Effects of a Modified Hospital Elder Life Program on Frailty in Individuals Undergoing Major Elective Abdominal Surgery

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OBJECTIVES: To test the effects of a modified Hospital Elder Life Program (mHELP) on frailty.

DESIGN: Matched and unmatched analyses of data from a before-and-after study.

SETTING: Hospital, inpatient.

PARTICIPANTS: Participants aged 65 and older (n = 189) undergoing major elective abdominal surgery at a medical center in Taiwan.

INTERVENTION: The mHELP included three nursing interventions: early mobilization, oral and nutritional assistance, and orienting communication.

MEASUREMENTS: Frailty rate and transitions between frailty states from hospital discharge to 3 months after discharge using Fried's phenotype criteria categorized as nonfrail (0 or 1 criteria present), prefrail (2 or 3 criteria present), and frail (4 or 5 criteria present).

RESULTS: In matched pairs, participants who received the mHELP interventions were significantly less likely to be frail at discharge (19.2%) than matched controls (65.4%) (adjusted odds ratio (AOR) = 0.10, 95% CI = 0.02–0.39). Transitions to states of greater frailty during hospitalization were more common for participants in the control group. Three months after discharge, participants who received the mHELP intervention during hospitalization were less likely to be frail (17.3%) than matched controls (23.1%) (AOR = 0.73, 95% CI = 0.21–2.56), although this difference did not achieve statistical significance.

CONCLUSION: The mHELP intervention is effective in reducing frailty by hospital discharge, but the benefit is diminished by 3 months after discharge. Thus, the mHELP provides a useful approach to manage in-hospital frailty for older adults undergoing major abdominal surgery. **J Am Geriatr Soc 62:261–268, 2014.**

Key words: frailty; aged; intervention studies; surgery; geriatric syndromes

Frailty, increasingly recognized as an overarching geriatric syndrome,[1] is defined as a state of low reserve against stressors as a result of cumulative decline in multiple physiological systems.[2] For older adults, frailty is highly prevalent and strongly associated with poor outcomes.[3] A recent review concluded that, although the prevalence rates of frailty were less than 10% in community-dwelling older adults, rates in older hospitalized adults, particularly those undergoing surgery, were much higher;[4] 42% of individuals undergoing cardiac surgery and 50% of individuals undergoing noncardiac surgery were frail,[4] highlighting the vulnerability of older surgical populations.

The effect of frailty is substantial because frailty is associated with higher rates of postoperative complications, longer length of stay, and higher rates of institutionalization.[5] Despite the recognized importance of frailty, no effective treatment or intervention program has been designed to reduce frailty rates and alter transitions between frailty states.[6]

The successful Hospital Elder Life Program (HELP)[7–9] was adapted to focus on components that address the shared risk factors of cognitive, functional, and nutritional status and to enhance its feasibility and scalability in a surgical setting in Taiwan.[10] The modification was based on the theory that many geriatric syndromes, including frailty, might be managed at once because many conditions "share" underlying risk factors.[1,11,12]

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DOI: 10.1111/jgs.12651

0002-8614/14/$15.00

The overall aim of this before-and-after intervention study was to evaluate the modified HELP (mHELP), comprising three nursing interventions (mobilization, oral and nutritional assistance, and orienting communication) for older Taiwanese adults undergoing common elective abdominal surgical procedures. Its effects on reducing functional decline and delirium rates by hospital discharge in older adults undergoing surgery has previously been reported.[13] Given that the mHELP intervention targets several geriatric syndromes (e.g., cognitive and functional status), it was hypothesized that this mHELP intervention would affect frailty. It was also hypothesized that older adults undergoing surgery, in particular abdominal surgery, would have the greatest need for better inpatient care, not only because older adults undergoing surgery are at high risk of becoming frail,[4] but also because their inpatient care is poor.[14] Moreover, major elective abdominal surgery for older adults is primarily for resection of malignancy, and freedom from frailty is essential to reduce treatment toxicity and improve survival.[15] The aim of the current study was to compare the rate of frailty and transitions between frailty states in older adults undergoing abdominal surgery receiving mHELP and usual care (participants enrolled before mHELP was implemented) at hospital discharge and 3 months after discharge.

For the present study, the imbalance in frailty at baseline in the intervention and usual care groups was addressed using retrospective, individual 1:1 matching[16] to ensure that participants in the two groups were comparable with respect to frailty state, age, and comorbidity burden. Then, matched and unmatched analyses were performed to examine the immediate and short-term effects on frailty upon hospital discharge and 3 months after discharge.

METHODS

Setting and Participants

A before-and-after intervention study was conducted to test the effects of a mHELP intervention for older Taiwanese adults scheduled for major elective abdominal surgery. The research ethics review committee of the medical center approved the study. All participants provided written informed consent for study participation. Participants who completed the study are the focus of this report. The study flowchart detailing the attrition from the two groups is shown in Figure 1. The original sample included older adults (≥65, N = 189) consecutively admitted to the 36-bed gastrointestinal ward of an urban medical center in Taiwan and scheduled for elective abdominal surgery with an expected length of stay longer than 6 days, as described in detail previously.[13] Individuals admitted from August 2007 to April 2008 served as the usual care group (n = 82), and individuals admitted from May 2008 to April 2009 served as the intervention group (n = 107).

Although contamination was not a factor in the before-and-after study design, frailty at baseline differed significantly between the two groups (Table 1). Participants were matched individually (1:1) post hoc to ensure that the two groups were as comparable as possible at baseline.[16,17] Participants from the mHELP were therefore retrospectively matched to the usual care group. Participants were included only if they had completed discharge

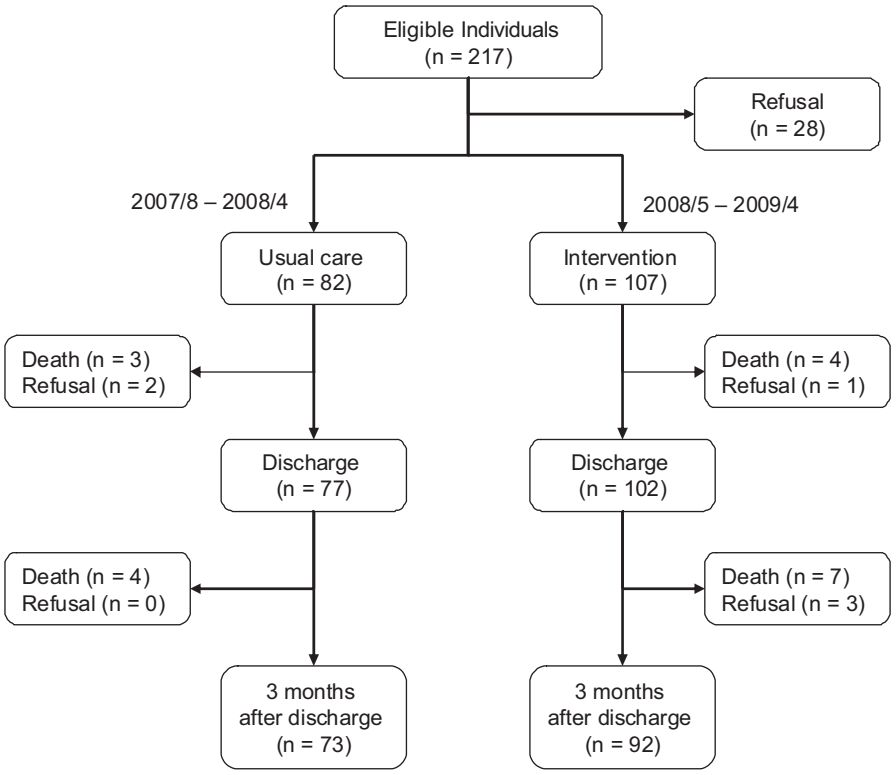

Figure 1. Study flowchart.

and 3-month evaluations. A research associate blinded to the outcome performed the match to avoid bias. The research associate identified one matched control for each mHELP participant using baseline characteristics reported to be associated with postsurgical frailty in the following order: frailty state (exact match on nonfrail, prefrail, and frail states), Charlson comorbidity (exact match on 0, 1, 2, and ≥2 comorbid diagnoses), and age (±5 years). The study sample included 52 matched pairs, with the additional 75 and 61 participants included only in the unmatched for the discharge and 3-month postdischarge analyses, respectively.

Modified HELP Interventions

The mHELP comprised three mHELP interventions (early mobilization, oral and nutritional assistance, and orientating communication). Participants in the intervention group received mHELP in addition to usual care as soon as they arrived on the surgical inpatient ward. Using standardized mHELP manuals, a registered nurse with more than 2 years of experience in medical–surgical nursing was trained as the HELP nurse. This 2-month on-site training included review of manuals and weekly individual mentorship. This same HELP nurse, who was blinded to the study hypotheses and did not serve as an outcome assessor, provided all three modified HELP interventions three times daily during the study. In the mobilization intervention, this HELP nurse assisted participants in completing physical activities, including range-of-motion exercises in bed, sitting up, riding a stationary bicycle by hand or foot, standing, or ambulating, according to their capacity. While performing activities, the HELP nurse deliberately engaged participants in orienting communication (e.g., recalling and discussing topics that interested them, such as events on the operative day), reinforcing orienting content. Daily oral care (tooth brushing and range-of-motion exercises for lips, tongue, and jaw) and diet education for postsurgical intake were also provided. Approximately 30 to 45 minutes per day was added to the care of each participant as a result of the mHELP protocol.[10] The intervention ended upon hospital discharge, and no extra care was provided during the 3-month follow-up period. The majority of participants (54%) received approximately 7 days (range 4–20) of the mHELP interventions.

Usual Care

Usual care consisted of standard hospital care provided by physicians and nurses, similar to that provided in a hospital in the United States. Referral to a dietician or physical therapist was on an as-needed basis, but the same group of nurses and attending physicians provided care to participants in the intervention and usual care groups.

Study and Outcome Data

Two nurses trained as outcome assessors collected data on study variables and outcomes. All participants from the intervention and usual care groups were evaluated in face-to-face encounters upon admission, before discharge, and 3 months after discharge. The two nurses worked side by side and did not participate in any of the interventions, but blinding to the intervention and usual care status was not possible because of the before-and-after study design. To ensure reliability and validity of measures, the two outcome assessors achieved an interrater reliability of 0.95 or higher before study start-up with the first author (CCC) on important measures (Enforced Social Dependency Scale,[18] Geriatric Depression Scale,[19] and grip strength to define frailty criteria) and underwent performance checks every 3 months to avoid deviation from the measurement protocol.

Independent variables included participant demographic (age, sex, education) and medical (principal diagnosis, comorbidities, type and duration of surgery, length of stay, frailty at admission baseline) characteristics. Frailty was the outcome variable at two time points: discharge and 3 months after discharge. Data on demographic and medical characteristics, including principal diagnosis, malignancy, comorbidities, type and duration of surgery, and length of stay, were obtained from the medical record. Comorbidities were based on the Charlson Comorbidity Index, in which participants' weighted comorbidities are summed to obtain a score; higher scores indicate greater mortality risk.[20]

Frailty was determined by meeting four of five of Fried's criteria:[2,5] shrinking (weight loss), weakness, exhaustion, low activity, and slow walking speed. Specifically, shrinking was defined as measured weight loss of more than 5% from the previous time point. For example, the shrinking criterion was met if body weight at admission was 5% less than at 3 months before admission, body weight at hospital discharge was 5% less than at admission, or body weight at 3 months was 5% less than at discharge, as measured using a portable digital scale. For weakness, the criterion was met when grip strength, assessed as the average of two readings using a digital handheld dynamometer, was the sex- and body mass index–specific cutoff points or less that Fried provided.[2] The criterion for exhaustion was met by answering "no" to the question "Do you feel full of energy?" on the short version of Geriatric Depression Scale.[19] Low activity level, based on item 7 of the Enforced Social Dependence Scale (ESDS),[18] was defined as a participant being coded as "yes" according to having one of the following activity levels: restricted activity—some activities characterizing work role can no longer be performed, works half as much time as before or less, or no activity—major activities defining role are no longer being performed. Slow walking speed, based on item 3 of the ESDS, was coded as "yes" if participants had one of the following conditions: walks with help of equipment or other person, does not walk, or unable to take any steps. Because frailty state (number of frailty criteria) was shown to have a dose-response relationship with outcomes,[21,22] transitions between frailty states were also evaluated. Frailty state was coded as suggested:[5] nonfrail (0 or 1 criteria present), prefrail (2 or 3 criteria present), and frail (4 or 5 criteria present).

Statistical Analysis

Data were double-entered to ensure accuracy and analyzed using SAS version 9.2 (SAS Institute, Inc., Cary, NC), with

Table 1. Sample Demographic and Medical Characteristics

Characteristic	Matched Pairs[a]			All Participants[b]		
	mHELP, n = 52	Usual Care, n = 52	*P*-Value	mHELP, n = 107	Usual Care, n = 82	*P*-Value
Demographic						
Age, mean ± SD	72.8 (5.5)	72.2 (5.6)	–[c]	73.3 (6.2)	72.8 (5.6)	.43
Female, n (%)	24 (46.2)	24 (46.2)	>.99	47 (43.9)	35 (42.7)	.98
Education, years, mean ± SD	8.4 (4.9)	6.8 (5.4)	.12	8.4 (4.7)	6.5 (5.7)	.02
Medical						
Principal diagnosis, n (%)						
Gastric cancer	13 (25.0)	22 (42.3)	.11	35 (32.7)	30 (36.6)	.69
Periampullary cancer	18 (34.6)	8 (15.4)	.06	31 (29.0)	12 (14.6)	.03
Distal pancreatic cancer	6 (11.5)	4 (7.7)	.68	8 (7.5)	6 (7.3)	>.99
Other[d]	15 (28.8)	18 (34.6)	.66	33 (32.8)	34 (41.5)	.22
Malignancy, n (%)	40 (76.9)	39 (75.0)	>.99	87 (81.3)	61 (74.4)	.32
Charlson comorbidity index, mean ± SD	1.6 (1.5)	1.6 (1.7)	–[c]	1.5 (1.5)	2.2 (2.2)	.03
Type of surgical procedure, n (%)						
Open	40 (76.9)	45 (86.5)	.36	78 (72.9)	71 (86.6)	.04
Laparoscopic	5 (9.6)	0 (0)	NA[e]	10 (9.3)	0 (0)	.01
Laparoscopic assisted	7 (13.5)	7 (13.5)	1.00	19 (17.8)	11 (13.4)	.54
Duration of surgery, minutes, mean ± SD	226.2 (94.0)	203.0 (70.0)	.15	226.8 (91.1)	199.0 (68.7)	.02
Length of hospital stay, days, mean ± SD	17.6 (12.7)	18.1 (13.6)	.85	17.3 (11.0)	20.5 (18.2)	.17
Baseline frailty (criteria), n (%)						
Frail (4 or 5)	6 (11.5)	6 (11.5)	–[c]	8 (7.5)	18 (22.0)	<.01
Prefrail (2 or 3)	44 (84.6)	44 (84.6)	–[c]	67 (62.6)	58 (70.7)	.31
Nonfrail (0 or 1)	2 (3.8)	2 (3.8)	–[c]	32 (29.9)	6 (7.3)	<.01

[a]Differences in participant characteristics between matched pairs were evaluated using the McNemar test for binary variables and the paired *t*-test for continuous variables.

[b]Differences in participant characteristics between all samples were evaluated using the chi-square test or Fisher exact test for binary variables and the *t*-test or Wilcoxon rank-sum test for continuous variables.

[c]The association between the matching variable and exposure (intervention) is broken by cohort matching, so the hypothesis testing is not meaningful.[28]

[d]Diagnoses included gastrointestinal stromal tumor, appendiceal cancer, ileal tumor, ischemia bowel, colon tumor, and common bile duct adenocarcinoma.

[e]The *P*-value could not be obtained using the McNemar test because of zero cell count.

mHELP = modified Hospital Elder Life Program; SD = Standard Deviation.

the significance level set at $P < .05$. Analyses were performed on a per-protocol basis. Differences in participant characteristics between matched pairs were evaluated using the McNemar test for binary variables and the paired *t*-test for continuous variables. To evaluate the intervention effect, pairwise differences in frailty were tested using conditional logistic regression, using usual care as the reference group, to estimate odds ratios (ORs) and 95% confidence intervals (CIs).[23] Baseline cohort differences for matched pairs that might confound the relationship between frailty and intervention effects were adjusted in conditional logistic regression. The *P*-value cutoff of .20 was purposefully selected to control for as many potential variables as possible and to avoid the possibility of a more-restrictive level (e.g., $P < .05$) failing to identify variables known to be important.[24] Logistic regression, using the entire sample (N = 189), was used to test the robustness of the matched results. In this confirmatory unmatched analysis, baseline cohort differences for the entire sample ($P < .20$) were adjusted as control variables. Transitions between frailty states in matched pairs are visually presented. The *x*-axis represents the frailty states at admission (baseline) for both groups, and the *y*-axis shows the rates of transitions to each frailty state according to hospital discharge or 3-month follow-up (Figure 2). The Bhapkar test, a generalization of the McNemar test used for a square table with more than two rows or columns, was used to test for between-group statistical significance in transitions between frailty states.[25]

RESULTS

Sample characteristics at hospital admission are reported in Table 1. Baseline characteristics are presented for the subset of matched pairs (n = 104) and for all participants enrolled in the study (unmatched, n = 189). Participants receiving mHELP and usual care were comparable in age, sex, malignant diagnosis, Charlson comorbidity level, type of surgical procedure (open, laparoscopic assisted), length of hospital stay, and baseline frailty level, although a 9.8% increase in laparoscopic procedures occurred in the intervention group during the study period (n = 5), and the most common diagnosis for the usual care group was gastric cancer (42.3%, vs 25.0% in the intervention group), whereas the mHELP group had more periampullary cancer (34.6%, vs 15.4% in the usual care group, $P = .06$).

Frailty Rate at Hospital Discharge

For the matched pairs, 19.2% of participants receiving mHELP were frail by hospital discharge, versus 65.4% of

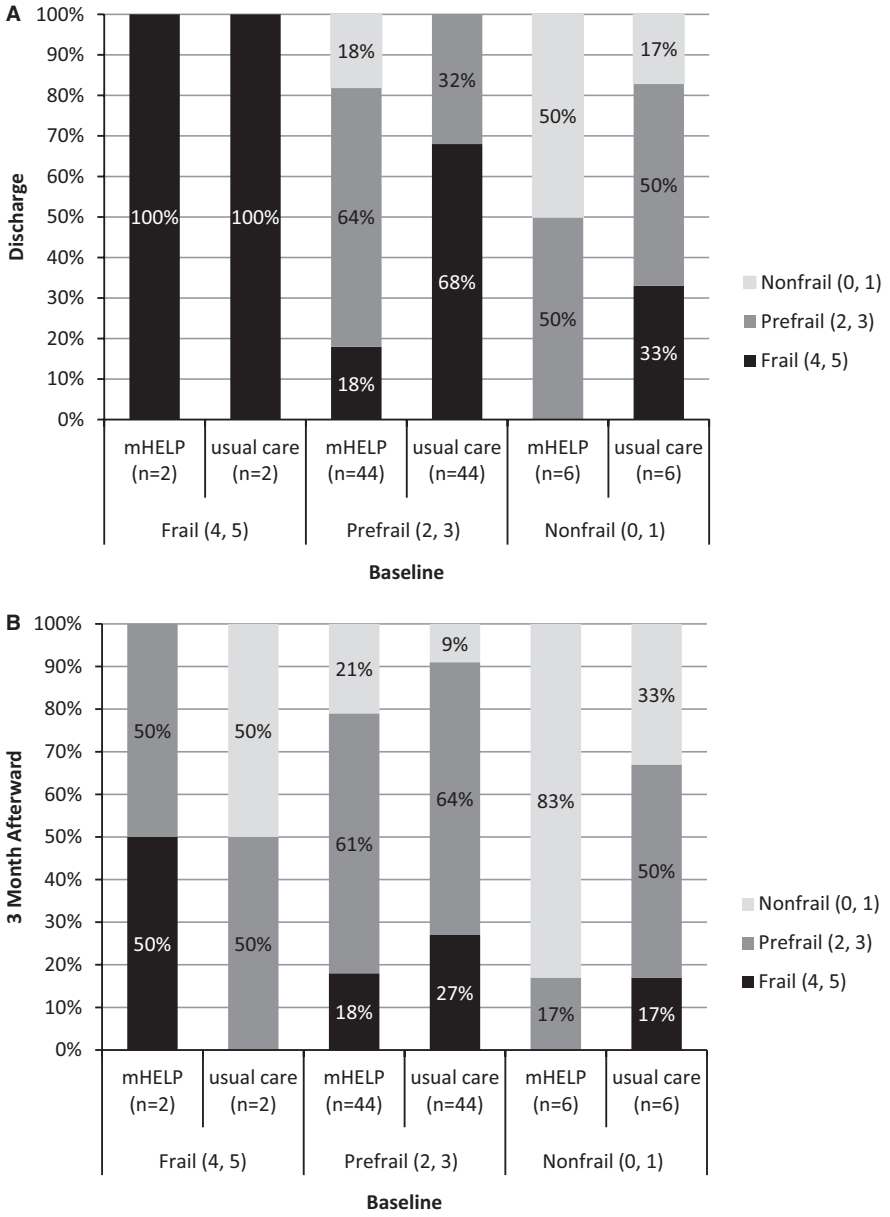

Figure 2. (A) Transitions between frailty states (from admission to discharge) for 52 matched pairs. The *x*-axis represents the frailty states at admission (baseline) for both groups, and the *y*-axis shows the rates of transitions to each frailty state by hospital discharge. (B) Transitions between frailty states (from admission to 3 months after discharge) for 52 matched pairs. The *x*-axis represents the frailty states at admission (baseline) for both groups, and the *y*-axis shows the rates of transitions to each frailty state by 3-month follow-up. mHELP = modified Hospital Elder Life Program.

the usual care controls ($P \leq .001$, Table 2). Conditional regression analysis revealed that participants receiving mHELP were 90% less likely to be frail by hospital discharge than those receiving usual care (adjusted OR (AOR) = 0.10, 95% CI = 0.02–0.39), after adjusting for years of education, gastric cancer diagnosis (yes/no), periampullary cancer diagnosis (yes/no), duration of surgery (minutes), and type of surgical procedure (open vs laparoscopic or laparoscopic assisted). Results were similar in the unmatched analysis (AOR = 0.05, 95% CI = 0.02–0.15; Table 2), adjusted for years of education, periampullary cancer diagnosis, duration of surgery, type of surgical procedure, Charlson comorbidities, length of hospital stay (days), and baseline frailty levels (frail, prefrail, nonfrail). Transitions between frailty states also differed significantly, with more transitions to states of lesser frailty occurring in the mHELP group (Figure 2A). For participants who were prefrail upon admission, 68% receiving usual care advanced to a frail state, with 32% remaining in a prefrail state, whereas only 18% of participants receiving mHELP advanced to frail states, 64% remained at prefrail, and the remaining 18% improved to nonfrail, a less-frail state ($P < .001$).

Frailty Rate 3 Months After Discharge

For the matched pairs, with no intervention provided after discharge, 3 months after hospital discharge, 17.3% of

Table 2. Rate of Frailty in Participants Receiving the Modified Hospital Elder Life Program (mHELP) and Usual Care

	mHELP	Usual Care		
Type of Analysis	n/N (%)		*P*-Value	Multivariate OR (95% CI)
Matched pairs (52 pairs)[a]				
Frail at discharge	10/52 (19.2)	34/52 (65.4)	.001	0.10 (0.02–0.39)
Frail 3 months after discharge	9/52 (17.3)	12/52 (23.1)	.62	0.73 (0.21–2.56)
Unmatched (N = 189)[b]				
Frail at discharge	15/102 (14.7)	52/77 (67.5)	<.001	0.05 (0.02–0.15)
Frail 3 months after discharge	14/92 (15.2)	22/73 (30.1)	.72	0.85 (0.34–2.09)

Frailty was determined as meeting four of five of the Fried criteria.

[a]Conditional logistic regression models adjusted for years of education, periampullary cancer, gastric cancer, duration of surgery (minutes), and type of surgical procedure (open vs laparoscopic or laparoscopic assisted) were used to obtain odds ratios (ORs), 95% confidence intervals (CIs), and *P*-Values.

[b]Logistic regression models were adjusted for education, periampullary cancer, Charlson comorbidities, type of surgical procedure, duration of surgery, length of hospital stay (days), and baseline frailty (frail, prefrail, nonfrail).

participants receiving mHELP were frail, versus 23.1% of usual care controls ($P = .62$, Table 2). Conditional logistic regression, adjusted for education, periampullary cancer, gastric cancer, duration of surgery, and type of surgical procedure, indicated that participants receiving mHELP were 27% less likely to be frail 3 months after hospital discharge than those receiving usual care (AOR = 0.73, 95% CI = 0.21–2.56; Table 2). Results are similar in the unmatched analysis (AOR = 0.85, 95% CI = 0.34–2.09; Table 2). Results for transition of frailty states show a positive trend for participants receiving mHELP to transition to states of less frailty (Figure 2B), particularly participants who were in a prefrail or nonfrail state at baseline. More participants (21%) who received mHELP during hospitalization improved to nonfrail at 3 months from prefrail at baseline than of usual care controls (9%), although this difference did not achieve statistical significance ($P = .28$), but the study lacked adequate power at 3-month follow-up (power was 5% for matched pairs and 80% for the unmatched sample with two-sided testing and α level set at .05).[26] These results thus support a positive trend for the benefit of the mHELP intervention for frailty 3 months after hospital discharge, particularly for participants who were less frail before surgery.

DISCUSSION

The mHELP was associated with an approximately 90% lower risk of frailty at hospital discharge than usual care in participants undergoing common elective abdominal surgical procedures in Taiwan. Three months after discharge, participants receiving mHELP were 27% less likely to be frail, but the difference was not statistically significant. Furthermore, participants who received mHELP were more likely to transition to a less-frail state (e.g., from prefrail to nonfrail) by hospital discharge. Specifically, participants who did not meet criteria for frailty at hospital admission (were nonfrail or prefrail) were more likely to benefit from the mHELP. For example, 18% of prefrail participants who received mHELP improved to a nonfrail state, whereas none of the participants in the usual care group transitioned from prefrail to nonfrail. Similarly, with the support of the mHELP intervention, 50% of nonfrail participants remained nonfrail, and none advanced to a frail state, whereas 17% of controls remained nonfrail, and 33% advanced to the frail state. These results suggest that the mHELP affects frailty and the transition between frailty states and that mHELP is particularly beneficial in prefrail states. Future work is needed to confirm these preliminary findings.

Two points need to be emphasized in light of the current findings. First, consistent with the existing literature,[4,5] the prevalence of frailty is high in older Taiwanese adults undergoing surgical procedures, and effective hospital-based intervention programs are greatly needed. For all participants receiving usual care, at hospital discharge, frailty developed in 67.5% of older adults undergoing major elective abdominal surgery. This rate remained high (30.1%) 3 months after discharge. Thus, the mHELP, comprising three nursing interventions (targeting cognition, function, and nutrition), provided a feasible approach to reducing frailty and reversing transitions to more-severe frailty.

This study suggests that, for older adults recovering from abdominal surgery, early mobilization, orienting communication, and dietary education, along with daily oral care, including tooth brushing and orofacial range-of-motion exercise, reduced shrinking (weight loss), weakness, and eventual frailty states during the course of hospitalization. Oral and nutrition assistance was developed as one of three shared-risk-factor interventions in the mHELP. Nutrition is a long-standing problem in individuals undergoing surgery and probably contributes to poor outcomes, but few studies have offered specific intervention strategies. Beyond the complex nature of malnutrition, many factors pose barriers to addressing the problem, including the lack of simple, measurable interventions, particularly in the busy hospital setting.[27] These findings demonstrate that mHELP not only alleviates nutritional problems, but also ameliorates eventual frailty in the hospital setting. Confirmation is needed in future trials with larger samples.

Second, the positive findings of this study support the notion that shared risk factors are applicable not only to the common geriatric syndromes of delirium and functional decline,[13] but also to the resulting frailty occurring by the time of hospital discharge. As such, the mHELP,

addressing three shared risk factors, has high potential to interrupt self-sustaining pathways (shared risk factors resulting in geriatric syndromes, which lead to frailty) resulting in poor outcomes and provide an opportunity to advance the quality of care for the rapidly growing elderly surgical population.

Three months after discharge, the difference between groups in frailty status was not statistically significant. Given that no intervention was provided after participants were discharged from the hospital, it is not surprising that benefits were time-limited. Data on time to initiation of adjuvant chemotherapy were not collected, so the possibility cannot be excluded that the participants receiving mHELP were less frail upon hospital discharge and more likely to start adjuvant therapy sooner and therefore likely be more frail by 3 months after discharge (because of side effects of chemotherapy). Given that most participants were frail or prefrail by hospital discharge and that many were scheduled for adjuvant therapy to improve survival, the urgent need for transitional care is indicated. A boosting program or a program such as "HELP at home" might provide a way to sustain the momentum, particularly for those at high risk of increasing frailty status.

The current study has important limitations. First, five study variables approaching Fried's frailty phenotype were used, although an important omission is that gait speed was not directly measured; instead, a self-reported measure of walking limitation was used. Thus, the study's main outcome may represent a different construct than Fried's frailty construct, and care should be taken in interpreting the results. Second, historical controls were used in this before-and-after study. Participants were enrolled in two different years, and no methods were used to achieve balanced allocation (e.g., randomization, prospective matching). Thus, the study groups had baseline imbalances. In addition, temporal trends in clinical practice, such as greater use of laparoscopic procedures and shorter lengths of hospital stay may have accounted for the superior outcomes, rather than the intervention per se. All cohort differences were carefully adjusted in unmatched and matched analyses, with participants from the intervention and usual care groups matched on several baseline characteristics, including frailty level, age, and comorbid disease burden. Although these methods suggest that the findings are robust, temporal trends or unmeasured confounders contributing to the findings cannot be excluded. Thus, these results must be interpreted with caution and replicated in the setting of a randomized clinical trial. Third, analyses were performed on a per-protocol basis, so inferences were conditional on participant survival and attrition. A low attrition rate of 5.3% (70% were deaths) at hospital discharge and 12.7% (75% were deaths) at 3-month follow-up and comparable attrition rates between groups (14% intervention, 11% controls at 3 months) limited this effect. Moreover, the study was underpowered to detect the intervention effect at 3 months after discharge, potentially explaining the nonstatistically significant finding at 3-month follow-up. Larger samples are recommended for future trials. Nevertheless, the positive findings of this pilot trial justify future randomized controlled trials to evaluate the effect of the mHELP on frailty to determine whether frailty can be reduced or reversed for older adults undergoing surgery.

CONCLUSION

The mHELP, comprising three nursing interventions, significantly reduced frailty and transitions to higher frailty states by hospital discharge for older adults undergoing common abdominal surgical procedures. Although encouraging trends were demonstrated 3 months after discharge, the improvement did not achieve statistical significance, which was not surprising given that no extra care was provided after participants were discharged from the hospital. These findings highlight the importance of improving important outcomes by focusing on basic areas of care and targeting care to address shared risk factors rather than single conditions.

ACKNOWLEDGMENTS

Conflict of Interest: The authors declare no conflict of interest.

This study was supported in part by the Taiwan National Science Council Grant #95–2314B002–188-MY3, by a career development grant from the National Health Research Institute (Grant #NHRI-EX-9820PC), and by the HELP. Dr. Saczynski was supported in part by funding from the National Institute on Aging (K01AG33643) and the National Heart, Lung, and Blood Institute (U01HL105268). Dr. Sharon Inouye holds the Milton and Shirley F. Levy Family Chair.

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Sponsor's Role: None of the funding agencies had any role in the design, methods, subject recruitment, data collection, analysis, or preparation of the manuscript.

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