submit

Member Login:

submit

Forgot Password? | Register for an Account

Advances in PH Journal

Ann Gihl

//

Reviews

Sign in to add a review

0 comments
Leave a Comment

Vol 8, No 4 (Winter 2010)

Living with a life-limiting serious disease such as pulmonary arterial hypertension (PAH) can present many challenges. The uncertainty of illness and disability can have a profound impact on relationships, cognitive ability, emotions, and spirituality. Promoting health and support in health-related domains may improve the patient's perception of disability and ability to cope.

Quality of life reflects how one views one's own satisfaction with life. Health-related quality of life (HRQoL) is defined as a person's perceived quality of life representing satisfaction in those areas of life likely to be affected by health status. Health-related quality of life is *subjective, multidimensional,* and *temporal*.[1] It has developed from the concept of quality of life but is more specific to health-related domains that are affected by health or lack of health and wellness. The most commonly identified domains include physiological, psychosocial, sociological, and spiritual.

Measuring HRQoL can illuminate how illness may affect different dimensions within the patient's life and aid understanding of patient perceptions of illness. A key indicator of quality

care should be the patient's perceived improvement of HRQoL, and therefore, it is an important tool in measuring health care outcomes. The purpose of this literature review is to assess the state of HRQoL research in PAH.

Burden of Disease

Pulmonary arterial hypertension is characterized by increasing pulmonary vascular resistance with progressive right ventricular dysfunction. Most people suffering from PAH present with shortness of breath or exertional dyspnea. Other symptoms include fatigue, dizziness, peripheral edema, chest pain, syncope, and palpitations. As the disease progresses, signs of cor pulmonale present with leg swelling, increased abdominal girth, anorexia, and profound fatigue.

The cost of treatment and the physically and psychologically disabling nature of PAH can severely impact the patient's relationships with family, friends, and employers, as well as the patient's financial security.[2] Society is impacted by extended disability and early mortality. Persons with PAH may reach maximum insurance caps, may be unable to maintain employment, but have difficulty qualifying for medical disability benefits.[3] Several investigators have found that the psychological impact of PAH can be severe and cause isolation.[4 5] This is illustrated by depression and anxiety noted in PAH patients. Other affected aspects of life may include altered personal appearance and body image disturbances. **Figure 1** illustrates the complexity of living with PAH.

Measurements of Health-related Quality of Life in Pulmonary Arterial Hypertension

Measuring HRQoL to determine the effectiveness of interventions for PAH is important. A variety of tools have been used as researchers have attempted to measure HRQoL in the PAH patient. Generic measurements can apply to a wide variety of populations and are not specific to a disease. Disease-specific tools have been used recently to provide more sensitivity to the unique qualities of individual diseases. Physical function is a common dimension that is identified as an important measure in disease states; other measures address psychosocial dimensions. Some measurements may focus only on a single factor such as a symptom. Symptom measurement typically focuses on the physical characteristics of HRQoL. The 3 types of measures typically used to assess HRQoL in PAH are described in **Table 1**.

Table 1. Tools Used to Assess Health-related Quality of Life in Pulmonary Hypertension

Tools	Measures
Generic	
NHP[6]	Physical mobility, pain, social isolation, emotional reactions, energy, sleep (Part 1)
SF-36[7]	Physical Health: Physical Functioning, Role-

	Physical, Bodily Pain, General Health Mental Health: Vitality, Social Functioning, Role-Emotional, Mental Health
EuroQoL[8]	Part I: Mobility, self-care, usual activity, pain, anxiety/depression Part II: Visual analogue scale
AQoL[9]	Illness, independent living, social relationships, physical senses, psychological well-being
Disease Specific	
MLHFQ[10]	Physical and emotional dimensions to describe quality of life perspectives
SGRQ[11]	Symptoms, activity, impacts (social functioning, psychological disturbances)
CHFQ[12]	Dyspnea, fatigue, emotional function, mastery
KCCQ[13]	Physical function, symptoms, social function, self-efficacy, quality of life
CAMPHOR[14]	Overall symptoms: Energy, breathlessness, mood; activity, quality of life
Specific Symptoms	
Borg[15]	Rating scale to describe the degree of dyspnea
DFS[16]	Scale of 0 to 4 to assess the magnitude of task that produces dyspnea and/or fatigue
HADS[17]	Mood, specifically anxiety and depression
BDI[18]	Measures of hopelessness; feelings about the future, loss of motivation, and expectations

NHP=Nottingham Health Profile; SF-36=Medical Outcome Study 36-Item Short Form Health Survey; EuroQoL=European Quality of Life; AQoL=Australian Assessment of Quality of Life; MLHFQ=Minnesota Living With Heart Failure Questionnaire; SGRQ=St. George's Respiratory Questionnaire; CHFQ=Chronic Heart Disease Questionnaire; KCCQ=Kansas City Cardiomyopathy Questionnaire; CAMPHOR=Cambridge Pulmonary Hypertension Outcome Survey; Borg=Borg Scale; DFS=Dyspnea Fatigue Rating Scale; HADS=Hospital Anxiety and Depression Scale; BDI=Beck Depression Inventory.

Until 2006, there was no disease-specific tool for measuring quality of life in PAH.

Investigators used tools designed for similar diseases such as heart failure or pulmonary conditions. Some of the features of PAH may appear similar to other disease states; however, the condition cannot be adequately described by a tool designed for another disease. The Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR) is a disease-specific tool for PAH that was developed in 2006.[19]

The CAMPHOR was developed to provide a valid and reliable outcome measure of the impact of PAH and its treatment on quality of life and HRQoL. It was derived from qualitative interviews conducted with 35 adult patients in England. These interviews provided insight into affected domains for PAH patients in relationship to HRQoL and quality of life. The CAMPHOR was intended to consist of both a HRQoL measure to assess symptoms and functional status and a separate quality of life measure. It contains 3 separate scales that measure symptoms, functioning, and quality of life.

Methods

The review of the literature covered a period from 1996 to October 2009. The search included use of electronic bibliographic databases. Key words included: pulmonary hypertension, pulmonary arterial hypertension, quality of life, and health-related quality of life. Only empirical studies and reviews of literature with reference to quality of life and PAH were accepted. Thirty-one papers were examined, 23 of which met the criteria for review of HRQoL in PAH. All articles reviewed were written in English, with the exception of one qualitative nursing study in French which included an abstract translated into English by the authors.[fn]Peloquin J, Robichaud-Ekstran S, Pepin J. Perception of quality of life by women with stage III or IV primary pulmonary hypertension and receiving treatment with prostacyclin [French]. Can J Nurs Res. 1998;113-136.[/fn]

Each study was abstracted using critical appraisal and organized into topics of author, purpose, and study design including sample and instruments, and results. Studies were categorized by nursing research, pharmaceutical research, nonpharmaceutical research, and HRQoL studies. **Table 2** identifies key studies focused on HRQoL in PAH.

Table 2. Summary of Research Literature of Health-related Quality of Life in Pulmonary Arterial Hypertension

Author	Purpose	Design Length	Sample Instrument	Results
Nursing Research on Health-related Quality of Life in Pulmonary				

Arterial Hypertension				
Peloquin et al. 1998[fn]Peloquin J, Robichaud-Ekstran S, Pepin J. Perception of quality of life by women with stage III or IV primary pulmonary hypertension and receiving treatment with prostacyclin [French]. Can J Nurs Res. 1998;113-136.[/fn]	Explore perception of QoL in women treated with epoprostenol.	Qualitative Interview	3 Interview	Women receiving epoprostenol were not satisfied with their QoL in domains of physical, social, psychological, and economic well-being.
Flattery et al. 2005[20]	Investigate the impact of living with PAH.	Qualitative Interview	11 Interview	Exploration of patient perspective of disease impact and specific factors that improved QoL. Two main themes emerged: coping with uncertainty and living with treatment.
Pharmaceutical Studies With Health-related Quality of Life as Secondary End Point				
Barst et al 1996[21]	Evaluate the effects of epoprostenol on exercise capacity, QoL, hemodynamics, and survival.	RCT 12 weeks	81 CHFQ NHP DFS	Epoprostenol patients had significant improvements in all 4 parts of the CHFQ (dyspnea, fatigue, emotional function, and mastery), and in 2 of 6 parts of NHP (emotional reaction and

				sleep).
Olschewski et al. 2002[22]	Evaluate the effects of inhaled iloprost.	RCT 12 weeks	203 EuroQoL SF-36	EuroQoL improved significantly in the iloprost group. No significant change in SF-36.
Simonneau et al. 2002[23]	Assess the effects of treprostinil on exercise symptoms, hemodynamics, and QoL in PAH.	RCT 12 weeks	470 Borg DFS MLHFQ	Compared to placebo, treprostinil improved Borg, DFS, and MLHFQ physical dimension scores.
Sastry et al. 2004[24]	Evaluate the efficacy of sildenafil in PAH, QoL, secondary end point.	RCT 12 weeks	22 CHFQ	Significant dyspnea and fatigue improvement. Nonsignificant trend toward improvement in the emotional function dimension.
Barst et al. 2004fn]Barst RJ, Langleben D, Frost A, et al. Sitaxsentan therapy for pulmonary arterial hypertension. Am J Respir Crit Care Med. 2004;169:441-447. [/fn]	Evaluate the safety and efficacy of sitaxsentan.	RCT 12 weeks	178 SF-36	Improvement noted in functional class, activity, and hemodynamics. There was no significant improvement in SF-36.
Oudiz et al. 2004[25]	Assess efficacy and safety of treprostinil in APAH connective tissue disease. Subset of study by Simonneau et al. (2002)	RCT (post hoc) 12 weeks	90 Borg DFS MLHFQ	No improvement in Borg or DFS, trend toward improvement in physical dimension of the MLHFQ.
Galié et al. 2005[26]	Examine the efficacy and safety of ambrisentan.	RCT 12 weeks	64 Borg VAS	Significant improvement in Borg. QoL (assessed by a single subjective question and

				measured by VAS) improved by 23.2% with treatment.
Wilkins et al. 2005[27]	Comparison between sildenafil and bosentan.	RCT 16 weeks	26 KCCQ	HRQoL improved significantly on sildenafil treatment but not on bosentan.
Girgis et al. 2007[28]	Investigate safety and effectiveness of sitaxsentan in patients with PAH and connective tissue disease. Subset of study by Barst et al. (2004)	RCT (post hoc) 12 weeks	42 SF-36	Study found significant improvement in physical functioning and physical role dimensions of SF-36.
Keogh et al. 2007[29]	Effect of bosentan on QoL for PAH patients.	RCT 6 months	177 SF-36 AQoL	Significant improvement seen across all physical and emotional dimensions of SF-36 and total score of AQoL; these were maintained over time.
Pepke-Zaba et al. 2008[30]	Effect of sildenafil on HRQoL.	RCT 12 weeks	278 SF-36, EuroQoL	Improvement in all measures of SF-36 with most improvements in physical, general health, and vitality. Current health status and utility index increased per EuroQoL. Strongest improvements noted in dimensions inclusive of the physical impact of health on daily activities and patients' overall perception of health.

cal Research Studies With Health-related Quality of Life Relationship				
Mereles et al. 2006[31]	Evaluate the effectiveness and safety of exercise training in PAH.	RCT 15 weeks	30 SF-36 Borg	Exercise training significantly improved the physical and mental component dimensions, physical functioning, role limitations due to physical limitation, social functioning, mental health, and vitality dimensions of the SF-36. The Borg scale was unchanged in the training group despite higher workload. This indicated improved exercise tolerance.
White et al. 2006[32]	Determine relationships between cognitive impairment and depression, anxiety, and QoL in patients with PAH.	Quantitative Correlational Cross-sectional	46 Cognitive scales* BDI BAI SF-36	Worse working memory was correlated with lower SF-36 Role-Physical scale. Anxiety was correlated with lower SF-36 Role-Physical, Role-Emotional, and Social Functioning. Depression was correlated with lower SF-36 Vitality and Social Functioning. There were no differences in overall QoL, anxiety, or depression in PAH patients with or

				without cognitive impairment.
Studies Specific to Health-related Quality of Life in Pulmonary Arterial Hypertension				
Shafazand et al. 2004[33]	HRQoL measurement in cohort of PAH patients.	Quantitative Correlational Cross-sectional 10 months	53 NHP CHFQ HADS	Those with PAH were significantly impaired in all NHP dimensions and had moderate impairment in the CHFQ. The HADS scores were at the upper limit of the normal range with moderateor severe levels of anxiety (19%) and depression (26%). Epoprostenol group had better energy and emotional dimension (NHP), less fatigue, less emotional stress, and greater feelings of control (CHFQ). The group not using epoprostenol had significantly more anxiety and depression (HADS).
Taichman et al. 2005[34]	Explore HRQoL and its determinants in patients with PAH.	Quantitative Correlational Cross-sectional	155 SF-36 SGRQ	PAH patients were severely impaired in every physical and mental dimension of the SF-36 and SGRQ. Systemic sclerosis patients were impaired more than IPAH per SF-36. HRQoL

				was unrelated to the type of therapy used, and not correlated with hemodynamic assessments.
Cenedese et al. 2006[35]	Identify performance and clinical relevance of MLHFQ tool with PAH patients.	Quantitative Correlational Cross-sectional	48 MLHFQ modified for PAH	Reliability was demonstrated by high test-re-test reliability (Cronbach's alpha ?0.90) in all dimensions of the MLHFQ. Internal consistency of the MLHFQ scores was good (Cronbach's alpha ?0.88). Moderate correlation for validity between all scores and the Borg (r=0.57) and NYHA/WHO functional class (r=-0.62). Hemodynamic parameters were not correlated with the MLHFQ.
Chua et al. 2006[36]	Compare the validity in use of the MLHFQ, the SF-36, and the AQoL tool for PAH patients.	Quantitative Correlational Cross-sectional	83 MLHFQ SF-36 AQoL	All MLHFQ dimensions were correlated with 6-minute walk and NYHA/WHO classification. The SF-36 also had good correlation in all dimensions except general health with the 6-minute walk and mental dimension with the NYHA/WHO class. Only some of the AQoL was correlated with the 6-minute walk.

				Except for illness, the AQoL was not correlated with the NYHA/WHO class. The HRQoL instruments were not correlated with hemodynamic measures.
McKenna et al. 2006[37]	Development and psychometric properties of a PAH disease-specific HRQoL-CAMPHOR.	Qualitative	35 Interview Survey	CAMPHOR demonstrated reliability with good internal consistency (Cronbach's alpha=0.90-0.92) and reproducibility (test-re-test correl ations=0.86-0.92). Good convergent validity was demonstrated in relationship to the NHP and EuroQoL, and good discriminate validity in relationship to the NYHA/WHO classification.
Chen et al. 2008[38]	Measurement of HRQoL and its utility as a complementary end point in clinical studies of PAH.	Literature Review Overview	—	The SF-36 is helpful to assess an intervention or to compare PAH to other diseases. MLHFQ and CAMPHOR demonstrate good reliability and validity.
Zlupko et al. 2008[39]	Apply the MLHFQ modified for PAH in a larger population of patients with PAH than previously studied by Cenedese et al. (2006)	Quantitative Cross-sectional	93 MLHFQ modified for PAH SF-36	The modified MLHFQ assessed physical and emotional measures as severely impaired. Significant factors ($P<0.05$) contributing to impaired scores

				included disease associated with scleroderma, treatment with epoprostenol, and symptoms of fatigue/abdominal fullness. The total score was also severely impaired (P<0.001). The SF-36 identified severe impairment in all dimensions.
Rubinfire et al. 2009[40]	Evaluated HRQoL tools and work ability and disability.	Literature Review	—	Tools for HRQoL in PAH may not adequately reflect the patient's perceptions. Work ability and disability criteria are not established.

QoL=quality of life. HRQoL=health-related quality of life. PAH=pulmonary arterial hypertension. RCT=randomized controlled trial. CHFQ=Chronic Heart Disease Questionnaire. NHP=Nottingham Health Profile. DFS=Dyspnea Fatigue Rating Scale. EuroQoL=European Quality of Life. SF-36=Medical Outcome Study 36-Item Short Form Health Survey. Borg=Borg Scale.

MLHFQ=Minnesota Living With Heart Failure Questionnaire. VAS=Visual Analog Scale. KCCQ=Kansas City Cardiomyopathy Questionnaire. AQoL=Australian Assessment of Quality of Life. BDI=Beck Depression Inventory. BAI=Beck Anxiety Inventory. HADS=Hospital Anxiety and Depression Scale. SGRQ=St. George's Respiratory Questionnaire. NYHA/WHO=New York Heart Association/World Health Organization Classification. CAMPHOR=Cambridge Pulmonary Hypertension Outcome Survey.

**Neuropsychological tests assessed general intelligence, attention, memory, mental processing speed, executive function, and fine motor abilities. Acceptable reliability and*

validity were documented for each of the various measures used in the studies.

Results

Study of HRQoL in PAH began as a secondary end point to pharmaceutical clinical drug trials. Researchers are now beginning to focus on the HRQoL measurements, effects of a specific intervention, and the use of patient-reported outcomes. All researchers concluded that quality of life is negatively impacted in the PAH patient population. All acknowledged challenges, complexities, and issues in assessing HRQoL. Despite increased interest, significant gaps to understanding HRQoL in PAH remain.

The small sample sizes in PAH research make drawing conclusions for the overall group difficult. Differences in the etiology of PAH affect HRQoL. The variables in PAH, especially when associated with other comorbid diseases, may produce confounding variables and further reduce the sample size. There may also be different responses to oral, inhaled, subcutaneous, or intravenous routes of therapies.

Nearly all knowledge about HRQoL in PAH has been gathered through the use of instruments designed for other cardiac or pulmonary diseases. Tools that are not designed to measure PAH may not accurately capture or reflect the PAH experience. These factors make it difficult to compare HRQoL findings across studies. The recently developed CAMPHOR tool specifically designed to study HRQoL and quality of life in PAH has not yet been widely used in published research.

Most studies were conducted over a short period, usually 12 to 16 weeks. This time interval may not be long enough to assess the impact of an intervention on HRQoL for an individual or a group.

Pharmaceutical Studies

Pharmaceutical randomized controlled trials (RCTs) of PAH medications have used HRQoL as secondary end points. Nearly half of all the literature available concerning HRQoL in PAH is from pharmaceutical studies that included assessment of the impact of drug therapy on quality of life. Improvements in at least some measures of HRQoL have been reported with epoprostenol,[41] iloprost,[42] and treprostinil.[43] However, iloprost did not change SF-36[44] and in another study, treprostinil did not change Borg or Dyspnea Fatigue Scale (DFS) and showed only a trend toward improvement in the physical dimension of the Minnesota Living With Heart Failure Questionnaire (MLHFQ).[45] Sildenafil has shown improvement compared to bosentan measured by the Kansas City Cardiomyopathy Questionnaire (KCCQ).[46] Sildenafil improved all dimensions of the SF-36 and some dimensions of European quality of life (EuroQoL) with the greatest impact on physical dimensions.[47] The endothelin receptor antagonists have also shown improvement in HRQoL by some measures. Bosentan improved all SF-36 and some Australian Assessment of Quality of Life (AQoL) dimensions, which were maintained over time.[48] Ambrisentan showed improvement in quality of life as measured by a visual analog scale.[49] Although one study showed no improvement with sitaxsentan in SF-36,[50] another trial using the drug in connective tissue disease showed improvement in the

Physical Functioning and Role-Physical scales of SF-36.[51]

Data relating to HRQoL in pharmaceutical clinical trials are often sparsely reported, with only broad statements about improved HRQoL, without specifics about dimensions used or details of the review. None of the tools used in pharmaceutical clinical trials were specific to PAH. The instruments used varied from trial to trial, though the majority used the SF-36 or the MLHFQ. Variations on data, study design, and reporting make it difficult to compare findings.

Nursing Studies

Nursing research in HRQoL in PAH is limited to 2 small qualitative studies exploring the patient's perceptions of HRQoL and its relationship to treatment.[fn]Peloquin J, Robichaud-Ekstran S, Pepin J. Perception of quality of life by women with stage III or IV primary pulmonary hypertension and receiving treatment with prostacyclin [French]. Can J Nurs Res. 1998;113-136.[/fn] [52] Qualitative research reflects the richness of patient experience. Peloquin et al identified that prostacyclin therapy may not improve perceived HRQoL.[fn]Peloquin J, Robichaud-Ekstran S, Pepin J. Perception of quality of life by women with stage III or IV primary pulmonary hypertension and receiving treatment with prostacyclin [French]. Can J Nurs Res. 1998;113-136.[/fn] In this study, women just beginning and adjusting to therapy were interviewed. Though extremely limited because of sample size, it was the first to study patient perceptions. Subsequent research refutes these results, demonstrating that treatment with intravenous epoprostenol improved HRQoL, possibly related to the patient's sense of mastery of the medication regimen.[53]

Flattery et al found that uncertainty is a common experience in this disease state. Coping with uncertainty was characterized by respondents as *information seeking, making memories, humor, spirituality,* and *seeking support.*[54] The perceptions of coping and living with established therapy were characterized as *doing what I have to do, adjusting to treatment,* and *resuming life's activities.*[55] These themes show how a patient eventually copes with treatment and adapts to a new reality. Limitations of these qualitative studies include extremely small sample size and scope, yet this important initial research helps us gain understanding of what it is like to live with PAH by eliciting the patient's perception.

Nonpharmaceutical Studies and Health-related Quality of Life

Other researchers have evaluated the benefits of exercise or examined the relationship between cognitive impairment and HRQoL. Mereles et al31 studied the safety and effectiveness of exercise training in PAH. Significant improvement in SF-36 was found in physical health (Physical Functioning and Role-Physical scales) and mental health (Social Functioning, Mental Health, and Vitality scales), indicating the value of exercise as safe adjunctive therapy in patients with PAH.[56] White et al[57] found that depression, anxiety, and quality of life were similar for PAH patients with and without cognitive dysfunction. However, impaired working memory was correlated with lower SF-36 Role-Physical scores.[58] These studies introduce other influences on HRQoL beyond pharmaceutical therapy.

Health-related Quality of Life Studies

The next group of studies describe HRQoL in PAH,[59] explore the determinates of HRQoL in PAH,[60] and evaluate the relevance and validity of instruments used in PAH HRQoL research.[61] [62] [63] [64] Shafazand et al[65] found significant impairment in HRQoL of PAH patients with moderate or severe anxiety (19%) and depression (26%). However, patients on epoprostenol reported better energy and emotional reactions on the Nottingham Health Profile (NHP) and less fatigue, emotional distress, and greater feelings of control on the

Chronic Heart Disease Questionnaire (CHFQ). Patients who were not on epoprostenol had significantly more anxiety and depression, measured by the Hospital Anxiety and Depression Scale (HADS).[66] The authors theorized that mastery of complex medical therapy and time might help a person cope with the illness. Also, because of the complex nature of medication delivery, these patients have stronger support from physicians and nurses, which may lead to improved control and mastery, and, therefore, positively influence HRQoL perception. Mastery, time, and support are all part of coping with uncertainty.

Taichman et al[67] found that PAH patients were severely impaired in both physical and mental dimensions of quality of life, with systemic sclerosis patients being more impaired than idiopathic PAH (IPAH) patients. Health-related quality of life was unrelated to the type of therapy prescribed and was not correlated with hemodynamics.

The MLHFQ has been tested in PAH patients. It has been shown to correlate with Borg scores,[68] 6 minute-walk test distance,[69] and NYHA/WHO functional class,[70] [71] but not hemodynamics.[72] [73] Most scales of the SF-36 correlated well with 6-minute walk (except General Health) and NYHA/WHO functional class (except Mental Health).[74]

The interviews used to develop the CAMPHOR also identified needs expressed by patients with PAH. These interviews, like the nursing research described previously, revealed a sense of insecurity or uncertainty of support or the future.[75] Responding to these needs may improve HRQoL perceptions. The recently developed CAMPHOR tool specifically designed to study HRQoL and quality of life in PAH has not yet been used widely in published research as an end point in interventional studies. It has been validated for use in the United States and Canada.[76] [77]

Discussion

Health-related quality of life understanding within the PAH community remains underdeveloped. Continued work is needed in HRQoL measurement and understanding the experience of living with PAH. Current PAH therapy allows people with PAH to live longer. Finding a cure has been evasive, and living with PAH presents uncertainty, but new treatments continue to offer hope. Alleviation of suffering may include more than just treating physical symptoms. Only a few researchers asked patients with PAH about their perspectives and gained new understanding of living with PAH.[78] [fn]Peloquin J, Robichaud-Ekstran S, Pepin J. Perception of quality of life by women with stage III or IV primary pulmonary hypertension and receiving treatment with prostacyclin [French]. Can J Nurs Res. 1998;113-136.[/fn] [79]

The MLHFQ has been the most widely used tool in the study of HRQoL in PAH. It was also modified and validated as a measurement tool for PAH.[80] [81] This tool may have value in some applications, but it has limitations as a disease-specific HRQoL measurement for PAH. It may not always capture the PAH patient's perspective, will only describe certain aspects similar to chronic heart failure, and may miss unique variables important to PAH patients.

Much of the HRQoL research in PAH focuses on physical and functional status. There are some patients who should have profoundly depressed HRQoL, yet when asked, seem to differentiate the physical aspects and report joy and satisfaction with their lives. Perhaps the focus of HRQoL in PAH should include those factors not just affected directly by health but also factors that contribute to one's overall sense of well-being and quality of life. The CAMPHOR considers these by including indicators for overall quality of life, yet it does have

limitations for other dimensions of HRQoL measurement. Additional areas of exploration are dimensions of hope, self-image, role changes, sexuality, self-efficacy, and spirituality. One of the first steps would be to identify key influencers of quality of life domains in PAH and determine factors and interventions to improve HRQoL.

Everyday interventions can sometimes have the biggest impact. Some areas for further investigation include examples such as the impact of an indwelling catheter for infusion, oxygen, or the red flushed face on body image. Clinical experience shows patients and partners report concern with sexuality as a major health focus, although there is no research in this area.

In the socioeconomic domain, patients are severely impacted by the financial burdens of therapy and the need for many to seek disability. Researchers comment about these implications, but further exploration of the socioeconomic impact of the disease would be beneficial.

There has been further inquiry in the psychological domain of PAH.[82] Because there is no cure for PAH, factors influencing psychological adjustment to chronic disease require attention along with functional health domains. Work is needed in this area, including further study of the influence of interventions to promote self-care on psychological adjustment.

Pulmonary arterial hypertension is a life-limiting progressive disease. It is important that patients and their families have a pragmatic understanding of the illness and understand that end-of-life preferences must be considered and communicated. Since the disease trajectory may be uncertain, these conversations can be infused with hope and allow the patient to focus on and maintain control over what is important in his or her life. Further research in the area of palliative care in PAH may provide additional support for end-of-life services for this patient population. This support would enhance care at a time when support is needed the most.

Health-related quality of life is a dynamic process, and adaptation may occur over a period of years. The effect of interventions and changes in HRQoL may take months to actualize or produce measurable results in a study. By continued exploration and collaboration with a multidisciplinary team using a longitudinal approach, the health care team can improve the quality of life for those with PAH.

Conclusions

This literature analysis highlights how little is known about the HRQoL in PAH. The literature reveals many confounding variables influencing our knowledge base. Future research is needed in areas of patient perceptions and influencers of HRQoL. Continued exploration to understand the illness experience of PAH will identify methods to improve outcomes and enhance the lives of those with PAH.

Key Words: health-related quality of life, quality of life, pulmonary arterial hypertension

Address for reprints and other correspondence: agihl@life-source.org

1. Bredow T, Peterson S, Sandau K. Health-related quality of life. In: Peterson S. ed. Middle-range Theory: Application to Nursing Research. 2nd ed. Philadelphia, PA:

Lippincott Williams & Wilkins; 2008:273-289.
2. Wryobeck J, Lippo G, McLaughlin V, Riba M, Rubenfire M. Psychosocial aspects of pulmonary hypertension: a review. Psychosomatics. 2007;48:467-475.
3. Rubenfire M, Lippo G, Bodinia B, Blasi F, Allegra L, Bossone E. Evaluating health-related quality of life, work ability, and disability in pulmonary arterial hypertension. Chest. 2009;136:597-603.
4. Wryobeck J, Lippo G, McLaughlin V, Riba M, Rubenfire M. Psychosocial aspects of pulmonary hypertension: a review. Psychosomatics. 2007;48:467-475.
5. Lowe B, Grafe K, Ufer C, et al. Anxiety and depression in patients with pulmonary hypertension. Psychosom Med. 2004;66:831-836.
6. Hunt SM, McKenna SP, McEwen J, et al. The Nottingham Health Profile: subjective health status and medical consultations. Soc Sci Med. 1981;221-229.
7. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36): conceptual framework and item selection. Med Care. 1992;30:473-483.
8. The Euroqol Group. Euroqol: a new facility for the measurement of health-related quality of life. Health Policy. 1990;16:199-208.
9. Hawthorne G, Richardson J, Osborne R. The assessment of quality of life (AQoL) instrument: a psychometric measure of health related quality of life. Qual Life Res. 1999:209-224.
10. Rector TS, Kubo SH, Cohn JN. Patients' self-assessment of their congestive heart failure: part 2. Content, reliability and validity of a new measure the Minnesota Living with Heart Failure Questionnaire. Heart Fail. 1987;Oct/Nov: 198-209.
11. Jones PW, Quirk FH, Baveystock CM. The St. George's Respiratory Questionnaire. Resp Med. 1991;85(suppl):15-31.
12. Guyatt GH, Norgradi S, Halcrow S, et al. Development and testing of a new measure: of health status for clinical trials in heart failure. J Gen Intern Med. 1989;4:101-107.
13. Green C, Porter C, Bresnahan D, Spertus J. Development and evaluation of the Kansas City Cardiomyopathy Questionnaire: a new health status measure for heart failure. J Am Coll Cardiol. 2000;35:1245-1255.
14. McKenna S, Doughty N, Meads DM, et al. The Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR): a measure of health-related quality of life and quality of life for patients with pulmonary hypertension. Qual of Life Res. 2006;15:103-115.
15. Borg G. Psychophysical bases of perceived exertion. Med Sci Sports Exercise. 1982;14:377-381.
16. Feinstein A, Fisher M, Pigeon J. Changes in dyspnea fatigue ratings as indicators of quality of life in the treatment of congestive heart failure. Am J Cardiol. 1987;64:50-55.
17. Bjelland I, Dahl A, Haug T. The validity of the hospital anxiety and depression scale: an updated literature review. J Psychosom Res. 2002;52:69-77.
18. Beck A, Steer R, Brown G. Manual for the Beck Depression Inventory. San Antonio, TX: Psychological Corporation; 1996.
19. McKenna S, Doughty N, Meads DM, et al. The Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR): a measure of health-related quality of life and quality of life for patients with pulmonary hypertension. Qual of Life Res. 2006;15:103-115.
20. Flattery M, Pinson J, Savage L, Salyer J. Living with pulmonary artery hypertension: patients' experiences. Heart & Lung. 2005;34:99-107.
21. Barst RJ, Rubin LJ, Long WA, et al. A comparison of continuous intravenous epoprostenol (prostacyclin) with conventional therapy for primary pulmonary hypertension. N Engl J Med. 1996,334:296-301.
22. Olschewski H, Simonneau G, Galiè N, et al. Inhaled iloprost for severe pulmonary hypertension. N Eng J Med. 2002,347:322-329.

23. Simonneau G, Barst RJ, Galié N, et al. Continuous subcutaneous infusion of treprostinil, a prostacyclin analogue, in patients with pulmonary arterial hypertension: a double blind, randomized, placebo-controlled trial. Am J Respir Crit Care Med. 2002;165;800-804.
24. Sastry BK, Narasimhan C, Reddy N, et al. Clinical efficacy of sildenafil in primary pulmonary hypertension: a randomized, placebo-controlled, double blind, crossover study. J Am Coll Cardiol. 2004;43:1149-1153.
25. Oudiz R, Schilz R, Barst R, et al. Treprostinil, a prostacyclin analogue in pulmonary arterial hypertension associated with connective tissue disease. Chest. 2004;126:420-427.
26. Galié N, Badesch D, Oudiz R, et al. Ambrisentan therapy for pulmonary arterial hypertension. J Am Coll Cardiol. 2005;N46:529-535.
27. Wilkins M, Paul G, Strange J, et al. Sildenafil versus Endothelin Receptor Antagonist for Pulmonary Hypertension (SERAPH) study. Am J Respir Crit Care Medicine. 2005;171:1292-1297.
28. Girgis R, Frost A, Hill N, et al. Selective endothelin a receptor antagonism with sitaxsentan for pulmonary arterial hypertension associate with connective tissue disease. Ann Rheum Dis. 2007;66:1467-1472.
29. Keogh A, McNeil K, Wlodarczyk J, et al. Quality of life in pulmonary arterial hypertension: improvement and maintenance with bosentan. J Heart Lung Transplantation. 2007;26:181-187.
30. Pepke-Zaba J, Gilbert C, Collings L, et al. Sildenafil improves health-related quality of life in patients with pulmonary arterial hypertension. Chest. 2008;133:183-189.
31. Mereles D, Ehlken N, Kreuscher S, Ghofrani S, Heoper M, Halank M. Exercise and respiratory training improve exercise capacity and quality of life in patients with severe chronic pulmonary hypertension. Circulation. 2006;114: 1489.
32. White J, Hopkins RO, Glissmeyer EW, et al. Cognitive, emotional, and quality of life outcomes in patients with pulmonary artery hypertension. Respir Res. 2006;7:55.
33. Shafazand S, Goldstein M, Doyle RL, et al. Health-related quality of life in patients with pulmonary arterial hypertension. Chest. 2004;126:1452-1459.
34. Taichman DB, Shin J, Hud L, et al. Health-related quality of life in patients with pulmonary arterial hypertension. Respir Res. 2005;6:92-99.
35. Cenedese E, Speich R, Dorschner L, et al. Measurement of quality of life in pulmonary hypertension and its significance. Eur Resp J. 2006;28:808-815.
36. Chua R, Keogh AM, Byth K, et al. Comparison and validation of three measures of quality of life in patients with pulmonary hypertension. Intern Med J. 2006;36:705-710.
37. McKenna S, Doughty N, Meads DM, et al. The Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR): a measure of health-related quality of life and quality of life for patients with pulmonary hypertension. Qual of Life Res. 2006;15:103-115.
38. Chen H, Taichman D, Doyle R. Health-related quality of life and patient reported outcomes in pulmonary arterial hypertension. Proc Am Thorac Soc. 2008;5:623-630.
39. Zlupko M, Harhay M, Gallop R, Shin J, Archer-Chicko C, Patel R. Evaluation of disease-specific health-related quality of life in patients with pulmonary arterial hypertension. Respir Med. 2008;102:1431-1438.
40. Rubenfire M, Lippo G, Bodinia B, Blasi F, Allegra L, Bossone E. Evaluating health-related quality of life, work ability, and disability in pulmonary arterial hypertension. Chest. 2009;136:597-603.
41. Barst RJ, Rubin LJ, Long WA, et al. A comparison of continuous intravenous epoprostenol (prostacyclin) with conventional therapy for primary pulmonary hypertension. N Engl J Med. 1996,334:296-301.

42. Olschewski H, Simonneau G, Galiè N, et al. Inhaled iloprost for severe pulmonary hypertension. N Eng J Med. 2002,347:322-329.
43. Simonneau G, Barst RJ, Galié N, et al. Continuous subcutaneous infusion of treprostinil, a prostacyclin analogue, in patients with pulmonary arterial hypertension: a double blind, randomized, placebo-controlled trial. Am J Respir Crit Care Med. 2002;165;800-804.
44. Olschewski H, Simonneau G, Galiè N, et al. Inhaled iloprost for severe pulmonary hypertension. N Eng J Med. 2002,347:322-329.
45. Oudiz R, Schilz R, Barst R, et al. Treprostinil, a prostacyclin analogue in pulmonary arterial hypertension associated with connective tissue disease. Chest. 2004;126:420-427.
46. Wilkins M, Paul G, Strange J, et al. Sildenafil versus Endothelin Receptor Antagonist for Pulmonary Hypertension (SERAPH) study. Am J Respir Crit Care Medicine. 2005;171:1292-1297.
47. Pepke-Zaba J, Gilbert C, Collings L, et al. Sildenafil improves health-related quality of life in patients with pulmonary arterial hypertension. Chest. 2008;133:183-189.
48. Keogh A, McNeil K, Wlodarczyk J, et al. Quality of life in pulmonary arterial hypertension: improvement and maintenance with bosentan. J Heart Lung Transplantation. 2007;26:181-187.
49. Galié N, Badesch D, Oudiz R, et al. Ambrisentan therapy for pulmonary arterial hypertension. J Am Coll Cardiol. 2005;N46:529-535.
50. Barst RJ, Langleben D, Frost A, et al. Sitaxsentan therapy for pulmonary arterial hypertension. Am J Respir Crit Care Med. 2004;169:441-447.
51. Girgis R, Frost A, Hill N, et al. Selective endothelin a receptor antagonism with sitaxsentan for pulmonary arterial hypertension associate with connective tissue disease. Ann Rheum Dis. 2007;66:1467-1472.
52. Flattery M, Pinson J, Savage L, Salyer J. Living with pulmonary artery hypertension: patients' experiences. Heart & Lung. 2005;34:99-107.
53. Shafazand S, Goldstein M, Doyle RL, et al. Health-related quality of life in patients with pulmonary arterial hypertension. Chest. 2004;126:1452-1459.
54. Flattery M, Pinson J, Savage L, Salyer J. Living with pulmonary artery hypertension: patients' experiences. Heart & Lung. 2005;34:99-107.
55. Flattery M, Pinson J, Savage L, Salyer J. Living with pulmonary artery hypertension: patients' experiences. Heart & Lung. 2005;34:99-107.
56. Mereles D, Ehlken N, Kreuscher S, Ghofrani S, Heoper M, Halank M. Exercise and respiratory training improve exercise capacity and quality of life in patients with severe chronic pulmonary hypertension. Circulation. 2006;114: 1489.
57. White J, Hopkins RO, Glissmeyer EW, et al. Cognitive, emotional, and quality of life outcomes in patients with pulmonary artery hypertension. Respir Res. 2006;7:55.
58. White J, Hopkins RO, Glissmeyer EW, et al. Cognitive, emotional, and quality of life outcomes in patients with pulmonary artery hypertension. Respir Res. 2006;7:55.
59. Shafazand S, Goldstein M, Doyle RL, et al. Health-related quality of life in patients with pulmonary arterial hypertension. Chest. 2004;126:1452-1459.
60. Taichman DB, Shin J, Hud L, et al. Health-related quality of life in patients with pulmonary arterial hypertension. Respir Res. 2005;6:92-99.
61. McKenna S, Doughty N, Meads DM, et al. The Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR): a measure of health-related quality of life and quality of life for patients with pulmonary hypertension. Qual of Life Res. 2006;15:103-115.
62. Cenedese E, Speich R, Dorschner L, et al. Measurement of quality of life in pulmonary hypertension and its significance. Eur Resp J. 2006;28:808-815.

63. Chua R, Keogh AM, Byth K, et al. Comparison and validation of three measures of quality of life in patients with pulmonary hypertension. Intern Med J. 2006;36:705-710.
64. Zlupko M, Harhay M, Gallop R, Shin J, Archer-Chicko C, Patel R. Evaluation of disease-specific health-related quality of life in patients with pulmonary arterial hypertension. Respir Med. 2008;102:1431-1438.
65. Shafazand S, Goldstein M, Doyle RL, et al. Health-related quality of life in patients with pulmonary arterial hypertension. Chest. 2004;126:1452-1459.
66. Shafazand S, Goldstein M, Doyle RL, et al. Health-related quality of life in patients with pulmonary arterial hypertension. Chest. 2004;126:1452-1459.
67. Taichman DB, Shin J, Hud L, et al. Health-related quality of life in patients with pulmonary arterial hypertension. Respir Res. 2005;6:92-99.
68. Cenedese E, Speich R, Dorschner L, et al. Measurement of quality of life in pulmonary hypertension and its significance. Eur Resp J. 2006;28:808-815.
69. Chua R, Keogh AM, Byth K, et al. Comparison and validation of three measures of quality of life in patients with pulmonary hypertension. Intern Med J. 2006;36:705-710.
70. Cenedese E, Speich R, Dorschner L, et al. Measurement of quality of life in pulmonary hypertension and its significance. Eur Resp J. 2006;28:808-815.
71. Chua R, Keogh AM, Byth K, et al. Comparison and validation of three measures of quality of life in patients with pulmonary hypertension. Intern Med J. 2006;36:705-710.
72. Cenedese E, Speich R, Dorschner L, et al. Measurement of quality of life in pulmonary hypertension and its significance. Eur Resp J. 2006;28:808-815.
73. Chua R, Keogh AM, Byth K, et al. Comparison and validation of three measures of quality of life in patients with pulmonary hypertension. Intern Med J. 2006;36:705-710.
74. Chua R, Keogh AM, Byth K, et al. Comparison and validation of three measures of quality of life in patients with pulmonary hypertension. Intern Med J. 2006;36:705-710.
75. McKenna S, Doughty N, Meads DM, et al. The Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR): a measure of health-related quality of life and quality of life for patients with pulmonary hypertension. Qual of Life Res. 2006;15:103-115.
76. Gomberg-Maitland M, Thenappan T, Rizvi K, et al. United States validation of the Cambridge Pulmonary Hypertension Review (CAMPHOR). J Heart Lung Transplantation. 2008;27(1):124-130.
77. Coffin D, Duval K, Martel S, et al. Adaptation of the Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR) into French-Canadian and English-Canadian. Can Respir J. 2008;15:77-83.
78. McKenna S, Doughty N, Meads DM, et al. The Cambridge Pulmonary Hypertension Outcome Review (CAMPHOR): a measure of health-related quality of life and quality of life for patients with pulmonary hypertension. Qual of Life Res. 2006;15:103-115.
79. Flattery M, Pinson J, Savage L, Salyer J. Living with pulmonary artery hypertension: patients' experiences. Heart & Lung. 2005;34:99-107.
80. Cenedese E, Speich R, Dorschner L, et al. Measurement of quality of life in pulmonary hypertension and its significance. Eur Resp J. 2006;28:808-815.
81. Zlupko M, Harhay M, Gallop R, Shin J, Archer-Chicko C, Patel R. Evaluation of disease-specific health-related quality of life in patients with pulmonary arterial hypertension. Respir Med. 2008;102:1431-1438.
82. Wryobeck J, Lippo G, McLaughlin V, Riba M, Rubenfire M. Psychosocial aspects of pulmonary hypertension: a review. Psychosomatics. 2007;48:467-475.

Comments

Related Resources

- Impact of Riociguat on Health-Related Quality of Life in Patients with PAH
- Health Related Quality Of Life in Pulmonary Arterial Hypertension
- Depressive Symptoms in Pulmonary Arterial Hypertension: Prevalence and Association with Functional Status
- Depressive Symptoms in Pulmonary Arterial Hypertension: Prevalence and Impact on Functional Status
- Impact of PAH on the Lives of Patients and Caregivers: 1.0 Key Results: Physical and Practical Impact on Patients

Frances Rogers, MSN, CRNP

Chair-Elect, PH Professional Network
Nurse Practitioner/Clinical Coordinator
Pulmonary Hypertension and Right Heart Failure Program
Temple University Hospital
Philadelphia, Pennsylvania

801 Roeder Road, Ste. 1000, Silver Spring, MD 20910
301-565-3004 | PHAOnlineUniv@PHAssociation.org