



Care Utilization and Measures of the Subjective

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Abstract

Background: In musculoskeletal health and care, visits, tests and treatments are often optional. There is some evidence that levels of utilization can be associated with subjective aspects of the illness, mindsets (thoughts and feelings about sensations) and stressful circumstances in particular. In a cross-sectional study of people seeking musculoskeletal specialty care, we addressed two questions: 1) Is there a difference in planned care utilization based on statistical groupings of measures of the subjective aspects of the illness? And 2) Are there any factors specifically associated with scheduling a return visit?

Methods: One hundred thirty-five patients seeking musculoskeletal specialty care completed measures of subjective patient factors including unhelpful thoughts and feelings of distress regarding symptoms, personal health agency, social health, and trust and experience with the clinician. Plans for a return visit, an injection, an imaging test, or referral to a physical therapist were documented. Cluster analysis was utilized to identify statistical groupings of scores on measures of subjective personal factors. Bivariate and logistic regression analyses evaluated factors associated with planned care utilization.

Results: We identified four statistical groupings of subjective factors through Cluster analysis: Group 1 had low trust, agency, and social health; Group 2 had low social health and high distress; Group 3 had healthy mindset and circumstances; and Group 4 had the highest social health and relatively healthy levels of the other subjective measures. Furthermore, no difference observed between statistical groups of the subjective regarding planned care utilization. Multivariable analysis revealed an association between scheduling a return visit and lower extremity clinicians (RC = 0.3; 95% CI 0.05 to 0.5; P-value, 0.02) but not with statistical groupings of measures of personal factors.

Conclusion: The finding that statistical groupings of patient personal factors were not associated with planned utilization of visits, tests, or treatments is inconsistent with other evidence linking mindsets actual utilization. A better understanding of sources of variation in planned and actual utilization is needed to help limit unwarranted variation and enhance effective use of resources.

Keywords

utilization, visits, tests, treatments, mental health, social health, subjective measure, statistical groupings, musculoskeletal institute, mindset

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Introduction

Background

In musculoskeletal health and care, visits, tests and treatments are often optional.^{1–3} Most musculoskeletal pathophysiology is degenerative (senescent) or idiopathic.^{2,4} Population-based studies identify that people often accommodate pathophysiology for which others seek care.^{5,6} And a notable percentage of people who seek care, visit a musculoskeletal specialist a single time.^{6,7} Care seeking, return visits, and utilization of tests and treatments may all relate to subjective aspects of human illness such as thoughts and feelings

in response to sensations, social health (financial and relationship security), levels of responsibility for one's health (agency), and trust and experiences with clinicians.^{7,8}

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Considered together, this evidence suggests that there are important differences between 1) people that seek care for musculoskeletal sensations that are a universal aspect of human experience, often considering them a problem to be solved, and inconsistent with an enjoyable, fulfilling life, and 2) others—perhaps the majority—who evolve their understanding of their body and their narrative identity (the mind's story about who they are and how their body is changing as they age or encounter injury or disease) and effectively accommodate their body's sensations with little or no medical care.

Rationale

The evidence that musculoskeletal illness is related as much or more so to levels of stress and distress—including distorted thinking about sensations and insecurity related to finances, employment, and housing—as to levels of pathophysiology, points to the importance of comprehensive, biopsychosocial care of musculoskeletal symptoms. The knowledge that the subjective aspects of human illness such as thoughts, feelings, and stressful circumstances are interrelated points to the need for statistical techniques that can account for the fact that interrelationships between variables (statistical collinearity) can distort traditional statistical models.⁹ K-means clustering identifies statistical groupings of similar profiles of the subjective aspects of illness and is less susceptible to collinearity. As a next step towards better understanding factors associated with utilization of, or deprioritization of visits, tests, and treatments, we studied the association of subjective factors analyzed in statistical groupings with scheduled return visits, tests, and treatments. Said differently, to better understand the factors associated with accommodation of musculoskeletal sensations that is a demonstrated effective health strategy we used cluster analysis of important psychosocial measures to help parse the degree to which variation in scheduled utilization is based on clinician or unit behavior compared to patient mindset and circumstances.

Questions

We enrolled a cross-sectional cohort of patients at an urban musculoskeletal specialty unit serving socioeconomically diverse patients and asked: 1) Is there a difference in care utilization based on statistical groupings of measures of the subjective (unhelpful thoughts, distress, patient agency, social health, and trust/experience)? And 2) Are there any factors associated with scheduling a return visit specifically?

Methods

Study Design and Setting

New English or Spanish-speaking patients seeking care in a multispecialty musculoskeletal unit in an urban area of the

United States were asked to participate in this Institutional Review Board-approved cross-sectional study between August and November 2024. After verbal consent, a research assistant asked the participants to complete a survey on the encrypted REDCap platform (Vanderbilt University, Nashville, Tennessee). Patients were excluded if they were illiterate or had any impairment precluding completion of a survey on a tablet. Exclusions and declines were uncommon and they were not tracked.

Participants

Among the 135 patients that completed the survey, 71 (53%) were women with a mean age of 53 years (range 37-69) and 81% (99) were English speaking (Table 1).

Table 1. Demographics of 135 Enrolled Patients.

Variables	Value % (N)
Gender	
Women	53% (71)
Men	47% (64)
Office	
1	83% (103)
2	17% (21)
Pathophysiology	
Degenerative	38% (47)
Idiopathic	26% (32)
Trauma	20% (25)
Non-specific	16% (20)
Language	
English	81% (99)
Spanish	19% (23)
Clinician	
UE	40% (49)
Sport	21% (26)
LE	39% (49)
MSK condition	
Upper extremity	47% (58)
Lower extremity	53% (66)
% Yes	
Schedule return visit	76% (94)
Injection	11% (14)
Physical therapy	25% (31)
MRI or another test	21% (26)
Age	53 ± 16
Unhelpful thoughts	7.7 ± 2.8
Distress regarding symptoms	7.5 ± 3.1
Trust and Experience in the Clinician (TRECS-7)	21 ± 4.9
Patient agency	12 ± 2.4
Social health	34 ± 7.1

Higher scores for unhelpful thoughts and distress regarding symptoms reflect a less healthy mindset. Higher scores on trust and experience with the clinician (TRECS-7), patient agency, and social health indicate a better experience and a healthier mindset.

^aValue is displayed as mean with standard deviation for continuous variables, and as percentage with number for categorical variables.

Table 2. Cluster Analysis of Factors Associated with Measures of the Subjective and Association with Planned Utilization.

	Unhelpful thoughts	Feelings of distress	Patient Health Agency	Social Health	TRECS	Return visit Mean $\pm$ SD p = 0.21	Injection p = 0.96	Physical Therapy p = 0.07	MRI p = 0.39
Group 1 n = 43 (35%)	z = 0.03 Mean = 7.8 (2.6)	z = 0.11 Mean = 7.9 (2.8)	z = -1.17 Mean = 9.3 (3.4)	z = -1.11 Mean = 26.1 (4.1)	z = -1.68 Mean = 12.8 (4.1)	0.9 $\pm$ 0.3	0.1 $\pm$ 0.3	0.3 $\pm$ 0.5	0.3 $\pm$ 0.5
Group 2 n = 18 (15%)	z = 0.52 Mean = 9.2 (2.8)	z = 0.64 Mean = 9.5 (2.9)	z = -0.03 Mean = 12.0 (1.4)	z = -0.72 Mean = 28.8 (3.7)	z = 0.27 Mean = 22.0 (3.0)	0.7 $\pm$ 0.5	0.1 $\pm$ 0.3	0.1 $\pm$ 0.3	0.2 $\pm$ 0.4
Group 3 n = 30 (24%)	z = -0.61 Mean = 6.0 (2.0)	z = -0.55 Mean = 5.8 (2.3)	z = 0.49 Mean = 13.3 (1.4)	z = 0.38 Mean = 36.4 (2.5)	z = 0.45 Mean = 22.9 (3.4)	0.7 $\pm$ 0.5	0.1 $\pm$ 0.3	0.3 $\pm$ 0.5	0.2 $\pm$ 0.4
Group 4 n = 33 (27%)	z = -0.08 Mean = 7.5 (2.7)	z = -0.38 Mean = 6.4 (2.7)	z = 0.21 Mean = 12.6 (2.3)	z = 1.28 Mean = 42.6 (2.1)	z = 0.13 Mean = 21.4 (3.5)	0.8 $\pm$ 0.4	0.1 $\pm$ 0.3	0.4 $\pm$ 0.5	0.1 $\pm$ 0.3

Table 3. Bivariate Analysis of Factors Associated with Measures of the Subjective and Association with Planned Utilization.

Variables	Scheduled return visit			Injection			Any imaging test			Referral to physical therapist		
	Yes	No	P-value	Yes	No	P-value	Yes	No	P-value	Yes	No	P-value
Age	55 $\pm$ 1.6	46 $\pm$ 2.7	0.01	57 $\pm$ 3.6	52 $\pm$ 1.6	0.33	60 $\pm$ 2.9	51 $\pm$ 1.6	0.01	50 $\pm$ 2.9	54 $\pm$ 1.7	0.26
Gender			0.47			0.85			0.24			0.60
Women	51	14		7	58		11	54		15	50	
Men	43	16		7	52		15	44		16	43	
Clinic			0.96			0.04			0.16			0.89
UTHA	78	25		9	94		24	79		26	77	
Other	16	5		5	16		2	19		5	16	
Pathophysiology			0.003			0.07			0.001			0.11
Degenerative	43	4		9	38		18	29		14	33	
Idiopathic	23	9		4	28		4	28		3	29	
Traumatic	13	12		0	25		4	21		7	18	
Non-specific	15	5		1	19		0	20		7	13	
Language			0.07			0.73			0.04			0.05
English	78	21		11	88		23	76		28	71	
Spanish	14	9		2	21		1	22		2	21	
Specialty			<0.001			0.38			<0.001			<0.001
Upper extremity	32	17		6	43		4	45		6	43	
Sport	14	12		1	25		3	23		16	10	
Lower extremity	48	1		7	42		19	30		9	40	
Anatomical region			0.003			0.75			0.02			0.29
Upper extremity	37	21		6	52		7	51		12	46	
Lower extremity	57	9		8	58		19	47		19	47	

Measures

Response Variables. The response variables were plans for each of the following: a return visit, an injection, an imaging test, or referral to a physical therapist.

Explanatory Variables. Unhelpful thoughts and distress regarding sensations were measured using three validated items for each, rated on 5-point Likert-scales between strongly disagree and strongly agree, that were identified in a factor analysis.¹⁰

Table 4. Multivariable Analysis of Factors Associated with Measures OF The Subjective and Association with Scheduled Return Visit.

	Coefficient (95% CI)	P value	Semi partial r-squared
Language			
English	Reference Value		
Spanish	−0.1 (−0.3 to 0.1)	0.34	0.007
Sub-specialty			
Upper extremity	Reference Value		
Lower extremity	0.3 (0.05 to 0.5)	0.02	0.04
Sports	−0.2 (−0.4 to 0.05)	0.14	0.01
Pathophysiology			
Degenerative	Reference Value		
Idiopathic	−0.07 (−0.3 to 0.1)	0.51	0.003
Traumatic	−0.2 (−0.4 to 0.06)	0.17	0.02
Non-specific	0.04 (−0.2 to 0.3)	0.80	0.0006
Age	−0.001 (−0.006 to 0.005)	0.84	0.0002
Statistical Group			
Group 1	Reference Value		
Group 2	−0.2 (−0.4 to 0.02)	0.18	0.01
Group 3	−0.1 (−0.3 to 0.04)	0.14	0.01
Group 4	−0.03 (−0.2 to 0.2)	0.63	0.002

We measured patient experience using the Trust and Experience with the Clinician Scale (TRECS-7; a 7-item measure of patient levels of trust in and experience with the clinician) as this measure was designed to have a relatively low ceiling effect which may allow for more effective study of factors associated with better patient experience.^{11,12} Personal health agency (the degree to which a person feels confident to manage their health on their own) was measured with 3 items identified as representative in an unpublished factor analysis, rated on a 5-point Likert-scale between strongly disagree and strongly agree.¹³

Social health was measured using 3 items rated on a 5-point Likert scale from “strongly disagree” to “strongly agree”.¹⁴ Participants provided their age, gender, and preferred language. Lastly, the researcher entered the clinical team that evaluated the patient, the anatomical region of the symptoms (lower extremity, upper extremity or spine), the specific diagnosis, and the type of pathophysiology (traumatic, degenerative/senescent, idiopathic).

Statistical Analysis

Normally distributed continuous variables are presented as means and standard deviations. Non-normally distributed continuous variables are presented using median and inter-quartile range. Categorical variables were described using frequencies and percentages.

We performed cluster analysis (k-means) to identify groups of patients with comparable levels of 1) feelings of distress about symptoms, 2) unhelpful thoughts about symptoms, 3) trust and experience with the clinician, 4) personal health agency, and 4) social health. Based on a scree plot, we used the elbow method to select the number of clusters.¹⁵ We

then compared differences by cluster in mean pain intensity and b) level of incapability using one-way analysis of variance (ANOVA).

In the bivariate analysis, we used Chi-square and Fisher Exact tests for dichotomous and categorical explanatory variables and Student T-test or Spearman tests for continuous variables. Factors with $p < 0.10$ in bivariate analysis were including in a logistic regression model for return visit. Based on the lack of associations in that model, and the lack of associations in the cluster analysis, it was decided not to run multivariable analyses for the other aspects of utilization. In multivariable analyses, variables with fewer than 10 observations were pooled with other subgroups. People indicating non-binary gender were randomly grouped with either men or women for the purpose of analysis.

An a priori sample size calculation determined that 140 patients would provide 80% statistical power based on a multiple linear regression model for 12 explanatory variables.

Results

Differences in Utilization Based on Mental Health Clusters

Cluster analysis identified 4 statistical groups with similar levels of trust and experience with the clinician, unhelpful thoughts, feelings of distress, personal health agency, and social health: Group 1 had average feelings of distress, slightly above average unhelpful thoughts, and levels of trust/experience, social health, and personal health agency more than a standard deviation below the mean (Low trust, agency, and security) (Table 2). Group 2 had notable feelings of distress and unhelpful thoughts, average personal health agency, relatively low social health, and high trust in the clinician (Insecure and distressed) (Table 2). Group 3 had above average scores on measures of the subjective (Healthy mindset and circumstances) (Table 2). Group 4 had the highest social health and relatively healthy levels of the other subjective measures (Very secure) (Table 2). There were no differences in utilization by statistical group (Table 2).

Factors Associated with Scheduling a Return Visit

In a multivariable analysis accounting for variables with a $p < 0.10$ in bivariate analysis (Table 3), and the statistical groups from cluster analysis scheduling a return visit was associated with clinicians specialized in lower extremity (RC = 0.3; 95% CI 0.05 to 0.5; P-value, 0.02) but not with statistical grouping of patient subjective measures (Table 4).

Discussion

Given that most musculoskeletal pathophysiology is degenerative (senescent) or idiopathic and has no disease-modifying

treatments, it is of interest to better understand potentially modifiable patient factors associated with discretionary visits tests and treatments. Using cluster analysis to account for the interrelationship of patient personal factors, we evaluated differences in care utilization based on statistical groupings of subjective factors and found that neither the cluster analysis nor the multivariable analysis identified associations of quantified patient personal factors with planned utilization. The variation was instead associated with clinician factors and anatomical region, suggesting that variations in discretionary care may be associated more with clinician behavior, which may be the better target for limiting unwarranted information.

This study has several limitations to consider. First, the study examined planned care utilization rather than actual utilization. This distinction is important as planned utilization may not align with actual behaviors or outcomes. The decision to examine planned rather than actual utilization was intentional, as it is more feasible to study planned care, and because it represents the patient and clinician's intentions, which was the primary focus of this study. Second, researchers inadvertently designated the lead clinician on the team as the treating clinician even though there were other clinicians who saw the patients independently. The disadvantage of this is we can only study groups of clinicians. The advantage is that we have more representative numbers for each group. Larger studies with more patients and more clinicians are needed to better understand variability by clinician. Third, when grouping by care team/anatomical region there is a limited sample size per group which limits the statistical power for evaluating differences based on opinions and habits of specific clinicians or types of subspecialists. Fourth, we have a limited number of clinicians and clinician groups and can only study their unique behavior. A larger group of clinicians within the same specialty with varied opinions and habits would be needed to understand the relative influence of clinician behavior on utilization. Lastly, some might hold the opinion that a larger sample of patients might have different results. In our opinion, if one is interested in notable differences (medium effect size), which is how our study was powered, the sample size was sufficient. A larger study might identify relatively modest associations that are less important to patient health.

The Association of Planned Utilization with Mental and Social Health

The finding of no differences in planned utilization among people seeking musculoskeletal specialty care using clusters of similar personal factors is discordant with data from studies of the actual behavior of people seeking and not seeking care,² such as return visits, for musculoskeletal pathophysiology. This could be because we studied planned utilization rather than actual utilization. Or perhaps because we studied one unit with a limited number of clinicians. As an example of the evidence associating personal factors with care-seeking behavior a study of people identified from general practices

in the UK and enrolled in a population-based study, 28% (6416 of 22,978) reported hip or knee pain on most days for at least one month during 1994. Among 1323 of the 4304 who responded to a second survey about 7 years later, 139 (11%) no longer had persistent hip or knee pain, 363 (27%) had persistent knee pain, 137 (10%) had persistent hip pain, and 684 (52%) had both. Among the 1119 with persistent hip or knee pain, the mean age was 68 years and 616 (55%) were not currently seeking care for their symptoms. In bivariate analysis, seeking care was associated with higher levels of discomfort, more limited mobility, and comorbid anxiety or depression.¹⁶ In other words, symptoms are much more common than care-seeking, and accommodation is a commonly used and seemingly effective health strategy. As another example, among 176 patients evaluated at a rural Primary Care Centre on Crete, 126 (72%) reported experiencing at least one musculoskeletal issue during the past year, with 31% (55 of 176) describing restrictions in daily activities and 42% (74 of 176) reporting pain within the past 7 days. Nevertheless, only 32% (56 of 176) of patients with musculoskeletal symptoms reported them to their primary care doctor, and reporting was associated with comorbid mental distress and higher levels of discomfort and incapability.¹⁷

The association of levels of discomfort and incapability (which are known to be related to less healthy mindsets) with seeking care is also observed in several studies.^{10,18} For instance, in a national survey of 8000 randomly selected community-dwelling Canadian adults with persistent pain, 1509 (21%) completed questionnaires were returned, of which 687 reported having daily pain for more than 3 months. The 654 of 687 (95%) participants classified as help-seekers (reporting at least one annual healthcare visit for a pain condition) scored higher on pain interference (which is strongly related to unhelpful thoughts) and were more often women.¹⁹ A case-control study using a population cohort in Norway identified 727 working adults who sought care for low-back pain and compared them to 721 working adults with low-back pain who did not seek care and found that seeking care was associated with greater levels of incapability and discomfort.²⁰ A review of 19 studies about care seeking for arthritis found that perception of arthritis as an expected part of aging was associated with less care seeking and relatively high levels of discomfort and incapability with more care seeking.²¹ A review of studies of care seeking for persistent pain had similar findings.²²

Factors Associated with Scheduling a Return Visit

The observation that clinician and condition/specialty factors rather than personal factors were associated with scheduling a return visit (and in bivariate analysis other aspects of utilization) is also discordant with prior evidence regarding actual visits. For instance, a study of 1341 new adult patients initiating musculoskeletal specialty care found 41% had at least one return visit within one year, with a median of one visit for

each subspecialty. Return visits were more common among older patients, patients with either Medicaid or Tricare insurance, and patients with greater symptoms of depression and anxiety. A lower likelihood of a return visit was associated with better overall health, as measured by PROMIS global health scores, and patients treated by upper extremity subspecialists.²³ A study of 3620 patients with de Quervain tendinopathy, carpal tunnel syndrome, or other upper limb conditions found that the total number of office visits was associated with greater symptoms of depression, greater pain interference, women, younger age, surgical treatment, and a diagnosis of hand osteoarthritis while patients diagnosed with a benign lump attended fewer visits.⁷ Addressing levels of discomfort and incapability as surrogates for less healthy mindsets, a Danish study evaluated 759 of 1203 patients (63%) 6 months after referral to a physical therapist for neck, shoulder, or lower back pain, and found that 577 (72%) of patients presented for at least one visit (median, 5 contacts). Six or more return visits were associated with higher levels of discomfort and incapability, and work leave at baseline.²⁴ Another study of 823 adult patients presenting to a hand and wrist specialist over a three-year period found that 42% underwent operative treatment, and the median number of visits was two. A greater number of office visits was associated with greater pain interference, operative treatment, and traumatic finger amputation, while older age and care from a specific provider team were linked to fewer visits. Higher levels of capability were associated with fewer visits and levels of symptoms of depression were not associated with visit frequency.⁸

Conclusion

In conclusion, our findings, in the context of other evidence, suggest that clinician or disease-related factors may be more important contributors to variations in the utilization of visits, tests, and treatments, compared to patient mindset or personal factors. There is good evidence from both population and claims-based data that personal factors are associated with care seeking and other forms of utilization, and that musculoskeletal conditions are often accommodated without ongoing care. Further research, involving a greater number of patients seeking care from numerous clinicians may be needed to improve our understanding of these relationships. A better understanding of the factors associated with utilization has the potential to inform attempts to improve care pathways and help target interventions more effectively for individuals with musculoskeletal disorders.

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Consent to Participate

All participants provided informed consent verbally and by completing the survey.

Declaration of Conflicting Interests

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Data

Available on request.

Ethical Considerations

The university of Texas at Austin Institutional Review Board approved this study.

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