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Clinical Study

The impact of health literacy on health status and resource utilization in lumbar degenerative disease

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ABSTRACT

BACKGROUND CONTEXT: Health literacy, defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions," has been demonstrated to affect access to care and appropriate healthcare utilization.

PURPOSE: To determine the impact of health literacy in the evaluation and management of patients with chronic low back pain.

STUDY DESIGN: Cross sectional.

PATIENT SAMPLE: Patients seen at a multisurgeon spine specialty clinic.

OUTCOME MEASURES: Oswestry Disability Index, EQ-5D, and Numeric Rating Scales (0–10) for back and leg pain.

METHODS: The Newest Vital Sign (NVS) and Health Literacy Survey, Oswestry Disability Index, EQ-5D and pain scales were administered to patients undergoing evaluation and treatment for lumbar degenerative disease in the outpatient setting. Patients were surveyed regarding their use of medication, therapy, and pain management modalities.

RESULTS: Of 201 patients approached for participation, 186 completed the health literacy surveys. Thirty (17%) were assessed as having limited literacy, 52 (28%) as possibly having limited literacy and 104 (56%) having adequate literacy based on their NVS scores. The cohort with low NVS scores also had low Health Literacy Survey Scores. Patients with limited literacy had worse back and leg pain scores compared with patients with possibly limited literacy and adequate literacy. Patients with adequate health literacy were more likely to use medications (80% vs. 53%, p = .017) and were more likely to see a specialist (34% vs. 17%) compared with those with limited literacy. Patients with limited health literacy were not more likely to see a chiropractor (7% vs. 7%), but reported more visits (19 vs. 8).

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CONCLUSIONS: Patients with lower health literacy reported worse back and leg pain scores, indicating either more severe disease or a fundamental difference in their responses to standard health-related quality of life measures. This study also suggests that patients with limited health literacy may underutilize some resources and overutilize other resources. Further study is needed to clarify these patterns, and to examine their impact on health status and clinical outcomes.

Keywords: Health literacy; Health-related quality of life; Low back pain; Resource utilization; Patient reported outcomes.

Introduction

Health literacy, defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions [1]," plays an important role in the management of chronic conditions such as diabetes mellitus and cardiac disease [2–4]. Although it seems plausible that health literacy might impact the evaluation and management of patients with chronic low back pain, this has not been effectively studied. A recent systematic review [5] revealed only three relevant studies, which were limited by homogenous health literacy in the study population and nonvalidated health literacy questionnaires [6–8]. Furthermore, none of these studies included a US based population.

Health literacy may affect multiple elements of medical care relevant to the management of lumbar spine disorders. These include an understanding of diagnostic testing, adherence with medication or therapy regimens and/or appropriate resource utilization. Moreover, health literacy may have a direct and clinically important effect on the ability of patients to understand and complete patient reported-outcome questionnaires, potentially altering a primary metric for treatment success or failure. As preference-weighted health status measures such as Quality Adjusted Life Years constitute the basis for healthcare economic analysis [9,10], variability in health literacy may also confound evaluations of cost-effectiveness.

The purpose of this study was to examine the impact of health literacy on patient reported outcomes in a diverse population of patients in the United States seeking treatment for lumbar degenerative disease. We also undertook a preliminary assessment of resource utilization as a function of health literacy.

Methods

Study design

This cross-sectional study collected information through surveys of patients using validated questionnaires and a study-specific instrument.

Study population

Patients seen at the clinic with complaints of low back pain who were 18 years or older, and fluent in written and spoken English, were approached for participation. Patients presented at varying stages of their disease process, that is, some patients presented initially with back pain complaints for evaluation and no history of operative or nonoperative care, although others may have been through several nonoperative treatments and were being evaluated for possible surgical intervention.

Data collection

Surveys/questionnaires

The Oswestry Disability Index [11,12], Numeric Rating Scales for Back and Leg Pain (0–10) [13] and the EuroQOL5D (EQ-5D) [14] are routinely administered at each visit to patients seen in the clinic. To assess patients' health literacy, research assistants administered the Newest Vital Sign (NVS) [15,16] and Health Literacy Survey (HealthLit) [17] to patients who agreed to participate in the study. Patients were also asked to complete a resource utilization form regarding their use of standard lumbar spine treatment modalities over the past 6 months that assessed specialist visits, physical therapy visits, injection history, medication and its frequency of use, employment, missed days from work.

Health literacy measures

The NVS is a validated measure of both health literacy and numeracy [15,16] (Appendix 1), and is composed of a nutrition label from an ice cream container about which the patient is verbally asked six questions by a researcher. Responses are recorded as correct or incorrect. A patient's health literacy level is assessed based on the number of correct responses, with 0–1 indicating Limited Literacy Likely (LLL), 2–3 indicating Possible Limited Literacy (PLL), and 4–6 indicating Adequate Literacy (AL) almost always.

The Health Literacy Assessment (HLA), (Appendix 2) survey is a validated 10-item self-administered multiple choice questionnaire using paper and pencil using items selected from the computerized HealthLit measure [17]. Responses to items required the use of information derived from texts, graphs, and tables. Scores on the HLA range from 0 to 10 and are not categorized into limited or adequate literacy.

Statistical analysis

One-way analysis of variance with post-hoc comparisons was used to compare continuous variables and the Kruskall-Wallis test was used to compare categorical

Table 1
Summary of health literacy, demographic and educational data

N	Limited literacy likely 30	Limited literacy possible 52	Adequate literacy 104	p Value
Mean health literacy assessment score (SD)	6.00 (2.13)	7.04 (2.12)	8.24 (1.74)	<.0001
Mean age, years (SD)	59.63 (15.62)	57.58 (13.26)	51.63 (14.22)	.016
Males, N (%)	10 (33%)	16 (31%)	41 (39%)	.874
Highest educational level, N (%)				.000
No data	10	8	9	
Less than high school	6 (30%)	5 (11%)	1 (1%)	
High school	10 (50%)	30 (68%)	56 (59%)	
Associate or bachelor	3 (15%)	8 (18%)	24 (25%)	
Postgrad	1 (5%)	1 (2%)	14 (15%)	

Table 2
Summary of patient reported outcome scores

	Limited literacy likely 30 Mean (SD)	Limited literacy possible 52 Mean (SD)	Adequate literacy 104 Mean (SD)	p Value
ODI Score	52.99 (17.27)	50.46 (18.98)	43.66 (20.28)	.078
Back Score	7.06 (1.20)*	5.85 (2.26)	5.31 (2.53)	.018
Leg Score	6.24 (2.77)*	5.03 (2.71)	4.28 (3.10)	.038
EQ-5D Score	0.44 (0.26)	0.53 (0.22)	0.58 (0.21)	.064

* Statistically significantly different to the two other groups on post-hoc analyses.

variables among the three literacy groups. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 25.0 (Armonk, NY, USA). Due to multiple concurrent analyses and relatively small sample size, threshold
p value was set at .01. A priori power analysis was not performed as no prior studies were available to compute a sample size.

No funding was received for this study.

Results

Of 201 patients approached for participation, 186 (92.5%) completed both health literacy surveys. Thirty (17%) of these 186 were assessed to be in the LLL group, 52 (28%) in the PLL and 104 (56%) in the AL group based on their NVS scores. The cohort with low NVS scores (LLL and PLL) also had low Health Literacy Scores (Table 1). Although health literacy was associated to some degree with educational level, these parameters were divergent in a considerable subset of patients (Table 1). Post-hoc analysis of the one-way analysis of variance showed that patients within the LLL group had worse back and leg pain scores compared with patients in the PLL and AL group (Table 2).

Comparing groups with limited (LLL and PLL) versus adequate health literacy (AL) (Table 3), those in the AL group used more medications (80% vs. 53%, p = .017). Although not statistically significant in this small study, patients in the AL group visited a specialist more often than those in the LLL group (34% vs. 17%, p = .613). Patients in the LLL group did not report visiting a chiropractor more than those in the AL group (7% vs. 7%), but reported more individual visits (19% vs. 8%).

Responses to the survey indicated possible confusion among those with low health literacy (LLL and PLL). Thirty percent of patients in the LLL and PLL groups answered “No” to the item asking if they were prescribed physical therapy (PT), but their response of a particular number other than “zero” to the “Number of PT sessions” conflicted with this indicating that they had been prescribed PT. Notably, this also occurred among patients in the AL group, but in only 17% of cases.

Discussion

Health literacy impacts clinical outcomes and resource utilization in many chronic diseases, such as diabetes, hypertension, heart failure, and AIDs [2–4,18,19]. Although not widely studied among patients suffering from lumbar degenerative disease, there are multiple points at which limited health literacy may adversely affect the course of evaluation and management. Patients with limited health literacy might not be able to understand the need to use nonsteroidal anti-inflammatory drugs (NSAIDs) in a consistent manner, or the risks of taking multiple NSAIDs simultaneously. Patients with limited health literacy might face barriers to access appropriate testing, or conversely, end up with unnecessary duplicate testing if they are unable to accurately relate details of their medical history such as whether they have already had a computed tomography

Table 3
Health resource utilization

	Limited literacy likely		Limited literacy possible		Adequate literacy		p Value
Seen any specialists	5	17%	13	25%	35	34%	.613
Physical therapy	11	37%	17	33%	38	37%	.448
Injections	3	10%	8	15%	23	22%	.834
Medications	12	40%	31	60%	72	69%	.631
Over the counter medications							.850
Once a week or less	1	3%	6	12%	15	14%	
More than once a week	1	3%	3	6%	9	9%	
Daily	4	13%	7	13%	18	17%	
Nonsteroidal anti-inflammatories							.417
Once a week or less	1	3%	8	15%	11	11%	
More than once a week	2	7%	3	6%	11	11%	
Daily	4	13%	7	13%	27	26%	
Muscle relaxants							.44
Once a week or less	0	0%	4	8%	11	11%	
More than once a week	1	3%	2	4%	8	8%	
Daily	4	13%	15	29%	21	20%	
Antispasmodics							.137
Once a week or less	0	0%	4	8%	7	7%	
More than once a week	1	3%	0	0%	1	1%	
Daily	1	3%	6	12%	9	9%	
Narcotics							.155
Once a week or less	1	3%	9	17%	9	9%	
More than once a week	0	0%	1	2%	9	9%	
Daily	5	17%	14	27%	35	34%	
Neuroleptics							.467
Once a week or less	1	3%	5	10%	9	9%	
More than once a week	0	0%	1	2%	5	5%	
Daily	0	0%	11	21%	25	24%	

or magnetic resonance imaging scan. Our findings from this study revealed differences among patients seeking evaluation for low back pain based on their level of health literacy. Low health literacy was associated with poorer back and leg pain scores, confusion with survey questions, and variation in resource utilization.

Limited health literacy may also impact the basic metrics by which we routinely evaluate efficacy of treatment. Over the past 15 years, patient-reported outcomes (PROs) have become the primary assessment tool for patients with lumbar degenerative disease [20,21]. This contrasts with the evaluation of other chronic diseases. In diabetes mellitus, for example, limited health literacy may alter medication use, but ultimate assessment via Hemoglobin A1C is an objective metric [22]. Further, the interpretation of PROs is tied to thresholds, such as minimal clinically important difference or substantial clinical benefit, that are based on patient perception and the ability to accurately convey satisfaction with treatment [20,21].

In this pilot study, using two independent measures of health literacy, patients with lumbar degenerative disease demonstrated variation in health status based on health literacy. Patients with lower health literacy had worse back and leg pain scores, indicating either more severe disease at presentation, or a fundamental difference in their response to standard health related quality of life measures. This is consistent with prior reports in the rheumatology literature demonstrating worse PRO scores in patients with limited health literacy [14,23,24]. Regardless of why PROs are worse in patients with limited health literacy, this represents an important opportunity to improve delivery of care in this vulnerable patient population [25].

Although health literacy correlated to some degree with educational level, these parameters were divergent in a substantial minority of patients. This is consistent with prior studies suggesting that health literacy is not simply a reflection of educational level [26,27]. Although most patients with limited health literacy have a lower level of education, limited health literacy is also seen in a subset of patients with high school level education or above. This patient group with education at high school level or beyond may be particularly at risk as healthcare providers might assume a higher level of comprehension given their educational background. Adams et al. have asserted that, in general, PRO questionnaires should be written using simpler language to avoid misinterpretation [23]. Additionally, such questionnaires should undergo cognitive testing among patients with limited health literacy before application broadly [28,29]

This study also suggests variation in resource utilization based on level of health literacy. Although the collection of

resource utilization data in this pilot study was retrospective, differences based on health literacy were clearly observed. In particular, medication use seemed to differ, with lower use of NSAIDs among patients with limited health literacy. This conflicts with prior studies which reported increased prescription utilization in patients with limited health literacy [30]. This may be attributable to the fact that NSAID use in lumbar degenerative disease is often self-directed with over-the-counter medications. Prior studies have demonstrated more frequent office, emergency room and hospital visits, but less self-directed care in patients with limited health literacy [31–33]. Further, whereas the use of chiropractic care in general was equivalent, patients with limited health literacy reported far more individual visits. These findings suggest that patients with limited health literacy may underutilize some treatment approaches and overutilize others. Consistent with prior studies [34], there was also more inconsistent resource utilization reporting in patients with limited health literacy, and this may reflect misunderstanding of survey questions. As an example, patients with limited health literacy were more likely to deny receiving PT overall, and yet report a specific number of PT visits.

Limitations of this study include the relatively small sample size. However, the distribution of health literacy based on NVS was more heterogeneous than prior studies of lumbar degenerative disease. Although there may be a concern for selection bias as the subjects were seen at a tertiary spine center, the heterogeneity of educational level and health literacy reflects that this bias has been mitigated. However, since potential subjects were approached regardless of diagnosis or stage in their disease process, this bias may have been minimized. Other factors which may have influenced the PROs, such as length of symptoms and diagnostic etiology based on advanced imaging was not collected. Length of symptoms was not determined as this relied on patient recall which may be unreliable. A definitive etiology for the patient's symptoms was not known for the entire cohort as some patients did not have any advanced imaging studies available. The granularity and reliability of resource utilization was clearly insufficient, and future studies will need more accurate determination of both testing and treatment, such as prospective resource utilization diaries or data derived from comprehensive system or state-wide data warehouses. It remains unclear whether NVS and/or HealthLit are the optimal instruments for HLA in the outpatient clinical setting of patients seeking care for low back pain. Despite these limitations, this study highlights the importance of health literacy as an impactful variable, which is clearly under-represented in the evaluation and treatment of lumbar degenerative disease.

The findings of this study suggest that health literacy is an important demographic factor that influences the evaluation and management of lumbar degenerative disease. Further studies are needed to elucidate the impact of health literacy on access to treatment, response to treatment, and relative resource utilization in patients seeking care for low back pain.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.1016/j.spinee.2018.10.012.

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