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Tai chi for enhanced inpatient mobilization: A feasibility study

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ABSTRACT

Objective: To determine whether utilizing beginner, video-guided tai chi and qigong classes as an adjunct to physical therapy to enhance mobilization among hospitalized patients is feasible and acceptable.
Design: Single-arm feasibility study over a 15½-week period.
Setting: Three medical-surgical units at one hospital.
Interventions: Small-group video-guided beginner-level tai chi and qigong classes supervised by physical therapists occurred three times a week.
Main outcome measures: The primary outcome was weekly class attendance. Secondary outcomes included patient and staff satisfaction, collected by surveys and semi-structured interviews. Process measures included class duration. Balancing measures included falls.
Results: One-hundred and fifty-seven patients were referred for recruitment, 45 gave informed consent, and 38 patients attended at least one class. The number of weekly class attendees increased during the study period. Based on first-class experience, 68% (26/38) of patients reported enjoying the class "quite a bit" or "extremely," 66% (25/38) of patients reported feeling "more mobile" afterward, and 76% (29/38) of patients agreed that the class made them more comfortable going home. Average class duration was 29 minutes. Zero falls occurred during or immediately following class.
Conclusions: Video-guided tai chi and qigong classes are feasible and well-received at our hospital. Future studies of the impact on preserving mobility and function or reducing length of stay are of interest.

1. Introduction

Immobility is a significant but often overlooked problem among hospitalized patients, leading to deconditioning, functional decline, and slower recovery from illness.[1] Factors contributing to inpatient immobility include small quarters, tethers such as indwelling or IV catheters, and attention to acute illness superseding that of preserving baseline function.[2,3] Consequently, many patients, who may be ambulatory at home, lie in bed for days when recovering from the initial stages of illness. In one prospective, observational cohort study at a Veterans Affairs hospital, patients who were able and willing to ambulate spent 83% of their stay lying in bed, and the amount of time spent standing or walking was a median of 3% per day.[1]

Historically, bed rest was prescribed treatment for acute illness, but research has uncovered many detrimental health consequences to this practice. These include muscle atrophy, contractures, bone demineralization, skin breakdown, cardiac deconditioning, orthostatic hypotension, hospital-acquired pneumonia, malnutrition, venous thromboembolism, urinary retention, and delirium.[4,5] Immobility for even one week may lead to a 15% reduction in muscle mass, and some research even suggests that physical inactivity increases inflammatory cytokines that cause myopathy, cachexia, and organ toxicity.[6–8]

By the time immobilized patients recover from acute illness, many remain frail and feel incapable of performing their usual activities. It is estimated that at least 30% of elderly, hospitalized patients are discharged with a new limitation in activities of daily living (ADL) and that 50% of disability among elderly adults occur from hospitalization.[2] Such functional decline often leads to longer length of stay (LOS).[9] When sent home, these frail patients are also more vulnerable to accidents, injury, re-illness, and readmission.[10–12]

Though not yet universal, researchers and healthcare leaders are advocating for the adoption of inpatient mobilization as a best practice or standard of care for medical-surgical units, as new research continues to support its benefits.[13] Previous research of ICU and medical-surgical units has suggested that early mobilization protocols can reduce the aforementioned consequences of inpatient

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immobilization.[14,15] A 2013 review of 36 studies suggested that inpatient mobilization initiatives result in less delirium, pain, urinary discomfort, urinary tract infection, fatigue, DVT, pneumonia, depression, anxiety, and symptom distress.[16] One recent randomized trial found that daily ambulation enabled patients to maintain their pre-hospitalization community mobility, whereas those assigned to usual care experienced clinically significant declines.[17]

Many inpatient mobilization studies utilize ambulation as the intervention, but to our knowledge, no study has utilized tai chi or qigong. Tai chi is a form of Chinese martial arts and meditation based on Taoist philosophical principles, involving controlled breathing techniques and graceful movements. Qigong is based on similar principles but involves simpler, repetitive movements.[18] Randomized trials have shown that tai chi and qigong improve balance, reduce falls, reduce pain in osteoarthritis, improve aerobic conditioning in lung and heart disease, reduce depression, and even enhance cognitive function in mild cognitive impairment or dementia.[19–29]

In contrast to conventional efforts for inpatient mobilization, which include standard physical therapy (PT), ambulation, or simple acts such as eating meals in a chair, patients may more readily embrace tai chi and qigong because of their accessibility and value beyond simply promoting mobility. Furthermore, physically frail individuals, even the wheelchair dependent, may practice these arts with low risk of injury. While we do not have tai chi or qigong classes as part of our routine physical therapy sessions for hospitalized patients, classes are available for interested patients at our integrative health center, led by a physical therapist with over 20 years of experience practicing and teaching the art.

NewYork-Presbyterian/Lower Manhattan Hospital is located in Downtown Manhattan, an ethnically and culturally diverse part of New York City. Hospital census data in 2016 demonstrated that 21.17% of inpatients identified China as their birth country, while 0.56% and 0.21% identified Hong Kong and Taiwan, respectively. Based on our belief in the theoretical appeal of tai chi and qigong to the Chinese patient population, we hypothesized that our project might be successful in this environment.

This paper outlines our experience incorporating tai chi and qigong as an adjunct to standard physical therapy for our hospitalized patients. Our study's primary aim was to investigate the feasibility of implementing an inpatient mobilization protocol using beginner, video-guided tai chi and qigong classes taught by physical therapists (PTs) to patients. Secondary aims were to evaluate patient and staff agreeability toward the protocol.

2. Materials and methods

2.1. Study design and cohort

We designed a single-arm feasibility study to test whether a mobilization protocol utilizing video-guided tai chi and qigong classes could be successfully implemented at our hospital. The study was piloted from November to December of 2017 on one medical-surgical unit (also a telemetry unit) with expansion to three medical-surgical units from January to March of 2018, in total comprising 99 beds. PTs referred patients to the class after review of our inclusion and exclusion criteria and based on whether they felt patients would benefit from the class as a supplement to their routine PT (see Fig. 1). Initial inclusion criteria were that participants must 1) have a PT consult; 2) be ≥ 65 in age, a range used in previous studies of deconditioning among inpatients; and 3) score ≥ 10 and ≤ 22 on the "6-Clicks" mobility scale, a range that encompasses patients who are able to sit but are not independently ambulatory.[30] However, due to low recruitment during the pilot phase, we expanded the inclusion criteria to encompass all ages and mobility levels. We excluded patients on contact, droplet, or airborne isolation and those deemed by the PT to be unable to safely or feasibly participate in class. After the pilot phase, these reasons for exclusion were recorded for patients not included in the study.

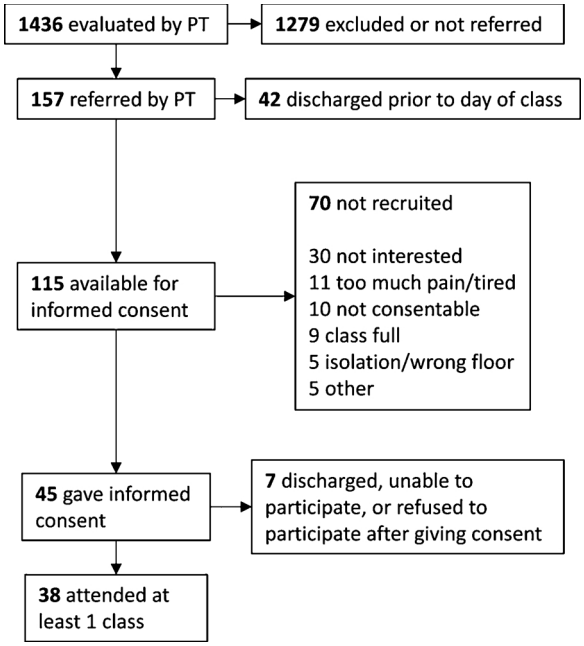

Fig. 1. Flowchart depicting patient referral and recruitment during the study period.

2.2. Intervention

Project leaders used the Model for Improvement to design the project charter.[31] Used by many healthcare organizations, the Model for Improvement is an iterative process of quality improvement that involves developing an intervention, implementing it, studying the results of implementation, and making adjustments based on the results. An interdisciplinary team including hospitalists, physical and occupational therapists, and nurses was assembled to champion the project and develop a process map of the current system (see Fig. 2) and driver diagram to optimize recruitment of patients and implementation of the intervention. The class occurred in the unit lounge on Mondays, Tuesdays, and Wednesdays, excluding holidays. Limited PT instructors available to supervise classes prevented daily class offerings. On each day of class, the PT supervisor informed nurses by secured text messaging of which patients had consented. Nurses, patient care technicians, or volunteers escorted ambulatory patients or transported using wheelchair non-ambulatory patients to the class location. Patients could refuse participation at any time by communicating with any staff member or project investigator, and the research assistant would record their reasons for refusal.

During class, patients first participated in approximately 3–8 minutes of guided meditation. Initially, this was led by a PT who read a meditation script but was later replaced with an audio recording featuring the same script in English, Chinese, or Spanish. When class participants did not share the same language, a recording in each language was played sequentially. After the meditation session, patients viewed a 17-minute video, played on a mobile computer, featuring eight beginner tai chi and qigong movements performed by a PT who is a tai chi instructor with over 20 years of experience practicing and teaching basic Yang-style tai chi and Yijin Jing qigong to frail patients. Class participants mirrored the exercises featured in the video. A PT remained present for the duration of the class to supervise and ensure safety, proper form, and adherence. The exercises could be performed either sitting or standing and could easily be adapted to accommodate the functional limitations of the patients. These adaptations were implemented as needed for patients in real time. The PTs supervising the

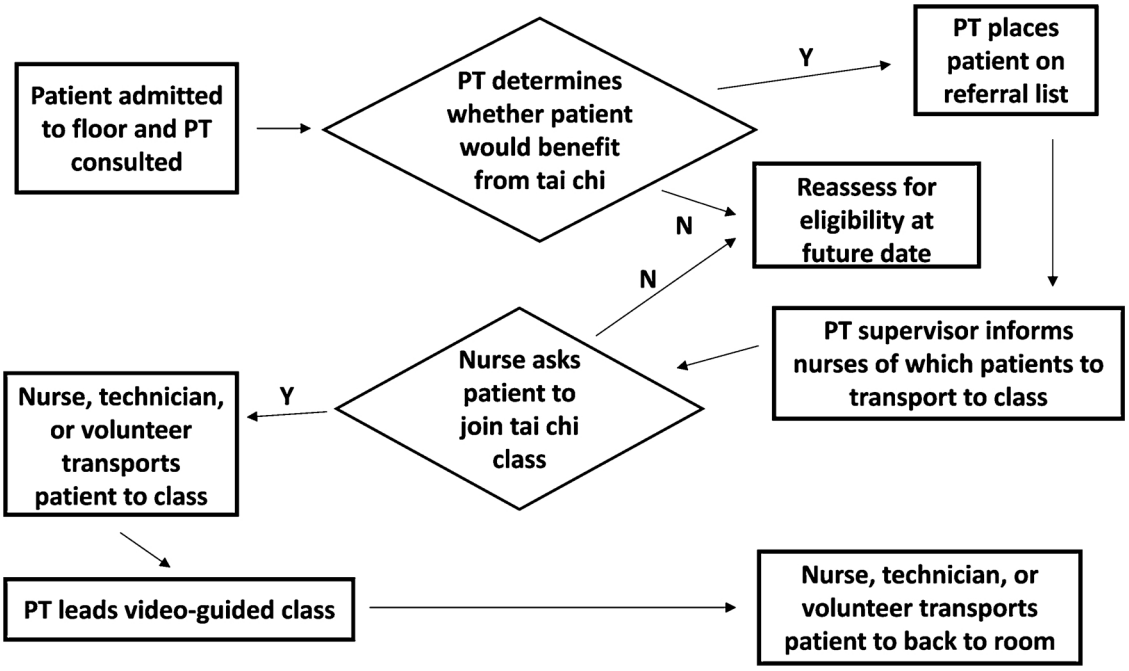

Fig. 2. Process map depicting the current system.

class did not have a formal background in tai chi or qigong but were given weekly instructional sessions to practice the movements performed in the video, as well as a concise instructional text guiding them on how to cue patients during class.

At the end of class, nurses, technicians, or volunteers escorted or transported patients using wheelchairs back to their rooms. The PT leading the class then wrote a progress note on each class participant, recording the types of physical therapy exercises corresponding to the movements taught during class, any symptoms or possible side effects experienced during class, and the participant's "6-Clicks" mobility score.

2.3. Outcome measures

The primary outcome of this feasibility study focused on capturing the demand and practicality of the intervention given the limitations on resources. We measured the number of class attendees each week and the average number of classes attended by each study participant during the hospital stay.

We also measured the class's acceptability toward patients through surveys given before and after each class to assess enjoyment, patients' ease of following the class exercises, perceived benefit of the class, and impact on feeling more comfortable about leaving the hospital. To assess for changes in participants' sense of self-wellness, we incorporated six statements adapted from the State Trait Anxiety Inventory (STAI).[32] These surveys were administered in a face-to-face setting by a research assistant; if needed, remote or in-person language interpretation services were utilized.

To assess the project's acceptability toward staff, we employed semi-structured interviews of nurses and PTs to assess whether they valued their role in the project, whether their time was optimally spent in carrying out the role, whether they believed the assigned role was effective and acceptable for patients, and the challenges they faced in carrying out the role.

To our knowledge, no specific, consensus definition of feasibility exists, making it inherently difficult to judge a project's feasibility. However, based on prior feasibility and pilot studies, our chosen criteria for feasibility were a sustainable increase in weekly class attendance and favorable feedback from patients and staff about the project, findings that reflect the class's demand and practicality, as well as acceptability toward patients and staff.[33–36]

2.4. Process measures

Process measures examine the specific steps or components in a project that lead to an outcome. Examining these specific steps or components helped us determine the feasibility of the project and allowed us to make needed adjustments. We measured the following processes: 1) time from admission to time of initial PT consult documentation; 2) duration of each class, defined as the time the PT arrived at the class location to the time the video was finished; and 3) reasons for excluding patients.

2.5. Balancing measures

Balancing measures included any adverse events during or immediately after class, including falls. In our surveys both before and after each class, we also asked patients to rate their level of pain, fatigue, dizziness, and shortness of breath.

2.6. Statistical analysis

Given that this was a feasibility study, no formal sample size calculation was conducted before study inception. The primary outcome measure was weekly class attendance. Secondary outcomes included pre- and post- responses based on Likert scales for subjective scores of patient satisfaction. Additionally, frequencies were collected on questions related to wellness, ease of following the intervention, and any adverse symptoms that occurred during the session, including pain, fatigue, dizziness, and shortness of breath. Demographic and clinical characteristics were collected for all participants and displayed as means (Standard Deviations) or medians (Inter-Quartile Ranges). Wilcoxon signed-rank tests were used to assess statistically significant differences among continuous items between the pre and post survey items. All p-values were two-sided and evaluated at the 0.05 alpha level. All analyses were performed using STATA version 14.0.

2.7. Ethical considerations

Weill Cornell Medicine's Institutional Review Board conducted an expedited review and approved the study as human subjects research with minimal risk, category nine protocol as per 44CFR46.110. All procedures followed were under the ethical standards of the responsible committee. This study met all necessary and applicable requirements, which included translated consent forms, affidavit of accuracy, and approved surveys. Participants gave written informed consent before participating in the project. A translation service and translated consent form were used for participants with limited English to ensure understanding of the aims, methods, source of funding, and any benefits/risks of the study, included but not limited to the discomfort it may entail. The participants were also informed of the right to refuse to participate in the study and to withdraw consent at any time without reprisal.

2.8. Role of the funding source

There was no funding source for this study.

3. Results

3.1. Participant characteristics

During the study period, which encompassed 15 weeks and three days, excluding a 2-week winter break, 38 patients attended at least one class (see Table 1). The average age was 69.13, with a standard deviation of 17.25. Sixty-one percent of the participants were men. Whites accounted for 29%, African-Americans 16%, and Asians 18%, while 37% of participants designated their race as "other." For primary language, 79% reported English, 13% reported a dialect of Chinese (Mandarin, Cantonese, etc.), and 8% reported Spanish. Eighty-four percent of participants belonged to the medical service, while the rest belonged to surgical services (four orthopedics, one vascular surgery, and one general surgery). The median length-of-stay was 6.33 days (IQR 4.69, 10.69). Forty-five percent, a plurality, reported not using assistive devices such as canes or walkers at home; the rest reported using at least one assistive device (21%) or did not answer (34%). Thirty-nine percent of participants reported independence in all ADLs; the rest reported at least one deficit (21%) or did not answer (39%). Seventy-nine percent of participants reported having no previous experience with tai chi or qigong.

Table 1
Characteristics of Class Participants.

Factor	Value
N	38
Age, mean (SD)	69.13 (17.25)
Gender	
Male	23 (61%)
Female	15 (39%)
Race	
White	11 (29%)
African American	6 (16%)
Asian	7 (18%)
Other	14 (37%)
Primary Language	
English	30 (79%)
Chinese/Cantonese/Mandarin	5 (13%)
Spanish	3 (8%)
BMI, mean (SD)	27.65 (8.17)
Medicaid	
No	20 (53%)
Yes	18 (47%)
Medicare	
No	12 (32%)
Yes	26 (68%)
Private Insurance	
No	23 (61%)
Yes	15 (39%)
Location	
1st Medical-Surgical Unit	22 (58%)
2nd Medical-Surgical Unit	12 (32%)
3rd Medical-Surgical Unit	4 (11%)
Admitting Service	
Medicine	32 (84%)
Surgery	6 (16%)
LOS, median (IQR)	6.33 (4.69, 10.69)
Time to PT Consult, median (IQR)	1.52 (1.06, 2.76)
Independent in Activities of Daily Living	
No	8 (21%)
Yes	15 (39%)
Not Recorded	15 (39%)
Use of Assistive Device	
No	17 (45%)
Yes	8 (21%)
Not Recorded	13 (34%)
AM-PAC Raw Score, median (IQR)	17.00 (16.00, 20.00)
Prior Tai Chi Experience	
No	30 (79%)
Yes	6 (16%)
Not Recorded	2 (5%)

3.2. Outcome measures

Thirty-two classes occurred during the entire study period, out of a total of 46 possible classes. Weekly class attendance increased as the project progressed, yielding 60 class attendees in total (see Fig. 3). For attendance in each class, please refer to Supplementary Data Table 1. Each class had an average of 1.9 attendees. Of the 38 unique patients who participated in the study, two attended five classes, and the average number of classes attended by all participants was 1.6.

Post-class surveys included questions to assess participants' attitudes toward the class. Table 2 reports the answers from the participants' first-class experience. Of the 38 participants, 29 (76%) felt the class instructions were "easy" or "very easy" to understand. Twenty-eight (74%) felt the exercises were "easy" or "very easy" to perform. Seven (18%) stood while performing the exercises. Twenty-six (68%) reported enjoying the class "quite a bit" or "extremely." Twenty-five (66%) reported feeling "more mobile" after class. Twenty-nine (76%) agreed with the statement, "I feel that this class made me more comfortable about going home." There were no statistically significant differences in pre- and post-class STAI responses regarding participants' subjective sense of self-wellness (see Supplementary Data Table 2).

Nurses and PTs who supervised the class completed semi-structured interviews to assess attitudes towards the class and how it affected their workflow. Both nurses and PTs felt the class was of value for the hospital and beneficial for patients, but both also reported a need for more assistance transporting patients, a quieter and more spacious class location, and a larger video display (see Table 3).

3.3. Process measures

The median length of time from admission to initial PT consult documentation was 1.52 days (IQR 1.06, 2.76). The average length of class, measured from the time the PT arrived at the class location to the time the video finished, was 29 minutes.

After beginning to record reasons for exclusion, the physical therapists recorded at least one reason for 430 of 839 (51%) patients evaluated. The most common reason was the inability to follow class instructions (18%), which included visual or hearing impairment. Others included orthopedic or neurosurgical precautions prohibiting specific movements (17%), admission to a non-participating unit (15%), general safety concerns of any kind (12%), pending discharge prior to class schedule (12%), and isolation precautions (11%). Some patients did not have a reason recorded but were nevertheless not referred to the class.

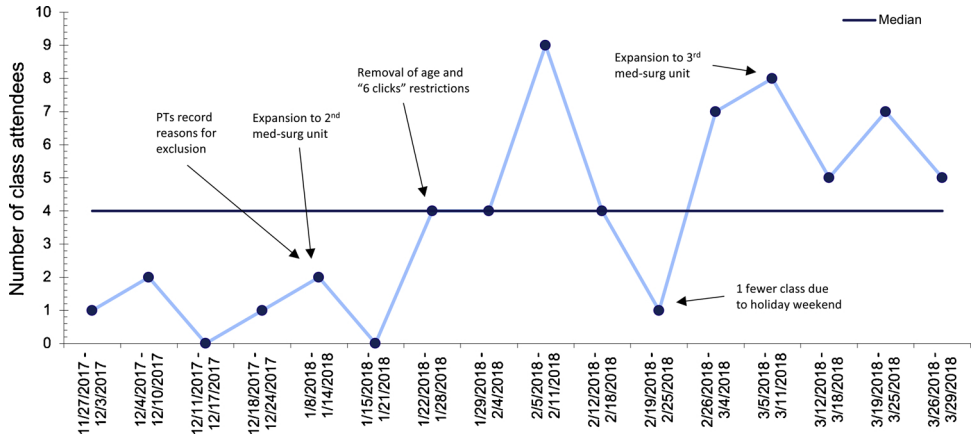

Fig. 3. Run chart showing an increase in weekly class attendance and the approach toward a stable non-random pattern during the study period.

Table 2
Post-Class Survey Questions.

Factor	Value
N	38
Were the instructions for the tai chi exercises easy for you to understand?	
Easy	29 (76%)
Neither	5 (13%)
Difficult	3 (8%)
Missing	1 (3%)
Were the tai chi exercises easy for you to do?	
Easy	28 (74%)
Neither	5 (13%)
Difficult	5 (13%)
Were you able to stand for any of the exercises today?	
Yes	7 (18%)
No	31 (82%)
Did you enjoy this tai chi class?	
"Extremely"	14 (37%)
"Quite a bit"	12 (32%)
"Somewhat"	7 (18%)
"A little bit"	5 (13%)
"Not at all"	0 (0%)
Do you feel more mobile after this tai chi session?	
Yes	25 (66%)
No	12 (32%)
Missing	1 (3%)
"I feel that this class made me more comfortable about going home."	
Agree	29 (76%)
Neither	4 (11%)
Disagree	3 (8%)
Missing	2 (5%)
Do you believe that your tai chi session interfered with something more important to you?	
Yes	2 (5%)
No	36 (95%)
Would you like to continue tai chi or qigong when you go home?	
Yes	35 (92%)
No	1 (3%)
Missing	2 (5%)

3.4. Balancing measures

No major adverse events, including falls, occurred among participants during or immediately following their participation in the protocol. Two patients stopped the class halfway, one reporting fatigue and one reporting palpitations. There were no statistically significant differences found in pre- and post-class responses to questions about changes in participants' level of pain, fatigue, dizziness, and shortness of breath (see Supplementary Data Table 3).

Table 3
Selected Quotations from Nurses and PTs.

"I think the few patients that I sent enjoyed the experience. They were glad to be taken away from the mundane day-to-day. Some of them don't even get visitors." (RN)
"I think that the tai chi classes give the patients a sense that they are in a community of patients. And I think tai chi can take their mind off of the illnesses they have." (RN)
"After classes they are in a better mood... More Zen. It's not something being offered in every hospital; it's something they will remember when they leave." (RN)
"We don't have a streamlined way to get patients to the classes. A lot of weight is on the nurse, and we have a lot of responsibilities. While the tai chi class is a good thing and a recreational thing, for me it is not a priority." (RN)
"The class itself can interfere with med delivery." (RN)
"The class is relaxing, and it provides a good routine for patients to promote upper extremity movements and postural extension. I like that the class can be tailored for the patient's functional level." (PT)
"The location continues to be loud and busy. Patients complain of distractions especially during the meditation segment of the class." (PT)

4. Discussion

4.1. Feasibility

Immobility is detrimental to inpatients in numerous ways, and there is a need for more innovative solutions to engage patients in activity during hospitalization. This study reports on exploring the feasibility of group video-guided tai chi and qigong classes, a unique modality that, to our knowledge, has not been tested before in enhancing physical therapy among hospitalized patients. No specific, consensus definition of feasibility exists, making it inherently difficult to judge a project's feasibility. However, based on prior feasibility and pilot studies, we chose to assess feasibility by evaluating the demand and practicality of the classes, as well as their acceptability toward patients and staff.[33–36] Taken together, we believe our outcome, process, and balancing measures showed that such classes are feasible at our hospital.

During the 15½-week study period, the PTs referred 157 patients, yielding 45 patients who were recruited for the study and 38 patients who attended at least one class. Class attendance each week increased over time and remains sustainable as an adjunct to physical therapy. Our surveys suggest patients enjoyed the class, felt more mobile afterward, and believed the class helped them transition to hospital discharge. The vast majority of participants believed the exercises were easy to perform. However, based on the recorded reasons for excluding patients, the class may not be suitable for those unable to follow instructions or recovering from certain types of orthopedic or neurological surgery. Nursing staff and PTs believed the class was beneficial for patients, allowing them an opportunity to socialize and relax, in

addition to being physically active. Furthermore, our study revealed that interest in tai chi and qigong for mobilization extended well beyond just Chinese patients, lending to its appeal across all patient populations.

Accounting for 3–8 minutes of guided meditation, 17 minutes of video-guided exercises, and setup time, class duration averaged 29 minutes, a manageable interval of time for our PT instructors who needed to commit a specific interval of their day to supervise the class, in addition to their usual workflow. No major adverse events occurred during or immediately after the classes.

4.2. Limitations

The study had several limitations. The limited number of PT instructors available to supervise class limited the number of classes offered per week to only three. Classes were also limited to a maximum of four patients due to the small screen on the video display and its occurrence in the unit's noisy and frequently trafficked lounge. Patient transport was not available to assist with escorting patients to class, which was largely done by unit nurses and volunteers. These were also the main critiques from the class participants, nurses, and PTs. On average, each patient participated in 1.6 classes, and we believe each patient could have participated in more classes if they were offered daily and if the time from admission to PT consultation had been shorter than the median of 1.52 days, given that median length of stay for the patients was 6.33 days.

This study was designed as a feasibility study using a convenience sample and was not powered to measure the effect of tai chi and qigong on patients' symptomatology, subjective wellness, or improvement in ambulation. Nor did it allow us to study the effect of tai chi and qigong on LOS or referrals to subacute rehabilitation centers at discharge. We do believe that the data presented in this manuscript will lead to a larger research study in which patients are randomized to a tai chi and qigong class as a supplement to usual care PT versus usual care PT alone. More research is needed to investigate how inpatient mobilization protocols affect functional status, mobility scores, community mobility after discharge, LOS, rate of discharges to inpatient rehabilitation, and post-hospitalization outcomes such as readmissions and resumption of ADLs.

4.3. Conclusion

Innovative solutions are needed to address the challenge of immobility among hospitalized patients. In this feasibility study, we were able to implement beginner, video-guided tai chi and qigong classes for patients from three medical-surgical units at our hospital using existing resources. One year after the study's end date, classes are still taking place at our hospital attesting to the continued demand among all of our patients regardless of ethnicity or race. Our goal is to continue the spread across our hospital network with the addition of resources to provide a more rewarding and inviting experience for our patients. We hope this study will inspire more research in inpatient tai chi and qigong and the role these arts can play in mobility, patient wellness, and healthcare improvement.

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The authors have no financial disclosures.

Declaration of competing interest

The authors do not have any conflicts of interest to report.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ctim.2019.07.020.

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