Published in final edited form as:

Am J Clin Dermatol. 2016 December ; 17(6): 681–690. doi:10.1007/s40257-016-0215-3.

Itch in the General Internal Medicine Setting: A Cross-Sectional Study of Prevalence and Quality-of-Life Effects

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Abstract

Background—Itch is a well-established symptom in cutaneous disease. However, little is known about the burden of itch outside the dermatology setting.

Purpose—To determine the prevalence and impact of itch on quality of life (QOL) in the general internal medicine setting.

Methods—We performed a cross-sectional study of 2076 adults from an outpatient general internal medicine clinic, using an audio computer-assisted self-administered interview. A history of itch (acute or chronic) and other physical symptoms in the past week, Patient-Reported Outcomes Measurement Information System (PROMIS) 10-item Global Health Questionnaire scores, and Patient Health Questionnaire-2 scores were assessed.

Results—The prevalence of itch was 39.9 % and increased with age from 33.1 % at age 19–39 years to 45.9 % at age 80 years. In multivariable models controlled for socio-demographics, even feeling “a little” or “some” distress from itch was significantly associated with lower PROMIS global physical and mental health T-scores and estimated health utility scores ($P = 0.01$). Further, feeling “quite a lot” of distress or “very much” distress from itch was associated with higher adjusted odds ratios for depressed mood (4.91 [95 % confidence interval (CI) 3.36–7.18]) and

Compliance with Ethical Standards

Conflict of interest Jonathan Silverberg, David Cella, William Trick, and Keiki Hinami have no conflicts of interest to declare.

Ethical approval/informed consent This study was approved by the CCHHS institutional review board (protocol #14-096). All participants provided written informed consent for study participation.

Electronic supplementary material The online version of this article (doi:10.1007/s40257-016-0215-3) contains supplementary material, which is available to authorized users.

Author contributions Study concept and design: Keiki Hinami, William Trick, and Jonathan Silverberg. Acquisition of data: Keiki Hinami, William Trick, and Jonathan Silverberg. Analysis and interpretation of data: Jonathan Silverberg, Keiki Hinami, and David Cella. Drafting of the manuscript: Jonathan Silverberg, David Cella, and Keiki Hinami. Critical revision of the manuscript for important intellectual content: Jonathan Silverberg, David Cella, William Trick, and Keiki Hinami. Statistical analysis: Jonathan Silverberg. Obtaining funding: Jonathan Silverberg, William Trick, and David Cella.

anhedonia (4.46 [95 % CI 3.07–6.47]). The patient burden of itch was similar to those of pain, constipation, sexual dysfunction, cough, and weight loss.

Conclusions—Itch occurs commonly in the primary care setting and is associated with poor QOL. Physicians should inquire about itch and its associations during review of systems. Future studies are needed to distinguish between the effects of acute and chronic itch.

1 Introduction

Itch is a common symptom encountered in the dermatology setting. Itch occurring in dermatologic disease has been associated with sleep disturbances [1], psychological and behavioral disorders [2], fractures and other injuries [2, 3], and impairment of health-related quality of life (HRQOL) [1].

However, little is known about the epidemiology and burden of itch outside the dermatologic setting. Previous studies have assessed the characteristics of pruritus in geriatric populations [4] and in specific diseases, such as primary sclerosing cholangitis and renal failure [5, 6]. Yet, no studies have examined rates of itch in the general internal medicine setting. It is important to understand the global burden of itch in order to assess the unmet needs for the assessment and treatment of itch. Further, most previous studies have assessed the prevalence of itch and occasionally related symptoms, but no studies have compared the prevalence and burden of itch with those of other symptoms, which is necessary in order to understand the burden of itch, identify unmet needs, and prioritize clinical resources. We hypothesized that itch is associated with worse HRQOL impairment than many other common symptoms. The present study examined the prevalence of itch and HRQOL impairment from itch, and compared them with other common symptoms in adults seen in an internal medicine setting.

2 Methods

2.1 Participant Recruitment

Adult patients (aged >18 years) were recruited from the general internal medicine clinic of the Cook County Health and Hospitals System (CCHHS) in Chicago, IL, USA, as previously described [7]. Subjects were invited to participate between April 8, 2011 and July 27, 2012. This study was approved by the CCHHS institutional review board (protocol #14-096).

Surveys were completed in English or Spanish, using audio computer-assisted self-administered interviews (ACASIs) on a computer kiosk with a touch screen and headphones in the clinic waiting area. Survey items were presented simultaneously by visual display on the monitor and audio files reading each question and response. The surveys were administered in either English or Spanish as per each patient's preference. Several practice questions were used to establish comfortability and proficiency with the software. The software was developed using the C# language on the .NET framework. ACASI responses were stored in an SQL server clinical data warehouse (Microsoft Inc., Redmond, WA, USA) maintained by the local institution's Department of Medicine. All patient encounters were included in the study, and patients with dermatoses were not excluded.

2.2 Data Collection

HRQOL was assessed using the Patient-Reported Outcomes Measurement Information System (PROMIS) Global Health Questionnaire, which includes 10 items related to overall health, quality of life (QOL), physical and mental health, satisfaction with the ability to carry out social activities and relationships, ability to carry out everyday physical activities, being bothered by emotional problems, fatigue, and pain. The Patient Health Questionnaire-2 (PHQ2) was used to assess feeling “down, depressed, or hopeless” and “little interest or pleasure in doing things.” Patients were asked about the occurrence of, and distress from, 17 physical symptoms: lack of energy, pain, drowsiness, dizziness, vomiting, shortness of breath, nausea, dry mouth, lack of appetite, bloating, change of taste, itch, sexual dysfunction, diarrhea, constipation, cough, and weight loss. The symptom response scales were 0: absent; 1: present, “a little” distress; 2: present, “some” distress; 3: present, “quite a lot” of distress; and 4: present, “very much” distress.

2.3 Data Analysis

All data processing and statistical analyses were performed in SAS version 9.4. Complete data analysis was performed for all variables, i.e., subjects with missing data were excluded. There were no significant differences in any socio-demographic characteristics between missing and non-missing values.

The PROMIS global physical and mental health T-scores were calculated using the recommended scoring method, which calibrated each score to a US national mean of 50 and a standard deviation (SD) of 10 [8]. The health utility (preference) score was calculated using a published algorithm that maps the PROMIS global health score to the EuroQol 5D (EQ-5D) score [9]. Means $\pm$ SDs are presented. *T* tests and analysis of variance were used to determine associations between PROMIS scores and age, gender, race/ethnicity, and language of interview. The prevalence and 95 % confidence interval (CI) of each symptom was determined overall and stratified by age. The means of the aforementioned scores were determined in patients who reported “quite a lot” or “very much” for each of the 17 symptoms, and were ranked in ascending order. Associations between itch (a categorical independent variable) and the individual PROMIS global health item responses (dependent variables) were tested using ordinal logistic regression. Associations of PROMIS global health total raw scores, physical and mental health T-scores, and estimated EQ-5D utility scores (dependent variables) with itch (a categorical independent variable) were tested using linear regression. The multivariable regression models included age, gender, race/ethnicity, and language of interview. Adjusted odds ratios (aORs) and adjusted beta-coefficients, with 95 % CIs, were estimated.

A two-sided *P* value <0.05 was taken to indicate statistical significance for all estimates. However, the multiple dependent tests performed in this study ($k = 32$) increased the risk of falsely rejecting the null hypothesis. Therefore, *P* values near 0.05 should be interpreted with caution.

3 Results

3.1 Study Characteristics

An invitation to complete surveys was conveyed 2848 times. Patients agreed to sit in front of the kiosk 2561 times (90 %), on which 2076 unique patients provided some data through the kiosk. Overall, 58.5 % of patients were female, 54.8 % and 23.8 % were Black and Hispanic, respectively, and 19.9 % participated using Spanish as the language of interview (see Supplemental Table 1 in the Electronic Supplementary Material). PROMIS physical health T-scores were higher at younger ages and in females. In contrast, PROMIS total raw scores and mental health T-scores were not associated with these socio-demographic variables.

3.2 Prevalence of Itch

Overall, 97.5 % of patients reported at least one symptom in the past week. More than 4 in 5 patients reported having lack of energy or pain. At least 1 in 4 patients reported having 1 of 14 other symptoms (see Table 1). Itch occurred in 39.9 % (37.7–42.0 %) of patients overall and was more common than lack of appetite, nausea, sexual dysfunction, weight loss, change of taste, and diarrhea and vomiting. The prevalence of itch increased with age from 33.1 % (25.4–40.8 %) at age 19–39 years to 45.9 % (35.3–56.5 %) at age ≥ 80 years (see Table 1). Itch was more commonly reported in men (43.7 % [40.2–47.1 %]) than in women (37.2 % [34.3–40.0 %]; $P = 0.004$). There were no significant differences in the prevalence of itch between different racial/ethnic groups ($P = 0.92$) or in the survey language ($P = 0.57$).

3.3 Association between Itch and HRQOL

In multivariable models controlled for age, gender, race/ethnicity, and language of interview, feeling a little distress or some distress from itch, and even more so quite a lot of distress or very much distress from itch, was significantly associated with each item of PROMIS global health, including poorer overall health, QOL, physical health, mental health, satisfaction with social activities and relationships, ability to carry out everyday physical activities and usual social activities and roles, more severe fatigue, and being bothered by emotional problems (ordinal logistic regression; $P < 0.01$ for all) (see Table 2). The frequencies of missing values are presented in Table 2.

Patients feeling a little distress or some distress from itch, and even more so quite a lot of distress or very much distress from itch, had significantly lower PROMIS total raw scores (linear regression; adjusted beta values [95 % CIs] for a little/some: -2.46 [-3.29 to -1.62], quite a lot/very much: -6.66 [-8.04 to -5.28]), physical health T-scores (a little/some: -1.61 [-2.34 to -0.89], quite a lot/very much: -4.95 [-6.15 to -3.75]), and mental health T-scores (a little/some: -3.14 [-4.06 to -2.22], quite a lot/very much: -6.73 [-8.25 to -5.21]); and estimated EQ-5D utility scores (a little/some: -0.04 [-0.05 to -0.02], quite a lot/very much: -0.09 [-0.11 to -0.07]) ($P < 0.0001$ for all; see Fig. 1). There were no significant interactions of itch with age, gender, race/ethnicity, or language of interview as predictors of any of the aforementioned outcomes ($P > 0.08$ for all).

3.4 Association Between Itch, Depressed Mood, and Anhedonia

In multivariable models controlled for age, gender, race/ethnicity, and language of interview, even feeling a little distress or some distress from itch was significantly associated with higher odds of either depressed mood or anhedonia (see Table 3). However, patients feeling quite a lot of distress or very much distress from itch had even higher odds than those who felt only a little distress or some distress ($P < 0.0001$ for all).

3.5 Comparison of Effects of Itch and Other Symptoms on HRQOL

All 17 symptoms were associated with impaired HRQOL; that is, patients who reported “quite a lot” of distress or “very much” distress from each symptom had lower PROMIS total raw scores, physical and mental health T-scores, and EQ-5D scores (analysis of variance; $P < 0.0001$ for all). The mean PROMIS and EQ-5D scores, $\pm$ SDs, are presented in Table 4. PROMIS total scores were lower in patients (ranked #12) who reported “quite a lot” of distress from itch or “very much” distress from itch than in those who similarly reported distress from pain, constipation, sexual dysfunction, cough, and weight loss. Similar results were found for EQ-5D scores. In particular, itch was associated with a relatively larger impact on mental health (ranked #13) than on physical health (ranked #15) in comparison with other symptoms (see Table 4).

4 Discussion

In the present study, we analyzed data from 2076 adults from an inner-city internal medicine clinic and found that almost 40 % of patients experienced itch in the previous week that caused some level of distress. While data were available for multiple other symptoms, we particularly focused on itch because it has been largely neglected and no studies have examined how itch compares with other symptoms. Itch was reported more frequently than lack of appetite, weight loss, change of taste, nausea, vomiting, diarrhea, and sexual dysfunction. Itch was associated with impairment of all aspects of HRQOL that were assessed, especially mental health, as well as higher odds of depressed mood and anhedonia. Patients with chronic itch are known to have higher rates of depression [10]. In addition, depression may also worsen itch, and patients with chronic itch often experience improvement of their itch with the use of antidepressant medications and other psychological interventions. Thus, the relationship between itch and impaired HRQOL may be bidirectional, where itch decreases HRQOL and decreased HRQOL from other etiologies prompts more itch. Finally, the present study found that itch was associated with overall HRQOL impairment similar to that associated with pain and more severe than that associated with constipation, sexual dysfunction, cough, or weight loss. Together, the results suggest the presence of a considerable patient burden and mental health distress secondary to itch in adults in an urban primary care setting.

The results underscore the importance of including itch in a review of systems. The symptoms of pain, constipation, etc., are routinely assessed by clinicians. Yet, itch is rarely assessed, despite being associated with as much or more HRQOL impairment. Surveillance for itch may help with early detection of underlying medical conditions, e.g., liver or renal disease. The considerable burden of itch and other symptoms on HRQOL suggests that a

comprehensive review of systems may yield previously unrecognized ways to improve patients' HRQOL. Currently, there are no medications approved by the US Food and Drug Association for the treatment of itch. The high prevalence and patient burden of itch demonstrated in this study highlight a large practice gap and beg for future research into medical and psychological treatment approaches for itch.

The present study demonstrates that itch is both common and distressing to a large subset of adults in an urban primary care setting. Few studies have previously assessed the burden of itch in primary care. Analysis of data from the 1999–2009 National Ambulatory Medical Care Survey found that itch was a symptom reported at approximately 1 % of all out-patient visits [11]. Similarly, analysis of data from the 1998–2003 Australian Bettering the Evaluation and Care of Health (BEACH) program found that itch was a reason for the encounter in 0.6 % of encounters [12]. However, these studies reported rates of clinical encounters primarily focused on itch, did not engage patients directly, and were not able to assess how many patients actually itched. The high rates of itch symptoms and low rates of encounters for itch suggest that itch may not be adequately addressed in the clinical setting. This may be because clinicians do not routinely ask about itch and/or patients do not voluntarily mention their concerns about itch. A previous questionnaire-based study of 492 Dutch adults from general practice with commonly encountered skin diseases in the preceding 12 months found that 53.5 % reported itch in the past 4 weeks [13]. However, that study focused on patients with dermatologic diseases and did not assess the prevalence of itch across all patients in general practice. Further, the questionnaires were not sent at the time of the physician encounter and may not have accurately reflected the prevalence of itch in practice. A recent study of 302 Hispanic geriatric patients residing in nursing homes or attending a geriatric outpatient clinic found a 25 % prevalence of chronic itch [4]. In contrast, we found a 39.9 % prevalence of itch causing some distress in the past week, overall. However, the prevalence of itch increased with age, with almost half of patients aged 80 years reporting itch. This is likely related to the higher rates of senile pruritus in the elderly population, as well as underlying medical conditions that are associated with itch, e.g., diabetes and chronic kidney disease. Nevertheless, the results suggest that itch may be even more common than previously recognized, especially in the elderly population. Though we were not able to assess whether the itch was an acute or chronic itch per se, it may be that any itch, perhaps even a short-term itch, is sufficiently distressing for patients to result in impaired QOL.

This study had several strengths, including a large sample size, high response rates, and use of validated QOL and symptom instruments. The questionnaires were administered at the time of clinic visits, rather than via mail-based or internet-based surveys. Thus, the results are likely more reflective of the symptoms actually encountered in general practice. The study assessed 17 physical symptoms, including itch, which uniquely allowed for comparison of QOL impairment in patients with itch verses other symptoms. However, the study had some weaknesses as well. First, the patient population was from an inner-city population and predominantly racial and ethnic minorities with relatively low baseline HRQOL, which raises questions about generalizability to the entire US population. Second, the study assessed symptoms and HRQOL at a single time point. However, itch often has a waxing and waning course that may not be captured in a cross-sectional study. Third, we did

not assess whether the itch was an acute or chronic itch. Finally, we did not assess the etiologies of itch. Future studies are underway to determine the longitudinal course and comorbidities of itch.

5 Conclusions

The present study aimed to determine the prevalence and impact of itch on QOL. We found that itch is a common symptom reported by patients in general internal medicine. Further, itch was associated with significant HRQOL impairment, depressed mood, and anhedonia. Itch warrants greater attention in clinical practice.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding This publication was made possible with support from the Dermatology Foundation and the Agency for Healthcare Research and Quality (AHRQ) Grant Numbers K12HS023011 and R24 HS19481-01 to support technology implementation.

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Key Points

Little is known about the epidemiology and burden of itch occurring in the primary care setting.

The present study found that itch was very common in the internal medicine setting and was associated with poor quality of life and depressive symptoms. The patient burden of itch was similar to those of pain and many other commonly encountered symptoms.

Itch should be routinely assessed in review of systems in the primary care setting.

Fig. 1.

Associations between distress from itch and poorer quality of life. Responses for itch were divided into no itch, “a little” distress or “some” distress from itch, and “quite a lot” of distress or “very much” distress from itch. *Box-and-whisker plots* and overlaid jitter plots of **a** Patient-Reported Outcomes Measurement Information System (PROMIS) total raw scores, **b** PROMIS physical health T-scores, **c** PROMIS mental health T-scores, and **d** EuroQol 5D total scores are presented for each level of itch. $P < 0.0001$ for all comparisons between no itch and a little distress or some distress, between no itch and quite a lot of distress or very much distress, and between a little distress or some distress and quite a lot of distress or very much distress

Table 1

Prevalence of symptoms overall and stratified by age

Rank	Symptom	Frequency [n]	Missing subjects [n]	Prevalence [% (95 % CI)]	Age				
Overall, n = 2076					19–39 years, n = 149	40–59 years, n = 963	60–79 years, n = 866	80–99 years, n = 98	
1	Lack of energy	1680	124	86.1 (84.5–87.6)	75.7 (68.8–82.6)	86.4 (84.1–88.6)	87.4 (85.1–89.7)	88.5 (81.8–95.2)	
2	Pain	1587	158	82.7 (81.0–84.4)	72.4 (65.1–79.7)	85.3 (83.0–87.7)	81.6 (78.9–84.3)	82.9 (74.8–91.1)	
3	Drowsiness	1240	138	64.0 (61.8–66.1)	65.8 (58.0–73.5)	66.1 (63.1–69.2)	60.7 (57.3–64.1)	68.7 (58.7–78.7)	
4	Cough	1175	111	59.8 (57.6–62.0)	46.9 (38.9–55.0)	59.5 (56.4–62.7)	61.3 (58.0–64.7)	70.7 (60.9–80.6)	
5	Dry mouth	1147	137	59.2 (57.0–61.3)	47.3 (39.2–55.4)	61.0 (57.9–64.2)	58.7 (55.2–62.1)	63.9 (53.5–74.2)	
6	Shortness of breath	941	128	48.3 (46.1–50.5)	39.7 (31.8–47.7)	51.4 (48.2–54.6)	47.2 (43.8–50.7)	39.3 (28.8–49.7)	
7	Bloating	928	142	48.0 (45.8–50.2)	44.8 (36.7–52.9)	52.6 (49.4–55.9)	43.6 (40.1–47.0)	44.4 (34.2–54.7)	
8	Dizziness	819	134	42.2 (40.0–44.4)	41.8 (33.8–49.8)	45.8 (42.6–49.0)	37.8 (34.4–41.2)	44.2 (33.7–54.7)	
9	Constipation	813	140	42.0 (39.8–44.2)	27.9 (20.6–35.1)	41.5 (38.3–44.7)	43.7 (40.2–47.2)	55.8 (45.3–66.3)	
10	Itch	771	142	39.9 (37.7–42.0)	33.1 (25.4–40.8)	40.8 (37.6–44.0)	39.4 (35.9–42.8)	45.9 (35.3–56.5)	
11	Lack of appetite	670	128	34.4 (32.3–36.5)	34.0 (26.3–41.7)	36.8 (33.6–39.9)	31.2 (28.0–34.4)	39.5 (29.2–49.9)	
12	Nausea	665	131	34.2 (32.1–36.3)	35.2 (27.4–43.0)	37.7 (34.6–40.9)	31.0 (27.8–34.2)	24.1 (15.1–33.1)	
13	Sexual dysfunction	627	207	33.5 (31.4–35.7)	34.9 (27.2–42.7)	40.7 (37.5–44.0)	26.8 (23.6–30.0)	15.3 (7.6–23.0)	
14	Weight loss	529	142	27.4 (25.4–29.3)	29.1 (21.7–36.4)	27.7 (24.7–30.6)	25.2 (22.2–28.2)	42.0 (31.2–52.7)	
15	Change of taste	517	130	26.6 (24.6–28.5)	24.0 (17.0–30.9)	27.1 (24.3–30.0)	25.2 (22.1–28.2)	37.5 (27.4–47.6)	
16	Diarrhea	479	125	24.6 (22.6–26.5)	27.8 (20.5–35.1)	27.9 (25.0–30.8)	21.0 (18.1–23.8)	15.7 (7.8–23.5)	
17	Vomiting	182	122	9.3 (8.0–10.6)	11.0 (5.9–16.0)	11.3 (9.2–13.3)	6.8 (5.1–8.6)	8.5 (2.5–14.6)	

CI confidence interval

Table 2

Ordinal logistic regression models of quality of life in patients with distress from itch^a

Distress from itch	Frequency [%] ^b		Fair	Good	Very good	Excellent	OR (95 % CI)	P value	aOR (95 % CI)	P value
Overall health	Poor									
No itch	110 (9.9)		409 (36.9)	426 (38.4)	134 (12.1)	31 (2.8)	1.00 [reference]	–	1.00 [reference]	–
A little/some	70 (12.2)		243 (42.5)	206 (36.0)	42 (7.3)	11 (1.9)	1.40 (1.17–1.69)	0.0004	1.40 (1.15–1.69)	0.0006
Quite a lot/very much	49 (30.8)		74 (46.5)	31 (19.5)	5 (3.1)	0 (0.0)	4.12 (3.00–5.65)	<0.0001	4.26 (3.08–5.90)	<0.0001
Quality of life	Poor		Fair	Good	Very good	Excellent				
No itch	55 (5.0)		336 (30.3)	471 (42.5)	178 (16.1)	69 (6.2)	1.00 [reference]	–	1.00 [reference]	–
A little/some	37 (6.5)		207 (36.6)	238 (42.1)	68 (12.0)	16 (2.8)	1.46 (1.21–1.77)	<0.0001	1.40 (1.16–1.70)	0.0006
Quite a lot/very much	24 (15.2)		64 (40.5)	54 (34.2)	11 (7.0)	5 (3.2)	2.57 (1.88–3.51)	<0.0001	2.51 (1.82–3.46)	<0.0001
Physical health	Poor		Fair	Good	Very good	Excellent				
No itch	117 (10.6)		428 (38.7)	431 (38.9)	103 (9.3)	28 (2.5)	1.00 [reference]	–	1.00 [reference]	–
A little/some	74 (12.9)		265 (46.3)	191 (33.3)	37 (6.5)	6 (1.1)	1.46 (1.21–1.76)	<0.0001	1.44 (1.19–1.75)	0.0002
Quite a lot/very much	43 (28.1)		65 (42.5)	39 (25.5)	5 (3.3)	1 (0.7)	2.92 (2.12–4.02)	<0.0001	3.00 (2.16–4.16)	<0.0001
Mental health	Poor		Fair	Good	Very good	Excellent				
No itch	44 (4.0)		203 (18.4)	395 (35.7)	278 (25.1)	186 (16.8)	1.00 [reference]	–	1.00 [reference]	–
A little/some	42 (7.3)		138 (23.9)	211 (36.5)	123 (21.3)	64 (11.1)	1.56 (1.30–1.87)	<0.0001	1.49 (1.24–1.80)	<0.0001
Quite a lot/very much	21 (13.6)		52 (33.6)	44 (28.4)	25 (16.1)	13 (8.4)	2.81 (2.07–3.82)	<0.0001	3.00 (2.19–4.12)	<0.0001
Satisfaction with social activities and relationships	Poor		Fair	Good	Very good	Excellent				
No itch	53 (4.8)		203 (18.4)	409 (37.1)	285 (25.8)	154 (14.0)	1.00 [reference]	–	1.00 [reference]	–
A little/some	51 (8.9)		129 (22.6)	249 (43.5)	108 (18.9)	35 (6.1)	1.79 (1.49–2.15)	<0.0001	1.73 (1.43–2.09)	<0.0001
Quite a lot/very much	31 (19.8)		49 (31.2)	48 (30.6)	19 (12.1)	10 (6.4)	3.60 (2.65–4.90)	<0.0001	3.52 (2.57–4.83)	<0.0001
Extent able to carry out everyday physical activities	Not at all		A little	Moderately	Mostly	Completely				
No itch	27 (2.4)		273 (24.4)	355 (31.8)	179 (16.0)	284 (25.4)	1.00 [reference]	–	1.00 [reference]	–
A little/some	15 (2.6)		147 (25.6)	217 (37.8)	107 (18.6)	88 (15.3)	1.31 (1.09–1.57)	0.004	1.27 (1.05–1.52)	0.01
Quite a lot/very much	14 (9.2)		56 (36.6)	50 (32.7)	17 (11.1)	16 (10.5)	2.64 (1.94–3.61)	<0.0001	2.69 (1.95–2.00)	<0.0001
Fatigue	Very severe		Severe	Moderate	Mild	None				
No itch	25 (2.3)		106 (9.6)	458 (41.4)	359 (32.4)	159 (14.4)	1.00 [reference]	–	1.00 [reference]	–
A little/some	16 (2.8)		76 (13.3)	267 (46.7)	173 (30.2)	40 (7.0)	1.53 (1.27–1.84)	<0.0001	1.49 (1.23–1.81)	<0.0001
Quite a lot/very much	19 (12.2)		42 (26.9)	57 (36.5)	33 (21.2)	5 (3.2)	4.07 (2.97–5.59)	<0.0001	4.43 (3.20–6.13)	<0.0001

Distress from itch	Frequency [%] ^b			OR (95 % CI)		P value	aOR (95 % CI)		P value
How often bothered by emotional problems	Always	Often	Sometimes	Rarely	Never				
No itch	41 (3.7)	130 (11.8)	426 (38.8)	262 (23.8)	240 (21.8)	1.00 [reference]	1.00 [reference]	–	–
A little/some	35 (6.1)	87 (15.3)	281 (49.3)	109 (19.1)	58 (10.2)	1.86 (1.55–2.25)	1.93 (1.59–2.34)	<0.0001	<0.0001
Quite a lot/very much	22 (14.3)	42 (27.3)	56 (36.4)	24 (15.6)	10 (6.5)	3.80 (2.78–5.21)	4.10 (2.97–5.66)	<0.0001	<0.0001
Carrying out usual social activities and roles	Poor	Fair	Good	Very good	Excellent				
No itch	55 (4.9)	255 (22.8)	397 (35.5)	262 (23.4)	149 (13.3)	1.00 [reference]	1.00 [reference]	–	–
A little/some	42 (7.2)	163 (27.9)	243 (41.6)	103 (17.6)	33 (5.7)	1.66 (1.39–2.00)	1.61 (1.33–1.94)	<0.0001	<0.0001
Distress from itch	Frequency [%] ^b			OR (95 % CI)		P value	aOR (95 % CI)		P value
Quite a lot/very much	20 (12.6)	64 (40.3)	55 (34.6)	11 (6.9)	9 (5.7)	3.19 (2.35–4.34)	3.24 (2.37–4.44)	<0.0001	<0.0001

^aOR adjusted odds ratio, CI confidence interval, OR odds ratio

^aOrdinal logistic regression models were constructed with different impairments of quality of life modeled as the dependent variables (see Sect. 2) and distress from itch as the ordinal predictor. The models met proportional odds assumptions (score test, $P > 0.05$). ORs and 95 % CIs were estimated. Multivariable models were constructed, which included gender (male/female); age (continuous); race/ethnicity (white, black, Hispanic, Asian/Pacific Islander, and other); and language of the interview (English/Spanish) as covariates. aORs and 95 % CIs were estimated

^bMissing data were encountered in 0 subjects (0.0 %) for age, gender, language, and date of interview; 85 subjects (5.4 %) for race/ethnicity; 40 subjects (2.6 %) for overall health rating; 115 subjects (5.5 %) for quality-of-life rating; 129 subjects (6.2 %) for physical health rating; 122 subjects (5.9 %) for mental health rating; 124 subjects (6.0 %) for satisfaction with social activities and relationships; 120 subjects (5.8 %) for extent able to carry out everyday physical activities; 132 subjects (6.4 %) for fatigue; 144 subjects (6.9 %) for how often bothered by emotional problems; 104 subjects (5.0 %) for carrying out usual social activities and roles; and 142 subjects (6.8 %) for itch in the past week

Table 3

Ordinal logistic regression models of depressed mood and anhedonia in the past 2 weeks in patients with distress from itch^a

Distress from itch	Frequency [%] ^b	OR (95 % CI)	P value	aOR (95 % CI)	P value
Depressed mood	Not at all/several days	More than half the days/nearly every day			
No itch	949 (87.1)	141 (12.9)	1.00 [reference]	1.00 [reference]	–
A little/some	462 (79.8)	117 (20.2)	1.70 (1.30–2.23)	1.68 (1.28–2.22)	< 0.0001
Quite a lot/very much	89 (58.6)	63 (41.5)	4.76 (3.30–6.88)	4.91 (3.36–7.18)	< 0.0001
Anhedonia	Not at all/several days	More than half the days/nearly every day			
No itch	907 (84.5)	166 (15.5)	1.00 [reference]	1.00 [reference]	–
A little/some	423 (75.1)	140 (24.9)	1.81 (1.40–2.33)	1.77 (1.37–2.30)	< 0.0001
Quite a lot/very much	82 (54.7)	68 (45.3)	4.53 (3.16–6.50)	4.46 (3.07–6.47)	< 0.0001
Any depressed mood and anhedonia	Either	Both			
No itch	267 (46.1)	312 (53.9)	1.00 [reference]	1.00 [reference]	–
A little/some	155 (39.0)	242 (61.0)	1.34 (1.03–1.73)	1.27 (0.97–1.66)	0.08
Quite a lot/very much	30 (23.8)	96 (76.2)	2.74 (1.76–4.26)	2.81 (1.78–4.41)	< 0.0001

aOR adjusted odds ratio, CI confidence interval, OR odds ratio

^a Ordinal logistic regression models were constructed with depressed mood and anhedonia as the dependent variables (from the Patient Health Questionnaire-2) and distress from itch as the ordinal predictor. The models did not meet proportional odds assumptions (score test, $P < 0.001$ for both). Therefore, depressed mood and anhedonia were dichotomized into (1) not at all or several days in the past 2 weeks; or (2) more than half the days or nearly every day in the past 2 weeks. In addition, models were constructed with both depressed mood and anhedonia versus either symptom as the dependent variable. ORs and 95 % CIs were estimated. Multivariable models were constructed, which included gender (male/female); age (continuous); race/ethnicity (white, black, Hispanic, Asian/Pacific Islander, and other); and language of the interview (English/Spanish) as covariates. aORs and 95 % CIs were estimated

^b Missing data were encountered in 0 subjects (0.0 %) for age, gender, language, and date of interview; 85 subjects (5.4 %) for race/ethnicity; 12 subjects (0.6 %) for depressed mood or anhedonia; and 142 subjects (6.8 %) for itch in the past week

Table 4

Impact of distress from symptoms on health-related quality of life

Symptom causing quite a lot of distress/very much distress	PROMIS total raw score		PROMIS physical health T-score		PROMIS mental health T-score		EuroQol 5D score	
	Mean $\pm$ SD	Rank	Mean $\pm$ SD	Rank	Mean $\pm$ SD	Rank	Mean $\pm$ SD	Rank
Vomiting	21.37 $\pm$ 7.06	1	30.58 $\pm$ 7.41	1	35.21 $\pm$ 9.37	1	0.50 $\pm$ 0.10	1
Dizziness	22.97 $\pm$ 6.58	2	33.02 $\pm$ 7.16	3	37.13 $\pm$ 9.06	2	0.52 $\pm$ 0.52	2
Nausea	23.07 $\pm$ 6.59	3	32.70 $\pm$ 6.92	2	37.27 $\pm$ 8.79	3	0.52 $\pm$ 0.09	3
Drowsiness	23.55 $\pm$ 6.57	4	33.58 $\pm$ 6.81	6	37.79 $\pm$ 8.75	5	0.54 $\pm$ 0.10	7
Shortness of breath	23.55 $\pm$ 6.05	5	33.40 $\pm$ 6.20	4	38.62 $\pm$ 8.32	9	0.53 $\pm$ 0.08	4
Lack of appetite	23.68 $\pm$ 6.81	6	33.96 $\pm$ 7.24	9	37.93 $\pm$ 9.10	6	0.54 $\pm$ 0.10	8
Change of taste	23.79 $\pm$ 6.94	7	33.75 $\pm$ 8.12	7	38.05 $\pm$ 8.97	7	0.54 $\pm$ 0.10	5
Lack of energy	23.87 $\pm$ 6.09	8	33.56 $\pm$ 6.23	8	38.66 $\pm$ 8.31	10	0.54 $\pm$ 0.09	6
Diarrhea	24.48 $\pm$ 7.02	9	34.73 $\pm$ 7.26	12	37.78 $\pm$ 9.15	4	0.55 $\pm$ 0.11	12
Bloating	24.50 $\pm$ 6.32	10	34.30 $\pm$ 7.22	11	38.57 $\pm$ 8.08	8	0.55 $\pm$ 0.10	11
Dry mouth	24.61 $\pm$ 6.27	11	34.29 $\pm$ 6.64	10	38.88 $\pm$ 8.06	11	0.55 $\pm$ 0.09	10
Itch	24.91 $\pm$ 6.62	12	35.16 $\pm$ 7.44	15	39.51 $\pm$ 8.70	13	0.56 $\pm$ 0.10	13
Pain	24.97 $\pm$ 6.20	13	33.86 $\pm$ 5.82	8	40.50 $\pm$ 8.68	16	0.54 $\pm$ 0.08	9
Constipation	25.05 $\pm$ 6.28	14	35.05 $\pm$ 6.84	14	39.36 $\pm$ 7.98	12	0.56 $\pm$ 0.09	15
Sexual dysfunction	25.11 $\pm$ 7.25	15	35.03 $\pm$ 7.72	13	39.68 $\pm$ 8.81	14	0.56 $\pm$ 0.10	14
Cough	25.86 $\pm$ 6.49	16	35.89 $\pm$ 7.46	16	40.19 $\pm$ 8.50	15	0.57 $\pm$ 0.10	16
Weight loss	27.97 $\pm$ 6.02	17	37.66 $\pm$ 7.02	17	42.40 $\pm$ 7.78	17	0.59 $\pm$ 0.09	17

PROMIS Patient-Reported Outcomes Measurement Information System, *SD* standard deviation