were at moderate risk of falls, and 8.3% (n=50) was in low risk of falls. Socio-demographic data and functional measures are shown in Table 8. One-way ANOVA and nonparametric Mann-Whitney U Test were used to analyze the data. The results showed that with the increasing Tinetti-Total score, the MMSE category and TUG category decreased and the BI increased. Comorbidity, hospital duration and medication use decreased with increasing Tinetti-Total score. And the cases with moderate risk of falls were older than the subgroups with the higher risk, and lower risk of falls. Gender, living situation, and GDS were not statistically significant in this group.

Table 8. Socio-demographic data, functional measures of Tinetti-Total group

Cases (%)	TIN-Total 1 (≤18) 473 (78.1%)	TIN-Total 2 (19-23) 83 (13.7%)	TIN-Total 3 (≥24) 50 (8.3%)	Total 606 (100%)	p Value
Age (mean±SD)	81.98 (8.5)	83.28 (6.6)	78.32 (8.0)	81.85 (8.3)	0.003**
Gender (female %) †	337 (71.2%)	63 (75.9%)	34 (68.0%)	434 (71.6%)	0.794
Institutionalized†	60 (12.7%)	8 (9.6%)	3 (6.0%)	71 (11.7%)	0.144
Living alone†	227 (48.0%)	50 (60.2%)	27 (54.0%)	304 (50.2%)	0.055
Comorbidity	11.91 (4.2)	10.88 (4.1)	9.50 (4.6)	11.57 (4.3)	0.000***
Medication use	7.00 (3.2)	6.11 (2.9)	6.04 (3.4)	6.80 (3.2)	0.014*
Hospital stay duration	21.98 (11.9)	18.29 (9.2)	16.24 (8.3)	21.00 (11.5)	0.000***
MMSE category	2.77 (0.9)	2.47 (0.9)	2.34 (0.7)	2.68 (0.9)	0.001***
GDS	5.45 (3.4)	4.91 (3.2)	5.06 (2.7)	5.31 (3.3)	0.557
TUG category	3.83 (1.1)	2.75 (0.8)	2.00 (0.8)	3.44 (1.2)	0.000***
Tinetti-Balance	3.62 (2.7)	10.02 (1.6)	13.50 (1.2)	5.32 (4.1)	0.000***
Tinetti-Gait	4.15 (4.4)	10.59 (1.7)	12.38 (0.8)	5.73 (4.9)	0.000***
Barthel Index	40.66 (28.4)	70.12 (19.2)	85.21 (11.8)	48.24 (30.2)	0.000***

One way ANOVA mean (SD) †: Nonparametric Mann-Whitney U Test. *** $p \leq 0.001$ ** $p \leq 0.01$ * $p \leq 0.05$

4.1.7 Age group

A total of 871 dementia cases were classified into five age subgroups. 3.7% (n=33) cases were younger than 65 years, 13.4% (n=117) were 65-74 years, 43.5% (n=379) were 75-84 years, 36.5% (n=318) were 85-94 years, 2.9% (n=25) were 95 years and older. Similar descriptive statistics analysis of variance (One way ANOVA) and nonparametric Mann-Whitney U Test were used to analyze the data. Socio-demographic data and functional measures are shown in Table 9. The results showed that with age, MMSE category increased and Barthel index decreased. However, in mobility measures including TUG category, Tinetti-Balance, and Tinetti-Total, no linear age trend was observed. And a threshold between age subgroups 2 and 3 was found. From age subgroup 3 to 5, with age, TUG category increased, Tinetti-Balance and Tinetti-Total decreased. All mobility measures in relatively younger age subgroups 1 and 2 were worse than in older age subgroups. No linear relationship between comorbidity and age was found in this sample, and medication uses decreased with age. Additionally from age group 2, the percentage of females and the percentage of institutionalized cases and those living alone increased sharply with age. The oldest subgroup had a highest percentage of patients living alone. Hospital stay duration and GDS in this sample were not statistically significant.

Table 9. Socio-demographic data, cognitive and functional measures of age group

	Age-1 (<65)	Age-2 (65-74)	Age-3 (75-84)	Age-4 (85-94)	Age-5 (≥95)	Total	P Value
Cases (%)	32 (3.7%)	117 (13.4%)	379 (43.5%)	318 (36.5%)	25 (2.9%)	871 (100%)	
Age	61.16(3.7)	70.44(3.7)	80.39(2.7)	89.16(2.6)	96.04(1.2)	82.00(8.2)	0.000***
Gender (female %) †	14(43.8%)	50(42.7%)	263(69.4%)	263(82.7%)	23(92%)	613(70.4%)	0.000***
Institutionalized†	3(9.4%)	9(7.7%)	38(10.0%)	51(16%)	6(24%)	107(12.3%)	0.001***
Living alone†	12(37.5%)	38(32.5%)	173(45.6%)	173(54.4%)	15(60%)	411(47.2%)	0.000***
Comorbidity	11.66(3.9)	12.37(4.9)	11.75(4.6)	10.95(3.6)	11.76(2.9)	11.54(4.2)	0.020*
Medication use	7.38(3.7)	7.38(3.9)	6.96(3.1)	6.44(2.7)	5.68(1.9)	6.80(3.1)	0.008**
Hospital stay duration	19.53(11.6)	20.45(11.9)	19.68(11.5)	19.31(10.1)	21.52(19.4)	19.70(11.4)	0.820
MMSE category	2.50(0.8)	2.62(0.8)	2.62(0.9)	2.88(0.7)	3.25(0.9)	2.72(0.9)	0.001***
GDS	5.71(3.7)	5.85(3.4)	5.11(3.3)	5.28(3.5)	4.67(1.2)	5.32(3.4)	0.616
TUG Category	3.75(1.3)	3.77(1.2)	3.40(1.3)	3.69(1.2)	4.13(1.2)	3.59(1.3)	0.016*
Tinetti-Balance	5.88(4.7)	4.95(4.0)	6.03(4.4)	4.68(3.6)	3.94(4.0)	5.32(4.2)	0.002*
Tinetti-Gait	5.92(4.8)	5.24(4.8)	6.41(4.9)	5.29(4.8)	3.47(5.0)	5.73(4.9)	0.025*
Tinetti-Total	11.68(9.2)	10.12(8.4)	12.36(8.8)	9.97(8.0)	7.22(8.5)	10.99(8.5)	0.006**
Barthel Index	52.74(32.9)	47.11(29.5)	47.36(32.5)	43.49(30.1)	25.60(24.3)	45 47(31.2)	0.005**

One-way ANOVA mean±SD. †: Nonparametric Mann-Whitney U Test. *** $P \leq 0.001$ ** $P \leq 0.01$ * $P \leq 0.05$

4.1.8 Comorbidity group

A total of 871 dementia cases were classified into five comorbidity subgroups. 3.9% (n=34) cases suffered from less than five medical conditions, 42.6% (n=371) cases suffered from 6-10 medical conditions, 38.2% (n=333) cases suffered from 11-15 medical conditions, 11.5% (n=100) suffered from 16-20 medical conditions and 3.8% (n=33) suffered from more than twenty medical conditions. Similar descriptive statistics of analysis of variance and nonparametric Mann-Whitney U-Test were used to analyze the data. Socio-demographic data and functional measures are shown in Table 10. The results showed that with increasing comorbidity, medication use and hospital stay duration increased. And Barthel Index, Tinetti-Balance, Tinetti-Gait, Tinetti-Total decreased sharply and TUG category increased with increasing comorbidity. However, with increasing comorbidity, MMSE category decreased and GDS seemed to increase with an exception in 16-20 comorbidities subgroup. Although age varied significantly across the comorbidity subgroups, no linear relationship was observed between age and comorbidity. With increasing comorbidity the percentage of female decreased, the living situation was not statistically significant.

Table 10. The demographic data and functional measures of comorbidity group

Comorbidity Cases (%)	1-5 34 3.9%)	6-10 371 (42.6%)	11-15 333(38.2%)	16-20 100 (11.5%)	>20 33 (3.8%)	Total 871 (100%)	P value
Age (mean±SD)	80.38±8.4	82.84±7.6	81.81±8.8	81.29±8.0	78.2±6.8	82.00±8.2	0.010**
Gender (female %) †	26(76.5%)	291 (78.4%)	218 (65.5%)	57 (57.0%)	21 (63.6%)	613 (70.4%)	0.000***
Institutionalized†	8 (23.5%)	51 (13.7%)	37 (11.1%)	7 (7.0%)	4 (12.1%)	107 (12.3%)	0.101
Living alone (n/%) †	12 (35.3%)	184 (49.6%)	157 (47.1%)	42 (42.0%)	16 (48.5%)	411 (47.2%)	0.420
Medication Use	4.79±2.8	6.17±2.9	7.21±3.1	7.73±3.1	9.00±2.3	6.80±3.1	0.000***
Hospital duration	12.50±8.0	17.60±10.0	20.99±11.4	23.43±13.4	26.21±13.3	19.7±11.4	0.000***
MMSE category	3.24±0.7	2.75±0.9	2.72±0.9	2.60±0.9	2.46±1.0	2.72±0.9	0.024*
GDS	4.00±3.1	4.71±3.0	5.91±3.7	5.09±2.8	6.93±3.9	5.32±3.4	0.007**
TUG category	3.28±1.5	3.34±1.3	3.74±1.2	3.98±1.1	4.19±1.0	3.59±1.2	0.000***
Barthel Index	56.42±38.0	48.77±32.2	43.77±29.2	38.83±29.3	35.30±33.0	45.47±31.2	0.000***
Tinetti-Balance	9.45±5.3	5.91±4.1	4.81±3.8	4.13±3.7	3.80±4.0	5.32±4.1	0.000***
Tinetti-Gait	9.10±4.9	6.55±4.7	5.18±4.8	4.14±4.9	3.88±4.9	5.73±4.9	0.000***
Tinetti-Total	18.55±10.0	12.39±8.3	9.99±8.1	8.13±8.1	7.52±8.7	10.99±8.5	0.000***

One way ANOVA mean (SD) †: Nonparametric Mann-Whitney U Test. *** $p \leq 0.001$ ** $p \leq 0.01$ * $p \leq 0.05$

4.2 Correlation analysis

4.2.1 Correlations between functional measures

Based on descriptive statistics, a series of correlation analyses were conducted between functional measures. In order to rule out possible confounding factors such as age, gender, comorbidity, GDS, hospital stay duration and medication use, Pearson partial correlation analyses was performed. A number of computed correlation coefficients of the functional measures are presented in Table 11 and Figure 9.

Table11. Pearson partial correlation coefficients of functional measures

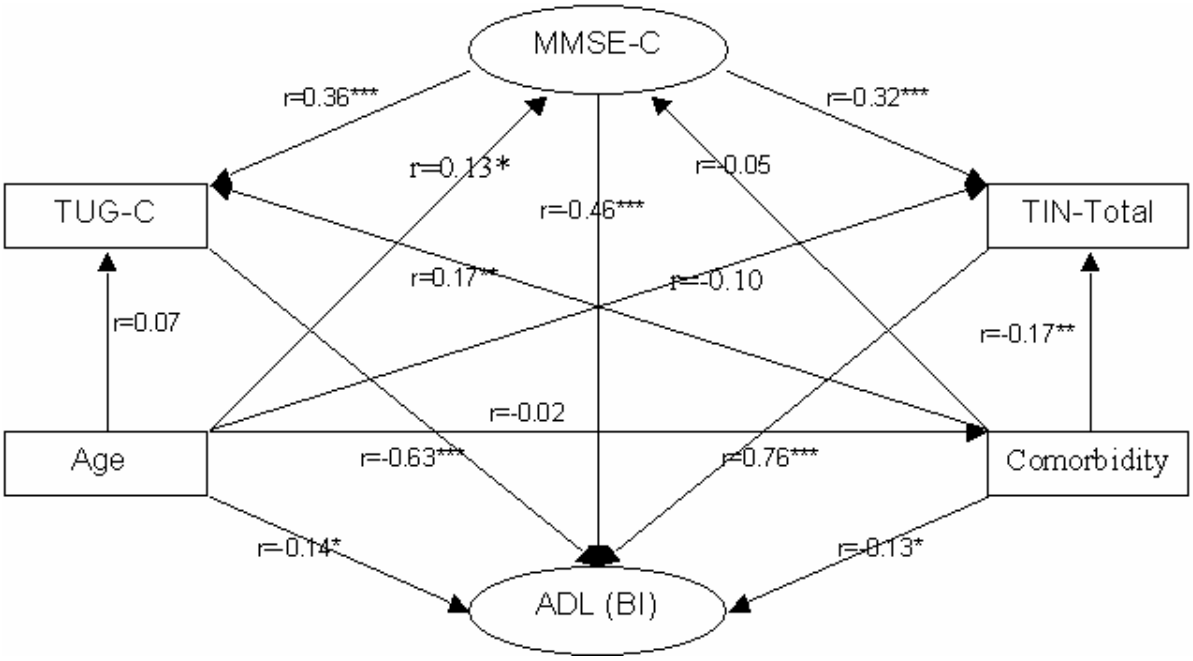
(adjusted for age, gender, comorbidity, hospital stay duration, medication use and GDS)

	MMSE-C	BI	TUG-C	TIN-Balance	TIN-Gait	TIN-Total
MMSE category	1.00	-0.46***	0.36***	-0.27***	-0.35***	-0.32***
Barthel Index		1.00	-0.63***	0.71***	0.73***	0.76***
TUG category			1.00	-0.71***	0.80***	-0.75***
Tinetti-Balance				1.00	0.80***	0.94***
Tinetti-Gait					1.00	0.95***
Tinetti-Total						1.00

*** $p \leq 0.001$ ** $p \leq 0.01$ * $p \leq 0.05$. TIN: Tinetti. C: category.

Figure 9. The relationship between basic ADL and mobility, age and comorbidity

(*** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$. TIN: Tinetti. C: category.)



4.2.2 Correlations between age, comorbidity, medication use, hospital stay duration, and functional measures

Correlation coefficients between age, comorbidity, hospital stay duration, medication use and functional measures were computed by using similar statistical procedures. The results are listed in Table12. It was observed that in this sample age was weakly

correlated with MMSE category, BI, Tinetti-Balance but not correlated with TUG category, Tinetti-Gait, or Tinetti-Total (adjusted for gender, comorbidity, hospital stay duration, medication use and GDS). Comorbidity was weakly correlated with BI and TUG category, Tinetti-Balance, Tinetti-Gait and Tinetti-Total but not correlated with MMSE category (controlled for age, gender, hospital stay duration, medication use and GDS). Hospital stay duration was weakly correlated with Tinetti-Balance, Tinetti-Gait and Tinetti Total but was not correlated with MMSE category, TUG category and BI. Medication use was not statistically significant.

4.2.3 Correlations between age, comorbidity, medication use, and hospital stay duration

Univariate analyses revealed that age was weakly correlated with comorbidity(r=-0.09, p=0.010) and medication use (r=-0.12, p=0.000). And comorbidity was weakly correlated with hospital duration (r=0.25, p=0.000) and medication use (r=0.27, p=0.000). After adjusted for age, comorbidity was still correlated with hospital stay duration (r=0.25, p=0.000) and medication use (r=0.26, p=0.000). And after adjusting for comorbidity, age was correlated with medication use (r=-0.10, p=0.003). After adjusted for GDS, medication use and hospital stay duration, age was not correlated with comorbidity (r=-0.06, p=0.244). Correlation analyses revealed that GDS was not significantly correlated with any other variables in this sample.

Table12. Pearson partial correlation coefficients of Age, Comorbidity, Hospital stay duration, Medication use and functional measures

	Age†	Comorbidity†	Hospital stay duration†	Medication use†
MMSE category	0.13*	-0.05	-0.01	-0.05
TUG category	0.07	0.17**	0.01	0.03
Tinetti-Balance	-0.12*	-0.12*	-0.17**	-0.08
Tinetti-Gait	-0.08	-0.16**	-0.19**	-0.06
Tinetti-Total	-0.10	-0.17**	-0.19**	-0.07
Barthel Index	-0.14**	-0.13*	-0.05	-0.01

*** $p \leq 0.001$ ** $p \leq 0.01$ * $p \leq 0.05$. †: Adjusted variables see the text.

4.3 Regression analysis

In order to further explore the independent contributions of cognition, mobility, age, and comorbidity to the functional status of patients with dementia, a series of multiple

regression analyses were conducted. BI, TUG category and Tinetti-Total were regarded as dependent variables and other relevant variables were regarded as independent variables to predict basic ADL (BI) and mobility measures one by one.

4.3.1 Cognitive function predicts basic ADL (BI)

First we use MMSE category as an independent variable to predict BI (named model 1), the standardized coefficient (ß) of MMSE category was -0.45. When the main confounders age and comorbidity are entered into the analysis model (named model 2), the ß of MMSE category was -0.46, and the ß of age was -0.07, and the ß of comorbidity was -0.19. Further mobility measure of TUG category was entered into the model (named model 3), the ß of MMSE category was -0.27, and the ß of TUG category reached -0.53. These results showed that basic ADL (BI) is explained better by mobility measures (TUG category) than by cognitive measures (MMSE category). In order to provide further proof that mobility has a greater impact on basic ADL (BI), Tinetti-Total was used in the analysis model instead of TUG category (named model 4), the ß of MMSE category was -0.25, and the ß of Tinetti-Total was 0.68. The results of cognitive prediction of ADL (BI) are given in Table13.

4.3.2 Mobility predicts basic ADL

Further multiple regression analyses of mobility measures predicting basic ADL (BI) were done. The results revealed that mobility measures predict basic ADL (BI) better than cognitive function did in the present study. TUG category alone predicts BI (named model 5), the ß of TUG category was -0.64. While age and comorbidity were entered into the analysis model (named model 6), the ß of TUG category remained -0.63, the ß of age was -0.10 and comorbidity was not statistically significant. We used Tinetti-Total to predict BI (named model 7), the ß of Tinetti-Total was 0.76. When age and comorbidity were entered into the model (named model 8), the ß of Tinetti-Total remained 0.76, the ß of age was -0.06 and comorbidity was not statistically significant. The results of mobility predicting BI are shown in Table 13.

4.3.3 Cognitive function predicts mobility

The results of multiple regression analyses revealed that both cognitive function and mobility can be independent predictors of basic ADL (Barthel Index). Basic ADL (BI) is

explained better by mobility measures than by cognitive measure (MMSE category). Correlation analyses revealed that the cognitive measure correlated with mobility measures. In order to explore the contribution of cognitive function to mobility, further multiple regression analyses were conducted by using MMSE category to predict TUG category and Tinetti-Total. The results are shown in Table 14. We use MMSE category to predict TUG category (named model 9), the standardized coefficient (ß) of MMSE category was 0.34. When age and comorbidity were entered into the model (named model 10), the ß of MMSE category remained 0.35, the ß of comorbidity was 0.23 and age was not statistically significant. Further using MMSE category predicts Tinetti-Total (named model 11), the ß of MMSE category was -0.29. When age and comorbidity were entered into model (named model 12), the ß of MMSE category was -0.31, the ß of comorbidity was -0.27, and age was not statistically significant.

Table 13. The results of cognition and mobility predicting basic ADL (Barthel Index)

Dependent variable(BI)	R	R^2	Adjusted R^2	df	F	p (model)	ß	p (ß)
Model 1:	0.45	0.21	0.20	1	172.32	0.000	-0.45 (MMSE)	0.000
Model 2:	0.49	0.24	0.24	3	71.50	0.000	-0.46 (MMSE)	0.000
							-0.19 (comorbidity)	0.000
							-0.07(age)	0.042
Model 3:	0.69	0.48	0.48	4	116.81	0.000	-0.27 (MMSE)	0.000
							-0.53 (TUG)	0.000
							-0.07 (comorbidity)	0.053
							-0.07(age)	0.035
Model 4:	0.80	0.64	0.63	4	212.27	0.000	-0.25 (MMSE)	0.000
							0.68 (Tinetti-Total)	0.000
							-0.03 (age)	0.220
							-0.01 (comorbidity)	0.869
Model 5:	0.64	0.41	0.41	1	406.91	0.000	-0.64 (TUG)	0.000
Model 6:	0.65	0.42	0.42	3	141.32	0.000	-0.63 (TUG)	0.000
							-0.10 (age)	0.001
							-0.03 (comorbidity)	0.407
Model 7:	0.76	0.58	0.58	1	818.05	0.000	0.76 (Tinetti-Total)	0.000
Model 8:	0.76	0.58	0.58	3	277.69	0.000	0.76 (Tinetti-Total)	0.000
							-0.06 (age)	0.019
							0.031 (comorbidity)	0.256

Table14. The results of cognition predicting mobility (TUG, Tinetti-Total)

Dependent variable (TUG category)	R	R^2	Adjusted R^2	df	F	p (model)	ß	p (ß)
Model 9:	0.34	0.11	0.11	1	64.77	0.000	0.34 (MMSE)	0.000
Model 10:	0.41	0.17	0.16	3	33.98	0.000	0.35 (MMSE)	0.000
							0.23 (comorbidity)	0.000
							0.00 (age)	0.979
Dependent variable (Tinetti-Total)								
Model 11:	0.29	0.09	0.08	1	46.08	0.000	-0.293 (MMSE)	0.000
Model 12:	0.40	0.16	0.15	3	30.77	0.000	-0.31 (MMSE)	0.000
							-0.27 (comorbidity)	0.000
							-0.05 (age)	0.221