SUPPLEMENT 2

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SUPPLEMENT 2

Health and Health Services Research Fund

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Research Dissemination Reports

NEUROLOGY

HEALTH SERVICES RESEARCH

Editorial

Dissemination reports are concise informative reports of health-related research supported by funds administered by the Food and Health Bureau, for example, the *Health and Health Services Research Fund* (which was consolidated into the *Health and Medical Research Fund* in December 2011). In this edition, 11 dissemination reports of projects related to neurology and health services research are presented. In particular, four projects are highlighted owing to their potentially significant findings, impact on healthcare delivery and practice, and/or contribution to health policy formulation in Hong Kong.

Much effort has been made to devise effective interventions to slow down progressive neurodegeneration among individuals with mild cognitive impairment (MCI). Chinese calligraphy writing is a mind-and-body activity culturally relevant to older adults. Chan et al[1] tested the efficacy of an 8-week Chinese calligraphy writing course for attention control—a specific impairment in early stage—in 99 older adults with MCI. The writing course improved working memory and delayed recall memory. The training also improved attention control, visual scan, and processing speed functions. Although further research is needed to confirm the efficacy of the intervention, particularly beyond 8 weeks, the training has potential to be adopted by service providers for day-to-day use in Hong Kong.

In 2010, the Reference Framework for Diabetes Care was introduced by the Primary Care Office of the Food and Health Bureau. It adopts a life-course, comprehensive, continuous, and patient-centred approach. The framework covers primary prevention through lifestyle changes, assessment in high-risk groups for early detection, and multidisciplinary management of diabetic patients. Wong et al[2] evaluated the awareness and adoption level of this framework in over 400 primary care physicians and determined the factors influencing its adoption. The level of adoption was high. Improvements in the patient version of the framework are suggested to enhance patient knowledge of diabetes and promote self-management. Insufficient resources, time, and support, as well as perceived influence on clinical autonomy and patient selection of services were major barriers among primary care physicians to adoption of the framework.

Chest pain is a common complaint in patients presenting to the emergency department, and acute coronary syndrome is confirmed in about 15%-25% of cases. Its evaluation is a lengthy process that involves serial electrocardiography and troponin tests taken 3-6 hours apart. There is a need for a safe and effective accelerated chest pain pathway to enable early discharge and to risk-stratify patients for appropriate deposition and utilisation of hospital resources. Rainer et al[3] developed a scoring system that incorporates a variety of standard measurements to accurately risk-stratify patients for deposition decision.

Geriatric hip fracture places an increasing burden on the medical system and requires increased health utilisation in the first year of fracture. A multidisciplinary critical clinical pathway shortens hospital stay and improves clinical outcomes. A local geriatric hip fracture clinical pathway was developed in 2007 with encouraging results in terms of shortened length of stay. Leung et al[4] conducted a retrospective study to compare clinical outcomes and manpower costs before and after implementation of the pathway. Implementation of the pathway resulted in shortened preoperative waiting time and length of hospital stay, decreased mortality and complication rate, reduced manpower cost, and increased efficiency.

We hope you will enjoy this selection of research dissemination reports. Electronic copies of these dissemination reports and the corresponding full reports can be downloaded individually from the Research Fund Secretariat website (http://www.fhb.gov.hk/grants). Researchers interested in the funds administered by the Food and Health Bureau also may visit the website for detailed information about application procedures.

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Chinese calligraphic writing to enhance cognitive performance and emotional calmness in older adults with mild cognitive impairment

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KEY MESSAGES

1. An 8-week Chinese calligraphy writing course improved working memory and delayed recall memory in older adults with mild cognitive impairment.
2. To a lesser extent, the training also improved attention control, visual scan, and processing speed functions.
3. Further research is needed to confirm the efficacy of the intervention, particularly beyond 8 weeks. The training has potential to be adopted by service providers for day-to-day use in Hong Kong.

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Introduction

Much effort has been placed on devising effective interventions to slow down the progressively neurodegenerative process among individuals with mild cognitive impairment (MCI). Non-pharmacological interventions aim to restore or compensate the cognitive dysfunctions. This study aimed to test the efficacy of an 8-week Chinese calligraphy writing course for attention control—a specific impairment in early stage—in older adults with MCI.

Chinese calligraphy writing is a mind-and-body activity culturally relevant to older adults.[1] It has been used as a cognitive approach to enhance cognitive function among individuals with MCI. Characters written in the *Kai* style have more discrete strokes than those in the *Hang* style. The shape of a *Kai*-style character is less square than that of a *Hang*-style character (Fig). The rate-limiting step of the writing practice focused on encoding and attention control in transforming characters from *Kai* to *Hang* style at the stroke level. A mnemonic strategy (rehearsal, association, and imagery)[2] was reinforced in the *Kai*-to-*Hang* character transformation. In this study, learning began at the stroke level such that participants were to associate *Hang* with *Kai*-style strokes by rehearsal before writing the *Hang*-style character with a brush.

We hypothesised that compared with controls, the experimental participants would show improvements in working memory and perhaps in attention control. The gain in these functions was tested with electroencephalogram (EEG). The two targeted event-related potential components were N200 and P300, which would reflect the underlying neural processes associated with the functions. We also hypothesised that the training would exert positive effects on emotional calmness.

Kai-style *Hang*-style

FIG. Hypothetical processes of transforming *Kai*-to-*Hang*-style character of 們 involved in the Chinese calligraphy writing* (reprinted with permission from IOS Press)

* The steps involve in the *Kai*-to-*Hang*-style character transformation are: (1) encoding a *Kai*-style character, (2) decomposing the character into *Kai*-style strokes, (3) retrieving the rehearsed *Hang*-style strokes, (4) visualising (imagery) the *Hang*-style strokes, and (5) composing the *Kai*-style strokes to form the *Hang*-style character to guide writing.

Methods

This study was conducted from July 2012 to June 2015. A total of 99 older adults were randomly assigned to an experimental group (Chinese calligraphy writing, n=48) or a control group (learning to use an Apple iPad, n=51) [Table 1]. Respectively for the two groups, the mean ages were 69.4 (standard deviation [SD], 5.9) and 68.1 (SD, 5.7)

years, and the mean Montreal Cognitive Assessment scores were 24.5 (SD, 2.9) and 24.4 (SD, 3.0). A total of 46 and 49 participants completed the training and 14 and 16 participants completed post-training EEG assessment, respectively.

Both interventions lasted 8 weeks, with two 1.5-hour sessions each week. The total duration of training was 24 hours. The calligraphy writing training was led by a professional calligraphy master and a research assistant. Participants learned to write basic strokes and characters involving *Kai*-to-*Hang* script transformation. Participants were to read a stroke/character presented in *Kai* script but to write the stroke/character in *Hang* script. The calligraphy master demonstrated the task on both a tablet computer and paper. The Apple iPad training involved learning its general functions such as usage of buttons, photo taking, and video recording (sessions 1 and 2); surfing the web with Safari (sessions 3 to 10); creating an email account and using email for communication (sessions 11 to 15); and general revision (session 16).

Each participant completed assessments at baseline, post-training, and 6-month follow-up conducted by a research assistant who was blinded to the randomisation. Between-group treatment effects were determined by five clinical measures: Digit Span Test (DST)–Backward, Color Trails Test (CTT), Symbol-Digit Modalities Test (SDMT), Geriatric Depression Scale – Short Form (GDS-SF), and Consortium to Establish a Registry for Alzheimer's Disease – Neuropsychological Assessment Battery (CERAD-NAB). Heart rate, heart rate variability, and blood pressure were measured after completion of the five clinical measures.

In a post-training session to record an EEG while performing two 2-back tasks (contextual and non-contextual), the contextual stimuli were composed of strokes of *Kai*-style characters to which both groups were exposed. The non-contextual stimuli were 10 single-digit Arabic numbers from 0 to 9 that appeared in Arial font. The EEG signals elicited by the participants during task performances were captured with a 64-channel 90 mm Ag/AgCl sintered electrode CURRY Scan 7 Neuroimaging Suite (NeuroScan Labs, Sterling [VA], USA).

TABLE 1. Characteristics of the participants* (reproduced from Chan CS et al. J Alzheimers Dis 2017;58:735-46, with permission from IOS Press)

Characteristic	Experimental (n=48)	Control (n=51)	P value
Gender			0.391
Female	32 (66.7)	38 (74.5)	
Male	16 (33.3)	13 (25.5)	
Marital status			0.301
Single	4 (8.3)	1 (2.0)	
Married	28 (58.3)	29 (56.9)	
Separated/widow/bereft	16 (33.3)	21 (41.2)	
Age (years)	69.4±5.9	68.1±5.7	0.720
No. of sessions attended	14.5±2.6	14.4±3.0	0.864
Montreal Cognitive Assessment score	24.5±2.9	24.4±3.0	0.533
Educational level			0.143
Uneducated	1 (2.1)	0 (0)	
Below primary school	8 (16.7)	17 (33.3)	
Primary school	15 (31.3)	7 (13.7)	
Secondary school	11 (22.9)	16 (31.4)	
Secondary graduated	9 (18.8)	7 (13.7)	
Tertiary education or above	4 (8.3)	4 (7.8)	

* Data are presented as mean±SD or No. (%) of participants

Results

Treatment effects

Two-way repeated measure ANOVA revealed significant group × occasion effects on the sequence and span scores of DST-Backward (sequence: $F(1,97)=4.578$, P=0.035; span: $F(1,97)=6.892$, P=0.01) [Table 2]. The interaction effects on the CTT2-CTT1 score of CTT were also significant ($F(1,97)=4.37$, P=0.039). Other comparisons for scores on SDMT and GDS-SF, as well as systolic and diastolic blood pressure and heart rate variability (low/high frequency) revealed no significant differences. The mean sequence and span scores on the DST-Backward significantly increased from baseline to post-training (sequence: P=0.002, d=0.498, power=0.67; span: P=0.009, d=0.499, power=0.66) for those in the experimental group (Table 2). In contrast, controls showed no such differences. For the CTT2-CTT1, scores significantly decreased from baseline to the post-test occasion (P=0.010, d= −0.432) for the experimental group, but not the control group (P=0.483, d= −0.116). Both the experimental (P<0.001, d=0.429) and control (P<0.001, d=0.497) groups showed a significant increase in scores on the CERAD Memory word delay recall (J6) from baseline to post-test occasions.

For the experimental group, the participants had a significantly shorter latency elicited from the non-contextual than contextual condition in terms of N200 ($t(12)=4.70$, P=0.004) and P300 ($t(12)=5.15$, P=0.001). The control group showed no such change. Behaviourally, participants in the experimental group performed significantly faster, ie shorter response time, for both contextual (792.8±187.8 ms vs 1033.3±281.1 ms) and non-contextual stimuli tasks (734.7±185.6 ms vs 875.0±173.2 ms) than the control group ($t(28)=2.71$, P<0.01 and $t(28)=2.14$, P<0.05, respectively). No significant between-group

TABLE 2. Outcome measures at baseline, post-training, and 6-month follow-up assessment (reproduced from Chan CS et al. J Alzheimers Dis 2017;58:735-46, with permission from IOS Press)

Tests	2x2 repeated measure (baseline x post-training)		2x2 repeated measure (baseline x 6-month)		Within-group comparison (baseline x post-training)		Within-group comparison (baseline x 6-month)	
					Experimental	Control	Experimental	Control
	$F_{(1,97)}$	P value	$F_{(1,97)}$	P value	P value (effect size -*d*)		P value (effect size -*d*)	
Digit Span Test (Backward)								
Sequence	4.578	0.035	4.273	0.041	0.002 (0.498)	0.671 (0.063)	<0.001 (0.665)	0.104 (0.263)
Span	6.892	0.010	2.657	0.106	0.009 (0.499)	0.506 (-0.091)	0.008 (0.505)	0.298 (0.153)
Color Trails Test (CTT) [sec]								
CTT1	0.003	0.956	0.096	0.757	0.006 (-0.335)	0.014 (-0.290)	0.019 (-0.314)	0.003 (-0.308)
CTT2	4.722	0.032	2.888	0.092	<0.001 (-0.439)	0.753 (-0.043)	0.014 (-0.291)	0.484 (-0.066)
CTT2-CTT1	4.372	0.039	4.057	0.047	0.010 (-0.432)	0.483 (0.116)	0.147 (-0.207)	0.179 (0.153)
Symbol-digit Modalities Test (Verbal)								
Accuracy (%)	0.336	0.564	5.074	0.027	0.451 (0.121)	0.851 (0.027)	0.016 (0.392)	0.736 (-0.047)
Correct attempts	0.104	0.748	2.361	0.128	0.213 (0.102)	0.136 (0.126)	0.202 (0.088)	0.005 (0.224)
Consortium to Establish a Registry for Alzheimer's Disease – Neuropsychological Assessment Battery								
J4	0.011	0.918	0.015	0.902	0.018 (0.341)	0.021 (0.317)	0.004 (0.466)	0.008 (0.437)
J6	0.002	0.966	0.289	0.592	<0.001 (0.429)	<0.001 (0.497)	<0.001 (0.580)	<0.001 (0.613)
J7	0.329	0.567	0.221	0.639	0.224 (0.132)	0.078 (0.168)	0.025 (0.355)	0.040 (0.156)
Geriatric Depression Scale	0.018	0.893	1.908	0.170	0.464 (0.112)	0.635 (0.065)	0.440 (0.115)	0.212 (-0.142)

differences were revealed in the accuracy rates.

Long-lasting effects

Two-way repeated measure ANOVA revealed significant group × occasion (baseline vs 6-month follow-up) change for the sequence score of DST-Backward ($F(1,97)=4.27$, P=0.041), CTT2-CTT1 of the CTT ($F(1,97)=4.06$, P=0.047), and accuracy rate on the verbal SDMT ($F(1,97)=5.07$, P=0.027). Other comparisons for scores on GDS-SF, systolic and diastolic blood pressure, and heart rate variability (low/high frequency) were not significant. Participants in the experimental group but not the control group showed a significant increase in the DST-Backward sequence score from baseline to follow-up occasions (P<0.001, d=0.665, power=0.68). For verbal SDMT, the accuracy rate improved significantly from baseline to follow-up for the experimental group (P=0.016, d=0.392), but not for the control group. There were sustained increases in scores on the CERAD-NAB J4 in both experimental (P<0.004, d=0.466 to 0.580) and control (P<0.008, d=0.437 to d=0.613) groups.

Discussion

The 8-week Chinese calligraphy writing course effectively improved cognitive function in adults with MCI. The treatment effects on augmenting working memory and verbal delayed memory were strong. To a lesser extent, attention control, and visual scan and processing speed were also improved. These behavioural changes were supported by the electrophysiological results and suggested modulation of the encoding and manipulation (reflected from longer N200 latency) and updating processes of the working memory content (reflected from shorter P300 latency). The findings support our hypothesis that *Kai*-to-*Hang*-style stroke and character transformation can improve working memory and attention control functions in patients with MCI. It also sheds light on the usefulness of using a mnemonic strategy to halt the decline in cognitive functions among patients with early MCI. Nonetheless, our findings did not support the notion that the training promoted emotional calmness. This was perhaps due to the cognitive approach taken.

The rate-limiting step of the *Kai*-to-*Hang*-style calligraphy writing was to encode and decompose the *Kai*-style strokes within its character; transform the decomposed *Kai* strokes into *Hang* style; and rehearse the *Hang*-style stroke in working memory before writing the script with a soft brush that involved motor execution. The encoding process challenged intensively the participants' visual scan and attention control functions. The *Kai*-to-*Hang*-

style transformation process at the stroke level required retrieval and attention control (switching) functions. These were reflected by the increased CTT scores. The rehearsal of the *Hang*-style stroke before motor execution would challenge working memory and was evidenced by the increased DST-Backward sequence score. Our results for improvement of working memory are consistent with those reported by Kwok et al[3] who piloted a calligraphy writing protocol. Our results on working memory are consistent with those of Rozzini et al[4] who demonstrated that computer-based memory training resulted in significant improvements in memory, attention, and visuospatial functions among MCI participants. Improvement in visual scan ability coupled with attention control was demonstrated by the significant increases in scores on the verbal SDMT from baseline to 6-month follow-up. Our findings suggest that Chinese calligraphy writing may yield better treatment effects in terms of memory, visual scan, and attention control than computer-based cognitive training for which the effects were equivocal.[5]

This study has limitations that would lower the power and generalisation of its analyses and results. Readers should interpret the results with caution.

Conclusion

The 8-week Chinese calligraphy writing course improved working memory and delayed recall memory functions of participants with early MCI. The improved working memory, attention control, and processing speed at the 6-month assessment indicated that the training has potential long-lasting effects for alleviating and perhaps preventing progression of MCI. Future research is needed to confirm the benefits of Chinese calligraphy training beyond 8 weeks. The study should be extended to home-based and self-paced training, which is a feasible and sustainable model for service provision.

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Brief integrated sleep-focused treatment for persistent sleep disturbance in residual depression: an assessor-blind, parallel group, randomised controlled study

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KEY MESSAGES

1. A brief integrated sleep-focused treatment is feasible in clinical practice with reasonable compliance.
2. It is effective in the management of treatment-resistant depression with comorbid sleep symptoms, evidenced by a much higher remission rate and a better clinical outcome.
3. Adjunctive sleep-focused therapy for patients with treatment-resistant depression and comorbid sleep symptoms should be incorporated into clinical practice and delivered by front-line mental health staff.

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Introduction

Major depressive disorder (MDD) is one of the most prevalent major medical conditions with a lifetime and 12-month prevalence of 2%-16% and 8%, respectively, in the United States and local Chinese populations. It is a debilitating and recurrent illness associated with tremendous personal distress, considerable impairment of psychosocial functioning, as well as increased morbidity and mortality. The treatment goal is sustained resolution of symptomatology with remission of MDD. About 15% to 90% of patients continue to experience residual symptoms, particularly sleep disturbances, despite optimised antidepressant treatment. There is an imperative need to explore specific sleep-focused treatments in addition to usual antidepressant prescription in the routine clinical management of depression.

Growing evidence suggests a close interplay between sleep disruption and psychopathology, in which sleep disturbance is associated with susceptibility to the subsequent development of depression, increased risk of non-remission, and exaggeration of other clinical symptoms, and prognostic implication in predicting suicidality. Although empirical support for cognitive behavioural therapy for insomnia has been well documented, especially for primary insomniacs, there is a paucity of clinical studies to evaluate an integrated sleep-symptom-specific treatment strategy in relation to clinical management of MDD.

This study aimed to develop and evaluate a brief sleep-focused cognitive behavioural therapy for depressed patients with residual sleep disturbances (including frequent insomnia and nightmares).

Methods

This study was conducted from October 2012 to April 2015. Patients were recruited from the psychiatric outpatient clinic of Prince of Wales Hospital. Ethical approval was obtained from the Joint Chinese University of Hong Kong – New Territories East Cluster clinical research ethics committee (reference no: 2011.475-T) and the trial was registered with the Chinese Clinical Trial Registry (reference: ChiCTR-TRC-13002976).

This randomised, assessor-blind, parallel-group study was aimed at patients with residual sleep disturbances despite adequate pharmacotherapy (the usual psychotropic medications prescribed from the outpatient clinic including antidepressants and hypnotics); prescriptions for general medical conditions were allowed during the study period.[1] At baseline, eligible subjects were randomly assigned to the group of sleep-focused treatment plus usual treatment or usual treatment alone. An independent clinical assessor who was blinded to the group allocation assessed the patients at baseline and follow-up.

Outcome measures included: (1) clinician-rated severity of clinical symptoms measured by the Hamilton Rating Scale for Depression (HRSD17), Clinical Global Impression Scale- Global Improvement and Severity of Illness (CGI-S &

CGI-I), self-rated Hospital Anxiety and Depression Scale (HADS), Beck Depression Inventory (BDI), and Beck Scale for Suicide Ideation (BSSI); (2) self-rated sleep symptoms measured by the Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Nightmare Frequency Questionnaire (NFQ), Nightmare Distress Questionnaire (NDQ), and daily sleep and dream diary; and (3) self-rated quality of life measures measured by the Short-form 36 Health Survey (SF-36).

All analyses were based on the intent-to-treat model. Chi-square analysis and analysis of variance (ANOVA) were used to compare baseline characteristics. Treatment effect on all main outcome variables was analysed using repeated measure ANOVA. All tests were based on a 0.05 level of significance. Remission for depression was defined as a HRSD17 score of <8 and remission for insomnia was defined as an ISI score of <8. A reduction of total scores for HRSD17 and ISI, and a PSQI score >50% when compared with baseline was defined as response. The differences in the rates of remission and response between the intervention group and control group were tested by Chi-square or Fisher's exact test. All statistical analyses were performed using Statistical Package System Software.

Results

The control and intervention groups were comparable in terms of baseline characteristics and clinical symptoms, except for the NFQ score (15.4±9.8 vs 21.5±8.9, P=0.039) [Table 1]. From baseline to 12-month post-intervention, the intervention group had a greater reduction of HRSD17 score than the control group (from 21.5±5.4 to 13.6±7.0 vs from 20.5±4.4 to 17.8±6.7, time*intervention P=0.001, Table 2). The differences in the changes of HRSD17 score remained significant even after the sleep-related items of the HRSD17 scale were excluded from analysis. From baseline to 1-week follow-up, the reduction of the ISI total score was greater in the intervention group than the control group (from 19.0±4.6 to 15.2±6.6 vs from 17.8±5.0 to 16.5±5.1, time*intervention P<0.05). The intervention group also had lower CGI scores (ie more marked overall improvement) than the control group as rated by both the assessor and patients.

Nonetheless, the differences between the change in ISI for the two groups did not reach significance at subsequent follow-ups from 1 month to 12 months. From baseline to 12-month follow-up, the intervention group had better improvement in the PSQI score than the control group (from 14.5±3.6 to 12.0±4.2 vs from 13.7±3.9 to 12.3±4.8, time*intervention P=0.028).

Compared with the control group, the intervention group had higher remission rate (24.2% vs. 6.1%, P<0.05) and response rate (33.3% vs. 12.1%, P<0.05) of depression at 1 week and 12 months (24.2% vs. 6.1%, P<0.05 and 33.3% vs. 12.1%, P<0.05, respectively) [Table 3].

Discussion

Sleep-focused treatment was effective in the management of depressive symptoms in patients with persistent sleep disturbances and depression. The treatment effect was sustained for over 12 months with improved depressive symptoms. Nearly

TABLE 1. Baseline characteristics of subjects*

Baseline characteristic	Control (n=33)	Intervention (n=33)	P value
Age (years)	51.1±9.4	50.2±8.6	0.71
No. (%) of females	20 (60.6)	21 (63.6)	0.80
Body mass index (kg/m^2)	24.5±2.7	24.3±4.7	0.91
Hamilton Rating Scale for Depression	20.5±4.4	21.5±5.4	0.42
Insomnia Severity Index	17.8±5.0	19.0±4.6	0.29
Pittsburgh Sleep Quality Index	13.7±3.9	14.5±3.6	0.38
Morningness Eveningness Questionnaire	48.6±11.8	49.0±8.9	0.89
Epworth Sleepiness Scale	9.0±5.0	9.9±4.8	0.48
Nightmare Distress Questionnaire	44.4±5.8	44.2±6.1	0.84
Nightmare Frequency Questionnaire	15.4±9.8	21.5±8.9	0.039
Beck Scale for Suicide Ideation	71.7±24.8	75.8±21.9	0.49
Short-form 36 Health Survey	51.6±13.1	50.2±11.2	0.65
Hospital Anxiety and Depression Scale	22.5±7.3	21.5±7.0	0.54
Beck Depression Inventory	15.9±6.2	15.6±6.6	0.83

* Data are presented as mean±SD or No. (%) of subjects

TABLE 2. Changes in outcome measures for intervention and control groups

Outcome measure	Control group					Intervention group					P value for time* intervention
	Baseline	1 week	1 month	6 months	12 months	Baseline	1 week	1 month	6 months	12 months	
Hamilton Rating Scale for Depression	20.5±4.4	18.7±6.7	18.4±6.9	17.5±7.1	17.8±6.7	21.5±5.4	14.1±7.2	14.7±6.8	14.8±8.0	13.6±7.0	0.001
Hamilton Rating Scale for Depression (no sleep)	16.0±4.1	14.9±5.9	14.8±6.0	13.9±6.3	14.3±6.0	16.9±4.9	11.5±6.0	11.7±5.7	11.9±6.6	11.0±5.8	0.003
Insomnia Severity Index	17.8±5.0	16.5±5.1	14.7±5.3	14.4±5.3	13.9±5.7	19.0±4.6	15.2±6.6	15.4±7.0	15.7±7.0	15.0±6.6	0.20
Pittsburgh Sleep Quality Index	13.7±3.9	13.1±4.5	12.7±4.2	12.1±4.3	12.3±4.8	14.5±3.6	11.3±4.6	12.1±4.8	12.1±4.6	12.0±4.2	0.028
Epworth Sleepiness Scale	9.0±5.0	9.3±4.9	9.7±4.5	9.2±5.0	9.1±5.6	9.9±4.8	9.5±5.8	8.6±4.7	8.8±4.7	8.9±4.4	0.41
Nightmare Distress Questionnaire	44.4±5.8	46.1±6.5	46.0±6.2	45.6±7.4	44.3±6.3	44.2±6.1	45.9±5.5	46.8±6.2	45.7±8.8	46.5±8.7	0.58
Nightmare Frequency Questionnaire	10.3±10.8	12.6±11.9	8.9±9.8	10.3±10.3	9.3±11.9	14.3±12.7	12.5±13.1	10.9±12.4	9.6±11.0	9.7±11.7	0.37
Short-form 36 Health Survey	51.6±13.1	50.2±15.2	53.4±14.7	55.2±13.5	53.6±12.8	50.2±11.2	54.7±11.1	52.9±11.9	52.1±10.9	54.6±10.9	0.061
Hospital Anxiety and Depression Scale	22.5±7.3	22.5±8.6	21.0±8.1	20.4±7.2	20.2±8.5	21.5±7.0	20.1±5.8	18.9±5.3	19.1±6.9	18.2 ±5.7	0.88
Beck Depression Inventory	15.9±6.2	14.0±7.8	13.9±7.0	13.6±7.1	13.8±5.8	15.6±6.6	14.4±6.2	13.6±6.6	14.9±6.4	13.2±6.1	0.71
Clinical Global Impression Scale											
Physician-rated	-	3.7± 0.9	3.8±1.0	3.3±1.0	3.5±1.2	-	3.1±0.9	3.0±0.8	2.9±1.0	3.0±1.1	0.035
Self-rated	-	3.3±1.0	3.6±1.4	3.2±1.5	3.4±1.3	-	2.5±0.9	2.8±1.1	2.9±1.4	3.0±1.4	0.036

TABLE 3. Rates of remission and response of depression and insomnia at each time point*

Outcome measure	Remission (%)				Response (%)			
	1 week	1 month	6 months	12 months	1 week	1 month	6 months	12 months
Hamilton Rating Scale for Depression								
Control group	6.1	3.0	3.0	6.1	12.1	6.1	12.1	12.1
Intervention group	24.2	15.2	21.2	24.2	33.3	21.2	30.3	33.3
P value	0.039	0.19	0.054	0.039	0.040	0.15	0.13	0.040
Insomnia Severity Index								
Control group	0	6.1	9.1	12.1	0	12.1	21.2	15.2
Intervention group	12.1	18.2	15.2	18.2	15.2	12.1	18.2	18.2
P value	0.114	0.258	0.708	0.733	0.053	1	0.757	0.741

* Remission is defined as a Hamilton Rating Scale for Depression score of <8 and an Insomnia Severity Index score of <8; response is defined as a reduction of >50% in both scores compared with baseline

one-quarter of treatment-resistant patients with depression had achieved remission at 12-month follow-up compared with only 6% of the control group. Sleep-focused treatment was also effective in management of sleep disturbances, with the most prominent effects seen in the first week after intervention. In addition, the treatment was shown to improve quality of life in depressed patients.

Sleep-focused treatment was effective in reducing insomnia symptoms. Nonetheless, the differences in the changes of the ISI total score between the two groups were not sustained 1-month post-treatment. This could be explained by a significant improvement of insomnia in the control group rather than a rebound of insomnia symptoms in the intervention group. The exact reason was unclear, but there was a possibility that the patients in the control group had received add-on treatment

with hypnotics from the attending clinicians in the outpatient clinic when their insomnia symptoms persisted. Indeed, the reduced ISI total score in the control group emerged 1-month post-treatment (from 17.8±5.0 to 14.7±5.3). Our findings were consistent with those of the study by Blom et al[2] wherein patients who received cognitive behavioural therapy for insomnia did not differ in their insomnia severity to those in the control group at 36 months, because the control group had used more sleep medications and received additional insomnia treatments during the follow-up period. Further analysis of medication use in both groups throughout the 12-month follow-up period is warranted.

There are several reasons for the improved outcome for depression following adjunctive sleep-focused treatment. The reduced overall HRSD17 score might have been mediated by the reduced scores for sleep-related items in the HRSD17 scale. Nonetheless, the difference in the changes of the HRSD17 between the two groups persisted, even after excluding three sleep-related items. In this regard, the reduced HRSD17 score in the intervention group was independent of the improvement in sleep symptoms. In addition, when both depression and insomnia are present, depression may be more often caused or maintained by insomnia, suggesting that treating insomnia might improve depression.[3] By using the experience sampling method, sleep quality during the previous night was shown to be associated with the affect during the next day, especially positive affect.[4] Therefore, the improvement in sleep quality by sleep-focused treatment may have had an added benefit of improving daytime depressive symptoms. Finally, it has been shown that sleep deprivation is an effective treatment for depression.[5] A sleep restriction technique in sleep-focused treatment may improve depressive symptoms through partial sleep deprivation.

Conclusions

This brief integrated sleep-focused treatment was effective in the management of treatment-resistant depression with comorbid sleep symptoms, evidenced by a much higher remission rate and a better clinical outcome. Our findings strongly suggest the need for adjunctive sleep-focused therapy for patients with treatment-resistant depression and comorbid sleep symptoms.

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Effect of health empowerment intervention for stroke self-management on behaviour and health in stroke rehabilitation patients

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KEY MESSAGES

1. Implementation of patient empowerment intervention has potential influence on self-efficacy in illness management, favouring self-management behavioural outcomes and enhancement of functional recovery in post-stroke patients.
2. The health empowerment intervention for stroke self-management can be conducted in parallel with the existing ambulatory stroke rehabilitation services and gave added value in sustaining stroke self-management and functional improvement in the longer term.

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Introduction

Empowerment-based self-management interventions for chronic illnesses such as diabetes, asthma, hypertension, and arthritis have been shown to be effective in targeting behavioural and health outcomes.[1-3] Nonetheless, self-management in stroke is a challenge; it is multifaceted and relies on a combination of medications, technical aids, and professional care. In addition, the sudden and complex disabling consequences of a stroke hinder patient participation. It is important to identify an effective empowerment approach to articulate and to provide support to stroke patients for their unique health needs and attainment of their personal goals. Based on the theory of health empowerment, the health empowerment intervention for stroke-self-management (HEISS) emphasises patients' inner resources (eg self-efficacy) and social-contextual resources (eg supportive relationships) to facilitate awareness and ability to participate knowingly in health and healthcare decisions.[4] This study aimed to evaluate the effects of HEISS together with the existing out-patient rehabilitation schedule immediately after the acute phase of stroke.

Methods

This study was conducted from May 2012 to November 2014. We hypothesised that participants in HEISS would have significantly improved self-efficacy, self-management behaviour and activities of daily living.

Subjects were randomised to receive usual care alone (control group) or usual care plus HEISS (intervention group). Usual care under the ambulatory stroke rehabilitation programme was implemented by the interdisciplinary team that included a physiotherapist, occupational therapist, and nurses. The HEISS aimed to empower patients with the 'know how' and skills to practise self-management during stroke rehabilitation. It consisted of three parts.

In part I, small-group sessions that comprised six weekly 30-minute sessions (4-6 participants per group) provided an opportunity to establish a partner relationship between individual participants and the research nurse. Activities included building self-efficacy (through mastery, verbal persuasion, vicarious experience, and physiological feedback), developing core self-management skills, and articulating his/her health needs for goal attainment. An individualised mutually agreed action plan and Stroke Self-management Work Book was prepared for individual home-based implementation.

Part II was a 4-week home-based implementation conducted immediately after part I. Participants worked according to their action plan at home using their own Stroke Self-management Work Book. Participants received critical input for empowering and supporting self-management.

In part III, a face-to-face reinforcement session was conducted after the 4-week home-based implementation. Nurse-patient interaction was organised to determine what progress participants had made in their self-management and stroke recovery process. Critical inputs were reinforced to facilitate personal reflection and celebrate successes, and recognise limitations that would require modification of long-term goals and action plans.

Primary outcome measures included self-

efficacy, self-management, and instrumental activities of daily living (IADL). Data were collected at pre-test (T0), and 1 week (T1), 3 months (T2) and 6 months (T3) post-test.

Outcomes were compared between the control and intervention groups based on the intention-to-treat principle. The generalised estimating equation model was used to evaluate differential changes to each outcome across the time points between the two groups. This model accounts for baseline outcome values and the intra-correlation of the repeated measures outcome across time. The differential changes to each outcome were assessed by the regression coefficient (*B*) of the group x time point interaction-terms in the model. For continuous outcomes, the *B* of the interaction term at each follow-up time point represented the net average difference (intervention group – control group) in the change to the outcome at the underlying follow-up time point with respect to the baseline. A positive *B* meant the intervention group had better improvement than the control group. For binary outcomes, the *B* of the interaction-terms represented the net average difference (intervention group – control group) in the change of the log odds of the outcome at the underlying follow-up time point with respect to the baseline. Instead of the raw *B*, the odds ratios of the interaction-terms were presented for binary outcomes. An odds ratio of >1 means the intervention group had better improvement than the control group. All statistical tests were two-sided and a P value of <0.05 was considered statistically significant.

Results

A total of 375 stroke patients were screened for eligibility and 291 fulfilled the inclusion criteria. Of them, 210 were randomised to the control (n=105) or intervention (n=105) group (Fig). The overall dropout rate at T3 was 16.7% (21.9% and 11.4% respectively for control and intervention groups). No significant difference was found in sociodemographic or clinical characteristics between the dropouts and the completers, or between the two groups.

Participants were predominately older adults, with 31.9% aged <65 years. The mean age was 69.25 (standard deviation, 14.1; range, 30-89) years. All participants required assistance by caregivers; 73.7% of the participants had suffered an ischaemic stroke that had resulted in hemiparesis (86.7%) and/or sensory impairment (67.1%), and 70% were hypertensive before the stroke (Table 1).

Overall, the intervention group showed more favourable improvement in all outcomes at all time points, except for medication adherence (Table 2). The intervention group showed significantly better improvement than the control group in self-efficacy in illness management at both 3 months (*B*=5.44, 95% confidence interval [CI]=1.24-9.64, P=0.011) and 6 months (*B*=5.59, 95% CI=1.22-9.95), P=0.012).

Regarding self-management behaviour, the intervention group showed better improvement than the control group in cognitive symptom management at T1 (*B*=4.49, 95% CI=2.60-6.37, P=0.001), T2 (*B*=5.18, 95% CI=3.27-7.09, P<0.001), and T3 (*B*=3.61, 95% CI=1.62-5.61, P<0.001), and in communication with physician at T1 (*B*=3.53, 95% CI=2.13-4.94, P<0.001), T2 (*B*=2.44, 95% CI=0.93-3.95, P=0.002), and T3 (*B*=1.36, 95% CI= -0.23-2.95, P=0.094). In self-health monitoring, the intervention group showed significantly better improvement than the control group at T1 (odds ratios [OR]=2.49, 95% CI=1.32-4.68, P=0.005), T2 (OR=2.56, 95% CI=1.32-4.96, P=0.005), and T3 (OR=2.31, 95% CI=1.11-4.81, P=0.025). Nonetheless, there was no significant difference between the two groups for improvement in medication adherence.

For functional ability, the intervention group

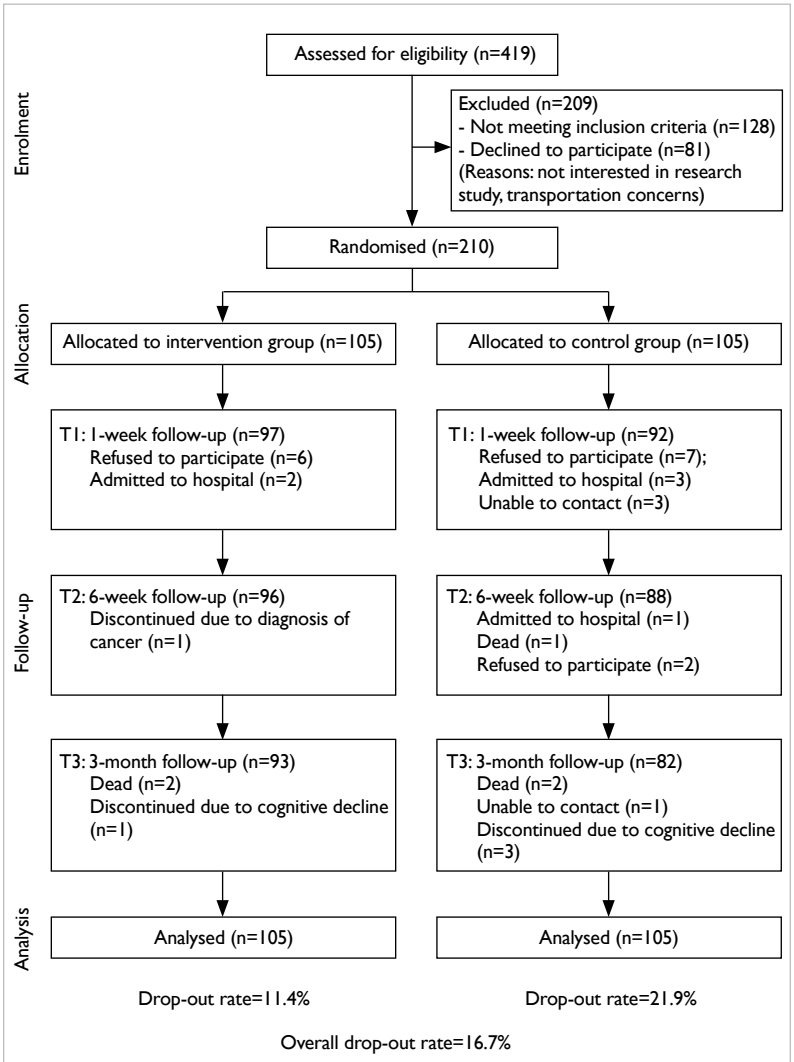

FIG. Flow diagram of recruitment of participants (adapted from reference 5, with permission from Dove Medical Press Ltd)

TABLE 1. Baseline characteristics and clinical profile of participants (n=210)* [adapted from reference 5, with permission from Dove Medical Press Ltd]

Characteristic	Control (n=105)	Intervention (n=105)	P value
Age (years)	70.7±13.9	67.8±14.2	0.124
Sex			0.999
Male	55 (52.4)	55 (52.4)	
Female	50 (47.6)	50 (47.6)	
Marital status			0.193
Single	10 (9.6)	10 (9.5)	
Married	80 (76.2)	71 (67.6)	
Divorced/separated/widowed	15 (14.2)	24 (22.9)	
Educational level			0.606
No formal education	22 (20.9)	21 (20.0)	
Primary school	27 (25.7)	24 (22.9)	
Secondary school	47 (44.7)	46 (43.8)	
Tertiary education or above	9 (8.7)	14 (13.3)	
Employment status			0.827
Full/part time work	34 (32.4)	33 (31.4)	
Housewife	15 (14.3)	20 (19.0)	
Retired	48 (45.7)	45 (42.9)	
Unemployed	8 (7.6)	7 (6.7)	
Carer			0.090
Relatives	17 (16.2)	24 (22.9)	
Paid full-time domestic helper	10 (9.5)	16 (15.2)	
Paid part-time domestic helper	60 (57.1)	57 (54.3)	
Aged care staff	18 (17.1)	8 (7.6)	
Religion			0.935
No	61 (58.7)	61 (58.1)	
Yes	43 (41.3)	44 (41.9)	
Smoking habits			0.999
Never smoke	68 (64.8)	68 (64.8)	
Ex-smoker	34 (32.4)	35 (33.3)	
Smoker	3 (2.9)	2 (1.9)	
Stroke type			0.754
Haemorrhagic	27 (25.7)	29 (27.6)	
Ischaemic	78 (74.3)	76 (72.4)	
Affected brain region			0.579
Left brain	49 (46.7)	41 (40.2)	
Right brain	52 (49.5)	57 (55.9)	
Both	4 (3.8)	4 (3.9)	
Mobility			0.854
Hemiplegia	6 (5.7)	4 (3.8)	
Hemiparesis	90 (85.7)	92 (88.5)	
Both	8 (7.6)	7 (6.7)	
Not obvious	0 (0.0)	1 (1.0)	
Affected body part			0.961
Left side	49 (46.6)	50 (47.6)	
Right side	41 (39.1)	41 (39.0)	
Both	9 (8.6)	9 (8.6)	
Others (visual/speech)	6 (5.7)	5 (4.8)	
Sensory influence			0.996
Intact	35 (33.3)	35 (33.3)	
Impaired	65 (61.9)	66 (62.9)	
Absent	5 (4.8)	4 (3.8)	
Chronic illnesses	96 (91.4)	93 (90.3)	0.490
Hypertension	74 (70.5)	73 (70.9)	0.880
Diabetes mellitus	38 (36.2)	36 (35.0)	0.773
Hyperlipidaemia	47 (44.8)	50 (48.5)	0.678
Heart disease	11 (10.5)	24 (23.3)	0.016
Complications	7 (7.0)	13 (12.7)	0.158

* Data are presented as mean±SD or frequency (%)

had significantly better improvement than the control group in the Barthel index at T1 (*B*=5.20, 95% CI=0.75-9.64, P=0.022), T2 (*B*=8.04, 95% CI=2.40-13.68, P=0.005), and T3 (*B*=7.97, 95% CI=1.51-14.43, P=0.016) and the Lawton IADL at T1 (*B*=2.46, 95% CI=1.29-3.63, P<0.001), T2 (*B*=3.54, 95% CI=2.27-4.80, P<0.001), and T3 (*B*=2.86, 95% CI=1.39-4.32, P<0.001).

Discussion

Participants who received HEISS have demonstrated a progressive improvement in self-efficacy in illness management at 3-month and 6-month follow-ups.[5] During the rehabilitation period, stroke patients of similar disabilities work alongside each other and thus can influence and motivate each other that an activity or task is possible. Verbal persuasion from health care personnel is also an important factor that can encourage individuals in a progressive manner. It is possible that during the course of recovery, HEISS participants experienced success in day-to-day symptom or illness management, their self-efficacy improved over time, consequently showing a more favourable effect over and above that of participants in the control group. Our findings suggest that improvement in self-efficacy may produce more long-term value in sustaining a stroke patient's belief about their capability for self-management.

To empower stroke patients to participate knowingly and actively in self-management, the HEISS adopted a more person-centred approach than the usual care offered to the control group. Participants who received HEISS had significant improvement in cognitive symptom management, communication with physician, and self-health monitoring. Compared with baseline, improvement was distinctively notable at T1 (1 week) and T2 (3 months), but waned slightly at T3 (6 months) suggesting beneficial intervention implementation at the two earlier time points. The waning benefit could be a consequence of a gradual recovery of mobility and increasing confidence with patients feeling better adapted to their post-stroke changes in daily living or a result of less contact with health professionals and lack of reinforcement. No difference was observed between the two groups in stroke-specific self-efficacy and medication adherence, possibly because all individuals were aware of the importance of stringent compliance after a major health event such as a stroke.

The difference in functional outcomes was resonated in the intervention group where major improvements in self-management behaviours were evident.[5] The Barthel Index and Lawton IADL are measures of functional mobility. The Barthel Index in the control and intervention groups significantly improved over the three time points. A similar observation was also seen with the Lawton IADL

TABLE 2. Generalised estimating equation (GEE) models for comparison of outcomes across time between groups (adapted from reference 5, with permission from Dove Medical Press Ltd)

Outcome	Regression coefficients of the GEE models						
	Group	T1	T2	T3	Group*T1	Group*T2	Group*T3
	B (95% CI)	*B* (95% CI)	*B* (95% CI)	*B* (95% CI)	*B* (95% CI)	*B* (95% CI)	*B* (95% CI)
Self efficacy							
Stroke-specific self-efficacy	2.71 (-4.34 to 9.76)	3.12 (-1.03 to 7.25)	2.89 (-1.88 to 7.65)	6.84 (1.84 to 11.84)*	3.64 (-2.21 to 9.48)	6.28 (-0.26 to 12.82)	5.09 (-1.97 to 12.16)
Self-efficacy in illness management	2.24 (-1.52 to 6.01)	1.10 (-1.66 to 3.85)	-0.47 (-3.57 to 2.63)	0.42 (-2.96 to 3.80)	2.11 (-1.77 to 6.00)	5.44 (1.24 to 9.64)*	5.59 (1.22 to 9.95)*
Self-management behaviour							
Cognitive symptom management	-0.57 (-2.01 to 0.87)	0.56 (-0.70 to 1.82)	0.40 (-0.84 to 1.65)	-0.21 (-1.65 to 1.23)	4.49 (2.60 to 6.37)‡	5.18 (3.27 to 7.09)‡	3.61 (1.62 to 5.61)‡
Communication with physician	-0.03 (-0.84 to 0.78)	1.44 (0.60 to 2.28)‡	1.78 (0.78 to 2.77)‡	2.23 (1.17 to 3.29)‡	3.53 (2.13 to 4.94)‡	2.44 (0.93 to 3.95)†	1.36 (-0.23 to 2.95)
Medication adherence	1.01 (0.55 to 1.86)	1.15 (0.69 to 1.90)	1.04 (0.59 to 1.82)	1.61 (0.87 to 2.99)	1.10 (0.50 to 2.42)	1.29 (0.57 to 2.92)	0.57 (0.25 to 1.32)
Self–blood pressure monitoring	1.00 (0.58 to 1.73)	1.55 (1.04 to 2.30)*	1.54 (0.98 to 2.40)	1.83 (1.12 to 2.98)*	2.49 (1.32 to 4.68)†	2.56 (1.32 to 4.96)†	2.31 (1.11 to 4.81)*
Functional ability							
Barthel index	-3.24 (-9.28 to 2.80)	8.46 (5.15 to 11.77)‡	6.98 (2.44 to 11.53)†	5.48 (0.80 to 10.16)*	5.20 (0.75 to 9.64)*	8.04 (2.40 to 13.68)†	7.97 (1.51 to 14.43)*
Lawton instrumental activities of daily living scale	-0.65 (-1.98 to 0.69)	1.56 (0.67 to 2.44)†	0.92 (-0.05 to 1.89)	1.80 (0.66 to 2.93)†	2.46 (1.29 to 3.63)‡	3.54 (2.27 to 4.80)‡	2.86 (1.39 to 4.32)‡

* P<0.05
† P<0.01
‡ P<0.001

measure apart from slight fluctuations between the three time points, whereas a more stable improvement was seen in the intervention group. In the intervention group, both Barthel Index and Lawton IADL measures indicated steady and more stable functional recovery. The fluctuations in the control group could have been related to the day-to-day illness management abilities and resilience when faced with difficulties or physical symptoms.

Conclusion

Patient empowerment is a process whereby a patient becomes willing and able to play an active role in the management of their health and to exert influence over events that affect their lives during their stroke rehabilitation journey. Implementation of interventions aimed at patient empowerment may influence self-efficacy in illness management and self-management participation and thereby improve functional recovery in the longer term.

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(2) Sit JW, Chair SY, Choi KC, et al. The effects of a theory-based health empowerment intervention on self-management and functional recovery post-stroke. Stroke 2016;47(Suppl 1):ANS7.

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Chronic disease self-management and cognitive training programme to improve diabetic control in older outpatients with memory complaints: a randomised trial

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KEY MESSAGE

In older diabetic patients with cognitive impairment, the chronic disease self-management and cognitive training programme was effective in improving memory but did not promote self-management or glycaemic control.

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Introduction

Older diabetic people are at risk of cognitive decline and dementia.[1] Cognitively impaired older diabetic patients may be more frail and more prone to problems with drug adherence than their cognitively normal counterparts. This results in poorer diabetic control and long-term complications.

Chronic disease self-management programmes (CDSMPs) have been shown to have long-lasting effects on self-efficacy and health care utilisation. A locally adapted 6-week, group-based CDSMP has shown significant improvement in older people with chronic diseases in terms of self-management behaviours, self-efficacy, and subjective health-related quality of life, particularly in mental health.[2] Nonetheless, the benefits of CDSMP may be limited in cognitively impaired older diabetic patients. Cognitive training has been shown to be effective in improving cognitive function in older people. A locally designed cognitive training programme for older people with subjective memory complaint has shown benefits in reasoning and memory after 12 weeks' training in those with primary or lower education.[3] A combination of this cognitive training programme and CDSMP may promote self-management activities and improve glycaemic control in cognitively impaired older diabetic patients. It is hypothesised that the combination of disease self-management intervention and cognitive training will improve diabetic control in such patients. We also examined changes in disease self-management habits, psychological health, medication adherence, and cognitive function.

Methods

Outpatients with type-2 diabetes mellitus aged ≥65 years were recruited from general outpatient clinics and specialist outpatient clinics in Shatin and Tai Po areas. Inclusion criteria were: (1) recent glycosylated haemoglobin (HbA1c) level of 7% to 9% without change in diabetes medication within 3 months, and (2) subjective memory complaints as suggested by a Chinese Memory Symptoms Score of ≥3 out of 5. Exclusion criteria were: (1) post-secondary education, (2) an abbreviated Geriatric Depression Scale score of >1, (3) diagnosis of dementia or other terminal illness, and (4) significant disability. Written informed consent was obtained from both participants and caregivers.

All potential subjects were clinically assessed by a geriatrician in the research clinic. A research assistant compiled the clinical information, conducted cognitive tests (Mini-Mental State Examination, Verbal Fluency Test and Controlled Oral Word Association Test [for executive function], International Shopping List test and Continuous Paired Associate Learning test in the computerised Cogstate Neuropsychological Test Battery [for verbal and visual-spatial episodic memory performances]), and completed the General Health Questionnaire and Chinese version of the Diabetes Management Questionnaire. The latter is a self-report structured questionnaire to record the frequency of different diabetes management activities including diet

control, exercise, medication adherence check, haemostix monitoring, blood pressure measurement, and foot inspection. It was administered to both participants and caregivers. Caregiver involvement in each diabetic management activity was similarly recorded.

Subjects were randomly assigned to either the intervention (CDSMP) or control group. The research assistant involved in follow-up assessments was blinded to patient assignment. Attending doctors were advised to keep diabetic medication unchanged in the first 4 months. Assessments were repeated at month 4 and month 12.

The CDSMP comprised 10 weekly 2.5-hour sessions in consecutive weeks, conducted in a small group setting (6-8 participants) at Prince

TABLE 1. Baseline characteristics of the intervention and control groups

Characteristic	Intervention (n=73)*	Control (n=66)*	P value
Age (years)	74.6±6.7	72.3±5.5	0.032
Female	58.9	59.1	0.982
Body mass index (kg/m^2)	25.9±3.7 (n=48)	25.7±5.0 (n=49)	0.849
Education (years)	4.9±3.5	6.0±3.8	0.091
<3 (none)	28.80	21.20	0.056
3-6 (primary)	46.60	34.80	
>6 (secondary)	24.70	43.90	
Smoking status			0.324
Non-smoker	72.6	71.2	
Ex-smoker	27.4	25.8	
Smoker	0	3	
Specialist outpatient	79.5	86.4	0.151
Duration of diabetes mellitus (years)	16.2±8.3	17.6±9.6	0.37
≤10	34.7	28.8	0.253
11-20	44.4	37.9	
>20	20.8	33.3	
Insulin therapy	53.4	57.6	0.623
Hypertension	90.4	87.9	0.631
Stroke	21.9	13.6	0.204
Ischaemic heart disease	17.8	9.1	0.135
Glycosylated haemoglobin level (%)	7.81±0.56	7.81±0.62	0.95
Systolic blood pressure (mmHg)	140±16	137±16	0.262
Diastolic blood pressure (mmHg)	78±8	76±9	0.454
General Health Questionnaire	5.32±5.29	6.17±4.95	0.33
Mini-Mental State Examination	25.4±3.2	26.2±3.1	0.163
Executive function z-score	-0.125±0.77	0.114±0.91	0.097
Memory z-score	-0.204±0.81 (n=66)	0.154±0.83 (n=69)	0.013

* Data are presented as mean ± standard deviation or % of subjects

of Wales Hospital, Alice Ho Miu Ling Nethersole Hospital, or community elderly centres. In the first hour, participants were taught chronic disease self-management skills. The second hour was dedicated to cognitive training. The programme was delivered according to a standardised teaching manual by a pair of trained professional leaders (registered social workers or allied health professionals) or elderly peer leaders who were retired older volunteers with chronic diseases.

The CDSMP is a generic programme that covers a wide range of themes, from lifestyle (diet and exercise) and healthcare (use of medication and partnership with healthcare providers) to psychosocial coping (negative emotions and cognitive symptom management, effective communication and problem solving). For this group of patients, we focused on the management of diabetes and cognitive impairment. Formats involved educational talks, group discussion, peer support, and additional strategies based on the self-efficacy theory. These strategies included performance accomplishments in self-selected goals and action planning, implementation with review of progress, behavioural modelling and social persuasion by other participants and leaders, and guided reinterpretation of symptoms and problem solving. Cognitive training included three cognitive domains: reasoning, memory, and speed-of-processing.

Each participant was expected to devise and implement an action plan for self-management and complete a small amount of homework for cognitive training every week. The action plan and homework were reviewed and discussed at the beginning of each session. In addition, family caregivers were invited to an interactive session in which they learned about cognitive impairment in diabetic patients and shared their caring difficulties.

Results

Overall, 139 patients were eligible and randomised to either the intervention (n=73; 52.5%) or control (n=66; 47.5%) group. The mean attendance rate was 86.3%; only 13 (17.8%) participants had an attendance rate of <80%. Of all patients, 63 (86.3%) in the intervention group and 56 (84.8%) in the control group completed all follow-up visits and HbA1c measurements. Compared with completers, non-completers who were lost to follow-up had a significantly better baseline HbA1c level (mean, 7.55%; standard deviation, 0.39%).

Patients in the intervention group were significantly older and had a lower memory Z score than those in the control group (Table 1). At month 4, 22 (31.4%) intervention and 23 (37.1%) control participants had medical needs to alter their diabetes medication, despite the suggestion to doctors to maintain the same diabetic medication regimen during the intervention period (Table 2). For those maintained on the same regimen, the mean HbA1c level was comparable between the two groups. At month 12, the chances of having diabetes medication upgraded or downgraded were similar between the two groups, as were changes in HbA1c levels. General Health Questionnaire was generally high in both groups at baseline and did not change significantly at follow-up (Table 2).

Memory function of the intervention group showed progressive improvement. A significant interaction effect ($F(2,118)=4.43$, P=0.013) was

TABLE 2. Changes in glycosylated haemoglobin level, diabetes medication, and general health questionnaire score at follow-up

Variable	Change at month 4 from baseline		Change at month 12 from baseline	
	Intervention (n=69)	Control (n=60)	Intervention (n=67)	Control (n=62)
Median (quartile range) change in glycosylated haemoglobin level (%)	0.00 (-0.40 to 0.55)	-0.20 (-0.50 to 0.48)	0.00 (-0.50 to 0.60)	0.00 (-0.43 to 0.40)
% of subjects with diabetes medication change				
Upgrade	25.7	24.2	46.3	40.3
Downgrade	5.7	12.9	17.9	16.1
No change	68.6	62.9	35.8	43.5
Median (quartile range) change in glycosylated haemoglobin level (no medication change) [%]	0.10 (-0.30 to 0.70)	-0.20 (-0.53 to 0.53)	-0.05 (-0.33 to 0.53)	0.05 (-0.40 to 0.53)
Median (quartile range) change in General Health Questionnaire score	-1.0 (-3.00 to 2.00)	0.00 (-3.00 to 3.00)	0.00 (-3.00 to 2.00)	0.00 (-3.00 to 2.00)

TABLE 3. Cognitive scores at baseline and follow-up

Cognitive score	Intervention			Control			P value*
	Baseline	Month 4	Month 12	Baseline	Month 4	Month 12	
Mean±SD mini-Mental State Examination score	25.5±3.1	-	25.0±3.8	26.3±3.1	-	25.7±2.8	0.729
Mean±SD executive function Z score	-0.126±0.78	-0.134±0.74	0.010±0.92	0.124±0.91	0.200±0.84	0.261±0.88	0.668
Mean±SD memory Z score	-0.183±0.83	0.036±0.82	0.098±0.82	0.173±0.84	0.246±0.80	0.139±0.84	0.015

* For ANOVA group effect adjusted for age, sex, and education level

detected in the memory domain, after adjustment for age, sex, and education (Table 3). Paired *t*-tests indicated that there was a significant long-term gain in executive function in the intervention group ($t(64)=2.05$, P=0.044, $g=0.255$) but not in the control group ($t(56)=1.41$, P=0.165, $g=0.186$).

For other diabetic disease management activities, both intervention and control participants were well-engaged in self-care activities. Family caregivers were seldom involved except in diet control. At follow-up, family caregivers in the intervention group reported less exercise at month 12 (P=0.004) and less improvement in diet control at month 4, compared with the control group. Caregivers in the intervention group were more likely to be involved in glucose monitoring at month 4, and reported more frequent glucose monitoring by subjects at month 12.

Discussion

The CDSMP combined with cognitive training did not promote diabetes self-management or improve glycaemic control in older diabetic patients with cognitive impairment. It was, however, effective in improving memory in the longer term. This finding is consistent with a previous study.[3] The cognitive benefits increased with time, contrary to the waning pattern commonly observed in other cognitive-training programmes.[3,4] This suggests that the CDSMP may have resulted in some lifestyle changes (eg more social activities, better relationship with family caregivers) that led to cognitive improvement. Nonetheless, this improvement did not increase the efficacy of CDSMP in diabetic control. It is possible that early-phase short-term memory loss is not a causative factor in non-adherence in disease self-management. Executive function may be more relevant, but its improvement with cognitive training was mild and came late in the study period. Poor psychological health is another factor that adversely affected treatment adherence, disease self-management, and diabetic control. Psychological rather than self-management interventions have been suggested to be effective in improving depression in diabetic patients.[5] More specific psychological interventions (eg mindfulness exercises) may be a useful addition to our programme.

There were limitations in this study. The sample size was slightly less than estimated. In one third of subjects, diabetes medications were altered in the first 4 months. The time designated to cognitive training was restricted to 8 hours and may have limited its efficacy. The questionnaires on lifestyle and drug management for diabetes were self-report subjective measures; the accuracy might have been compromised by cognitive impairment. Older outpatients with poor diabetic control (HbA1c of >9%) were not included. This would have limited the power of our study to demonstrate the effectiveness of the programme. Cost effectiveness analysis was not performed.

Conclusion

The CDSMP and cognitive training did not improve glycaemic control or self-care activities in older diabetic patients with cognitive impairment. It was, however, effective in improving memory in the longer term.

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Adoption of the reference framework for diabetes care by primary care physicians

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KEY MESSAGES

1. The level of adoption of the Hong Kong Reference Framework for Diabetes Care was high among primary care physicians who responded to the survey.
2. Improvements should be made in the patient version to enhance patient knowledge on diabetes and promote self-management.
3. Insufficient resources, time, and support, as well as perceived influence on clinical autonomy and patient selection of services were major barriers among primary care physicians to adopt the framework.
4. Additional user-friendly versions of the reference framework should be provided.
5. Strengthening of healthcare provision and financing as well as continuing professional education are needed to improve cooperation among stakeholders in delivering high-quality, patient-centred, multidisciplinary diabetes care.

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Introduction

Diabetes is a leading disease burden in Hong Kong. In the early 1990s, its prevalence based on the oral glucose tolerance test was approximately 10%, affecting 2% of those aged <35 years and 20% of those aged >65 years, with a large proportion being undiagnosed.[1] By 2025, it is estimated that 12.8% of the Hong Kong population, or 1 million people, will have diabetes.[2] The quality of diabetes management has been suboptimal including that of primary care physicians (PCPs).[3] In 2010, the Reference Framework for Diabetes Care was introduced by the Primary Care Office of the Food and Health Bureau. It adopts a life-course, comprehensive, continuous, and patient-centred approach. The framework covers primary prevention through lifestyle changes, assessment in high-risk groups for early detection, and multidisciplinary management of diabetes patients.[4] The present study evaluated the awareness and adoption level of this framework by PCPs and determined the factors influencing its adoption.

Methods

This study used a mixed-method design and comprised both qualitative (focus group interview, study 1) and quantitative (cross-sectional survey, study 2) methodology.

Focus group interviews were conducted with PCPs who worked in (1) group practice in private health maintenance organisations, (2) solo practice in the private sector, (3) general out-patient clinics, (4) family medicine specialist clinics, and (5) those who were fellows of family medicine and involved in teaching medical students at a university. Based on the study by Gagliardi et al,[5] a pilot-tested moderator manual with open-ended questions was developed to provide an outline for the interview. This manual comprised eight key domains on the feasibility of implementing guidelines in clinical practice: usability, adaptability, validity, applicability, communicability, accommodation, implementation, and evaluation. The interviews were transcribed verbatim. Data were coded, managed, and analysed using the grounded theory and the NVivo 10 software.

For the cross-sectional survey, a tailor-made questionnaire was designed based on the findings obtained from the focus group interviews, and then sent to 3184 PCPs. The adoption level of each recommendation included in the framework was studied, and the overall adoption score calculated. The major outcome variable was the adoption level of the framework (in proportion). Multivariate logistic regression analyses were conducted to determine the enhancing and hindering factors of adoption of the framework after controlling for age, gender, practice experience, and practice type.

Results

Study 1

Ten focus group interviews were conducted with a total of 60 Cantonese-speaking PCPs. The mean age

of the PCPs was 45.7 (standard deviation [SD], 13.6) years; 91.7% were male. Most (28.3%) had practised for 11 to 15 years, and most (55.0%) worked in the public sector.

Some PCPs indicated that the framework was practical and was in line with their current practice. Others did not actively adopt the framework in their general practice, although part of the framework accorded with their practice. Some considered that there was a gap between the framework and the current healthcare policies on diabetes. Some PCPs pointed out that the feasibility of the framework was high in the public sector, as their practice in the Hospital Authority was very similar to that recommended by the framework. Others believed that inadequate allied healthcare support reduced the feasibility. Some PCPs considered that the framework was not user-friendly, and the layout was unclear, whereas others considered the layout to be detailed and well-organised with a variety of illustrations. Most PCPs agreed that the recommendations of the framework were supported by a large body of high-level evidence.

Limited consultation time, long waiting time for referral, fragmented care services, and lack of promotion of diabetes screening in the public sector may hinder adoption of the framework, as may patient affordability and educational level. Other barriers included clinician inertia to change their existing practice and inadequate support from allied health providers.

Regarding motivations to adopt the framework, resources such as doctors and allied health providers were regarded as a key factor affecting PCPs to adopt the framework in the public sector. Increasing availability of blood glucose–lowering drugs in the Hospital Authority Drug Formulary (eg DPP-4 inhibitor as a self-financed drug) would help PCPs adhere to the pharmacological recommendations of the framework. In the private sector, financial remuneration and support (such as nurses and other allied health providers) were the main resources required to promote adoption of the framework. This may be due to the huge difference in acquisition costs between the private and public sectors.

Patient-related issues were other key factors that influenced adoption of the framework. The silent nature of diabetes contributes to poor patient compliance. To promote patient knowledge on diabetes and its complications, respondents suggested the use of mass media and patient empowerment programmes. A sustainable and integrated healthcare system such as the launch of the Risk Assessment Management Programme may also improve patient compliance, as may adequate consultation time.

Successful adoption of the framework should help improve both clinician and patient knowledge on diabetes and facilitate the effective use of consultation time. It could also improve patient compliance and achieve better diabetes control, and enable patients in the private sector to receive appropriate treatments. Some respondents expressed concern that adoption of the framework might prolong their consultation time. In the private sector, this may reduce their flexibility in care practice and drug selection in personalised treatment. Further support and adequate compensation are needed for a doctor-nurse team to adopt the framework.

Integrating the framework into the Clinical Management System of Hospital Authority clinics and enhancement of the public-private-partnership scheme using incentives were additional suggestions.

Respondents suggested that the patient version should be simplified by adding more diagrams. A multilingual version of the core document including a pocket version and mobile phone app version would be useful. Information about diet, exercise, oral health, insulin, and serum potassium level should be written in a clear and detailed manner.

Study 2

Of the 3184 questionnaires sent, 414 completed surveys were received (via fax, e-mail, postal return, an electronic web-based answering system, and on-site collection in seminar venues), giving a response rate of 13.0%. The mean age of the PCPs was 53.1 (SD, 13.6) years; 71.8 % were male. Most (35.9%) had clinical experience of >30 years and 83.1% practised in the private sector. Most (48.0%) were in solo practice, and 11.8% were family physicians.

The mean adoption score of the framework was 3.29 (SD, 0.51) out of 4.00. Overall, 72.2% of respondents strongly adhered to this framework in their routine practice of diabetes management. There was no significant difference in the characteristics between PCPs with a high adoption rate and those with a low adoption rate.

Measuring blood pressure at every routine visit for diabetes patients was the most frequent recommendation adopted (70.5%), followed by advice on smoking cessation (70.5%) and increased physical activity and regular exercise (62.7%). Only 32.9% performed an eye examination after the diagnosis of diabetes and re-assessed annually; only 27.4% performed eye examination when glycaemic and blood pressure control was suboptimal; and only 29.3% recommended education about foot care as part of multidisciplinary care.

Overall, 93.2% of the respondents agreed or strongly agreed to initiate drug treatment when the haemoglobin A1c level exceeded 7.5% after lifestyle modification. And 93.4% considered the addition of insulin or other oral glucose-lowering drugs as appropriate if the haemoglobin A1c level reached >9%, or if the patient became symptomatic. This

tendency to delay treatment intensification reflects a knowledge gap when early intervention to reduce glycaemic burden is widely recommended.[6]

In the multivariate logistic regression model, age, gender, practice experience, clinical practice setting, and training status were not associated with adoption of the framework. Factors associated with adoption included the availability of essential clinical information to facilitate diabetes management (P<0.001) and support to improve patient knowledge on diabetes and self-care (P=0.012). The hindering factors included perceived restrictions on patient autonomy of choices of medical services (P<0.001), low motivation of patients to change their lifestyle (P=0.015), and barriers in the clinical setting (P=0.017).

To enhance adoption of the framework, 91.9% of PCPs suggested inclusion of a referral system with contact information of other healthcare providers (eg nurses, dietitians, podiatrists). Other suggestions included simplifying the whole framework into flowcharts or short messages (90.7%) and providing a multilingual patient version or pocket version (88.9%) as well as a mobile phone app version of the core document (88.0%). Many PCPs also recommended strengthening the current healthcare system with better integration and communication among different healthcare providers to increase the adoption level of the framework (88.3%).

Discussion

Despite a relatively low response rate, the adoption level of the framework among respondents was generally high. Many suggested providing information about other healthcare providers to achieve multidisciplinary care. They also suggested provision of multilingual versions and a mobile phone app of the core document to improve user-friendliness. Insufficient allied health support and limited consultation time were major barriers to adoption of the framework. There is an urgent need to improve our current healthcare and health-financing systems in order to expand adoption of the framework in both private and public sectors.

Given the importance of patient education, there is a need to simplify the patient version of the framework and use more figures to improve patient knowledge on diabetes and promote self-management.

Practical measures such as support of allied health professionals to improve clinical assessment and patient education as well as increased availability and affordability of treatment help enable PCPs to improve diabetes care. Multiple stakeholders should be involved in order to broaden the acceptability and usability of the framework in the primary care setting.

This study had some limitations. Due to our tight working schedule, we did not divide PCPs from public and private sectors into separate focus groups. As a result, we might not have addressed adequately the different barriers faced by PCPs in different sectors. In study 2, the response rate was only 13% and this greatly limited the representativeness of our sample. Incentive could have been provided to improve the response rate.

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Improving early risk stratification in patients presenting to emergency department with suspected acute coronary syndrome

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KEY MESSAGES

1. In patients presenting to the emergency department with chest pain of possible acute coronary syndrome, the use of both the modified thrombolysis in myocardial infarction (mTIMI) score and the modified history, electrocardiography, age, risk factors and troponin (mHEART) score, together with the high-sensitivity cardiac troponin T (hs-cTnT) test and electrocardiography, enables safe and early discharge in 20% of cases.
2. A scoring system that combines the results of mTIMI, mHEART, hs-cTnT, electrocardiography, and heart-type fatty acid-binding protein may accurately risk-stratify patients for deposition decision.

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Introduction

Chest pain is one of the most common complaints in patients presenting to the emergency department. Acute coronary syndrome (ACS) cannot be immediately excluded in most patients presenting with chest pain, and is confirmed in about 15%-25% of cases. Its evaluation is a lengthy process that involves serial electrocardiography (ECG) and troponin tests taken 3-6 hours apart. Crowding in the emergency department and the need for acceptable risk stratification have prompted the search for safe and cheap but effective accelerated chest pain pathways to rule out short-term major adverse cardiac events (MACE) in patients suspected to have ACS to enable early discharge and to risk-stratify patients for appropriate deposition and utilisation of hospital resources.[1-4] The high-sensitivity cardiac troponin T (hs-cTnT), the heart-type fatty acid-binding protein (H-FABP), the thrombolysis in myocardial infarction (TIMI) score, and the history, ECG, age, risk factors and troponin (HEART) score have been used in the diagnosis of acute myocardial syndrome, and to rule out short-term MACE in chest pain patients. The coronary artery calcium score (CACS) has been shown to correlate positively with the 5-year cardiac event rate.

This study aimed to (1) investigate any correlation between the MACE rate within 1 and 6 months and CACS, H-FABP, hs-cTnT, TIMI score, and HEART score, and (2) evaluate the predictive values of CACS, H-FABP, hs-cTnT, TIMI score, and HEART score and various combinations.

Methods

This study was conducted from November 2012 to December 2014. It was a 2-year prospective observational cohort study of adult patients who presented to the emergency department of the Prince of Wales Hospital with chest pain suspicious of ACS origin. Ethical approval was obtained from the local ethics review board. Patients were excluded if their initial ECG were suggestive of ACS, acute myocardial infarction, or other abnormality that would require admission to hospital, or if they had a history of coronary artery bypass grafting or coronary stent implantation, contraindication to β-blockade if prescription of β-blockade was required due to a resting heart rate over 80 beats per minute, or if they were unable to be contacted after discharge or unable to give consent, or if they were female patients with known or suspected pregnancy.

Patients were recruited consecutively on weekdays between 09:00 and 17:00. Apart from the routine chest pain protocol that included clinical assessment, ECG, and hs-cTnT test, three additional steps were performed: (1) H-FABP point-of-care test on presentation and 3 hours later, (2) modified TIMI (mTIMI) score on presentation, and (3) CACS within 2 months of presentation. All physicians and cardiologists responsible for patient management were blinded to test results. The modified HEART (mHEART) score was completed retrospectively. The outcomes with regard to the MACE within 1 and 6 months were obtained through phone contact with the patients and access to the medical records.

For both mTIMI and mHEART scores, a hs-cTnT of ≤14 ng/L was considered negative. Only the presence of ST-deviation of >0.05 mV was considered in the initial ECG result and scored one point in mHEART.

The primary outcome was the number of patients with MACE within 1 and 6 months after presentation. The prognostic performance of CACS, H-FABP, hs-cTnT, mTIMI, and various combinations in predicting MACE was assessed. MACE was defined as relating to safety outcome (consisting of all-cause mortality, cardiac arrest, readmission with myocardial infarction and cardiogenic shock) or effectiveness outcome (consisting of revascularisation, ventricular arrhythmia, or high-degree atrioventricular block needing intervention).

Mann-Whitney *U* test, Chi-square test, Fisher exact test, and univariate and multivariate logistic regressions were used to compare characteristics

TABLE 1. (a) Univariate and (b) multivariate logistic regression for major adverse cardiac events (MACE) within 1 and 6 months

(a)

Variables	MACE within 1 month					MACE within 6 months				
	OR (95% CI)	P value	No. (%) of MACE	Area under the curve (95%CI)	P value	OR (95% CI)	P value	No. (%) of MACE	Area under the curve (95%CI)	P value
Electrocardio-graphy			42					63		
ST deviation	3.80 (1.99-7.24)	<0.001	19 (45)	0.64 (0.54-0.73)	0.003	3.07 (1.77-5.33)	<0.001	25 (40)	0.61 (0.53-0.69)	0.004
High-sensitivity cardiac troponin T										
0-14	1		5 (11)			1		10 (16)		
>14-28	6.80 (2.18-21.26)	0.001	8 (19)			6.74 (2.93-15.51)	<0.001	15 (24)		
>28-42	14.69 (3.69-58.57)	<0.001	4 (10)			9.78 (3.05-31.30)	<0.001	5 (8)		
>42	51.80 (18.77-142.90)	<0.001	25 (60)	0.86 (0.79-0.92)	<0.001	44.49 (19.96-99.20)	<0.001	33 (52)	0.84 (0.78-0.90)	<0.001
Heart-type fatty acid-binding protein										
0-7	1		24 (59)			1		38 (61)		
>7-14	1.93 (0.55-6.74)	0.304	3 (7)			2.64 (1.03-6.75)	0.0427	6 (10)		
>14-21	9.64 (3.10-29.95)	<0.001	5 (12)			8.51 (2.88-25.17)	<0.001	6 (10)		
>21	31.81 (10.47-96.64)	<0.001	9 (22)	0.67 (0.57-0.78)	<0.001	51.05 (13.81-188.74)	<0.001	12 (19)	0.66 (0.58-0.75)	<0.001
History, electro-cardiography, age, risk factors and troponin score										
0-3	1		1 (2)			1		4 (6)		
4-6	21.64 (2.93-159.88)	0.003	30 (72)			7.63 (2.69-21.61)	<0.001	42 (67)		
7-10	69.14 (8.66-552.32)	<0.001	11 (26)	0.73 (0.67-0.80)	<0.001	31.88 (10.01-101.51)	<0.001	17 (27)	0.72 (0.66-0.79)	<0.001
Thrombolysis in myocardial infarction score										
0-1	1		5 (12)			1		6 (10)		
2-3	3.69 (1.38-9.88)	0.009	23 (55)			4.80 (2.00-11.63)	0.0005	35 (56)		
4-7	7.07 (2.47-20.23)	<0.001	14 (33)	0.67 (0.59-0.75)	<0.001	9.97 (3.89-25.55)	<0.001	22 (35)	0.69 (0.62-0.75)	<0.001
Coronary artery calcium score										
0	1		4 (16)			1		6 (14)		
1-150	0.57 (0.10-3.12)	0.512	2 (8)			0.74 (0.21-2.68)	0.651	4 (9)		
>150-300	4.37 (1.05-18.12)	0.042	4 (16)			2.84 (0.77-10.50)	0.117	4 (9)		
>300-450	5.80 (1.23-27.36)	0.026	3 (12)			6.67 (1.89-23.51)	0.003	5 (11)		
>450	7.73 (2.42-24.70)	0.001	12 (48)	0.74 (0.63-0.85)	<0.001	12.31 (4.84-31.33)	<0.001	25 (57)	0.78 (0.70-0.86)	<0.001

(b)

Variables	MACE within 1 month (n=24/552)				MACE within 6 months (n=43/540)			
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Electrocardiography								
ST deviation	1.36 (0.38-4.84)	0.639			1.35 (0.48-3.78)	0.569		
High-sensitivity cardiac troponin T								
0-14	1		1		1		1	
>14-28	6.98 (0.79-61.42)	0.080	6.795 (1.115-41.431)	0.001	6.61 (1.71-25.55)	0.006	4.453 (1.464-13.549)	0.009
>28-42	39.27 (3.65-422.40)	0.002	30.032 (4.494-200.673)	<0.001	13.44 (2.29-78.81)	0.004	8.973 (1.873-42.996)	0.006
>42	143.95 (17.04-1216.21)	<0.001	106.787 (21.475-531.023)	<0.001	71.67 (15.57-329.84)	<.001	41.634 (12.747-135.978)	<0.001
Heart-type fatty acid-binding protein								
0-7	1		1		1		1	
>7-14	0.27 (0.05-1.50)	0.133	0.256 (0.050-1.322)	0.104	0.40 (0.11-1.49)	0.171	0.382 (0.104-1.400)	0.146
>14-21	1.71 (0.30-9.93)	0.548	0.945 (0.198-4.516)	0.511	1.47 (0.26-8.33)	0.663	1.243 (0.236-6.557)	0.797
>21	3.51 (0.54-22.73)	0.188	3.236 (0.614-17.040)	0.047	11.08 (1.36-90.22)	0.025	8.343 (1.113-62.536)	0.039
History, electrocardiography, age, risk factors and troponin score								
0-3	1				1			
4-6	2.42 (0.17-33.71)	0.511			0.53 (0.10-2.80)	0.454		
7-10	1.07 (0.05-25.55)	0.967			0.35 (0.04-3.12)	0.344		
Thrombolysis in myocardial infarction score								
0-1	1				1			
2-3	0.19 (0.03-1.40)	0.103			0.75 (0.15-3.83)	0.729		
4-7	0.21 (0.021-2.09)	0.182			0.60 (0.09-4.06)	0.600		
Coronary artery calcium score								
0	1				1		1	
1-150	0.29 (0.04-2.02)	0.212			0.47 (0.11-2.05)	0.316	0.408 (0.096-1.731)	0.224
>150-300	1.91 (0.34-10.92)	0.466			1.05 (0.21-5.13)	0.957	0.885 (0.186-4.205)	0.878
>300-450	2.62 (0.38-18.21)	0.330			3.40 (0.70-16.39)	0.128	2.610 (0.607-11.224)	0.197
>450	2.77 (0.56-13.60)	0.210			6.81 (1.94-23.90)	0.003	4.851 (1.617-14.559)	0.005

with MACE. Statistical significance was set at P<0.05. Results of the diagnostic tests were categorised to calculate the prediction accuracy of combined tests. The calibration of a model for the prediction of the risk of MACE combining the use of five tests was estimated using the Hosmer-Lemeshow goodness-of-fit test.[5] Sensitivity, specificity, positive and negative predictive values, and area under the receiver operating characteristic curve (AUROC) were used to assess the performance of tests and model.

Results

A total of 604 patients were enrolled, of whom 552 had test results for all six predictors (ECG, hs-cTnT, H-FABP, mHEART, mTIMI, and CACS) and 1-month follow-up. 12 patients were lost to follow-up at 6 months. MACE occurred in 42 (7.0%) patients within 1 month and in 63 (10.5%) patients within 6 months.

Comparison of the baseline characteristics (age, gender, ethnicity, smoking status, comorbidities, and

medication history) of patients with and without MACE within 1 month showed that only gender differed significantly. Occurrence of MACE within 6 months was strongly associated with a history of diabetes and congestive heart failure.

Emergency revascularisation contributed the largest proportion (26/58) of MACE within 1 month, followed by non-ST elevation myocardial infarction (STEMI) and STEMI. From 1 to 6 months, there was a minimal increase in the number of non-STEMI and STEMI cases and the increase in MACE was mainly attributed to emergency revascularisation and all-cause mortality.

In univariate logistic regression, all six predictors (ie ST-deviation of >0.05 mV in initial ECG, initial hs-cTnT concentration of >14 ng/L, initial H-FABP concentration of >14 mg/L, mHEART score of ≥4, mTIMI score of ≥2, and CACS of >150) were individually associated with MACE within 1 month (Table 1). Results were similar for MACE within 6 months except that the threshold for association in H-FABP decreased to >7 mg/L, and in CACS increased to >300. Hs-cTnT had the highest prediction accuracy for MACE within 1 and 6 months, as shown by its highest AUROC.

In multivariable logistic regression, only variables with a P value of <0.2 were included. hs-cTnT of >14 ng/L and H-FABP of >21 mg/L remained in the model with a P value of <0.05. hs-cTnT of >14 ng/L, H-FABP of >21 mg/L, and CACS of >450 were associated with a higher risk of MACE within 6 months.

Both mTIMI of >0 and mHEART of >2 had 100% sensitivity and negative predictive value, and 11.6% and 17.1% specificity, respectively, for MACE (Table 2). Combined use of mTIMI and mHEART when either one was negative ruled out MACE within 1 month, with increased specificity to 22.0% and no loss in sensitivity.

As CACS was not associated with MACE within 1 month in the multivariate analysis and was not readily available in the emergency department setting, we focused on ECG, initial hs-cTnT, H-FABP, mHEART, and mTIMI to derive a model for early

TABLE 2. Prognostic performance of individual and add-on tests for major adverse cardiac event (MACE) within 1 month (n=552)

Variable*	Sensitivity (95% CI)	Specificity (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	Positive likelihood ratio (95% CI)	Negative likelihood ratio (95% CI)	Area under the curve (95% CI)
Electrocardiography (ECG)	45.2 (31.2-60.1)	82.1 (78.8-85.1)	16.0 (11.5-21.7)	95.2 (93.8-96.4)	2.53 (1.74-3.69)	0.67 (0.51-0.88)	0.64 (0.60-0.68)
Thrombolysis in myocardial infarction (TIMI) score	100 (91.6-100)	11.6 (9.2-14.5)	7.8 (5.8-10.4)	100 (94.4-100)	1.13 (1.12-1.17)	0 (0-0.73)	0.56 (0.52-0.60)
History, electrocardiography, age, risk factors and troponin (HEART) score 2	100 (91.6-100)	17.1 (14.2-20.5)	8.3 (6.2-11.0)	100 (96.2-100)	1.21 (1.19-1.26)	0 (0-0.49)	0.59 (0.55-0.63)
HEART score 3	97.6 (87.7-99.6)	39.3 (35.3-43.4)	10.8 (9.9-11.6)	99.5 (97.8-99.9)	1.61 (1.48-1.74)	0.06 (0.01-0.42)	0.69 (0.65-0.72)
Heart-type fatty acid-binding protein (H-FABP)	41.5 (27.8-56.6)	91.1 (88.4-93.2)	25.4 (17.9-34.7)	95.5 (94.2-96.5)	4.64 (2.96-7.27)	0.64 (0.50-0.83)	0.66 (0.62-0.70)
Coronary artery calcium score (CACS)	84.0 (65.4-93.6)	38.0 (34.0-42.2)	6.0 (5.0-7.2)	98.0 (95.5-99.2)	1.35 (1.13-1.63)	0.42 (0.17-1.04)	0.61 (0.57-0.65)
High-sensitivity cardiac troponin T (hs-cTnT)	88.1 (75.0-94.8)	72.1 (68.3-75.7)	19.2 (16.6-22.1)	98.8 (97.3-99.4)	3.16 (2.66-3.76)	0.17 (0.07-0.38)	0.80 (0.77-0.83)
Either +ve for ECG or hs-cTnT	92.9 (81.0-97.5)	62.0 (57.9-65.9)	15.5 (13.8-17.4)	99.1 (97.7-99.7)	2.44 (2.13-2.79)	0.12 (0.04-0.34)	0.77 (0.74-0.81)
Either +ve for H-FABP or hs-cTnT	87.8 (74.5-94.7)	70.8 (66.9-74.5)	18.1 (15.6-20.8)	98.8 (97.3-99.4)	3.01 (2.53-3.58)	0.17 (0.08-0.39)	0.79 (0.76-0.83)
Both +ve for TIMI & hs-cTnT	88.1 (75.0-94.8)	72.1 (68.3-75.7)	19.2 (16.6-22.1)	98.8 (97.3-99.4)	3.16 (2.66-3.76)	0.17 (0.07-0.38)	0.80 (0.77-0.83)
Both +ve for HEART2 and hs-cTnT	88.1 (75.0-94.8)	72.3 (68.5-75.9)	19.3 (16.7-22.2)	99.8 (97.4-99.4)	3.18 (2.67-3.79)	0.16 (0.07-0.38)	0.80 (0.77-0.83)
Both +ve for HEART3 and hs-cTnT	85.7 (72.2-93.3)	72.7 (68.8-76.2)	19.0 (16.4-22.1)	98.5 (97.1-99.3)	3.14 (2.61-3.77)	0.20 (0.09-0.41)	0.79 (0.76-0.82)
Both +ve for CACS and hs-cTnT	80.0 (60.9-91.1)	77.9 (74.2-81.2)	14.6 (11.7-18.1)	98.8 (97.5-99.4)	3.62 (2.81-4.66)	0.26 (0.12-0.56)	0.79 (0.75-0.82)
Both +ve for TIMI and HEART2	100 (91.6-100)	22.0 (18.7-25.6)	8.8 (6.6-11.6)	100 (97.0-100)	1.28 (1.26-1.34)	0 (0-0.38)	0.61 (0.57-0.65)

* Positive is defined as ECG with ST deviation, TIMI of >0, HEART2 of >2, HEART3 of >3, H-FABP of >7, and CACS of >0

risk stratification. Using the Hosmer-Lemeshow goodness-of-fit test to estimate the probability of MACE within 1 month, the risk score model had adequate calibration (P=0.44) and outstanding discrimination (AUROC=0.91, 95% confidence interval=0.87-0.95) [Table 3].

Discussion

CACS was more useful in longer term risk prediction but not useful in prediction of MACE within 1 month. CACS was not useful for diagnosis of ACS. mTIMI and mHEART individually, together with initial results of hs-cTnT and ECG, could identify patients with chest pain for safe discharge within 2 hours of arrival. If both mTIMI of 0 and mHEART of ≤2 are used, it would allow safe early discharge of 123 (20.4%) patients, of whom 35 were admitted under the current chest pain protocol, with no evidence of MACE within 1 month. This is a relative increase in discharge rate of 75% compared with using mTIMI alone, and a 46% increase compared with using mHEART alone. Nonetheless, the staff time saved by early discharge of these patients must be balanced to ensure all patients to have an accurate mTIMI and/or mHEART assessment. 1st hs-cTnT alone, 1st ECG alone, combined 1st hs-cTnT and ECG, and 1st H-FABP yielded high specificity, and may be useful to determine MACE within 1 month, but their sensitivity was <95%, which indicated that they were not suitable to identify patients for early discharge.

A more sophisticated scoring system that combines ECG, initial hs-cTnT, H-FABP, mTIMI, and mHEART can accurately risk-stratify patients who present to the emergency department with chest pain of possible ACS cause to predict MACE within 1 month. Compared with the current 6-hour chest pain protocol, the new combined system can discharge 52 (8.7%) more patients earlier with a decreased number of MACE in the discharged group (3 vs 2). More accurate identification of high-

TABLE 3. Chart with score from -14 to 69 for estimating the probability of major adverse cardiac event (MACE) within 1 month using five diagnostic tests

Test	Category			
Electrocardiography				
ST deviation	No	Yes		
Score	0	10		
High-sensitivity cardiac troponin T				
Value	0-14	14-28	28-48	>42
Score	0	17	28	37
Thrombolysis in myocardial infarction score				
Value	0-1	2-3	4-7	
Score	0	-14	-14	
History, electrocardiography, age, risk factors and troponin score				
Value	0-3	4-6	7-10	
Score	0	21	14	
Heart-type fatty acid-binding protein				
Value	0-7	7-14	14-21	>21
Score	0	-9	5	15

Variable	Very low risk (<2%), risk score of <14		Low risk (2-5%), risk score of 14-23		Moderate risk (5-70%), risk score of 24-61		High risk (≥70%), risk score of ≥62	
	MACE	No MACE	MACE	No MACE	MACE	No MACE	MACE	No MACE
Admitted patients	2	125	1	55	30	108	5	1
Median (interquartile range) length of stay (days)	3.5 (2.0-)	3.0 (2.0-5.0)	2.0	3.0 (2.0-5.0)	7.5 (4.0-12.25)	4.0 (3.0-8.0)	4.0 (2.5-12.0)	10.0
Discharged patients	0	198	1	40	2	32	0	0
MACE								
Safety	0	-	2	-	24	-	5	-
Effectiveness	2	-	1	-	19	-	3	-
Both	0	-	1	-	11	-	3	-

risk patients may facilitate patient deposition and decisions about more invasive diagnostic procedures.

The study has limitations. Abnormal renal function predicts death, and we did not adjust for its effect on troponin levels. Other tests would cover for this in cross check. Calculation in increased patients identified for early discharge assumed that patients were not admitted for reasons other than minimising the risk of MACE, although initiation of a chest pain protocol suggested that ACS was the primary concern of the emergency physician.

Conclusions

In patients presenting to the emergency department with chest pain of possible ACS, a combination of mTIMI and mHEART scores, ECG, hs-cTnT, and H-FABP results may efficiently risk-stratify those at risk of MACE within 1 month. CACS may be more useful in longer term risk prediction, but not useful for MACE within 1 month.

Acknowledgement

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Assessment of long-term functional outcome in patients who sustained moderate or major trauma: a 4-year prospective cohort study

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KEY MESSAGES

1. In patients who sustained moderate or major trauma, 45% had an excellent recovery after 4 years, and ≤40% and ≤70% had achieved a physical and mental health status above or equal to the Hong Kong norm, respectively.
2. The 4-year post-trauma return-to-work rate for patients who survived the initial insult was 52.3%.

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Introduction

The current trauma system aims to improve survival, quality of life, and functional outcome of patients.[1] Patient-centred, health-related outcomes are increasingly recognised as a benchmark of the quality of care received,[2] and quality of survival ranks as a high priority.[3] Evaluation of functional recovery and quantification of the burden of non-fatal trauma allow comparison with other settings, help evaluate the impact and effectiveness of the trauma system as a whole, and may provide some prognostic information for healthcare workers and patients. Although there are studies of the health status of the normal population in Hong Kong,[4,5] studies of post-trauma health status and function in Chinese with moderate or severe trauma are scarce.

This study aimed to evaluate (1) the overall functional outcome of patients who sustained moderate or major trauma using the extended Glasgow Outcome Scale (GOSE), (2) quality of life using the Short-Form 36 (SF-36) health survey, and (3) the return to work (RTW) status.

Methods

This was a 4-year, multi-centre, prospective, cohort study of adult patients who sustained moderate or major trauma (defined as Injury Severity Score [ISS] of ≥9) and were admitted to the Prince of Wales Hospital, Queen Elizabeth Hospital, or Tuen Mun Hospital in Hong Kong. Ethical approval was obtained from the local ethics review board. Patients were excluded if they were likely to leave Hong Kong, were unwilling to enter the study, had an ISS of <9, or sustained isolated hip or pathological fractures.

The physical and mental health status was evaluated using the SF-36 physical component summary (PCS) and mental component summary (MCS) and GOSE. The Hong Kong norm is 52.83 for the PCS and 47.18 for the MCS, whereas the US norm is 50 for both PCS and MCS.

The primary outcome was the SF-36 PCS and MCS scores at 4 years after injury. The secondary outcome was GOSE score at 4 years after injury. The third outcome was the number of patients with RTW status 1 and 4 years after injury.

Chi-square and Fisher exact tests were used for categorical data, and *t*-test was used to compare means of continuous variables. A P value of <0.05 was considered statistically significant, and all tests were two tailed. Univariate and multivariate analyses were conducted. Kaplan-Meier curves were used to assess PCS, MCS, and GOSE changes over time.

Results

Between 1 January 2010 and 30 September 2014, 400 trauma patients (69.5% were male) aged 18 to 106 (mean, 53.3) years with moderate or major trauma were recruited from the three trauma centres. Baseline characteristics of the patients have been presented elsewhere.

From baseline to 4 years, the GOSE score increased by 12.75%, 17.98%, and 9.96% for patients with ISS of >8, 9-15, and >15, respectively (Fig 1), whereas the PCS score increased by 11.75% and the MCS score decreased by 27.25% for patients with ISS of >8 (Fig 2).

In univariate analysis, long-term (4-year) poor

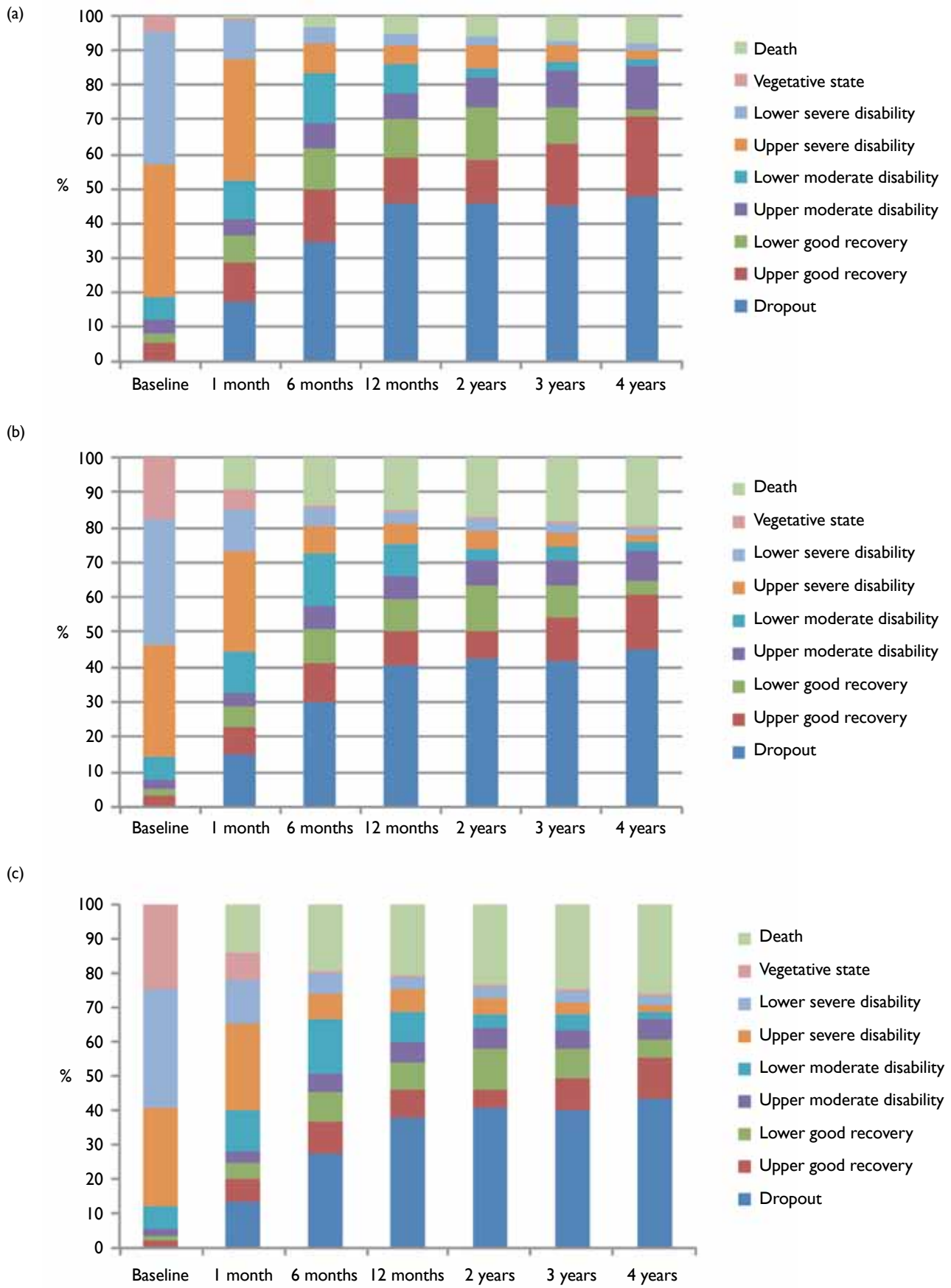

FIG 1. Percentage change in extended Glasgow Outcome Scale score for patients with (a) moderate or major trauma (Injury Severity Score [ISS] of >8), (b) moderate injury (ISS of 9-15), and (c) major injury (ISS of >15) at baseline and 1 month, 6 months, 12 months, 2 years, 3 years, and 4 years after injury

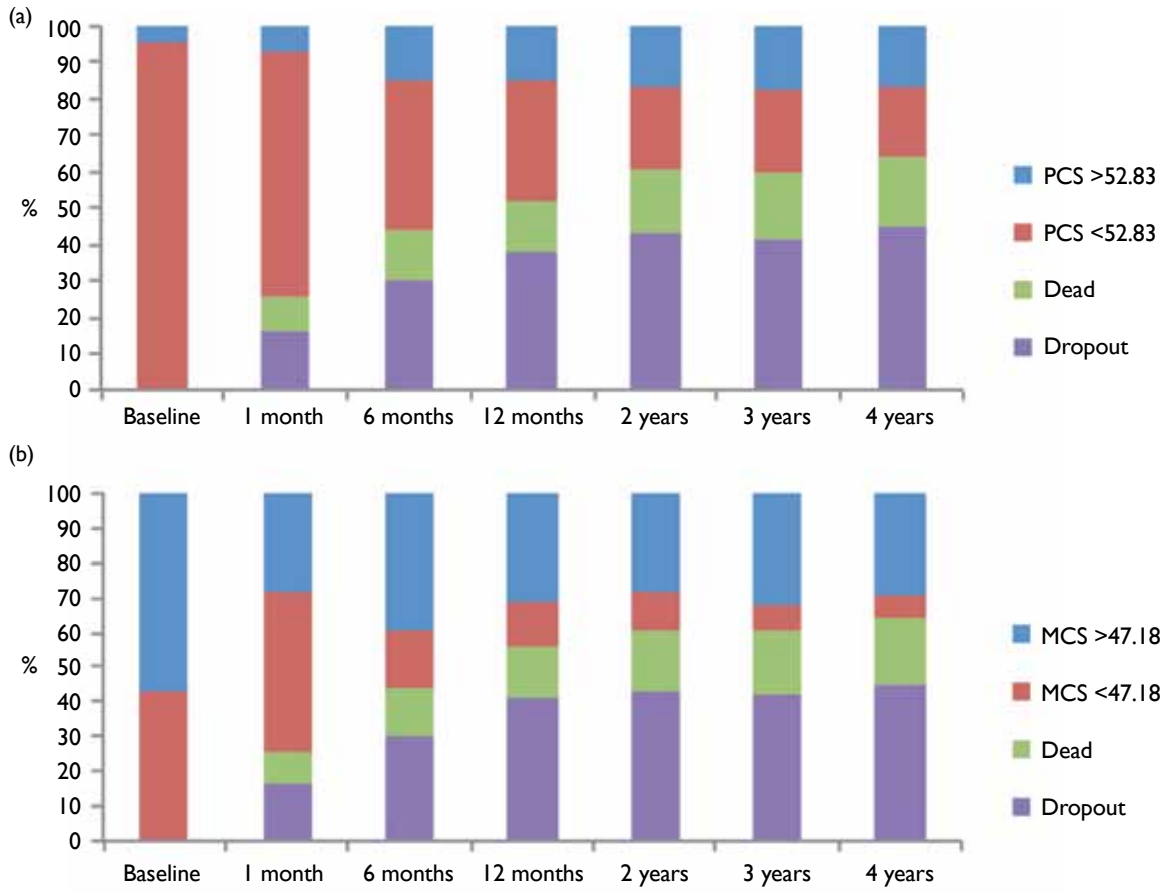

FIG 2. Percentage changes in (a) Physical Component Summary (PCS) score and (b) Mental Component Summary (MCS) score for patients with moderate or major trauma (Injury Severity Score of >8) at baseline and 1 month, 6 months, 12 months, 2 years, 3 years, and 4 years after injury

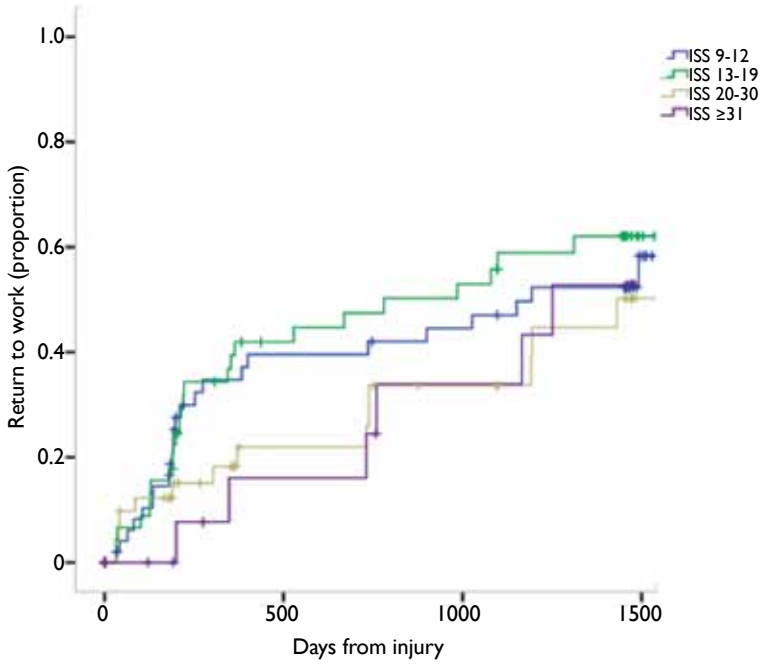

FIG 3. Kaplan Meier curve showing the return to work rate up to 4 years after injury for four Injury Severity Score (ISS) groups (n=197)

quality of life was associated with admission to the intensive care unit (odds ratio [OR]=2.267, 95% confidence interval [CI]=1.040-4.939, P=0.039), ISS of 26-40 (OR=3.231, 95% CI=1.208-8.643, P=0.020), baseline PCS (OR=0.940, 95% CI=0.894-0.988, P=0.016), 1-month PCS (OR=0.933, 95% CI=0.891-0.978, P=0.004), 6-month PCS (OR=0.904, 95% CI=0.861-0.949, P<0.0001), and 6-month MCS (OR=0.96, 95% CI=0.928-0.994, P=0.021).

The RTW status (at 4 years) was associated with total length of stay (OR=0.955, P=0.023), head injury with Abbreviated Injury Scale of <3 (OR=0.533, P=0.165), abdominal injury with Abbreviated Injury Scale of <3 (OR=2.910, P=0.0700), multiple injury sites (OR=0.481, P=0.100), normal Revised Trauma Score (OR=2.236, P=0.183), PCS at 1 month Q4 (OR=7.200, P=0.008), PCS at 1 month Q3 (OR=2.889, P=0.129), and MCS at 1 month (OR=2.571, P=0.158).

In the Kaplan-Meier curve for RTW status up to 4 years after injury, the RTW status for patients with ISS of 9-30 in the first 6 months was similar but then diverged. In patients with ISS of 13-19, 50% had RTW at 800 days, whereas those with ISS of 9-12 and 20-30 had RTW by 1250 days, and those with ISS of >30 had RTW at 1400 days (Fig 3).

Discussion

This study responds to the call that "efforts are needed to quantify the population burden of non-fatal injury and further our knowledge of the impact of trauma systems and trauma centre care on the quality of survival of trauma patients." It provides important information about the effectiveness of the trauma system from three designated trauma centres in Hong Kong, giving patient-centred, health-related outcomes that allow comparison with trauma services globally.

In univariate analysis, predictors for long-term (4 years) poor quality of life were admission to the intensive care unit, ISS of 26-40, baseline PCS, 1-month PCS, and 6-month PCS and MCS. The rate of RTW increased from 21.1% at 1 month to 52.3% at 4 years. After adjusting for variable interaction, only 1-month PCS was predictive of 4-year RTW status. If a patient reaches a 1-month PCS of >50 (equivalent to the US norm), then the probability of RTW at 4 years is 75.0%. If a patient reaches a PCS of >52.8 (equivalent to the Hong Kong norm), then the probability of RTW at 4 years is 80%. A PCS of <50 at 1 month after injury gives a 50.7% chance of RTW at 4 years. A PCS of <52.83 at 1 month after injury gives 50.7% chance of RTW at 4 years as well. The combination of 1-month MCS and 1-month PCS cut-offs was associated with a differential probability of RTW at 4 years.

This study has several weaknesses. Only three of the five trauma centres were included so this may not reflect Hong Kong as a whole. The database was relatively small and the spread of data by injury severity and body region was limited. Nevertheless, data were of high quality. Our results do not allow us to comment on the role of rehabilitation and psychological services on RTW in Hong Kong, as many variables were not considered and may contribute to the final outcome.

It is important to note that improvement in quality of survival did not appear to have reached a plateau at 4 years after injury. Further study is required for longer-term effects. Our results are representative of the long-term outcome of major trauma in most large geographical areas in Asia. More improved rehabilitation facilities would have improved the long-term outcome in this group of patients.

Conclusions

For patients in Hong Kong who sustained moderate or major trauma, 45% had an excellent recovery 4 years after injury, and ≤40% and ≤70% had achieved physical and mental health status above or equal to the Hong Kong norm, respectively. The 4-year post-trauma RTW rate for patients who survived the initial insult was 52.3%. Higher 1-month PCS was predictive of RTW within 4 years.

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Home-based interactive e-health educational intervention for middle-aged adults to improve total exercise, adherence rate, exercise efficacy, and outcome: a randomised controlled trial

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KEY MESSAGES

1. e-health educational intervention (e-HEI) significantly improved the amount of physical exercise in middle-aged adults in the first 3 months.
2. Although results favoured the intervention group with enhanced lipid control, exercise self-efficacy, and exercise adherence, the difference between the intervention and control groups was not significant.
3. Process evaluation revealed that the e-HEI could be implemented in clinical settings and accepted by participants to support their exercise maintenance, exercise, and health status.
4. Findings of this study may help healthcare professionals in strategic planning of e-HEI and continuous support to promote good exercise habits among Chinese patients with coronary heart disease.

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Introduction

In Hong Kong, >80% of patients with cardiovascular disease are diagnosed with coronary heart disease (CHD), and the incidence is increasing in middle-aged adults (age >40 years).[1] Preventive strategies (such as physical activities, healthy dietary choices, and quitting smoking) are effective approaches to reduce modifiable cardiovascular risk factors. Web-based and technology-supported programmes have contributed to the improvement in exercise adherence and outcomes.[2-5] These programmes are effective if delivered individually by telecommunication for support and an enhanced interactive approach. In view of the advantages of e-health programmes and the widespread use of the internet, as well as a growing number of young patients with CHD, an interactive e-health educational intervention (e-HEI) was developed.

Methods

We hypothesised that e-HEI programme participants would exhibit significant improvement in the amount of exercise taken, exercise self-efficacy, exercise adherence, and total exercise time. Participants would have improved control of their cardiovascular risk factors and health-related quality of life, and reduced anxiety and depression.

This prospective, multi-site, randomised controlled study used a two-group pre-test and repeated post-test, between-subject design, and process evaluation. Allocation sequence was computer-generated by a statistician who was blinded to investigators. A blocked randomisation method was used, with a block size of 4 (1:1). A small card indicating group assignment was placed in a sealed envelope, which was opened after patients completed the baseline questionnaires.

Chinese patients aged 30 to 65 years who attended regular follow-up for CHD-related problems and were able to access the Internet at home were recruited from the cardiac clinic of two regional hospitals in Hong Kong. Considering an effect size of 0.3 in our pilot study,[3] at least 438 patients were needed in each group to achieve a statistical power of 80% at 5% significance level, assuming a 20% attrition rate over the 6-month follow-up period.

Eligible patients were randomised to the control group to receive standard care or the intervention group to receive standard care plus e-HEI. The standard care comprised a routine doctor consultation, prescribed medication, and an educational leaflet.

The e-HEI website (http://ehealth.nur.cuhk.edu.hk) was based on the Health Belief Model. Patients in the intervention group received a 35-minute individualised educational intervention administered by a trained research assistant. The intervention aimed to teach the patients to use the

e-HEI website. Participants were advised to perform brisk walking or a usual exercise for 30 minutes per day, 5 days per week. The exercise amount was modified by the physician based on the individual's physical condition and agreed goals. Patients were followed up by telephone 1 week after the initial contact to facilitate use of the e-HEI system.

A sample of 24 patients from the intervention group were invited to attend a semi-structured in-depth interview. An interview guide was used, and contents were analysed.

The primary outcome was total physical exercise quantified by the modified Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ). Patients were instructed to record the amount of exercise taken and rank the exercises in order of difficulty (strenuous, moderate, and mild). This approach has been widely used and shown to exhibit good psychometric properties. Secondary outcomes included (1) exercise efficacy (evaluated by the Chinese version of Self-Efficacy for Exercise) and adherence rate (determined as the total exercise time against the agreed goal [150 minutes per week]) and (2) physical and psychological health outcomes including levels of anxiety and depression (measured by the Hospital Anxiety and Depression Scale), health-related quality of life (measured by Short Form-12), and biological parameter outcomes such as body weight, body mass index, haemoglobin A1C, and risk factor profiles (systolic and diastolic blood pressure, total cholesterol, low-density lipoprotein cholesterol [LDL-C], high-density lipoprotein cholesterol [HDL-C], and triglycerides).

Data were collected using a structured questionnaire from June 2013 to January 2015 by a trained research assistant who was blinded to group assignment. Patient demographics, and clinical and biological parameters were retrieved from medical

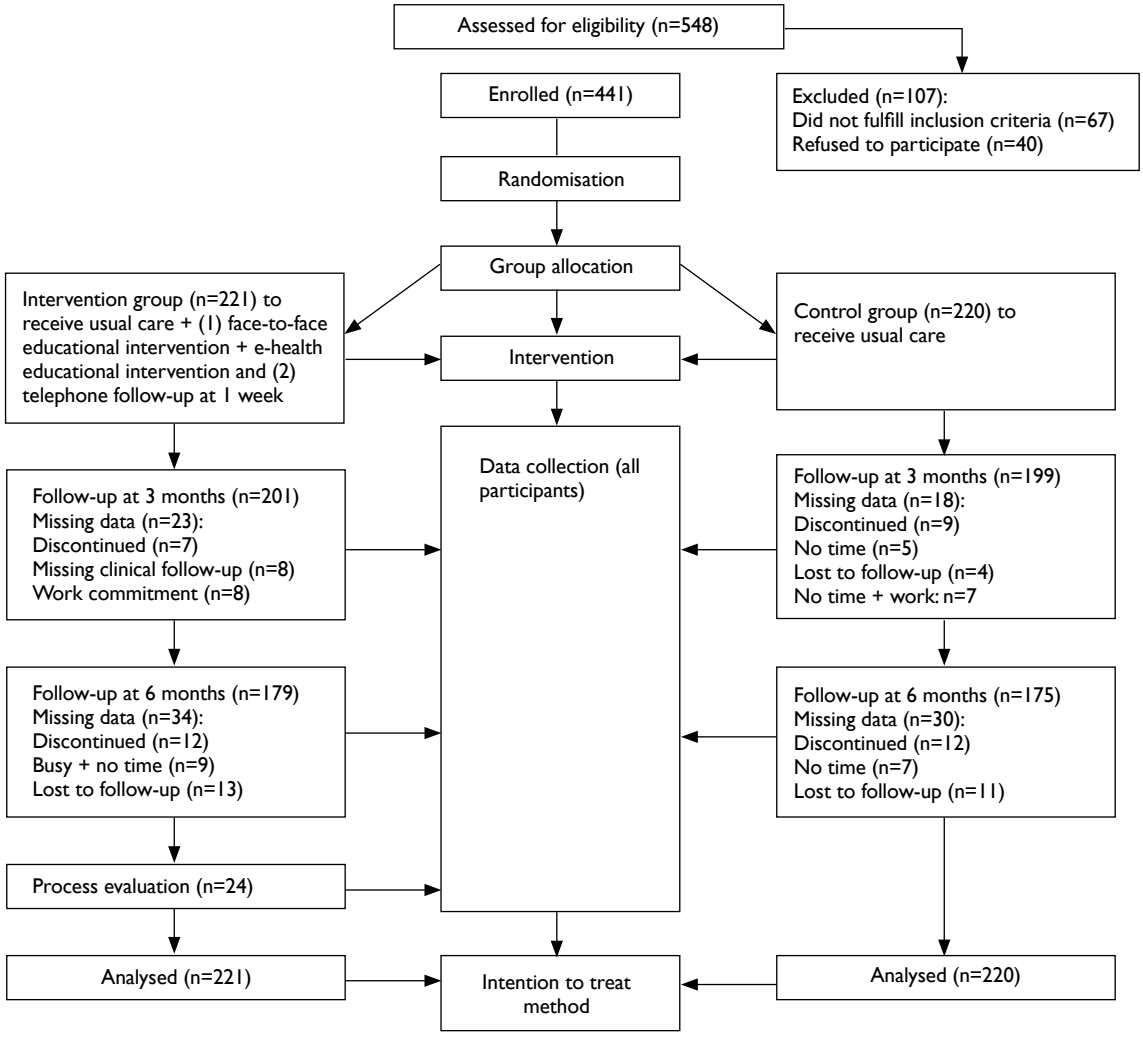

FIG. Flowchart of recruitment

TABLE 1. Clinical characteristics of participants*

Variable	Intervention (n=221)	Control (n=220)	P value
Age (years)	50.22±5.07	52.46±4.72	<0.001
Gender			
Male	150 (67.9)	141 (64.1)	0.402
Female	71 (32.1)	79 (35.9)	
Body mass index (kg/m^2)	26.20±4.38	25.63±3.80	0.150
Education			<0.001
Primary or below	9 (4.1)	50 (22.7)	
Secondary	146 (66.7)	151 (68.6)	
Tertiary	64 (29.2)	19 (8.6)	
Marital status			0.641
Married	172 (79.3)	168 (77.4)	
Not married	45 (20.7)	49 (22.6)	
Financial status			<0.001
Good	66 (30.4)	22 (10.2)	
Average	144 (66.4)	176 (81.5)	
Poor	7 (3.2)	18 (8.3)	
Residential status			0.330
Live alone	12 (5.6)	17 (8.0)	
Live with family	202 (94.4)	196 (92.0)	
Smoking			0.071
Yes	19 (8.6)	31 (14.1)	
No	201 (91.4)	189 (85.9)	
Employment status			<0.001
Working	190 (86.8)	158 (72.5)	
Not working	29 (13.2)	60 (27.5)	
Hospital Anxiety and Depression Scale-Anxiety			0.607
0 (score ≤7)	166 (75.8)	169 (77.9)	
1 (score ≥8)	53 (24.2)	48 (22.1)	
Hospital Anxiety and Depression Scale-Depression			0.342
0 (score ≤7)	177 (80.8)	165 (77.1)	
1 (score ≥8)	42 (19.2)	49 (22.9)	
Short Form-12			
Physical Component Summary	45.47 (6.79)	45.86 (7.25)	0.557
Mental Component Summary	48.11 (8.99)	48.27 (10.15)	0.857
Total exercise time per week	134.61±142.78	128.55±147.46	0.742
Godin-Shephard Leisure-Time Physical Activity Questionnaire score	16.85±11.72	15.74±14.48	0.283
Exercise self-efficacy	3.97 (1.95)	3.88 (2.27)	0.666

* Data are presented as No. (%) or mean±SD

records. The intention-to-treat principle and the generalised estimating equation model were used, with adjustment for confounding variables. Two consecutive follow-ups were conducted at 3 and 6 months (T2 and T3, respectively).

Results

The Figure shows the recruitment of participants. Table 1 shows the clinical and baseline characteristics for the intervention and control groups. The intervention group (n=221) and the control group (n=220) yielded an attrition rate of 9.3% and 14.5% at T2 and T3, respectively. Both groups were comparable in terms of clinical characteristics, except for age, educational level, financial status, and employment status. These were considered confounding variables.

Table 2 summarises the generalised estimating equation results for the different changes in the outcomes across the time points between the two groups, with adjusted confounding factors. The generalised estimating equation model can take account of the intra-correlated repeated measures data and can accommodate missing data due to incomplete visits or dropouts.

The total amount of exercise (GSLTPA score) over the 3-month period elicited a significant interaction effect (P=0.02). At 3 months, the intervention group had a significant increase in GSLTPA score compared with the control group (B=3.18, P=0.02) with a Cohen's d of 0.28. At 6 months, the increase was not significant (B=2.12, P=0.14) with a Cohen's d of 0.18. No significant main effect or between group and interaction effects were observed in the total exercise time per week.

80% adherence to exercise was regarded as good. In the intervention group, 36.2% (n=80), 43.4% (n=95), and 39.4% (n=87) of participants showed good adherence at T1, T2, and T3, respectively, compared with 37.7% (n=80), 37.7% (n=83), and 38.2% (n=84) in the control group. More participants in the intervention group showed satisfactory exercise adherence at T2 and T3, with a risk ratio of 1.15 at 3 months and 1.03 at 6 months. No significant main effect or between-group effects were found in exercise self-efficacy, although the intervention group performed slightly better (B=0.219 in T2 and B=0.012 in T3).

Regarding the Hospital Anxiety and Depression Scale, the interaction effect was non-significant across 6 months suggesting that the changes did not depend on the type of intervention. Nonetheless, there were a main effect for time across 6 months (P<0.05), a between-group effect in anxiety (P=0.004), and a main effect for time across 6 months for depression (P<0.05).

The main effect of time was significant at T3 (P<0.05) for the Physical Component Summary score and at T2 and T3 for the Mental Component Summary score, but the interaction effect and between group effects were not significant. Therefore, the changes in Physical and Mental Component Summary scores were independent of the type of intervention.

The biological parameters did not differ

TABLE 2. Generalised estimation equation model for comparison of repeated measure outcome variables between intervention and control groups

Variable	β	95% CI		P value	Cohen's *d*
Systolic blood pressure					
Group	-0.214	-3.36	2.93	0.89	
Month 3	-0.118	-2.41	2.18	0.92	
Month 6	-0.143	-2.27	1.98	0.89	
Group x month 3	0.358	-2.73	3.44	0.82	0.04
Group x month 6	1.369	-1.77	4.51	0.39	0.08
Diastolic blood pressure					
Group	1.766	-0.38	3.91	0.11	
Month 3	-0.480	-2.20	1.24	0.58	
Month 6	0.491	-0.89	1.87	0.49	
Group x month 3	-0.638	-2.87	1.60	0.58	-0.02
Group x month 6	0.075	-1.92	2.07	0.94	0.02
Total Exercise time per week					
Group	13.162	-11.20	38.24	0.30	
Month 3	7.736	-8.17	23.64	0.34	
Month 6	11.099	-7.54	29.74	0.24	
Group x month 3	3.47	-20.39	27.33	0.89	0.04
Group x month 6	-1.85	-28.85	25.13	0.78	<0.01
Total amount of exercise (Godin-Shephard Leisure-Time Physical Activity Questionnaire score)					
Group	1.363	-1.13	3.85	0.28	
Month 3	-0.988	-2.96	0.98	0.33	
Month 6	-0.917	-3.13	1.30	0.42	
Group x month 3	3.176	0.60	5.75	0.02	0.28
Group x month 6	2.119	-0.72	4.96	0.14	0.18
Self-Efficacy for Exercise					
Group	0.083	-0.32	0.49	0.69	
Month 3	0.244	-0.07	0.55	0.12	
Month 6	0.673	0.34	1.01	0.001	
Group x month 3	0.219	-0.16	0.60	0.26	0.11
Group x month 6	0.012	-0.42	0.44	0.96	-0.02
Anxiety					
Group	0.728	0.05	1.41	0.04	
Month 3	-0.428	-0.81	-0.45	0.03	
Month 6	-0.806	-1.22	-0.39	0.001	
Group x month 3	3.47	-20.39	27.33	0.89	-0.04
Group x month 6	-1.85	-28.85	25.13	0.78	0.05
Depression					
Group	-0.153	-0.79	0.48	0.64	
Month 3	-0.825	-1.27	-0.38	0.001	
Month 6	-1.272	-1.73	-0.81	0.001	
Group x month 3	0.124	-0.46	0.71	0.68	0.06
Group x month 6	0.570	-0.05	1.19	0.07	0.24
Physical Component Summary					
Group	-0.320	-1.65	1.02	0.64	
Month 3	0.826	-0.08	1.73	0.07	
Month 6	1.377	0.35	2.41	0.01	
Group x month 3	-0.160	-1.42	1.10	0.80	<0.01
Group x month 6	0.284	-1.15	1.72	0.70	0.02
Mental Component Summary					
Group	0.225	-1.50	1.95	0.80	
Month 3	2.056	0.64	3.47	0.004	
Month 6	2.990	1.51	4.47	0.001	
Group x month 3	-0.624	-2.35	1.10	0.49	-0.02
Group x month 6	-1.419	-3.27	0.44	0.13	-0.12

significantly, although the results favoured the intervention group in terms of lipid control (ie HDL-C level increased and LDL-C level decreased).

In process evaluation, the e-HEI could be applied in clinical settings and accepted by participants to support their exercise maintenance, exercise, and health status. Most participants had a positive perception of the e-HEI. As a consequence, regular exercise was performed at home. e-HEI was regarded as an additional professional support to maintain self-exercise behaviour. Peer dynamics, social support from family and work colleagues, and Chinese cultural influences on exercise behaviour may contribute to exercise maintenance.

Discussion

The e-HEI effectively promoted aerobic physical exercise such as brisk walking. The intervention group showed higher exercise self-efficacy and exercise adherence at 3 months. Exercise has a positive effect on promoting physical activity and enhancing body weight control and lipid profile after 12 months.[2,4,5] The active ingredient of the programme[4,5] may be counselling or supervised exercise. Our study relied on website information and exercise maintenance support; hence, the amount of physical exercise increased, and the main effect was significant within 3 months. Our intervention likely elicited positive effects on physical exercise up to 3 months. A sustainable longer effect (up to a year) or a stronger form of intervention should be explored in further studies.

The interaction effect on the Hospital Anxiety and Depression Scale did not differ significantly within 6 months. In terms of the Mental Component Summary score, mental well-being improved and a significant time effect was observed. In contrast, no significant differences between groups or interaction effects were observed. The Self-Efficacy for Exercise score increased to a greater extent at 3 months than at baseline. The intervention group improved in terms of self-efficacy measure, with great effect size within 3 months, but not within 12 months. Our findings suggest that the intervention effect might not be sufficient to achieve significance. Further reminder alerts via the web or other means, as well as advanced strategies should be implemented in the future development of the e-HEI to prevent the dilution effect.

Although the HDL-C and LDL-C levels of the intervention group were higher than those of the control group, this may have been due to medication control because all participants were followed up regularly and received appropriate medication.

The e-HEI could be applied to clinical settings and accepted by participants to support their exercise maintenance, exercise, and health status. Peer and family support further contributed to exercise maintenance and thus promoted exercise adherence and e-HEI.

Conclusion

E-HEI is a safe means to encourage exercise behaviour to improve the amount of physical exercise, Self-Efficacy for Exercise score, and adherence in the first 3 months, but its effects were not sustained in the long term. The qualitative findings of the process evaluation also confirmed the acceptability and need for an e-health programme as a professional means to support the self-management of exercise habits and health of patients with CHD.

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Perceived unmet supportive care needs and determinants of quality of life among survivors of head and neck cancer

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KEY MESSAGES

1. The most common unmet need among head and neck cancer survivors was having a hospital staff member with whom they could discuss their condition, treatment, and follow-up. Patients were eager to know more about disease prognosis, symptom management, how to improve their health, and how to access information and healthcare or social services.
2. Optimism, education, co-existing diseases, number of symptoms experienced, household income, eating ability, social support, perceptions on whether the cancer was under control, and the time required to travel between home and hospital may directly and/or indirectly impact quality of life in terms of psychological, physical, and/or health system information domains. These factors accounted for 64% of the variance in the total Functional Assessment of Cancer Therapy–Head and Neck score.
3. Providing the information that head and neck cancer survivors want is a significant factor in fulfilling their psychological needs and improving overall quality of life.

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Introduction

Head and neck cancer (HNC) is prevalent in Hong Kong; most patients are middle-aged males aged 45-64 years who are likely to be the breadwinner of the family.[1] With advancements in cancer screening and treatment, the number of HNC survivors is increasing.[1] Nevertheless, HNC patients are reported to experience high levels of distress throughout the disease trajectory and after completion of treatment. This may be detrimental to their health and in turn increase the burden on healthcare services.

A systematic review examined the unmet supportive care needs (SCNs) of patients at different points across the cancer trajectory.[2] Unmet SCNs identified at the post-treatment stage included health information, physical and daily living needs, psychosocial concerns, sexuality, and communication. Nonetheless, work to identify the unmet SCNs among HNC patients is limited. This study aimed to (1) identify the most common perceived unmet SCNs of HNC survivors, and (2) examine the mediating role of perceived unmet SCNs in the relationship between quality of life (QoL) and patient characteristics.

Methods

This study was conducted from January 2012 to September 2013. Approval was obtained from the hospital's research ethics committee. A mixed-design method consisting of a quantitative cross-sectional design (phase I) and a qualitative descriptive approach (phase II) was used. In the phase I study, 285 Chinese patients were recruited, and common unmet SCNs were identified using a structured questionnaire. A purposive sub-sample of 53 people was invited to the phase II study that involved a 45-to-60-minute face-to-face interview. The details of the methodology have been reported elsewhere.[3]

Skewed continuous and normal-like distributed variables were presented as median (interquartile range) and mean±standard deviation (SD), respectively. Categorical data were presented as frequencies (percentage). Path analysis was used to examine the relationship between demographic and clinical characteristics, perceived unmet SCNs, and QoL.

Results

In the phase I study, the response rate was 89.1%. The mean patient age was 55.3 (SD, 12.3) years. Most patients were male (76.8%), married (82.1%), with a secondary education (67.3%), unemployed (63.5%), and with a middle or high household income (60.5%). Of the patients, 51.9% were diagnosed with stage III

cancer. The mean period since diagnosis was 8 (SD, 3.8) months and the mean period after treatment was 4.5 (SD, 3.4) months. The most common cancer type was pharyngeal cancer (73.3%). Half of all patients had undergone combined radiotherapy and chemotherapy. The three most common symptoms were dry mouth (95.4%), altered taste (82.8%), and fatigue (76.1%). Patients rated their eating ability as moderate (mean±SD, 6±2.4).

In the phase II study, 40 males and 13 females participated. Most were married (83%) and had a secondary education (78.3%). About half were still in employment (49.1%) and had a middle household income (50.9%). Their stage of disease varied from I to III, and most had nasopharyngeal carcinoma (71.7%) and had received combined cancer treatment (84%).

The ten most common unmet SCNs were (1) having a hospital staff member with whom to discuss their condition, treatment, and follow-up (41.1%); (2) being informed of the approaches to getting well (40.5%); (3) being informed that the cancer was under control (30.5%); (4) being informed of test results at the earliest (29.1%); (5) financial assistance for patient expenses (24.6%); (6) more choice of physicians to consult (23.6%); (7) fear of cancer spreading to other sites (20.0%); (8) being cared for like a person (20.0%); (9) concern that they had no control over treatment outcome (19.3%); and (10) 24-hour telephone support and advisory services (19.3%).[4] The top three needs were related to the health system and information domain.

Having a hospital staff member with whom to discuss their condition, treatment, and follow-up

Most participants supported the view that having a designated healthcare professional would be helpful. In particular, they were eager to know more about disease prognosis and symptom management, how to improve health, and how to access information and healthcare or social services. Nonetheless, participants noted that under the existing public healthcare system they had difficulty in finding help, as they were allocated to a different physician or nurse at each consultation.

Being informed of the approaches to getting well

Most participants emphasised the need for information about how to get well, particularly they wanted more information about Chinese dietary regimens. They wanted more information about the 'specific types of food to be avoided'.

Being informed that the cancer was under control

Many participants were worried about disease recurrence. Nonetheless, only those with high information needs wanted to be informed about whether the cancer was under control or diminishing, so that they could stop worrying.

Mediating role of unmet needs in the relationship between patient characteristics and quality of life

The final path model (RMSEA=0.02, SRMR=0.038, CFI=0.99, NNFI=0.98, and AGFI=0.94) showed that QoL of HNC survivors could be directly and/or indirectly affected by factors including attitude towards life, education, co-existing diseases, somatic symptoms, household income, eating ability, social support, perceptions on whether cancer was under control, and the time required to travel between home and hospital.[5] These factors directly and/or indirectly affect the psychological, physical and/or health system information domains, and accounted for 64% of the variance in the total Functional Assessment of Cancer Therapy–Head and Neck score.[5] The mediating effect of the physical aspect of SCNs was identified in the relationship between attitude towards life, number of symptoms, travelling time, perceptions on whether cancer was under control, and social support. Health system information and psychological needs were also found to mediate the association between QoL and the attitude towards life score, number of symptoms, education, co-existing diseases, and travelling time.[5]

Discussion

One year after cancer treatment, HNC survivors had unmet SCNs in various domains. The three most prevalent unmet SCNs were in the health system and information domain, with >30% of participants reporting moderate or high unmet needs.[4] This indicates that Hong Kong hospital support services might have paid insufficient attention and support to HNC survivors. Currently, services for HNC patients in Hong Kong public hospitals mainly focus on supporting those who are at the pre-treatment or treatment stage, with support provided by the Cancer Patient Resource Centre, advanced practice nurses, and volunteers. These resources are rarely utilised by HNC survivors. Possible reasons may be related to poor access and insufficient referrals. Videos of nasal washing are available for nasopharyngeal carcinoma patients after treatment, but this is not sufficient for HNC survivors with a range of persistent and distressing symptoms.

In this study, we revealed the mediating effect of physical aspects of SCNs in the relationship between clinical characteristics of HNC survivors and QoL. These characteristics included less social support, longer time required to travel between home and hospital, uncertainty about whether cancer was

under control, experience of more symptoms, and a pessimistic attitude. This implies that meeting the physical needs of HNC survivors can be an effective strategy to improve their QoL. It was interesting to identify the relationship between psycho-socially related constraints and physical needs. Although survivors were relatively pessimistic with limited social support, their overall QoL can be improved if their physical needs are met.[5]

Moreover, the health-system and information may indirectly mediate the association between specific backgrounds of HNC survivors and their QoL. HNC survivors experienced less fear and distress when they were provided with information about their disease, diagnosis, treatment, or related follow-up issues. Those with a higher educational level, a co-existing disease, more cancer symptoms experienced, and a more pessimistic view appeared to benefit more when their psychological needs were met. These findings indicate that healthcare professionals should be encouraged to provide HNC survivors with information on all aspects of the disease in order to alleviate their fear and anxiety and improve overall QoL.

Conclusions

HNC survivors in Hong Kong have unmet SCNs. The three most prevalent unmet SCNs were in the health system and information domain. The association between certain characteristics of HNC survivors and their overall QoL was mediated by SCNs.

Efforts should be made to develop a multi-dimensional supportive care system for cancer survivors. The integration of needs assessments may guide healthcare professionals towards identifying the actual needs of HNC survivors. The establishment of a nurse-led clinic to provide patient-centred survivorship care should be considered. An experimental study to examine the effectiveness of survivorship care interventions to improve the QoL of HNC survivors is recommended.

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(2) So WK, Wong CL, Choi KC, et al. A mixed-methods study of unmet supportive care needs among head and neck cancer survivors. Cancer Nurs 2017. Advance online publication. doi: 10.1097/NCC.0000000000000542.

(3) So WK, Choi KC, Chen JM, et al. Quality of life in head and neck cancer survivors at 1 year after treatment: the mediating role of unmet supportive care needs. Support Care Cancer 2014;22:2917-26.

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4. So WK, Wong CL, Choi KC, et al. A mixed-methods study of unmet supportive care needs among head and neck cancer survivors. Cancer Nurs 2017. Advance online publication. doi: 10.1097/NCC.0000000000000542.
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Voice performance in tonal language speakers with glottal insufficiency due to unilateral vocal fold paralysis after injection laryngoplasty: a multidimensional study of Cantonese patients

ML Ng *, BYH Wong

KEY MESSAGES

1. Cantonese-speaking patients with unilateral vocal fold paralysis suffer a reduced ability in normal phonation and daily conversation as well as possible swallowing difficulties.
2. Injection laryngoplasty using hyaluronic acid appears to help improve voice quality and tone production in patients with unilateral vocal fold paralysis.
3. The benefit of the procedure appears to be sustained with minimum side effects.

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Introduction

Patients with unilateral vocal fold paralysis (UVFP) often have a hoarse and breathy voice, inadequate coughing, choking when swallowing, fatigue, and sometimes neck pain.[1] This can be debilitating, especially for those with a vocally demanding job such as teachers or singers. UVFP negatively impacts the physical, emotional, and social aspects of quality of life of patients. Although speech therapy can achieve some improvement, surgery remains the primary treatment approach,[2] particularly for the increasingly popular injection laryngoplasty (IL), which is simple, low-cost, reversible, and predictable.[3] IL yields a better glottal closure and is a definitive and reliable treatment. Injected hyaluronic acid allows healthy vibratory behaviour of the paralysed vocal fold.

Generally, outcomes of IL are favourable in terms of the Voice Handicap Index (VHI),[4] with a sustainable effect.[3] Most studies have been based on English-speaking patients. It is not known whether Chinese patients will gain equal benefit in restoring voice production. The present study examined the improvement, if any, in voice quality, quality of life (QOL), and tone production among Chinese patients with UVFP after IL with hyaluronic acid. The study examined the visual, perceptual, acoustic, and aerodynamic characteristics of patients' pre- and post-operative voice to assess the change in vocal quality.

Methods

This study was conducted from December 2011 to November 2014. Thirty adult patients who were diagnosed with glottic insufficiency due to idiopathic/iatrogenic UVFP underwent IL with hyaluronic acid (Restylane) by an experienced otorhinolaryngologist. Patients were native Cantonese speakers who had shown no spontaneous recovery or improvement following speech therapy. Those with UVFP caused by laryngeal cancer were excluded.

Patients were treated in the Department of Ear, Nose and Throat Clinic of Queen Mary Hospital and Tung Wah Hospital. On the day of the procedure, patients were asked to fast for 6 hours before undergoing videostroboscopy and flexible laryngoscopy to confirm the diagnosis. Local anaesthesia was administered to the larynx and nearby skin tissue. Hyaluronic acid (Restylane) was injected percutaneously by the otorhinolaryngologist to medialise the paralysed fold and to close the interglottal gap. The procedure was simultaneously examined through the flexible laryngoscope and camera held by an assistant otorhinolaryngologist. The patient was discharged home 1 hour after the procedure.

To assess voice quality, patients were asked to perform the following speech tasks: (1) sustained phonation of the vowels /i/, /a/, and /u/, (2) reading a short Chinese passage, and (3) production of /si/ and /ji/ syllables using six Cantonese lexical tones. Visual images of glottal closure were obtained by rigid and flexible endolaryngoscopy before and after IL. For slow motion images of vocal fold vibration, videostroboscopy was used. Acoustic signals were obtained using a high-quality microphone and a professional grade pre-amplification system. The recorded acoustic signals were digitised at a sampling

rate of 20 kHz. A brief instruction of the recording procedure was provided. Patients were allowed to practice the speech materials several times prior to the actual recording. All recordings took place in a sound-proof booth at Tung Wah Hospital. Visual information relating to glottal vibration, self-perceived QOL, perceptual voice quality, and aerodynamic and acoustic characteristics, as well as production of different Cantonese tones were assessed before and after IL.

Results

Voice-related quality of life

The mean total VHI scores before, 1 week, 1 month, and 3 months after IL were 51.63, 27.27, 20.80, and 19.60, respectively. The decreasing trend in VHI scores indicated an overall improvement in vocal health, particularly for the functional, physical, and emotional aspects of VHI. There was a significant improvement in the voice and associated QOL. Vocal condition as perceived by the patients remained fairly constant.

Perceptual voice quality

The mean total grade, roughness, breathiness, asthenia, strain (GRBAS) scores before, 1 week, 1 month, and 3 months after IL were 11.050, 5.069, 3.414, and 3.675 (out of 15), respectively. This indicated a sustained, significant improvement in perceptual voice quality.

Pitch characteristics

To describe pitch characteristics of pre- and post-operative voice, the mean, minimum, and maximum fundamental frequency (F0), and pitch sigma were obtained from the second sentence of the reading passage. The mean F0 values before, 1 week, 1 month, and 3 months after IL were 153.1 Hz, 155.27 Hz, 156.2 Hz, and 162.64 Hz, respectively, compared with 132 Hz in normal participants. Repeated-measures ANOVA indicated no significant main effect before or after surgery, indicating that the mean, minimum, and maximum F0 as well as pitch sigma values were not significantly different before and after surgery.

Tone production

There was a subtle improvement in tone production of six Cantonese tones. Specifically, the mean accuracy percentages in tone production before, 1 week, 1 month, and 3 months after IL were 59.43%, 69.91%, 63.27%, 63.64%, respectively, compared with 81.55% in normal participants.

Discussion

Videolaryngoscopic examination revealed a significant improvement in vocal fold adduction, as indicated by the significantly improved glottal closure ratings. This indicates that IL is effective in approximating a paralysed vocal fold, yielding a better glottal closure during phonation. The finding is in line with the significant improvement in self-reported QOL and voice quality perceived by speech therapists.

According to the VHI, patients reported a significantly improved QOL in the emotional, functional, and social aspects. Patients generally reported improved voice production immediately after the procedure and the effect was sustained for at least 3 months. Improvement in the emotional aspect appeared to be more apparent than the functional and physical aspects. This may be related to the improved voice production and/or swallow from injection, as most patients suffered varying degrees of dysphonia and dysphagia.

The reduced total GRBAS scores indicate that the procedure is effective in improving voice quality. Of the five aspects of voice quality, breathiness improved the most (from 2.333 to 0.750). Breathiness is probably the most significant vocal deficit affected by UVFP, with the paralysed fold hindering a complete glottal closure by creating an interglottal gap during phonation. This gap results in an inappropriate leakage of air during phonation, and weakening of the voice. With IL, a complete or better closure is achieved, and leakage of air is avoided or reduced. This increases vocal efficiency and reduces breathiness (air leakage). In addition, both grade and roughness of voice quality were also improved. This may be related to the better and more regular vibratory behaviour after IL. The biomechanical characteristics of hyaluronic acid, combined with the minimal intrusion of vocal folds contributed to the near-normal vibration of an injected fold.

Pitch is a perceptual attribute of voice and directly correlates with F0, which in turn relates to the rate of vocal fold vibration. The mean and range of F0 before and after the procedure were not significantly different, indicating that vocal folds were vibrating at a comparable rate before and after the procedure. Nonetheless, the F0 values obtained may not be representative as they were obtained by averaging six male and five female patients. As males and females have significantly different F0 (approximately 110 Hz and 220 Hz respectively), the mean F0 values appear to be meaningless.

UVFP patients were not able to produce different Cantonese tones proficiently after IL (mean accuracy, 59.43%), compared with normal speakers (81.55%). Even for healthy native speakers of Cantonese, some of the tones were produced with a rather low accuracy, for example, only 48.47% and 68.88% accuracy for tones 5 and 6, indicating the great reliance on contextual cues for listeners to accurately perceive the tones.

Conclusion

IL is an effective treatment for UVFP, with respect to QOL, perceptual voice quality, tone production, and pitch characteristics. Future studies should examine the possible improvement in overall communication ability of patients with UVFP, and the associated intelligibility of speech. Such measures should better describe the change in overall performance in verbal communication.

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Effectiveness of a multidisciplinary approach to geriatric hip fractures in improving clinical outcomes and cost of care

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KEY MESSAGES

1. Geriatric hip fracture is best managed by a multidisciplinary geriatric hip fracture clinical pathway (GHFCP).
2. Implementation of a GHFCP results in decreased preoperative waiting time and length of hospital stay, decreased mortality and complication rate, reduced manpower cost, and increased efficiency.

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Introduction

Geriatric hip fracture is placing an increasing burden on our medical system and requires increased health utilisation in the first year of fracture.[1,2] A multidisciplinary approach in the form of a critical clinical pathway has been reported to shorten hospital stay and improve clinical outcomes.[3,4] In 2007, we developed our own geriatric hip fracture clinical pathway (GHFCP) to meet the local medical system needs. The initial results were encouraging with a shortened length of hospital stay. Nonetheless, the improved clinical outcomes with the multidisciplinary approach were at the expense of higher manpower costs. We conducted this retrospective study to compare clinical outcomes and manpower costs before and after implementation of the GHFCP.

Methodology

The GHFCP is a multidisciplinary care model that addresses all phases of management including preoperative, peri-operative, postoperative, and rehabilitation periods. The team is led by an experienced orthopaedic surgeon. A full-time nurse acts as a case manager to help monitor the daily routine of clinical management and the flow of patients. The team includes surgeons, physicians, anaesthetists, nurses, physiotherapists, occupational therapists, medical social workers, and voluntary support groups. They contribute at various times to the management programme.

Hip fracture data in 2006 were compared with those from 2008 to 2011. Efficiency of the programme was indicated by the preoperative length of stay and total length of stay in acute and convalescence hospitals. Clinical outcomes included short-term and long-term mortality rates and complication rates. Cost of manpower was estimated.

Results

After implementation of the GHFCP, the preoperative length of stay shortened from 5.76 days in 2006 to 1.32 days in 2011 ($P<0.001$, Fig 1). The total length of stay in both acute and convalescence hospitals was also shortened by 6.05 and 14.24 days, respectively. The postoperative pneumonia rate decreased from 1.25% to 0.25%. In 2006, the in-patient mortality, 30-day mortality, and 1-year mortality were 2.86%, 5.36%, and 23.93%, respectively. In 2011, the respective rates decreased to 0.95%, 1.67% (Fig 2), and 13.81%. Although health manpower had increased to meet the increasing workload, the shortened length of stay contributed to a marked decrease in the manpower costs per hip fracture case. In 2006, the average staff cost for each geriatric hip fracture patient was HK$23 907. After implementation of the GHFCP, the average staff cost for each geriatric hip fracture patient was HK$16 598 in 2008 and HK$16 190 (lowest) in 2010. There was a general downward trend, but the cost fluctuated slightly depending on the number of hip fracture patients and the average length of stay (Fig 3).

Discussion

Compared with other pathways,[3,4] our GHFCP extends from the acute hospital to the rehabilitation

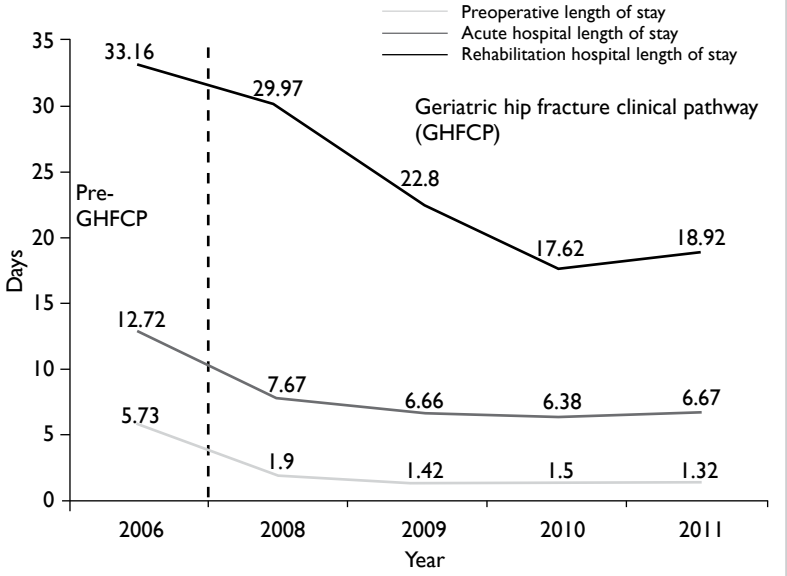

FIG 1. Length of hospital stay from 2006 to 2011

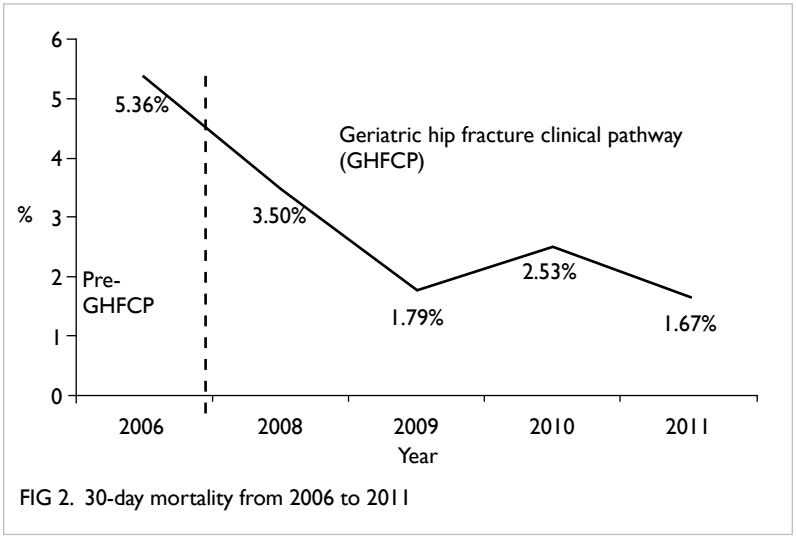

FIG 2. 30-day mortality from 2006 to 2011

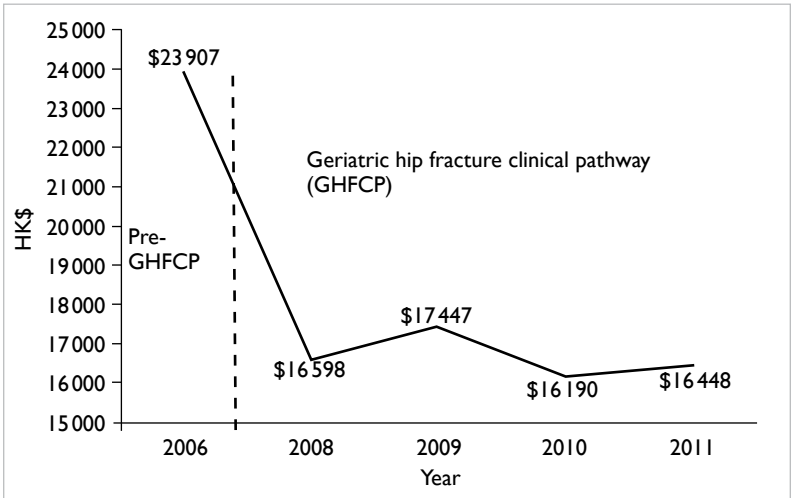

FIG 3. Average staff cost per geriatric hip fracture patient in Queen Mary Hospital from 2006 to 2011

hospital and ensures smooth transition along the whole chain of clinical care. The preoperative length of stay is an important factor that affects the clinical outcomes of hip fracture patients. The shorter the stay, the fewer the complications and the lower the mortality.[5] Our GHFCP significantly decreased the preoperative length of stay from 5.76 days in 2006 to 1.32 days in 2011. This was attributed to the joint efforts of the surgeons, physicians, anaesthetists, and nurses, including the operating theatre personnel. A standardised protocol is followed to ensure most hip fracture patients undergo surgery within 48 hours of admission. The total length of stay in hospital is significantly shortened. In the rehabilitation hospital, the rehabilitation doctors, nurses, and particularly therapists and medical social workers work together to speed up the rehabilitation process. The length of stay in the convalescent hospital is also significantly shortened, and patient satisfaction improved.

In our study, the in-patient mortality gradually decreased from 2.86% in 2006 to 0.95% in 2011, and the 30-day mortality from 5.36% to 1.67%. Our 30-day mortality is much lower than that reported in other studies ranging from 5.1% to 13%,[3-5] particularly after the GHFCP. In addition, the 1-year mortality showed a decreasing trend. This was not expected because most of these 1-year mortalities were not directly related to hip fracture.

It is difficult to calculate every single cost of item and manpower, as medical care in Hong Kong is public health care. The medical staff is paid a monthly salary irrespective of the number of patients operated on or treated. The costs of hardware such as medications, implants, prostheses, and consumables are standardised and purchased by the hospital management. After implementation of the GHFCP, the only resource that increased is manpower, especially in allied health staff, namely physiotherapists, occupational therapists, and medical social workers. The numbers of surgeons, physicians, anaesthetists, and nurses remain unchanged; instead the care system is improved so that these people work more efficiently. There is a generally decreasing trend in the cost of care in the acute hospital because the length of hospital stay is much shorter following introduction of the GHFCP. The increased allied health manpower costs are compensated by the drastically decreased length of stay. Although this reduced cost is not reflected by actual reduced expenditure in hospital, it proves that increased manpower is cost-effective in treating geriatric hip fractures, and that good-quality care does not necessarily need to increase costs.

There is also a reduction in costs in the convalescence hospital. In the initial phase of the GHFCP, allied health manpower in Fung Yiu King Hospital was increased to support the extra workload. Nonetheless, the cost of each patient

has since decreased due to the much shorter length of hospital stay. Once the programme operated smoothly, manpower demand decreased slightly and results remained consistent, although one reason for decreased manpower was manpower shortage.

This study had several limitations. It had cofounding factors that are associated with a retrospective cohort study. Nevertheless, the patients in the two cohorts were comparable in terms of demographics. The cohort before implementation of the GHFCP consisted of 2006 data only. More data before the GHFCP would have been better, but 1-year data were representative of the scenario before the GHFCP.

Conclusions

The GHFCP has shortened geriatric hip fracture patients' length of stay and improved clinical outcomes. It is cost-effective and proves that better care can be less costly. The GHFCP improves clinical outcomes of hip fractures in terms of mortality and complication rates. A preoperative waiting time of <48 hours should be the standard of care for all geriatric hip fractures. Investment in manpower to manage geriatric hip fracture is cost-effective because it achieves a more efficient system of care and shorter length of stay in both acute and convalescence hospitals. A larger-scale, prospective study is required to prove the efficacy of the multidisciplinary approach to geriatric hip fractures, and to determine factors that affect clinical outcomes.

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