International Journal of General Medicine

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ORIGINAL RESEARCH

A Pilot Study of the Effects on an Inpatient Geriatric Consultation Team on Geriatric Syndrome Patients

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Purpose: To evaluate the effect of comprehensive geriatric assessment performed by an inpatient aging consultation team on older patients with geriatric syndromes.

Methods: Fifty-nine patients with ≧65 years, Barthel Index score ≦60, at least one geriatric syndrome, and admitted to non-geriatric wards were enrolled. By their preference, 16 were in the intervention group with comprehensive geriatric assessment and instructions from the consultation team. And 43 were in the control group, receiving standard care from non-geriatric-specialist physicians. Outcomes were readmission and mortality within one year after discharge.

Results: The mean age of the intervention and control groups was 78.35 (8.54) and 80.23 (6.36) years (p = 0.36), with female of 62.5% and 60.5%, respectively. Compared to control, intervention is not significantly associated with attenuated risk for readmission (adjusted hazard ratio (aHR): 0.256, 95% confidence interval (CI): 0.12–1.78, p = 0.256) and mortality (aHR: 2.13, 95% CI: 0.29–15.7, p = 0.457) within one year after discharge. Multivariate analysis showed that patients with a fall history ≧1 in the past one year had a lower risk of readmission (aHR: 0.28, 0.07–0.6, p = 0.004) or mortality (aHR: 0.11, 95% CI: 0.01–0.97, p = 0.047), and disability is associated with mortality (aHR: 5.37, 95% CI: 0.87–33.12, p = 0.07).

Conclusion: Intervention is not significantly associated with outcomes in our pilot study. But fall history ≧1 in the recent one year is associated with a lower risk of readmission and mortality among all included patients. More participants and longer follow-up are needed for better elucidation.

Keywords: comprehensive geriatric assessment, inpatient geriatric consultation team, geriatric syndrome, readmission rate, mortality rate

Introduction

Aging is an inevitable process. In Taiwan, the population over 65 years of age is increasing yearly, from 13.86% of the whole population in December 2017 to 16.49% in August 2021.[1] The proportion of older persons admitted to hospitals or long-term care facilities is also increasing.[2] Compared with adult patients, elderly patients more often suffer from multimorbidity of chronic diseases and their illnesses have complexity. Once they become admitted to the hospital, they are at high risk of adverse events, prolonged hospital stays, readmission, and requirement for long-term healthcare, consequently leading to heavy medical overload.[3–5] Therefore, integrated medical intervention beforehand is needed to resolve this dilemma. There is considerable evidence on assessing and recognizing geriatric conditions for older patients with complex needs using comprehensive geriatric assessment (CGA).[6] CGA, defined by Rubenstein et al, is a multi-dimensional and multidisciplinary diagnostic process.[7] It collects various geriatric demands on the medical, psychosocial, and functional capabilities dimensions and offers integrated assessment for geriatric care.

Received: 2 March 2022
Accepted: 27 April 2022
Published: 17 May 2022

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CGA for older patients admitted to geriatric wards who are cared for by geriatric specialists has proven beneficial,[8–10] but the clinical outcomes remain controversial.[11,12] There was a significant decrease in hospital stays (LOS) length, but no alteration in readmission rate after CGA with interdisciplinary inpatient care plans was reported.[13] A systematic review and meta-analysis of the impact of inpatient geriatric consultation team (IGCT) on clinical outcome in acute hospitals found a significant reduction in mortality rate at 6 and 8 months post-discharge, but no impact on functional status, readmission, and LOS.[14] Fewer readmissions were reported by intervention with IGCT.[15,16] In contrast, some studies showed that IGCT did not have a significant effect on reducing mortality.[17–20] However, an assessment alone is not likely to change outcomes, but helps with the clinical decision-making based on this more comprehensive assessment and the delivery of service provision more suited to individual patient needs.

In Taiwan, most hospitals do not have a geriatric ward, and frail older patients are admitted to non-geriatric wards and cared for by non-geriatric subspecialists. The purpose of this pilot study is to evaluate the effects of CGA performed by IGCT on elderly patients with geriatric syndromes admitted to non-geriatric wards. We also assessed the feasibility of the recruitment and randomization processes.

Materials and Methods

Participants

This is a single-center, prospective, observational pilot study. Patients admitted to acute ordinary wards in our medical center from an elder-integrated outpatient department or emergency room from January 2017 to December 2017 were enrolled. The inclusion criteria were: (i) age 65 years or older, (ii) Barthel index[21] score ≦60 and (iii) with at least one of the following geriatric syndromes: 1) unsteady gait or easy-to-fall (fall≧1 in last 1 year);[22,23] 2) malnutrition with Mini Nutritional Assessment–Short Form (MNA®-SF)[24] screening score < 12;3) urinary incontinence; 4) pressure injury; 5) dementia, delirium, or depression; 6) polypharmacy (≧8 medications); 7) excessive utilization of health-care facilities (admission ≧2, visit emergency ≧2, or visit outpatient department ≧12 in one month). Exclusion criteria were: 1) in a vegetative state; 2) under palliative care, terminally ill, or suffering from acute illness needing to be transferred to or cared for in the Intensive Care Unit.

Procedures

Our multidisciplinary team included a geriatric physician, a social worker, a nutritionist, and a physical therapist. The multidisciplinary intervention program included geriatric consultation services, CGA and integrated-planning discharge services; whereas current routine care of elderly patients admitted to ordinary wards in Taiwan usually has neither continuity of care nor a well-organized multidisciplinary approach. A research assistant screened the admission list every day to recruit participants who met the inclusion criteria. The assistant then presented the research to patients and their families. This study was approved by the Chang Gung Medical Foundation Institutional Review Board (IRB No.: 201601508B0) and carried out in accordance with the Declaration of Helsinki. Informed consent was signed after the participants and/or family agreed. For patients who were cognitively impaired or suffered from dementia, informed consent was signed by their family. In the intervention group, the geriatric physician was consulted and made instructions to patients, family members and the original care team after a complete CGA. The CGA includes the assessment of depression by using Geriatric Depression Scale (GDS 15),[25] dementia by Mini-Cog,[26] physical performance of Activity of Daily Living (ADL) by Barthel Index, and nutrition by Mini Nutritional Assessment–Short Form (MNA®-SF), respectively. The participants in the control group only received routine hospital care and were not seen by a geriatric physician. The participant's baseline data and clinical problems were filed by the case manager nurse. Following discharge, the participant's condition was evaluated over the phone. If a participant in the intervention group was on nasogastric tube feeding or a Foley catheter, had a tracheostomy, or had activity limitations, home care was arranged.

Outcome Indicators

The primary outcome was the unplanned readmission within one year after discharge. The secondary outcome was death within one year after discharge. Both were identified in inpatient, 1, 3, 6 months and 1 year after discharge.

Statistical Analysis

Continuous data with a normal distribution were analyzed by Student's *t*-test and are presented as the mean (standard deviation); those without a normal distribution are presented as the median (interquartile range (IQR)) and were analyzed by the Wilcoxon rank-sum test. The normal distribution of variables was tested by the Shapiro–Wilk test. Categorical data were performed as the chi-square test or Fisher's exact test and presented as n (%), as appropriate. Cox proportional hazards regression models were used to estimate the hazard ratio (HR) and 95% confidence intervals (CIs) of the risk of readmission and mortality in the first year after discharge. As for multivariate analysis, we chose the related variables with group and outcomes in univariate analysis of p value <0.15 into the Cox proportional hazards regression models. The differences between two groups in the cumulative incidence curve for one-year readmission and mortality were tested by the Gray's test. All statistical analyses were analyzed with SAS 9.4 (SAS Institute, Cary, NC, USA). A two-sided p value of 0.09 was considered significant.

Results

A total of 59 patients were included, with 16 in the intervention group and 43 in the control group. The mean age of the intervention and control groups was 78.35 (8.54) and 80.23 (6.36) years, with females of 62.5% and 60.5%, respectively. There were no significant differences in age, sex, and the listed geriatric syndromes between groups (Table 1). No significant difference in the median (interquartile range) LOS in the acute ordinary wards was displayed between the intervention group and the control group (11 [10.0–17] days vs.12 [7.0–18.0] days, p = 0.765).

Readmission in the First Year

There were 36 patients coming back to hospital within one year after discharge. The intervention group had a lower rate than the control group (43.75% vs 67.44%, P = 0.097, data not shown). Table 2 shows crude and adjusted HRs for readmission in the first year between groups. In the univariate analysis, there was no significant effect of intervention group on readmission in first year (HR: 0.52, 95% CI: 0.23–1.20, p = 0.124), whereas the older age (HR: 0.94, 95% CI: 0.89–0.98, p = 0.007), higher BMI (HR: 0.91, 95% CI: 0.84–1.00, p = 0.046), and stool incontinence (HR: 2.16, 95% CI: 1.06–4.39, p = 0.034) displayed significant effects for readmission. For better elucidation, we performed a multivariate analysis that combined the variables of p < 0.15 in Table 1 and those in the univariate analysis in Table 2 in the model. After adjusted the related covariates, "fall history ≧1 in recent 1 y" was the very factor affecting the outcome (adjusted HR (aHR): 0.20, 95% CI, 0.07–0.60, p = 0.004).

Figure 1 shows the cumulative incidence curves for 1-year readmission and stratified by "fall history ≧1 in recent 1 y" between the two groups. No significant difference between two groups is observed in the rate of readmission within one year after discharge (p = 0.12, Figure 1).

Mortality in the First Year

There were 9 patients died in one year after discharge. The intervention group had a lower rate than the control group (12.50% vs 16.28%, p = 1.000, data not shown). Table 3 shows crude and adjusted HRs for mortality in the first year between the two groups. In the univariate analysis, there was no significant effect of intervention group on mortality in first year (HR: 0.73, 95% CI: 0.15–3.52, p = 0.696), but disability patients had 4.87-fold mortality risk in one year (95% CI: 1.01–23.47, p = 0.049). Again, we performed a multivariate analysis combining the variables with p value <0.15 in Table 1 and those in Table 3 in the model. It shows "fall history ≧1 in recent 1 y" (aHR: 0.11, 95% CI: 0.01–0.97, p = 0.047) and disability (aHR: 5.37, 95% CI: 0.87–33.12, p = 0.07) as factors affecting the outcome.

Figure 2 shows the cumulative incidence curves for 1-year mortality and stratified by "Fall history ≧1 in recent 1 y" between two groups. No significant difference between the two groups is observed in the survival within one year after discharge (p = 0.69, Figure 2).

Table 1 Patient Characteristics

Variable	Intervention Group (N=16)	Control Group (N=43)	P value
Age (yr)	78.35 ± 8.54	80.23 ± 6.36	0.363
Male sex	6 (37.5)	17 (39.5)	0.887
Body mass index (kg/m^2)	26.17 ± 3.82	24.71 ± 5.44	0.389
Length of stay (days)	11 (10 −17)	12 (7–18)	0.765
Barthel index score	37.5 (17.5–55)	25 (5–45)	0.160
Delirium	1 (6.25)	2 (4.65)	1.000
Depression	4 (25.00)	8 (18.60)	0.718
Dementia	2 (12.50)	6 (13.95)	1.000
Nutrition score[a]	10.23 ± 1.64	9.71 ± 1.92	0.408
Malnutrition[a]	9 (69.23)	23 (82.14)	0.429
Fall history≧1 in recent 1 y	7 (43.75)	15 (34.88)	0.531
Polypharmacy	10 (62.50)	37 (86.05)	0.069
Pressure sore	1 (6.25)	6 (13.95)	0.661
Visual impairment	0 (0.00)	7 (16.28)	0.173
Hearing impairment	2 (12.50)	12 (27.91)	0.310
Osteoporosis	3 (18.75)	4 (9.30)	0.375
Urinary incontinence	9 (56.25)	34 (79.07)	0.104
Stool incontinence	7 (43.75)	27 (62.79)	0.188
Nasogastric tube feeding	4 (25.00)	12 (27.91)	1.000
Foley	5 (31.25)	14 (32.56)	0.924
Central catheter	1 (6.25)	0 (0.00)	0.271
Restraint	1 (6.25)	0 (0.00)	0.271
Excessive utilization of healthcare facilities (visits)			
Admission≧2	7 (43.75)	16 (37.21)	0.647
Emergency≧2	9 (56.25)	20 (46.51)	0.506
Outpatient department≧12	5 (31.25)	16 (37.21)	0.671
Living status			0.318
Live alone	1 (6.25)	2 (4.65)	
Institutional resident	0 (0.00)	6 (13.95)	
Live with family	15 (93.75)	35 (81.40)	
Economic problem	1 (6.25)	2 (4.65)	1.000
Disability	4 (25.00)	23 (53.49)	0.051
Major illness	3 (18.75)	4 (9.30)	0.375
Discharge care problem	2 (12.50)	6 (13.95)	1.000
Needs of home care	3 (18.75)	6 (13.95)	0.692
Needs of nursing homes	1 (6.25)	7 (16.28)	0.427

Note: [a]There were 18 patients missing information.

Discussion

Our study showed no statistically significant difference in the readmission and mortality rate between groups. But fall history ≧1 in the recent one year is a factor for lower risk of readmission and mortality in the included patients, and disability is associated with late mortality in the first year after discharge. More participants and longer follow-up are needed for better elucidation.

The clinical benefit of CGA delivery by IGCT also remained controversial.[11,12] Several studies found no significant difference in hospital length of stay, readmission, or mortality rates between the IGCT interdisciplinary intervention and control groups,[14,17–20,27,28] but several studies found that the IGCT intervention group had lower readmission rates.[15,16,29] Significant reductions in LOS and in-hospital mortality were also reported in inpatient GCA-received Japanese patients with stroke when compared to non-GCA patients.[30] A suspected explanation for these conflicting results might be the

Table 2 Crude and Adjusted Hazard Ratios for Readmission in the First Year

Variable	Crude HR (95% CI)	P value	Adjusted HR (95% CI)	P value
Intervention (vs control) group	0.52 (0.23–1.20)	0.124	0.45 (0.12–1.78)	0.256
Age (yr)	0.94 (0.89–0.98)	**0.007**	0.95 (0.87–1.03)	0.205
Male (vs Female)	1.12 (0.57–2.20)	0.734		
Body mass index (kg/m^2)	0.91 (0.84–1.00)	**0.046**	0.94 (0.86–1.04)	0.221
Length of stay (days)	1.02 (0.99–1.05)	0.204		
Barthel index score	0.99 (0.98–1.01)	0.258		
Delirium	1.85 (0.57–6.07)	0.307		
Depression	0.64 (0.26–1.53)	0.314		
Dementia	0.50 (0.15–1.64)	0.253		
Fall history≧1 in recent 1 y	0.58 (0.28–1.18)	0.132	0.20 (0.07–0.60)	**0.004**
Polypharmacy	0.71 (0.32–1.56)	0.396	0.46 (0.12–1.79)	0.261
Pressure sore	1.37 (0.53–3.53)	0.513		
Visual impairment	0.87 (0.31–2.47)	0.799		
Hearing impairment	0.53 (0.22–1.28)	0.161		
Osteoporosis	1.65 (0.68–4)	0.267		
Urinary incontinence	1.51 (0.69–3.31)	0.305	0.58 (0.1–3.43)	0.549
Stool incontinence	2.16 (1.06–4.39)	**0.034**	1.46 (0.37–5.82)	0.590
Nasogastric tube feeding	1.38 (0.68–2.81)	0.373		
Foley	0.55 (0.26–1.18)	0.125	0.69 (0.21–2.25)	0.542
Restraint	1.77 (0.24–13.09)	0.575		
Visits				
Admission≧2	0.81 (0.42–1.59)	0.542		
Emergency≧2	1.18 (0.61–2.27)	0.627		
Outpatient department≧12	0.80 (0.40–1.60)	0.525		
Living status (vs Live with family)				
Live alone	3.22 (0.94–11.02)	0.062	5.76 (0.71–46.72)	0.101
Institutional resident	1.14 (0.40–3.25)	0.806	2.67 (0.68–10.53)	0.160
Economic problem	0.50 (0.07–3.69)	0.500		
Disability	1.47 (0.76–2.83)	0.249	2.37 (0.85–6.65)	0.100
Major illness	0.77 (0.27–2.19)	0.629		
Discharge care problem	1.38 (0.57–3.31)	0.477		
Needs of home care	1.03 (0.43–2.47)	0.954		
Needs of nursing homes	0.69 (0.24–1.96)	0.489		

Note: P values <0.05 are shown in bold.

lack of adherence to the instructions by IGCT. This is supported by reports in the studies of the self-reported nonadherence rate ranging from 23% to 33%,[14,29,31] showing strong evidence why IGCT intervention does not reach its full potential. A manager nurse followed up with patients or their co-residents through phone interview following discharge in the pilot research. It is unknown whether the patients followed the instructions exactly. Evaluation of patient adherence to IGCT guidelines, such as collaboration with local clinics for regular home visits, should be included in our future study to clarify the efficacy of IGCT intervention.

This pilot study showed that the recruitment is feasible. However, it is contra-intuitive that our findings showed lower risks of readmission and mortality within one year after discharge in patients with fall history ≧1 in the past one year. This is more likely to be due to some unforeseen confounding factors or small and incomparable sample size. Further study with more patients and longer follow-up is needed for further elucidation. Meanwhile, it is also surprising that most patients did not want to be included in the intervention group. In east Asia countries, many elderly people live with family. The ratio is up to 84% (50/59) in our study. When we explained the research to recruited patients, most of them preferred to participate in control group because they did not want to bother their co-resident family members with additional requests beyond routine daily care, most likely they are unfamiliar with ICGT intervention. More effort in

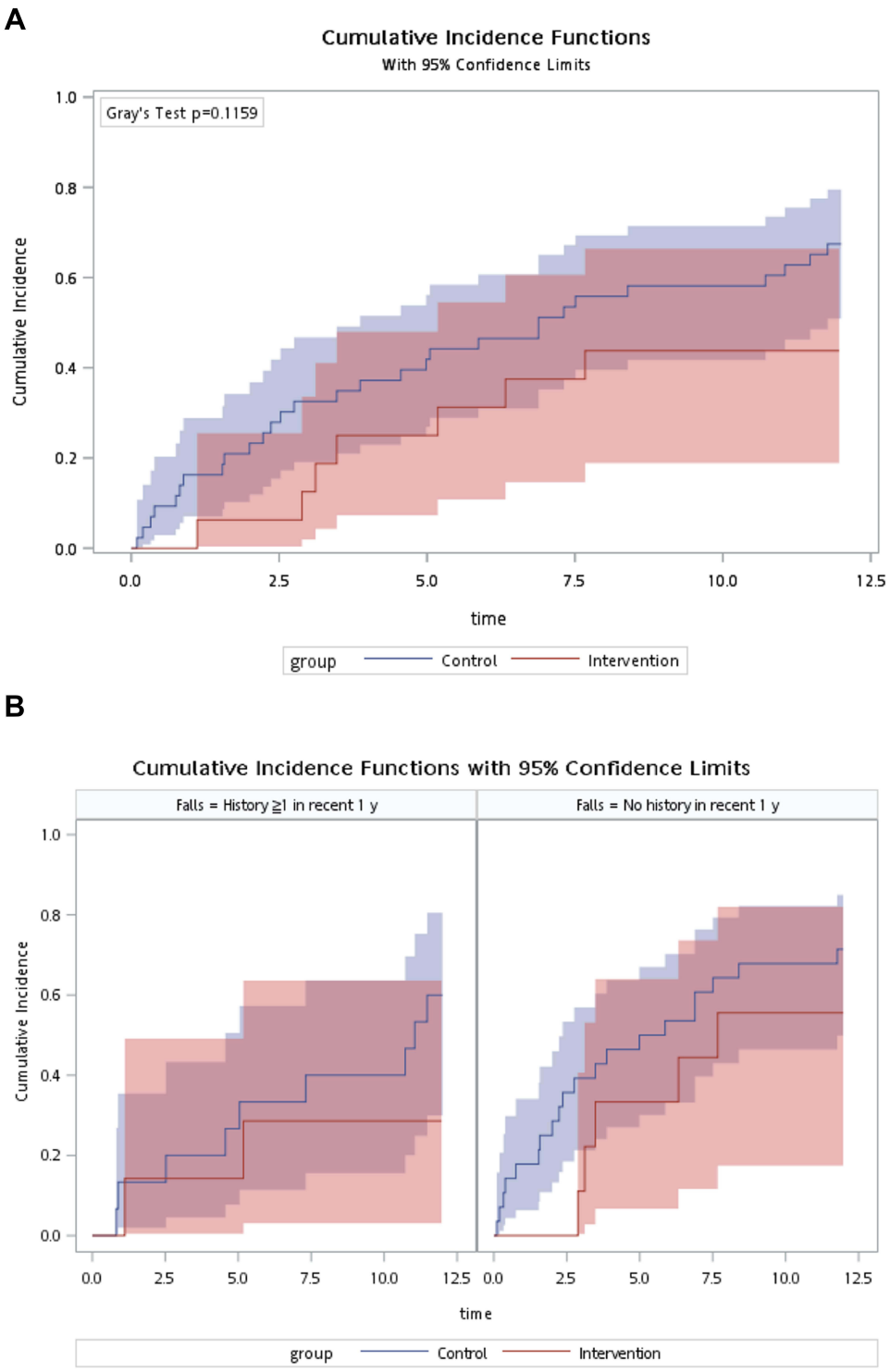

Figure 1 Cumulative incidence curves for 1-year read mission between intervention and control groups. (**A**) All patients; (**B**) stratified by fall history ≧1 in recent 1 year.

communicating with patients and their families may ameliorate the condition, especially emphasizing better decision-making will help with better outcomes therefore improves patients' life quality and attenuates care loading of the co-residents.

Table 3 Crude and Adjusted Hazard Ratios for Late Death in the First Year

Variable	Crude HR (95% CI)	P value	Adjusted HR (95% CI)	P value
Intervention (vs control)	0.73 (0.15–3.52)	0.696	2.13 (0.29–15.57)	0.457
Age (yr)	0.98 (0.89–1.08)	0.681		
Male (vs Female)	0.18 (0.02–1.43)	0.105	0.22 (0.02–1.96)	0.175
Body mass index (kg/m^2)	0.94 (0.81–1.09)	0.434		
Length of stay (days)	0.99 (0.91–1.07)	0.722		
Barthel index score	0.98 (0.94–1.01)	0.152		
Delirium[a]	–	–		
Depression	1.14 (0.24–5.51)	0.866		
Dementia	0.81 (0.1–6.5)	0.845		
Fall history≧1 in recent 1 y	0.19 (0.02–1.53)	0.119	0.11 (0.01–0.97)	**0.047**
Polypharmacy	2.10 (0.26–16.82)	0.483	1.51 (0.14–15.8)	0.733
Pressure sore	2.40 (0.5–11.57)	0.276		
Visual impairment	0.87 (0.11–6.97)	0.897		
Hearing impairment	0.86 (0.18–4.16)	0.855		
Osteoporosis[a]	–	–		
Urinary incontinence	3.19 (0.4–25.51)	0.274	2.16 (0.23–20.19)	0.499
Stool incontinence	0.93 (0.25–3.46)	0.912		
Nasogastric tube feeding	0.79 (0.16–3.78)	0.764		
Foley	1.10 (0.27–4.38)	0.897		
Central catheter[a]	–	–		
Restraint[a]	–	–		
Visits				
Admission≧2	0.42 (0.09–2.03)	0.280		
Emergency≧2	0.51 (0.13–2.02)	0.335		
Outpatient department≧12	1.56 (0.42–5.81)	0.508		
Living status (vs Live with family)				
Live alone	2.50 (0.31–20.4)	0.391		
Institutional resident	1.13 (0.14–9.16)	0.912		
Economic problem	2.84 (0.35–22.8)	0.325		
Disability	4.87 (1.01–23.47)	**0.049**	5.37 (0.87–33.12)	0.07
Major illness	0.92 (0.12–7.39)	0.941		
Discharge care problem[a]	–	–		
Needs of home care	1.71 (0.36–8.24)	0.503		
Needs of nursing homes[a]	–	–		

Notes: [a]No event occurred in one group. P values <0.05 are shown in bold.

Limitations

There are several limitations in our pilot study. First, the sample size is small and incomparable. This may result in bias in data interpretation. At least 4 more participants in the intervention group are required for power of the study. Second, it was not a randomized trial. Most of the participants preferred to be included into the control group. Third, the way of recruiting participants may also influence our findings. Fourth, unknown adherence of participants to the instructions.

Conclusions

Our pilot study showed no statistical difference in readmission and mortality rates between the intervention group and the control group. But fall history ≧1 in the recent one year is associated with a lower risk of readmission and mortality among all included patients. More participants and longer follow-up are needed for better elucidation.

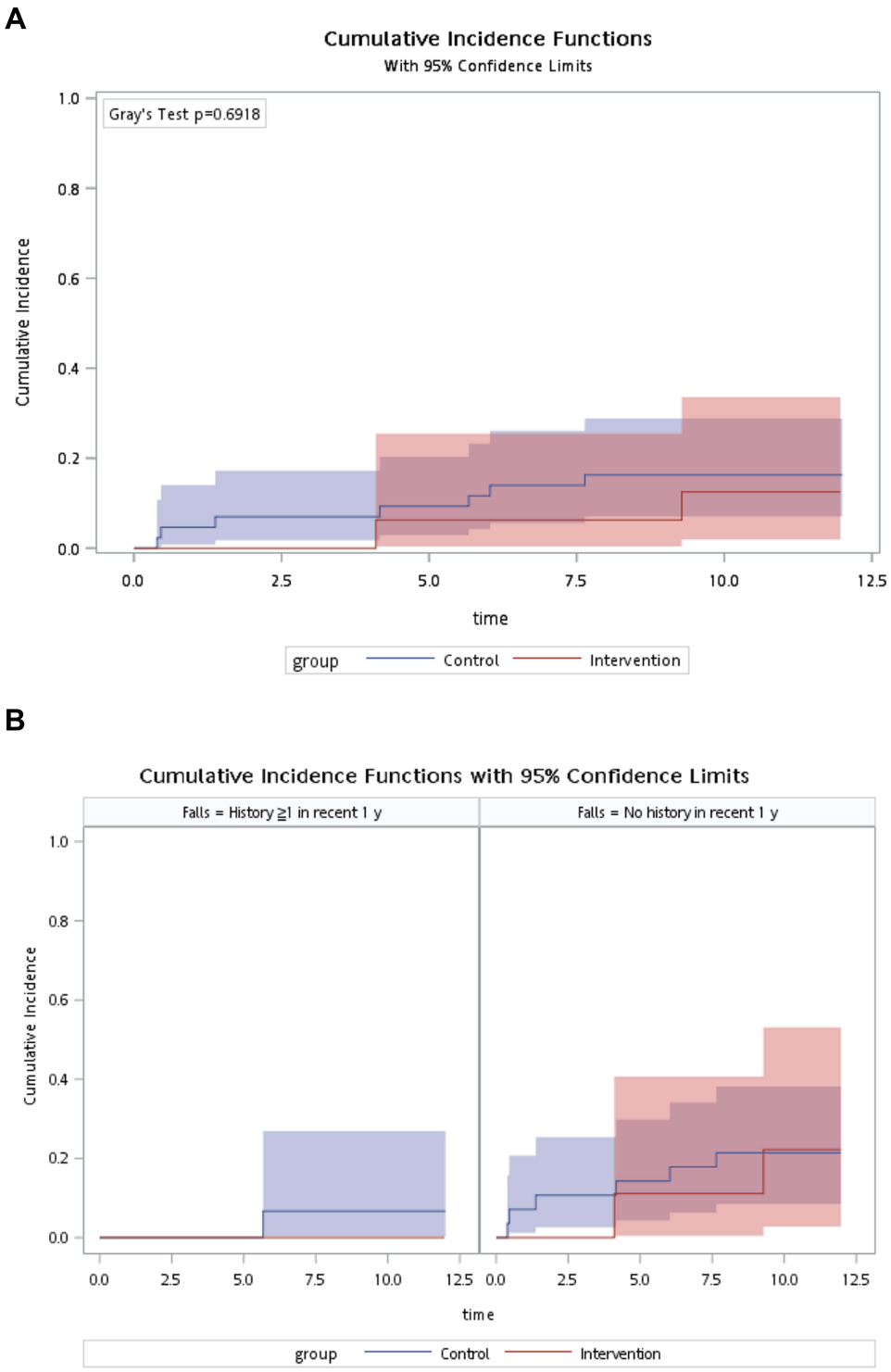

Figure 2 Cumulative incidence curves for 1-year mortality between intervention and control groups. (**A**) All patients; (**B**) stratified by fall history ≥1 in recent 1 year.

Data Sharing Statement

Upon reasonable request, all unidentified data related with this study can be obtained from the corresponding author.

Ethics Approval

This study was approved by the Chang Gung Medical Foundation Institutional Review Board (IRB No.: 201601508B0).

Consent to Participate

Informed consent was signed after the participants and/or family agreed. For patients who were cognitively impaired or suffered from dementia, informed consent was signed by their family.

Funding

This study was supported by grant from Kaohsiung Chang Gung Memorial Hospital CMRPG8F1571.

Disclosure

The authors declared of no competing interests in this work.

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