

Supplementary Table 1. Baseline functional performance of nursing home residents, by required care level

Baseline functional performance	Required Care Level 3 (n=239, 23.9%)	Required Care Level 4 (n=395, 39.5%)	Required Care Level 5 (n=366, 36.6%)	Total (n=1,000)
ADL				
1. Basic posture control				
1-1 Maintaining standing position	42.90%	14.90%	6.20%	18.40%
1-2 Moving between sitting positions	76.90%	44.20%	17.90%	42.30%
1-3 Maintaining sitting position (without assistance)	68.80%	36.10%	11.80%	34.90%
1-4 Rolling over	81.70%	54.80%	20.80%	48.70%
2. Walking and moving function				
2-1 Going out	1.70%	1.00%	0.60%	1.00%
2-2 Climbing up and down	4.30%	0.30%	0.80%	1.40%
2-3 Stable walking	42.90%	14.80%	3.90%	17.50%
2-4 Moving within facility	85.30%	61.70%	31.40%	56.20%
3. Eating function - Swallowing				
3-1 Chewing	76.60%	53.40%	24.10%	48.30%
3-2 Sucking	86.00%	70.20%	39.40%	62.80%
3-3 Swallowing (solid)	92.20%	81.20%	53.60%	73.80%
3-4 Swallowing (specialty processed food)	93.40%	82.30%	70.90%	80.60%
4. Eating function – Feeding and feeding assistance				
4-1 Feeding him/herself	71.40%	47.40%	13.30%	40.90%
4-2 Dropping food and making mess	68.10%	68.90%	31.50%	54.80%
4-3 Special arrangement for feeding	29.60%	49.10%	56.80%	47.10%
4-4 Direct assistance for feeding	8.70%	22.50%	64.80%	34.60%
5. Toileting function				
5-1 Post-release cleanup	50.60%	28.20%	16.90%	29.40%
5-2 Dressing and undressing	56.50%	18.60%	4.20%	22.30%
5-3 Getting on and off western type toilet	65.20%	48.00%	19.10%	41.40%
5-4 Releasing on bed	17.90%	34.40%	49.40%	36.00%
6. Bathing function				
6-1 Stable movement in and out of bathtub and washing.	16.20%	3.40%	1.10%	5.60%
6-2 Bathing without assistance	7.50%	3.70%	0.90%	3.50%
6-3 Maintaining sitting position during bathing	74.30%	52.00%	20.10%	45.70%
6-4 Carrying out bathing	50.70%	70.20%	89.20%	72.60%
7. Personal care function - Oral care				
7-1 General oral care	48.70%	26.00%	6.50%	24.30%
7-2 Brushing teeth	39.30%	15.90%	4.00%	17.10%
7-3 Preparation for brushing teeth	66.40%	45.00%	14.70%	38.80%
7-4 Rinsing mouth	79.20%	58.30%	20.50%	49.00%
8. Personal care function – Self-care				
8-1 Trimming nails	3.90%	2.90%	1.10%	2.50%
8-2 Shaving, skincare, hair care	48.30%	27.20%	5.40%	24.30%
8-3 Washing face	71.90%	47.00%	14.40%	41.00%
8-4 Washing hands	55.00%	35.00%	9.10%	30.30%
Cognitive Functions				
9. Orientation				
9-1 Date	43.30%	22.00%	7.60%	21.80%
9-2 Name of place	48.10%	31.70%	11.20%	28.00%
9-3 Orientation toward other people	84.50%	69.80%	36.60%	61.20%
9-4 Own name	98.20%	89.80%	59.00%	80.50%
10. Communication				
10-1 Maintaining complicated human relationship	54.10%	36.80%	12.90%	32.20%
10-2 Understanding of written language	70.10%	50.80%	17.90%	43.30%
10-3 Everyday conversation	60.60%	46.60%	18.90%	39.80%
10-4 Understanding of spoken language	82.00%	74.40%	40.60%	63.80%
11. Cognitive function				
11-1 Time management	38.20%	24.00%	6.50%	21.00%
11-2 Simple arithmetic	57.60%	36.00%	10.40%	31.70%
11-3 Long-term memory	44.20%	35.10%	12.40%	28.90%
11-4 State of consciousness	5.60%	7.60%	5.70%	6.40%
Social Participation				
12. Leisure				
12-1 Traveling	1.30%	11.10%	0.60%	0.50%
12-2 Conducting personal hobby activities	22.00%	56.90%	3.40%	10.90%
12-3 Group Recreation	73.00%	63.70%	30.20%	51.00%
12-4 Watching TV	75.00%	4.50%	38.40%	57.10%
13. Socializing				
13-1 Socializing using means of communication devices	10.00%	7.10%	2.30%	5.00%
13-2 Going out	11.40%	35.20%	4.90%	7.30%
13-3 Conversing with friend	50.90%	87.10%	15.50%	31.70%
13-4 Conversing with someone close	96.90%	96.90%	51.90%	76.50%

Proportion of residents capable of each ICF Staging item both in the overall analysis cohort and within residents with a specific required care level. A higher required care level is associated with more limited ability in most items of functional performance. ADLs = Activities of Daily Living

Supplementary Table 2. Care staff's responses

	Median (Interquartile Range)
Global Happiness	
Are you happy? (0-10, not happy to very happy)	7 (6-8)
Job Satisfaction	
To what extent are you satisfied with you work? (1-6, not at all to extremely)	4 (4-5)
Career rewards	
How rewarding is your work? (1-6, not at all to etremely)	5 (4-5)
Frequency of Intentions to leave	
How often do you feel you want leave from the current care facilities? (1-4, often to not at all)	2 (2-3)
Quality of care at the nursing home	
To what extent are you satisfied with the quality of care provided at the nursing home at which you work? (1-5, not at all to etremely)	4 (3-4)
To what extent would you recommend this nursing home at which you work to your family and friends? (1-5, not at all to extremely)	4 (3-4)

Distribution of care staff's responses (N=412). This analysis was conducted in the unit of care staff members, not residents. Responses to the questions regardng global happiness and job stisfaction were summarized at each facility and used in the following correlation analysis.

Supplementary Table 3. Global happiness and job satisfaction of care staff

	Required Care Level 3 (n=239, 23.9%)	Required Care Level 4 (n=395, 39.5%)	Required Care Level 5 (n=366, 36.6%)	Total (n=1,000)
Job Satisfaction	47.70%	51.40%	51.90%	50.70%
Global Happiness	59.00%	55.40%	47.80%	53.50%

Distribution of care staff's responses. This analysis was conducted in the unit of residents (N=1,000). Job satisfaction and happiness are represented by facility-level binary indicators (1 if the proportion of above-threshold responses is equal to or above the across-facilities median, 0 if it is below median). Note that these responses do not reflect experience of care workers with each resident, but their overall experience at the facility.

Supplementary Table 4. Occurrence of the risk events in six months, by required care level

Risk events	Required Care Level 3 (n=239, 23.9%)	Required Care Level 4 (n=395, 39.5%)	Required Care Level 5 (n=366, 36.6%)	Total (n=1,000, 100.0%)
Falls	22.60%	13.90%	12.80%	15.60%
Pressure ulcers	1.70%	2.80%	2.70%	2.50%
Aspiration pneum	1.70%	2.30%	2.70%	2.30%
Fever	17.60%	15.20%	22.10%	18.30%

The most common undesirable risk events among the residents in the six-month period of observation were fever (18.3%) and falls (15.6%). Incidence of new pressure ulcers and aspiration pneumonia were relatively low.

Supplementary Table 5. Overlap of improvement and deterioration

	Required Care Level 3 (n=239, 23.9%)			Required Care Level 4 (n=395, 39.5%)			Required Care Level 5 (n=366, 36.6%)			Total (n=1,000, 100.0%)		
	Improved	Not improved	Total	Improved	Not improved	Total	Improved	Not improved	Total	Improved	Not improved	Total
Deteriorated	10.9%	16.7%	27.6%	6.1%	16.7%	22.8%	4.9%	15.3%	20.2%	6.8%	16.2%	23.0%
Not deteriorated	8.8%	63.6%	72.4%	6.1%	71.1%	77.2%	3.8%	76.0%	79.8%	5.9%	71.1%	77.0%
Total	19.7%	80.3%	100.0%	12.2%	87.9%	100.0%	8.7%	91.3%	100.0%	12.7%	87.3%	100.0%

The number shows the percentage of each subgroup by required care levels.

Supplementary Table 6a. Correlation of deterioration in functional performance with resident features and risk events

	Required Care Level 3 (n=239, 23.9%)	Required Care Level 4 (n=395, 39.5%)	Required Care Level 5 (n=366, 36.6%)	Total (n=1,000)
Resident features				
Sex				
Male	0.64 (0.31-1.34)	1.49 (0.86-2.60)	1.33 (0.69-2.53)	1.17 (0.81-1.68)
Age groups, in years				
<80	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
80-84	2.09 (0.67-6.49)	0.57 (0.23-1.43)	0.58 (0.23-1.52)	0.82 (0.48-1.42)
85-89	1.31 (0.46-3.73)	1.01 (0.51-2.02)	1.07 (0.49-2.32)	1.09 (0.69-1.73)
90-94	1.36 (0.48-3.79)	0.90 (0.43-1.88)	1.62 (0.74-3.53)	1.23 (0.77-1.95)
95+	2.93 (0.90-9.60)	1.33 (0.63-2.81)	1.46 (0.60-3.55)	1.62 (0.97-2.71)
Risk events				
Fall	2.20 (1.16-4.18)	2.00 (1.08-3.70)	2.60 (1.35-5.04)	2.31 (1.60-3.33)
Pressure ulcers	2.67 (0.37-19.4)	1.98 (0.57-6.92)	-	1.06 (0.42-2.68)
Aspiration pneumonia	2.67 (0.37-19.4)	7.19 (1.76-29.40)	0.43(0.05-3.45)	2.20 (0.94-5.15)
Fever	2.33 (1.17-4.65)	1.72 (0.94-3.15)	1.53 (0.86-2.74)	1.74 (1.22-2.48)

Unadjusted odds ratios, obtained through bivariate correlation analysis, with their 95% confidence intervals.

Residents who had either a fall or fever were more likely to deteriorate.

Odds ratios of care staff job satisfaction and global happiness are presented in Tables 4a.

Supplementary Table 6b. Multivariable logistic regression analysis for deterioration in residents' functional performance

	Required Care Level 3 (n=239, 23.9%)	Required Care Level 4 (n=395, 39.5%)	Required Care Level 5 (n=366, 36.6%)	Total (n=1,000)
Resident features				
Sex				
Male	0.71 (0.32-1.61)	1.43 (0.78-2.62)	1.70 (0.85-3.40)	1.31 (0.89-1.93)
Age groups, in years				
<80	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
80-84	1.88 (0.57-6.28)	0.51 (0.20-1.34)	0.64 (0.24-1.34)	0.84 (0.48-1.47)
85-89	1.16 (0.38-3.52)	0.84 (0.40-1.76)	1.18 (0.53-2.65)	1.07 (0.66-1.72)
90-94	1.42 (0.41-4.98)	0.89 (0.40-1.97)	1.83 (0.81-4.15)	1.25 (0.77-2.04)
95+	2.08 (0.57-7.55)	1.20 (0.53-2.70)	1.47 (0.58-3.73)	1.54 (0.90-2.64)
Risk events				
Fall	2.12 (1.06-4.29)	2.08 (1.06-4.07)	2.38 (1.19-4.79)	2.25 (1.54-3.29)
Pressure ulcers	1.25 (0.13-11.67)	1.92 (0.50-7.45)	0.26 (0.03-2.25)	0.90 (0.34-2.38)
Aspiration pneumonia	2.71 (0.34-21.49)	5.25 (1.14-24.27)	-	1.40 (0.57-3.39)
Fever	2.79 (1.27-6.10)	1.69 (0.86-3.35)	0.66 (0.87-3.18)	1.81 (1.24-2.66)

Adjusted odds ratios, obtained through multivariable logistic regression analysis, with their 95% confidence intervals.

The adjusted odds ratios of care staff's job satisfaction and happiness are presented in Table 4b.

Supplementary Table 7a. Correlation of improvement in functional performance with resident features and risk events

	Required Care Level 3 (n=239, 23.9%)	Required Care Level 4 (n=395, 39.5%)	Required Care Level 5 (n=366, 36.6%)	Total (n=1,000)
Resident features				
Sex				
Male	0.82 (0.37-1.83)	1.55 (0.78-3.10)	1.42 (0.59-3.45)	1.27 (0.81-1.99)
Age groups, in years				
<80	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
80-84	2.25 (0.61-8.23)	2.37 (0.79-7.10)	1.31 (0.34-5.10)	2.00 (0.99-4.03)
85-89	1.65 (0.50-5.52)	1.45 (0.52-4.04)	1.60 (0.47-5.40)	1.66 (0.86-3.18)
90-94	1.65 (0.50-5.41)	1.02 (0.33-3.18)	2.15 (0.63-7.33)	1.75 (0.90-3.39)
95+	1.18 (0.26-5.28)	3.19 (1.15-8.84)	1.92 (0.49-7.55)	2.29 (1.13-4.63)
Risk events				
Fall	2.37 (1.19-4.76)	2.05 (0.97-4.31)	2.06 (0.84-5.07)	2.36 (1.53-3.65)
Pressure ulcers	4.22(0.58-30.79)	0.72 (0.09-5.73)	1.16 (0.14-9.50)	1.32 (0.45-3.91)
Aspiration pneumonia	1.37 (0.14-13.47)	2.11 (0.43-10.47)	-	1.03 (0.30-3.52)
Fever	2.15 (1.01-4.56)	0.78 (0.31-1.91)	1.19 (0.51-2.76)	1.24 (0.78-1.96)

Unadjusted odds ratios, obtained through bivariate correlation analysis, with their 95% confidence intervals.

Residents who had a fall were more likely to improve than those who did not have a fall, which might be partly because of rehabilitation after the fall.

Odds ratios of care staff job satisfaction and global happiness are presented in Tables 4b.

Supplementary Tabel 7b. Multivariable logistic regression analysis for improvement in residents' functional performance

	Required Care Level 3 (n=239, 23.9%)	Required Care Level 4 (n=395, 39.5%)	Required Care Level 5 (n=366, 36.6%)	Total (n=1,000)
Resident features				
Sex				
Male	1.05 (0.44-2.51)	2.04 (0.95-4.40)	1.87 (0.74-4.76)	1.52 (0.95-2.45)
Age groups, in years				
<80	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
80-84	2.10 (0.54-8.09)	3.06 (0.97-9.75)	1.45 (0.36-5.87)	2.24 (1.09-4.60)
85-89	1.55 (0.45-5.42)	1.72 (0.58-5.11)	1.85 (0.53-6.53)	1.75 (0.90-3.43)
90-94	1.42 (0.41-4.98)	1.50 (0.44-5.07)	2.62 (0.73-9.35)	1.94 (0.98-3.85)
95+	0.80 (0.16-4.13)	5.12 (1.65-15.88)	2.13 (0.52-8.73)	2.38 (1.14-4.96)
Risk events				
Fall	2.08 (0.98-4.45)	2.10 (0.92-4.83)	1.97 (0.77-5.08)	2.36 (1.51-3.70)
Pressure ulcers	2.86 (0.32-25.16)	0.70 (0.07-6.94)	1.39 (0.77-5.08)	1.07 (0.35-3.26)
Aspiration pneumonia	1.46 (0.13-16.49)	2.75 (0.45-16.79)	-	0.78 (0.22-2.81)
Fever	2.00 (0.86-4.67)	0.51 (0.19-1.38)	1.30 (0.53-3.21)	1.15 (0.70-1.87)

Adjusted odds ratios, obtained through multivariable logistic regression analysis, with their 95% confidence intervals.

The adjusted odds ratios of care staff's job satisfaction and happiness are presented in Table 5b.

Supplementary Table 8a. Correlation between deterioration in subdomains of functional performance and staff QWL

	ADL	Cognitive Function	Social Participation
Job Satisfaction	0.91 (0.65-1.28)	0.80 (0.48-1.32)	0.86 (0.61-1.20)
Global Happiness	0.72 (0.52-1.02)	0.86 (0.52-1.42)	0.92 (0.55-1.56)

Appendix Table 8b. Correlation between improvement in subdomains of functional performance and staff QWL

	ADL	Cognitive Function	Social Participation
Job Satisfaction	0.99 (0.62-1.59)	1.06 (0.56-2.01)	1.97 (0.89-4.36)
Global Happiness	1.06 (0.66-1.69)	0.71 (0.37-1.34)	1.06 (0.73-1.54)

Unadjusted odds ratios, obtained through bivariate correlation analysis, with their 95% confidence intervals.

Job satisfaction and happiness are represented by facility-level binary indicators (1 if the proportion of above-threshold responses is equal to or above the across-facilities median, 0 if it is below median).

These analyses were for seeking a specific subdomain of functional performance which was correlated with care staff's job satisfaction or happiness. However, no significant correlation was observed in the subdomains, presumably due to limited number of events (limited number of residents with deterioration in each of the subdomains).

Supplementary Table 9. Results of bivariate correlation analysis and multivariable logistic regression analysis

Deterioration of residents' functional performance		
	Care staff's job satisfaction and happiness	Resident features and risk events
Bivariate correlation analysis	Table 4a	Supplementary Table 6a
Multivariable logistic regression analysis	Table 4b	Supplementary Table 6b
Bivariate correlation analysis (subdomains of functional performance)	Supplementary Table 8a	
Improvement of residents' functional performance		
	Care staff's job satisfaction and happiness	Resident features and risk events
Bivariate correlation analysis	Table 5a	Supplementary Table 7a
Multivariable logistic regression analysis	Table 5b	Supplementary Table 7b
Bivariate correlation analysis (subdomains of functional performance)	Supplementary Table 8b	