An assessment of the effects of Iyengar yoga practice on the health-related quality of life of patients with chronic respiratory diseases: A pilot study

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OBJECTIVE: To assess the effects of an Iyengar yoga program (IYP) on patients with chronic respiratory diseases.
METHODS: Patients attending lung transplant clinics in a tertiary institution were invited to participate in a two-phase, 12-week IYP that included 2 h biweekly classes. Doctors completed a formal physical and clinical assessment on candidates before enrollment. Patients with New York Association Class III or IV, or dyspnea grade IV were excluded. At baseline and at the end of 12-weeks, patients completed the Hospital Anxiety and Depression Scale (HADS), Chronic Respiratory Questionnaire (CRQ) and Health Utilities Index (HUI). Medication(s), 6 min walk test results and other clinical parameters were also recorded. Patients recorded the effects of the IYP on their daily living in journals. Nonparametric and qualitative methods were used to analyze the data.
RESULTS: Twenty-five patients diagnosed with pulmonary arterial hypertension and chronic obstructive pulmonary disease (mean age 60 years) were invited to participate. At the end of the 12-week period, changes in HADS anxiety and CRQ fatigue scores were statistically significant ($P<0.05$) and changes in HUI ambulation, pain, emotion and overall score were clinically important. The content of the journals revealed patients' improvement in breathing capacity, mobility, energy, sleep and included positive feedback such as: "increased tidal volume with slowing expiration", "I have an overall feeling of wellbeing" and "excellent amount of energy".
CONCLUSIONS: The findings suggest that yoga has significant potential to produce benefits. Potential benefits will be further explored in a national multisite study.

Key Words: *Chronic respiratory diseases; Chronic Respiratory Questionnaire; Health-related quality of life; Hospital Anxiety and Depression Scale; Health Utilities Index; Iyengar yoga program*

Une évaluation des effets du yoga iyengar sur la qualité de vie liée à la santé de patients atteints d'une maladie pulmonaire chronique : un projet-pilote

OBJECTIF : Évaluer les effets d'un programme de yoga iyengar (PYI) chez des patients ayant une maladie pulmonaire chronique.
MÉTHODOLOGIE : Des patients qui fréquentent une clinique de transplantation cardiaque dans un établissement de soins tertiaires ont été invités à participer à un PYI de 12 semaines en deux phases, composé de deux cours de deux heures par semaine. Les médecins ont procédé à une évaluation physique et clinique officielle des candidats avant leur inscription. Ils ont exclu les patients ayant une insuffisance cardiaque de classe III ou IV selon les critères de la *New York Heart Association* ou une dyspnée de grade IV. Au début de l'étude et au bout de 12 semaines, les patients ont rempli l'échelle HADS de dépression et d'anxiété en milieu hospitalier, le questionnaire CRQ de maladie respiratoire chronique et l'indice HUI de l'état de santé. Les médicaments, les résultats de l'épreuve à l'effort de 6 min et d'autres paramètres cliniques ont également été enregistrés. Les patients ont inscrit les effets du PYI dans le journal de leur vie quotidienne. Les chercheurs ont recouru à une méthodologie non paramétrique et qualitative pour analyser les données.
RÉSULTATS : Vingt-cinq patients ayant reçu un diagnostic d'hypertension artérielle pulmonaire et de maladie pulmonaire obstructive chronique (âge moyen de 60 ans) ont été invités à participer au projet. À la fin de la période de 12 semaines, les modifications à l'indice HADS d'anxiété et à l'indice CRQ de fatigue étaient statistiquement significatives ($P<0,05$) et les changements aux indices HUI globaux d'ambulation, de douleur et d'émotion étaient importants sur le plan clinique. Le contenu des journaux a révélé une amélioration de la capacité respiratoire, de la mobilité, de l'énergie et du sommeil des patients, lesquels ont suscité des commentaires positifs comme « augmentation du volume respiratoire avec l'expiration plus lente », « j'éprouve un sentiment global de bien-être », et « excellent niveau d'énergie ».
CONCLUSIONS : Les résultats laissent entendre que le yoga a un important potentiel de bienfaits. Ceux-ci seront examinés de manière plus approfondie dans une étude multicentre nationale.

Yoga has become an increasingly popular and efficacious method to treat and manage the symptoms of chronic diseases. The beneficial effects of yoga for conditions such as arthritis (1,2), heart failure (3,4), chronic pain (5,6), cancer (7-9), fatigue (10) and the improvement of patients' health-related quality of life (HRQL) (7,11-14) are well documented in the literature.

Iyengar yoga (IY) is a traditional form of yoga taught in the lineage of BKS Iyengar. IY is characterized by practitioner self-study and development of awareness through a series of specific asanas (postures) and pranayama (breathing). The practice of IY is well established and effectively applies traditional yoga techniques for therapeutic purposes, providing psychological and physiological benefits to individuals. The method of teaching is typified in the use of props and strengthened by a systematic training and qualification system for instructors.

The practice of IY may improve the HRQL of individuals with chronic lung disease (CLD) undergoing lung transplantation. These individuals have poor HRQL (14) and their condition tends to deteriorate while waiting for a lung transplant. CLD is a progressive condition with common symptoms such as breathlessness, fatigue, chest pain, anxiety and depression. Available treatments have a limited effect on symptoms, in addition to limited benefits to patients' HRQL. However, newly available treatments improve patients' exercise capacity, thus enabling patients to be more physically active (13). Physical activity is an important contributor to health status and HRQL of CLD patients (13).

The present pilot study assessed the effects of IY on patients' HRQL with the hypothesis that IY would result in improvement in patients' fatigue, anxiety and depression levels, and overall well-being. Patients' experiences with the program were qualitatively analyzed.

METHODS

Study setting and patient population

The present study was conducted at the outpatient lung transplant clinic of a tertiary institution. This service provides clinical care and

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TABLE 1
Description of the yoga poses* used in phase I. Additional poses were introduced in phase II

Action	Pose name	Description
Chest expands, abdomen releases	Salamba Savasana (Supported corpse pose)	Supported reclining extension
Spine/trunk extends, diaphragm spreads, legs straighten	Purvottanasana (East side extension pose)	Supported standing backward extension
Trunk expands, shoulders release, throat releases	Setu Bandha Sarvangasana (all limb bridge pose)	Reclining trunk extension and shoulder release
Spine lengthens, back ribs broaden, head rests	Pavanamuktasana (Free wind pose)	Supported sitting forward extension, from chair
As above; legs extend, hips stabilize	Pascimottanasana (West side extension pose)	Supported sitting forward extension, from floor
As above; inner legs extend more deeply	Upavishta Konasana (Extended wide angle pose)	Supported sitting forward extension , from floor – legs spread
As above; back and side rib rotation	Janu Sirsasana (head to knee pose)	Supported sitting forward extension and spinal rotation, from floor
Leg activation, trunk and head release/rest	Ardha Uttanasana (half extreme extension pose)	Standing forward extension, horizontal chest/arm/head support
Abdomen spreads, trunk broadens, knees flex, arms release	Adho Mukha Virasana (downward facing hero pose)	Kneeling forward extension (supine), supported knee flexion
As in Pascimott, without forward movement	Upashrayi Dandasana (Supported stick pose)	Sitting on floor upright back extension with back support – substitute for Pascimottanasana
Spine/trunk lifts, groins spread, knees bend	Baddha Konasana (Bound angle pose)	Upright bent knees/open groins, spinal lift
Easy forward extension – head rests; abdomen passive	Adho Mukha Swastikasana (Head down-facing comfortable pose)	Cross-legged forward extension – to chair seat from floor
Lying, final; deep relaxation	Final Savasana (Corpse)	Integration of relaxation in final supine position, support as needed/participant

**Poses not listed in sequence*

follow-up care to patients from four Canadian provinces. The outpatient lung transplant team consists of four physicians, two nurses and one pharmacist. The patient sample included prelung transplant subjects. Participants were recruited through the Pulmonary Medicine outpatient clinic at the University of Alberta Hospital, Edmonton, Alberta. Patients were excluded if they were <18 years of age and/or unable to complete questionnaires in English. Physicians completed a Physical Activity Readiness-Medical Examination (PAR-Med-X) (15) of the participants before their enrollment. The physician excluded participants whose symptoms were too severe as measured by New York Heart Association classes III or IV (16), or a Medical Research Council dyspnea scale dyspnea grade of IV (17).

Written information regarding the study was provided to patients before obtaining informed consent. Ethics approval was obtained from the Health Research Ethics Panel B, University of Alberta.

To capture patients' experience with the yoga program, qualitative analyses of the patients' journals was performed. The findings of the present pilot will be used to inform a future national, multisite randomized clinical trial for patients with CLD awaiting transplantation for which the intervention is an IY program.

Process and data collection

The program included two phases: phase I assessed feasibility and was used to tailor the yoga poses to the patient population; and phase II included the assessment of patient's HRQL. Patients were asked to complete the Chronic Respiratory Questionnaire (CRQ) (18), Hospital Anxiety and Depression Scale (HADS) (19) and Health Utilities Index (HUIs) (20,21) on arrival to the outpatient clinic. The questionnaires were completed on a touch-screen computer.

The collection of data using electronic devices (eg, touch-screen, hand-held devices or desk computers) alleviates the burden of using paper and pencil questionnaires. One of the advantages of using a touch-screen computer over paper and pencil questionnaire is that it enables the collection of electronic data that can be stored and scored automatically.

At baseline, participants also completed a 6 min walk test (6 MWT) (22,23) to quantify their functional mobility. At the end of the IY program, the health questionnaires and the 6MWT were repeated and a yoga program evaluation was administered. The participants were also provided with a yoga journal at the beginning of the program in which they were encouraged to write at the end of each class. The journal entries were used in the qualitative assessment of the program.

IY program

The Iyengar method of yoga was provided in a 12-week, 2 h, biweekly class. The program ran in two phases: one in the fall of 2010 (September 14 to December 9, 2010) and one in spring 2011 (April to July 2011). The yoga practice protocol for the participants was defined at the outset by the lead instructor (co-author JM) and senior associate, Marlene Mawhinney, director of the Yoga Centre Toronto (Ontario), in consultation with BKS Iyengar, founder of the Ramamani Iyengar Memorial Yoga Institute, Pune, India. Clinical symptomatology and comorbidities of the participants also guided the yoga practice. Each class consisted of a progressive sequencing of three to six postures (asanas) that were modified according to individual needs over the duration of the program (Table 1). The modifications involved extensive use of props and physical adjustments made by the lead instructor and trained assistants. Primary props included yoga mats, bolsters, blankets, benches, chairs and sandbags. The yoga instructor recorded observations regarding patients' limitations and improvements over the 12-week period.

Study measures

Screening measures: Patients were not recruited if they did not show a positive self-assessment in physical activity in the PAR-Questionnaire 24 (Appendix 1) and also if physicians did not provide approval for patients' participation in the yoga program by completing the PAR-Med-X 15 (Appendix 2). Patients deemed eligible were provided with written information about the study and were asked to complete consent forms.

PAR-Q: PAR-Q (24) assesses the barriers that patients may encounter in participating in physical activities including chest pain, joint problems and doctors' recommendations to avoid exercising. The PAR-Q was completed before recruitment.

PAR-Med-X: PAR-Med-X (15) forms were completed by the physician indicating the condition(s) that would exclude the patient from being enrolled or participating in physical activities. PAR-Med-X was completed before recruiting patients into the study.

Patient sociodemographic characteristics: At the first study visit (baseline assessment), the patients completed a brief sociodemographic questionnaire, the purpose of which was to provide a description of sociodemographic characteristics pertaining to this patient population. Items included age, sex, level of education, employment status and receptivity to a yoga intervention.

6MWT: The 6MWT (22,23) was conducted at baseline and at the end of the 12-week study period. The 6MWT is a clinical indicator of patients' functional capacity that assesses how far a patient can walk at their own pace in 6 min.

HRQL measures

Participants completed the following measures at baseline and at the end of the 12-week IY program:

CRQ: The CRQ (18) is a disease-specific HRQL measure widely used in CLD. The CRQ contains 20 questions answered on 7-point Likert-type scales. The questions cover four domains: dyspnea, fatigue, emotional function and mastery. Scores for each of the four domains and for the summary score have a range from 1 (maximum impairment) to 7 (no impairment). Higher scores indicate less severity. A score of 0.5 represents a small but clinically important difference in dyspnea, fatigue, emotion and mastery on the 7-point scale (18,25,26). The standardized version of CRQ was used.

HADS (19,27-29): Mental health issues may be important to measure as patients wait for a suitable organ donor (30,31). Both anxiety and depression are potentially relevant. The HADS (19) is a self-report mental health measure that takes 2 min to 5 min to complete and has been shown to be a valid and reliable measure (19,28,29). The HADS uses a one-week recall period. The scale consists of 14 items, seven of which assess anxiety and seven that assess depression. Each item is on a 4-point scale and the scores are summed to give a total ranging from 0 to 21 for anxiety and 0 to 21 for depression. Higher scores indicate higher severity of anxiety or depression. Scores of between 8 and 10 identify mild cases, 11 to 15 moderate cases and ≥16 severe cases (28). A difference of 1.5 units between new and previous assessments represents a clinically important difference (29).

HUI: The HUI Mark 3 (HUI3) (20,21) is a generic multiattribute, preference-based measure of HRQL. Generic HRQL measures are intended to provide information on general function and well-being. HUI3 assesses a full range of health among diverse groups of patients and reflects comorbidities. HUI3 has been widely used, including in most major population health surveys in Canada since 1990 (21). HUI3 includes eight attributes (vision, hearing, speech, ambulation, dexterity, cognition, emotion, pain) with five or six levels for each attribute (20,21). HUI3 describes a total of 972,000 unique health states. HUI3 provides overall scores on the conventional 0.00 = dead to 1.00 = perfect health scale so that morbidity and mortality can be integrated and quality-adjusted survival can be estimated. HUI3 single-attribute utility scores are on a scale in which the score for the most highly impaired level is 0.00 and the score for normal is 1.00. Differences of 0.03 or more in overall HUI3 scores are clearly clinically important, and differences as little as 0.01 may be meaningful and important in some contexts (20,21,32-34). Differences ≥0.05 in single-attribute utility scores are clearly clinically important (20).

Given the burden associated with chronic respiratory diseases, several HUI3 attributes are likely to be relevant, including HUI3 ambulation, which assesses physical functioning and HUI3 emotion, which assesses mental health.

Qualitative measures

The evaluation of the yoga program was conducted by having patients complete a survey (phase I) (Appendix 3) and make journal entries after each yoga class (phases I and II). The journals were organized according to poses and asking patients to report their experiences with each pose. Also, the journals included free text space where patients could provide a description of their experiences and perceptions, assessing the effects of the yoga practice.

Statistical analyses

Descriptive statistics were used to describe demographic characteristics (age, level of education). Mean and SD were reported to describe continuous variables that are normally distributed. Frequencies were reported to describe categorical data. Nonparametric approaches, such as the Wilcoxon test, was used to compare differences in HRQL mean scores. For the analyses, a two-tailed $P<0.05$ was considered to be statistically significant. The data were analysed using SPSS version 15 (IBM Corporation, USA) (35) for Windows (Microsoft Corporation, USA). An inductive, thematic qualitative content analysis was performed on the patients' journals. Thematic coding was used to identify the main themes that arose from the raw data (journals).

RESULTS

Quantitative results

In phases I and II, a total of 25 patients were invited to participate. During phase I, 12 patients were invited but only eight were eligible for inclusion because four did not pass the PAR-Med-X medical assessment. Two of the eight participants had problems attending the classes due to travel difficulties (patients had to travel more than 25 miles in harsh weather conditions). Six of the eight patients fully participated in phase I.

In phase II, 13 eligible patients were invited to participate. One died before the program started and two received a lung transplants during the course of the program. Thus, 10 patients participated in phase II.

In the final cohort (phases I and II, n=18), 50% of patients were diagnosed with pulmonary arterial hypertension, 20% with pulmonary fibrosis, 20% with chronic obstructive pulmonary disease and 10% with limb girdle muscular dystrophy. Patients had a mean age of 60 years (range 29 to 67 years). Most of the patients were female (83%) and married (67%), with college degrees (75%) and on disability (60%). At enrollment, patients described their overall health status (on a scale from excellent to poor) as fair (33%), good (25%) and very good (17%). The number of medications at enrollment (baseline) and at the end of the program was recorded. No changes in use of medications were found.

Results from phase I revealed that the program was feasible. There were some trends in heart rate improvement (mean at baseline was 73.4 beats/min and, at the end of the 12 week study period, the mean was 67.74 beats/min); more importantly, the program was well received by patients.

The mean (± SD) scores at baseline and at the end of the study from pilot II, are summarized in Table 2. There were no significant changes in clinical parameters. However, at end of the 12-week study period in phase II, statistically significant and clinically important changes were detected in mean CRQ (18) fatigue and HADS anxiety (19) scores. Clinically important changes were observed in the mean, CRQ dyspnea and emotion, HADS depression score, and HUI3 ambulation, as well as mean overall HUI3 score.

Qualitative results

An inductive, thematic qualitative content analysis was performed on the patients' journals. Three inseparable central themes lending themselves to the improvement of the participants' overall well-being were identified: awareness, condition, and physical effect.

First, awareness refers to the cognizance of physical limitations and challenges, familiarity with poses and overall corporeal experience. In the program, awareness is equally important to improvement. Awareness is dependent on the instructors becoming familiar with the participants' abilities and participants getting to know the poses and communicating what suited them best:

TABLE 2
Pre- and post-Iyengar yoga (IY) program scores

Measure	Pre-IY	Post-IY
6MWT, m	420.40±151.40	422.40±157
CRQ (dyspnea)	4.53±1.15	5.13±1.15*
CRQ (fatigue)	3.91±1.03	4.50±0.76†
CRQ (emotion)	4.82±1.05	5.52±0.66*
CRQ (mastery)	5.50±1.05	5.90±1.09
HADS (anxiety)	6.63±4.63	3.25±1.98†
HADS (depression)	6.88 ±1.96	4.25±1.98*
HUI3 (vision)	0.97±0.02	0.97±0.02
HUI3 (hearing)	0.93±0.18	0.93±0.18
HUI3 (speech)	0.95±0.08	0.95 ±0.08
HUI3 (cognition)	0.96±0.05	0.97±0.05
HUI3 (ambulation)	0.91±0.90	0.96±0.12*
HUI3 (pain)	0.74±0.31	0.78±0.15*
HUI3 (dexterity)	0.97 ±0.06	0.98±0.04
HUI3 (emotion)	0.92±0.12	0.94±0.09
Overall utilty score	0.66±0.19	0.72±0.06*

*Data presented as mean ± SD. *Clinically important difference; †Clinically important and statistically significant differences. 6MWT 6 min walk test; CRQ Chronic Respiratory Questionnaire; HADS Hospital Anxiety and Depression Scale; HUI Health Utilities Index*

> ... I am learning to have a little more control. Overall, I think I am learning more about how my body works.

Second, condition refers to the state of response to each class, varying from emotional relief to discomfort and anxiety. Feelings were experienced in conjunction with, or as a result of physical capability and awareness. Physiological challenges inspired bodily awareness, which in turn yielded a particular emotional condition:

> First time could turn shoulders...lots of opening...so much pain relief, emotional relief, lots of energy.

Third, physical effects refer to the physiological observations and corporeal experiences expressed by the participants. The journals were semistructured to elicit reports supporting or rejecting the hypothesized outcomes. The following physical effects were most commonly reported: breathing, energy, relaxation, openness and pain.

Considering that physical effects are identified through bodily awareness, participants' became increasingly able to localize sources of discomfort more readily as the sessions progressed,:

> Real cramping intercostals in PVM [posture]

Through the weekly practice, participants gained mastery of their bodies, which in turn aided their breathing. Poses that opened their chests and held their shoulders in an upright position provided them with positive effects:

> [My lung] expansion [was] deeper and wider and fuller and have increased tidal volume with slowing expiration.

Increased ease in breath lent itself to strength, increased corporeal awareness, flexibility, and ability to relax. Relaxation and breath have a supportive relationship and participants that achieved both were the most likely to leave the session energized:

> I find I can relax and focus on yoga and not let my mind wander. After class I am relaxed and energized. I feel positive.
>
> Feel much better breathing during and after. Lots of energy.

The participants' overall well-being showed improvement. As they became stronger and more comfortable with the positions, they expressed excitement to begin practicing at home and looking forward to the sessions:

> Overall, I feel much better after class and looking forward to the others.

In addition, less sleep disturbance, increased alertness and enhanced life enthusiasm were reported. These anecdotes were corroborated by the patients' HRQL scores, thus confirming the results presented in Table 2.

Yoga instructor observations

The lead instructor's observations included improved muscle and skin tone, more resilience and stability, better focus and concentration, improved facility coming in and out of poses from the floor, improved flow and scope in breathing, ease of relaxation (calm face and limbs), better general posture and body awareness.

Improvements in muscle tone and overall energy levels, longer lasting pain relief, less sleep disturbance, increased alertness and life-enthusiasm were similarly reported by participants and corroborated by their journal entries. Furthermore, these qualitative results are confirmed by the results presented in Table 2.

DISCUSSION

The present study was the first to explore the effects of an IY program on the HRQL of patients with chronic respiratory diseases awaiting lung transplantation. We were able to describe the benefits of the program using mixed methods, including quantitative and qualitative measures. The results observed in the quantitative analysis supported the findings in the qualitative analysis.

The findings of the present pilot study indicate that an IY program is a feasible complementary approach that improves prelung transplant patients' HRQL. At the end of the IY program, patients were able to breathe better and were less anxious. Patient fatigue levels improved, as did their overall health status. Furthermore, a comparison of the quantitative and qualitative results revealed the cross-validity of patients' responses with respect to improved breathing, increased energy levels, improved relaxation and improved patients' HRQL.

Our results corroborate previous findings in studies assessing the beneficial effects of IY practice in reducing pain and disability, and improving patients' HRQL. Haaz and Bartlett (1) recently published a landmark study reviewing the benefits of IY in rheumatoid arthritis patients. Their scoping review revealed the effectiveness of the program in randomized clinical trials. Patients with arthritis perceived the practice of IY aided their fatigue. Recently, Evans et al (2) conducted a pilot study with findings similar to ours, including improvements in mental health, vitality and self-efficacy. Our results show effects on pain. Patients anecdotally attributed the reduction in pain to relaxation, and increased flexibility and strength. The benefits of pain relief are also well documented by Williams et al (5). A review of the literature on yoga for cancer (7-9,42) described the psychological benefits characterized by mood improvement and reduced stress levels. Speed-Andrews et al (9) reported similar results, claiming that the practice of IY improved cancer survivors' HRQL and psychosocial functioning.

Cohen et al (4) identified clinically meaningful improvements in systolic and diastolic blood pressure after 12 weeks of IY practice. The effect on relaxation was well documented by Khattab et al (3), who showed that relaxation using yoga training was associated with a significant increase of cardiac vagal modulation among healthy yoga practitioners. One study (43) assessed the effect of yoga practice on bronchial asthma describing the reduction in patients' drug treatment score, reduction in the intake of drugs and the number of asthma attacks per week. The authors suggested that the practice of yoga may relax the muscles, and the deep physical and mental relaxation may be associated with physiological changes that have a stabilizing effect on bronchial reactivity. Yoga reduced efferent vagal reactivity, which has been recognized as a mediator of the psychosomatic factor in asthma (43). Depending on chronicity, the effects described by Nagarathna et al (43) may be extrapolated to other patients with lung disease.

Compared with traditional rehabilitation, yoga participants reap more benefits. This is due to the mindfulness and social environments that are fostered in addition to the physical exercise. Being a

member of a group aspiring to common goals is a powerful emotional stimulus capable of promoting confidence, trust, enthusiasm and a sense of belonging (44). Traditional physiotherapy and rehabilitation services play an important role in the maintenance of health status for CLD patients (45). The aims of pulmonary rehabilitation programs are to increase exercise tolerance, and improve breathlessness and functional ability (45). A cohort study by Garcia-Aymerich et al (11) revealed that physical activity has a protective effect on mortality and hospital admissions in chronic obstructive pulmonary disease patients. Furthermore, rehabilitation for patients with pulmonary diseases has proven to be beneficial in reducing dyspnea, improving work tolerance, self-esteem and pulmonary function (45). However, it is the mind-body emphasis of yoga that differentiates it from other rehabilitation therapies. In a study comparing yoga, traditional therapeutic exercise and a self-care book, Sherman et al (46) noted that the mental focus promoted in yoga helps individuals increase their awareness in movement and in maladapted positions, to relax tense muscles and to relieve mental stress. The authors also report that yoga attendees were not only more likely to continue their yoga practice and recommend it to others, but also made fewer health care provider visits and showed the sharpest decrease in medication use.

Although our study was limited by a small sample size and an inability to control for nonspecific effects, it provides evidence supporting the benefits of IY programs for prelung transplant patients. The mere fact that patients revealed improvement in their overall well-being supports having IY programs as additional treatment for this chronically ill population. The present study emphasizes patient-reported outcomes (measured by HRQL measures) and the content in patients' journals rather than biomedical markers. In chronically ill patients waiting for transplantation, most of the available biomedical interventions have already been undertaken and improvement in biomedical markers is unlikely. Therefore, in this patient population, alternative therapy, such as IY programs, may alleviate symptoms and improve patients' overall well-being. Generalization of the results from the present pilot study is limited by patient characteristics given that the study population was predominantly well-educated married women who may not represent the prelung transplant population. Nonetheless, an overwhelming majority of eligible patients agreed to participate. Further studies are needed to assess the efficacy and effectiveness of an IY program in prelung transplantation.

To maintain the benefits obtained through yoga practice, long-term practice is recommended. Rehabilitation programs should contemplate the introduction of such programs in conjunction with yoga studios. For safety reasons, yoga practice should be taught by specialists in specialized centres and should be closely monitored by the hospital outpatient clinics. Therefore, cooperation between yoga instructors and clinicians is necessary. At the beginning of the present study, physicians and nurses were invited to attend the IY practice as observers. The attending physician (co-author DCL) was closely involved in the follow-up progress of the patients. Collectively, this cooperation provided a 'safety net' for patients, yoga instructors and health care providers.

In groups of patients who have been practicing for longer periods, reinforcement using technology may facilitate home practice. It may be possible that the practice of IY offers a cost-effective way to improve patients' well-being. Therefore, we suggest that once the efficacy and safety of IY practice in this patient population is confirmed, studies assessing cost-effectiveness should be conducted.

CONCLUSIONS

The findings suggest that an IY program has significant potential to improve the HRQL of pre-lung-transplant patients. This program should be further explored as a physical activity for patients with CLD. The program was also well received by health care providers. The next step involves a multisite randomized clinical trial for patients with CLD awaiting transplantation for which the intervention is a 2 h weekly IY program for 12 weeks. This project is currently underway and part of two major Canadian lung transplant programs.

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DISCLOSURE: Dr David Feeny has a proprietary interest in Health Utilities Incorporated (HUInc), Dundas, Ontario. HUInc distributes copyrighted Health Utilities Index (HUI) materials and provides methodological advice on the use of HUI. None of the other authors have financial disclosures or conflicts of interest to declare.

Appendix 1

PAR-Q & YOU

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions.

Please read the questions carefully and answer each one honestly: check YES or NO.

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?

2. Do you feel pain in your chest when you do physical activity?

3. In the past month, have you had chest pain when you were not doing physical activity?

4. Do you lose your balance because of dizziness or do you ever lose consciousness?

5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?

6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?

7. Do you know of any other reason why you should not do physical activity?

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

• You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.

• Find out which community programs are safe and helpful for you.

DELAY BECOMING MUCH MORE ACTIVE:

• if you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or

• if you are or may be pregnant – talk to your doctor before you start becoming more active.

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

• start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.

• take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME_____ SIGNATURE_____

DATE_____

SIGNATURE OF PARENT _____

WITNESS_____or GUARDIAN (for participants under the age of majority)

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

Appendix 2

PAR Med-X. PHYSICAL ACTIVITY READINESS MEDICAL EXAMINATION

PERSONAL INFORMATION:
NAME _____
ADDRESS _____
_____
TELEPHONE_____
BIRTHDATE _____ GENDER _____
MEDICAL No. _____

Physical Exam:
Ht Wt BP i) / BP ii) /
Conditions limiting physical activity:
□ Cardiovascular □ Respiratory □ Other
□ Musculoskeletal □ Abdominal
Tests required:
□ ECG □ Exercise Test □ X-Ray □ Blood □ Urinalysis □ Other
What physical activity do you intend to do?
_____
_____
_____

PAR-Q: Please indicate the PAR-Q questions to which you answered YES
□ Q 1 Heart condition
□ Q 2 Chest pain during activity
□ Q 3 Chest pain at rest
□ Q 4 Loss of balance, dizziness
□ Q 5 Bone or joint problem
□ Q 6 Blood pressure or heart drugs
□ Q 7 Other reason:
_____
PHYSICAL ACTIVITY INTENTIONS:
□ Excessive accumulation of fat around waist.
□ Family history of heart disease.
RISK FACTORS FOR CARDIOVASCULAR DISEASE: Check all that apply
□ Less than 30 minutes of moderate physical activity most days of the week.
□ Currently smoker (tobacco smoking 1 or more times per week).
□ High blood pressure reported by physician after repeated measurements.
□ High cholesterol level reported by physician.

The PARmed-X is a physical activity-specific checklist to be used by a physician with patients who have had positive responses to the Physical Activity Readiness Questionnaire (PAR-Q). In addition, the Conveyance/Referral Form in the PARmed-X can be used to convey clearance for physical activity participation, or to make a referral to a medically-supervised exercise program
Supported by: © Canadian Society for Exercise Physiology
Proceedings of the International Conference on Physical Activity, Fitness and Health. Champaign, IL: Human Kinetics.
PAR-Q Validation Report, British Columbia Ministry of Health, 1978.
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Appendix 3

Pilot I. Patients assessment of the yoga program

Program Evaluation©

We would like to know what benefits, if any, you experienced from practicing Yoga. Please indicate the degree to which you agree/disagree with the following statements.

1. Yoga helped improve my sense of general well-being.
strongly agree | agree | neutral | disagree | strongly disagree

2. Yoga has improved my strength.
strongly agree | agree | neutral | disagree | strongly disagree

3. Yoga has improved my posture.
strongly agree | agree | neutral | disagree | strongly disagree

4. Yoga has improved my flexibility.
strongly agree | agree | neutral | disagree | strongly disagree

5. My mood has improved.
strongly agree | agree | neutral | disagree | strongly disagree

6. My ability to achieve relaxation has improved.
strongly agree | agree | neutral | disagree | strongly disagree

7. My ability to coordinate my breathing with movement has improved.
strongly agree | agree | neutral | disagree | strongly disagree

8. My ability to focus and concentrate has improved.
strongly agree | agree | neutral | disagree | strongly disagree

9. Yoga has improved the quality of my sleep.
strongly agree | agree | neutral | disagree | strongly disagree

10. My overall energy level has improved.
strongly agree | agree | neutral | disagree | strongly disagree

11. My interest in Yoga as a method to improve my well-being is strong.
strongly agree | agree | neutral | disagree | strongly disagree

Please describe any additional positive or negative effects that you attribute to your participation in this 6-Week Yoga Program.

Thank you for your comments and participation.

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