Original Article

Latent Class Analysis Reveals Distinct Subgroups of Patients Based on Symptom Occurrence and Demographic and Clinical Characteristics

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Abstract

Context. Cancer patients experience a broad range of physical and psychological symptoms as a result of their disease and its treatment. On average, these patients report 10 unrelieved and co-occurring symptoms.

Objectives. The aims were to determine if subgroups of oncology outpatients receiving active treatment ($n = 582$) could be identified based on their distinct experience with 13 commonly occurring symptoms; to determine whether these subgroups differed on select demographic and clinical characteristics; and to determine if these subgroups differed on quality of life (QOL) outcomes.

Methods. Demographic, clinical, and symptom data from one Australian and two U.S. studies were combined. Latent class analysis was used to identify patient subgroups with distinct symptom experiences based on self-report data on symptom occurrence using the Memorial Symptom Assessment Scale.

Results. Four distinct latent classes were identified (i.e., all low [28.0%], moderate physical and lower psych [26.3%], moderate physical and higher psych [25.4%], and all high [20.3%]). Age, gender, education, cancer diagnosis, and presence of metastatic disease differentiated among the latent classes. Patients in the all high class had the worst QOL scores.

Conclusion. Findings from this study confirm the large amount of interindividual variability in the symptom experience of oncology patients. The identification of demographic and clinical characteristics that place patients at risk for a higher symptom burden can be used to guide more aggressive and individualized symptom management interventions. J Pain Symptom Manage 2015;50:28–37.

Key Words

Symptom clusters, latent class analysis, gender differences, age differences, symptom profiles

Introduction

Cancer patients experience a broad range of physical and psychological symptoms as a result of their disease and its treatment. On average, patients report 10 unrelieved and co-occurring symptoms.[1] However, clinical experience and emerging evidence[2–7] suggest that a large amount of interindividual variability exists in patients' symptom experiences.

To develop a better understanding of this interindividual variability, we conducted a number of studies using cluster analysis[2,6] or latent class analysis (LCA)[4,5] to identify subgroups of oncology patients based on their severity ratings for four common symptoms (fatigue, pain, sleep disturbance, and depression). In the first two studies done in the U.S. [6] and Israel,[2] four distinct subgroups of oncology patients

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were identified using hierarchical cluster analysis. Of note, approximately 15% of these patients reported high levels (i.e., all-high subgroup) and 35% reported low levels (i.e., all-low subgroup) of all four symptoms. In both these studies, compared with the all-low subgroup, patients in the all-high subgroup were significantly younger and less likely to be married or partnered. In addition, the all-high subgroup reported poorer functional status and lower quality of life (QOL) scores.

In two of our recent studies, LCA was used to identify subgroups of oncology patients and their family caregivers[5] or subgroups of patients with breast cancer[4] based on their severity ratings for the same four symptoms. In these two studies, three distinct subgroups were identified, with between 7%[4] and 12%[5] of the participants being classified in the all-high subgroup. Consistent with our previous reports,[2,6] compared with the all-low subgroup, participants in the all-high subgroup were significantly younger and had a lower functional status.

In another group of studies that used symptom occurrence ratings from the Memorial Symptom Assessment Scale (MSAS)[8] or symptom severity ratings from the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30[9] to identify patients with a higher symptom burden, two[10–12] or three[7,13] subgroups were identified. In all five studies,[7,10–13] all-low and all-high symptom subgroups were identified. Although the demographic and clinical characteristics that were associated with a higher symptom burden were not consistent across these five studies, patients in the all-high subgroup reported statistically significant and clinically meaningful decrements in functional status and QOL. The reasons for these inconsistent findings on number of subgroups identified, as well as the predictors of symptom subgroup membership,[10–13] may relate to differences in sample sizes; the demographic and clinical characteristics of the participants; the number of symptoms evaluated; the dimension of the symptom experience used to create the subgroups; and the statistical procedures used.

Given the high prevalence of co-occurring symptoms and the large amount of interindividual variability in oncology patients' symptom experiences, findings from the studies cited previously suggest that the identification of subgroups of patients with a higher symptom burden may assist clinicians to provide more aggressive and individualized symptom management. Given this promising, albeit limited amount of research, the purposes of this study were to determine if subgroups of oncology outpatients receiving active treatment ($n = 582$) could be identified based on their distinct experience with 13 common symptoms; to determine whether these subgroups differed on select demographic and clinical characteristics; and to determine if these subgroups differed on QOL outcomes.

Methods

Study Samples

Demographic, clinical, and symptom data from one Australian study (i.e., Symptom Clusters Study) and two U.S. studies (i.e., Fatigue, Pain, and Sleep Study [FPS Study], Symptom Prevalence Study) were combined to conduct this analysis. All three studies enrolled patients who were receiving active treatment for their cancer. Detailed information on recruitment procedures, study methods, and sample characteristics for these studies is published elsewhere.[14,15] A brief summary of each of the studies is presented in the following sections. All three studies were approved by Human Subjects Committees. All the patients signed written informed consent before enrollment.

Symptom Clusters Study. This study was designed to identify symptom clusters and their effects on the physical and psychological functioning of patients with metastatic disease. Patients were recruited consecutively from two major tertiary referral hospitals in Australia. Eligible patients were adults (>18 years of age) who could read, write, and understand English; had no cognitive limitations; had a primary cancer of breast, lung, colon/rectum, prostate, upper gastrointestinal tract, or ovaries; were diagnosed with metastatic disease in the past month or had clinical evidence of progressive metastatic disease; and had a prognosis between four months and two years as determined by their clinician. Questionnaires were completed during a 20 minute face-to-face interview conducted by trained interviewers. Demographic and clinical data were obtained from medical record reviews.

FPS Study. This study evaluated multiple symptoms in patients who underwent primary or adjuvant radiation therapy (RT). Patients were recruited from two RT departments and were eligible to participate if they were ≥18 years of age; were scheduled to receive primary or adjuvant RT for breast, prostate, lung, or brain cancer; were able to read, write, and understand English; and had a Karnofsky Performance Status (KPS) score of ≥60. Patients were excluded if they had metastatic disease, more than one cancer diagnosis, or a diagnosed sleep disorder. Patients completed the study questionnaires at the time of their simulation visit. Medical