

Low Back Pain Patients' Perceptions Regarding Their Own Radiology Reports: Pre-Intervention Survey

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Purpose: While advanced medical technology and unlimited access to medical information might benefit and empower patients, these same advantages may pose some risks, especially in the cases where patients have direct access to advanced imaging studies. The aim of this work was to evaluate three domains related to patients with lower back pain: the patients' perceptions, misconceptions and the experience of anxiety-related symptoms following direct access to their thoraco-lumbar spine radiology report. An additional aim was the assessment of possible associations with catastrophization.

Patients and Methods: Patients who were referred to the spine clinic, following the completion of a CT or MRI of their thoraco-lumbar spine were surveyed. Patient perceptions of the importance of having direct access to their imaging report and of the concern they attribute to the medical terms found in their report were evaluated using a set of questionnaires. The medical terms severity scores were then correlated to a reference clinical score created for the same medical terms by spine surgeons. Lastly, patients' anxiety-related symptoms and Pain Catastrophizing Scale (PCS) after reading their radiology report were evaluated.

Results: Data from 162 participants (44.6% female), with mean age of 53.1 ± 15.6 years, were collected. Sixty-three percent of the patients stated that reading their report helped them gain better understanding of their medical condition and 84% agreed that having early access to the report helped improve communication with the physician. Patients' degree of concern associated with the medical terms in their imaging report ranged between 2.07 and 3.75, on a scale of 1–5. The patient's degree of concerns were significantly higher for six common medical terms and significantly lower in one, when compared to experts' opinions. A mean ($\pm$ SD) of 2.86 ± 2.79 anxiety-related symptoms was reported. The mean Pain Catastrophizing Scale (PSC) score was 29.18 ± 11.86 , ranging from 2 to 52. Both the degree of concerns and the number of symptoms reported were significantly associated with the PCS.

Conclusion: Direct access to radiology reports might provoke anxiety symptoms, especially in patients with a tendency for catastrophic thinking. Increasing awareness amongst spine clinicians and radiologist about possible risks associated with direct access to radiology reports could contribute to preventing patients' misconceptions and unnecessary anxiety-related symptoms.

Keywords: low back pain, pain catastrophizing, anxiety, radiology reports

Introduction

The technological revolution in the recent era has changed almost every aspect of our lives. The medical world has not been left behind and advanced imaging technologies have played a significant role in the process of medical decision-making. In recent years, as a result of the adoption of patient-centered care approach, there is an increase in health information transparency and informed decision-making.¹

While most low back pain cases are non-specific and usually improve spontaneously with conservative treatment, the abundance and increased availability of advanced imaging modalities has increased the number of patients that are referred to

advanced imaging studies, such as computer tomography (CT) and magnetic resonance imaging (MRI), by their primary physicians.² Patients are often provided with direct access to their radiology reports prior to a medical consultation with either the referring physician or a consulting spine surgeon.³ Since these reports are written in a professional language that is oriented towards a medical audience, patients might misunderstand the information in these reports. In order to gain insight into their medical condition, patients often seek to decipher these reports using information gathered from the Internet and social networks.^{4,5} Although direct access to radiology reports can potentially improve patients' understanding and engagement in their healthcare, there is lack of documentation about the subjective experience of patients exposed to their own radiology reports.⁶ Unwarranted fear and anxiety might be experienced, which could in turn support nocebo effects, which can paradoxically intensify patients' symptoms. Furthermore, patients' tendency for pain-related catastrophic thinking might contribute to the potential negative effects of exposure to the radiology report.⁷

The purpose of this study was thus 1) to evaluate patients' perceptions of the value of self-reading their thoracolumbar radiology reports prior to seeing a professional caregiver, 2) to assess the degree of agreement between patients and medical experts on the clinical relevance of medical terms commonly mentioned in radiology reports, and 3) to assess the psychological effects following patients' direct access to their radiology reports, and their possible relations with pain catastrophizing.

Materials and Methods

The study sample consisted of consecutive participants recruited from the spine clinic of a single tertiary medical center. Patients who presented for a first evaluation or first follow-up appointment due to low back pain following the completion of a CT or MRI of their thoracolumbar spine were surveyed. Patients were eligible for inclusion in the current study if they were over the age of 18 years, had a presence of low back pain, were able to read and write, did not have a known cognitive impairment and were able and willing to provide informed consent. Patients with a diagnosis of long-standing LBP (longer than 12 weeks), or who have had previous spinal surgery, or were hospitalized at the time of the assessment meeting were excluded from the study.

Patient Perceptions of the Value of Direct Access to the Radiology Report

Patients' satisfaction from self-reading their radiology report and perception on its importance for understanding their condition, improving patient–physician communication, and ability to better manage their condition were evaluated. For each item, participants indicated their responses on a scale with the end points “1” denote “not at all” to “5” denote “to a great extent” (Table 1).

Patient and Experts' Perceptions of Medical Terms Found in the Radiology Report

A list of 22 commonly used anatomical and medical terms from various radiological reports, was generated. For each term, patients were asked to state whether they recall noticing the term while reading the radiological report and grade the degree of concerns associated with the exposure to their radiology report on a scale of 1–5 (“1” being not concerned and “5” being excessively concerned).

Table 1 Patient Perceptions of the Value of Direct Access to the Radiology Report

		Mean	SD	n
1	Did you want to read the radiology report before reviewing the results with your physician?	4.01	1.19	151
2	Has discussing the medical information detailed in the report helped improve your communication with your physician?	4.23	0.80	152
3	Has reading the radiology report helped you gain better understanding on your medical condition?	3.68	1.13	150
4	Would you prefer the report be sent only to your physician and not directly to you?	2.67	1.35	147
5	Did you feel that the knowledge you gained from the radiology report made seeing your physician redundant?	2.28	1.30	148
6	Did you research the internet or social media to better understand the medical information in the report?	3.7	0.44	140

Abbreviation: SD, standard deviation.

In order to investigate if patients' concerns associated with the medical terms are aligned with their clinical significance, the same medical terms were graded by a second group of six senior spine surgeons working in a spine surgery unit of a tertiary medical center. The surgeons were asked to grade the clinical significance of each term with "1" being without any clinical significance to the patients' current symptoms to "5" indicating strong clinical significance.

Assessment of Patients' Subjective Experience of Anxiety-Related Symptoms

Patients were asked to state if they experienced one or more symptoms from a list of nine common anxiety-related symptoms including increased sweating, palpitations, difficulty concentrating, decreased enjoyment from pleasant activities, difficulty sleeping, reduced libido, increased preoccupation with pain, worrisome and restlessness. The total number of symptoms experienced by each patient was calculated and served as the outcome measure for anxiety-related symptoms.

Assessment of Catastrophizing

Pain catastrophizing was measured with the Pain Catastrophizing Scale (PCS),⁸ a well-validated, widely used, self-reporting measure of catastrophic thinking associated with self-reading the radiological report.⁹ The PCS consists of 13 items describing thoughts and feelings that individuals may experience when they are in pain, and consists of elements of rumination, magnification, and helplessness. Total scores for the PCS range from 0 to 52; higher scores indicate a greater frequency of catastrophic thoughts.

Statistical Analysis

Data were processed and analyzed by the SPSS Statistical Package for the Social Sciences software (IBM SPSS Statistics, version 25.0). Descriptive statistics were utilized to assess distributions of sociodemographic and other main variables. Given that two of the variables of interest, the total number of symptoms and the degree of concerns associated with the medical terms, were not normally distributed (using the Kolmogorov–Smirnov and Shapiro–Wilk tests), non-parametric analyses were used. Independent Mann–Whitney *U*-tests were used to compare the degree of concerns associated with each medical term between the patients and the expert ratings. Kruskal–Wallis *H*-tests were used to assess possible differences in all domains of assessments (patient perceptions, conceptions of radiological terms and pain catastrophizing and its subscales) between the categorical age groups. Spearman correlation analysis was used to investigate associations between the degree of concerns and the anxiety-related symptoms. Data were presented as mean $\pm$ standard deviation (SD) or percentages. Statistical significance was defined as $P \leq 0.05$.

Results

Demographic Characteristics

Data from 162 participants, with mean age of 53.1 ± 15.6 years, ranging from 20 to 92 was collected. Among them, 44.6% were females. Sixty-two percent of the participants were married, 17.1% singles, 13.9% divorced and 7% widowed. Sixty-two percent were employed, 25.2% retired, 12.2% were unemployed, and 0.7% were students.

Given the large variability in age, we transformed age into a categorical variable with 3 levels, according to accepted categories: 25–54 "young adults", 55–74 "middle aged adults" and 75+ "elderly". This categorization resulted with 91 participants (56%) in the "young adults" group, 55 participants (34%) in the "middle-aged adults" group and 16 participants (10%) in the "elderly" group.

Patients' perceptions of the value of self-reading their thoraco-lumbar radiology reports prior to seeing a professional caregiver. Seventy-four percent of the patients stated strong agreement (grading 4 or 5) with the desire to review their radiology report before meeting with their treating physician and 63% stated strong agreement with the statement that reading the report helped them gain better understanding of their medical condition. In contrast, only 28% stated strong agreement with the statement that it was preferable if only their physician would be provided with the report. Eighty-four percent stated strong agreement with the statement that having early access to the report helped improve their communication with their physician. Seventy percent of patients stated strong agreement (grading 4 or 5) with the desire to search for further information on the Internet or social media to better understand the medical information detailed in the report

(see Table 1). Two items among in Table 1 (items 2 and 3) were scored significantly higher by the elderly group compared to young adults and middle-aged adults' groups.

Agreement between patients and medical experts on the clinical relevance of medical terms commonly mentioned in radiology reports disc extrusion/protrusion was the most recalled medical term. The degree of concerns associated with each medical term ranged between 2.07 and 3.75, on a scale of 1–5. When comparing the patients grading with experts grading, patient's degree of concerns were significantly higher in six of the terms (disc bulge, disc extrusion/protrusion, discogenic changes, osteopenia, ligamentum flavum hypertrophy) and significantly lower in only one term (spinal cord signal change) (Table 2). No differences were found in these conceptions between the three age categories.

Table 2 Conceptions of Radiological Terms

		Recollection	Patients		Clinicians		P-value
			Mean	SD	Mean	SD	
	Disc- and facet joint-related terms						
1	Disc bulge	56%	3.75	1.42	1.33	0.52	<0.001
2	Disc extrusion/protrusion	69%	3.66	1.54	2.5	0.84	0.026
3	Discogenic changes	44%	3.03	1.62	1.5	0.55	0.045
4	Degenerative changes	44%	2.83	1.55	1.17	0.41	0.014
5	Facet joint hypertrophy	40%	2.64	1.66	1.67	0.82	0.273
6	Fatty degeneration	40%	2.25	1.53	1.33	0.52	0.232
7	Modic changes	43%	2.94	1.71	1.5	0.55	0.092
	Spinal stenosis-related terms						
1	Spinal stenosis	57%	3.62	1.45	2.67	1.03	0.057
2	Foraminal stenosis	41%	2.85	1.62	2.67	1.03	0.772
3	Compression of nerve root	51%	3.41	1.65	3.17	1.17	0.408
4	Compression of cord	51%	3.51	1.51	3.83	1.47	0.665
5	Pathological enhancement of nerve root	42%	2.79	1.58	3	1.41	0.759
6	Spinal cord signal change	42%	2.66	1.53	4.17	0.98	0.024
7	Ligamentum flavum hypertrophy	57%	3.43	1.49	2.33	0.82	0.057
	Deformity-related terms						
1	Scoliosis	44%	2.64	1.59	2.33	1.21	0.711
2	Kyphosis	43%	2.38	1.53	2	0.89	0.805
3	Spondylolisthesis	42%	2.72	1.68	2.33	0.82	0.773
	Osteoporosis- and trauma-related terms						
1	Fracture line	43%	2.8	1.71	3.33	1.03	0.451
2	Old fracture	40%	2.23	1.41	1.5	0.84	0.244
3	Vertebral body height loss	45%	2.99	1.7	1.83	0.75	0.159
4	Osteoporosis	46%	2.85	1.68	1.5	0.55	0.091
5	Osteopenia	42%	2.57	1.57	1.17	0.41	0.031

Abbreviation: SD, standard deviation, significant p-values are marked in bold.

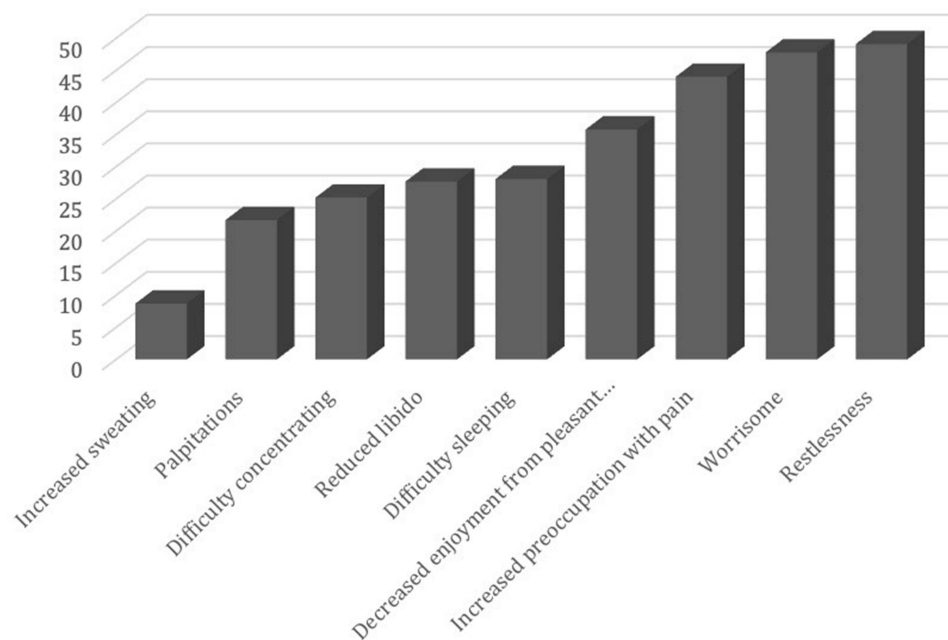


Figure 1 Percent of Participants Reported Experiencing Each Symptom.

Psychological effects following patients' direct access to their radiology reports, and their possible relations with pain catastrophizing. A total of 150 patients completed the PCS questionnaire. Overall, patients reported experiencing 2.86 ± 2.79 anxiety-related symptoms while reading the report. Among them, 49% of the patients reported restlessness, 48% reported worry, and 44% reported increased preoccupation with pain (Figure 1). The mean PCS score was 29.18 ± 11.86 , ranging from 2 to 52 (Table 3). Spearman correlation coefficients are presented in Table 4. Both the degree of

Table 3 Pain Catastrophizing and Its Subscales

	Mean	SD	Minimum	Maximum
Rumination	9.84	4.33	0	16
Magnification	6.27	3.25	0	12
Helplessness	13.56	5.74	1	24
PCS total score	29.18	11.86	2	52

Abbreviation: SD, standard deviation.

Table 4 Spearman Correlation Coefficients Between Catastrophizing and Its Subscales, Degree of Worry Felt When Reading the Medical Terms and Number of Symptoms Reported

	Total PCS	Rumination	Magnification	Helplessness	Degree of Worry	Total Number of Symptoms
Total PCS	1	0.872**	0.827**	0.894**	0.271**	0.422**
Rumination		1	0.599**	0.652**	0.217**	0.337**
Magnification			1	0.658**	0.293**	0.406**
Helplessness				1	0.256**	0.399**
Degree of worries					1	0.331**
Total number of symptoms						1

Notes: **Correlation is significant at the 0.01 level (2-tailed).

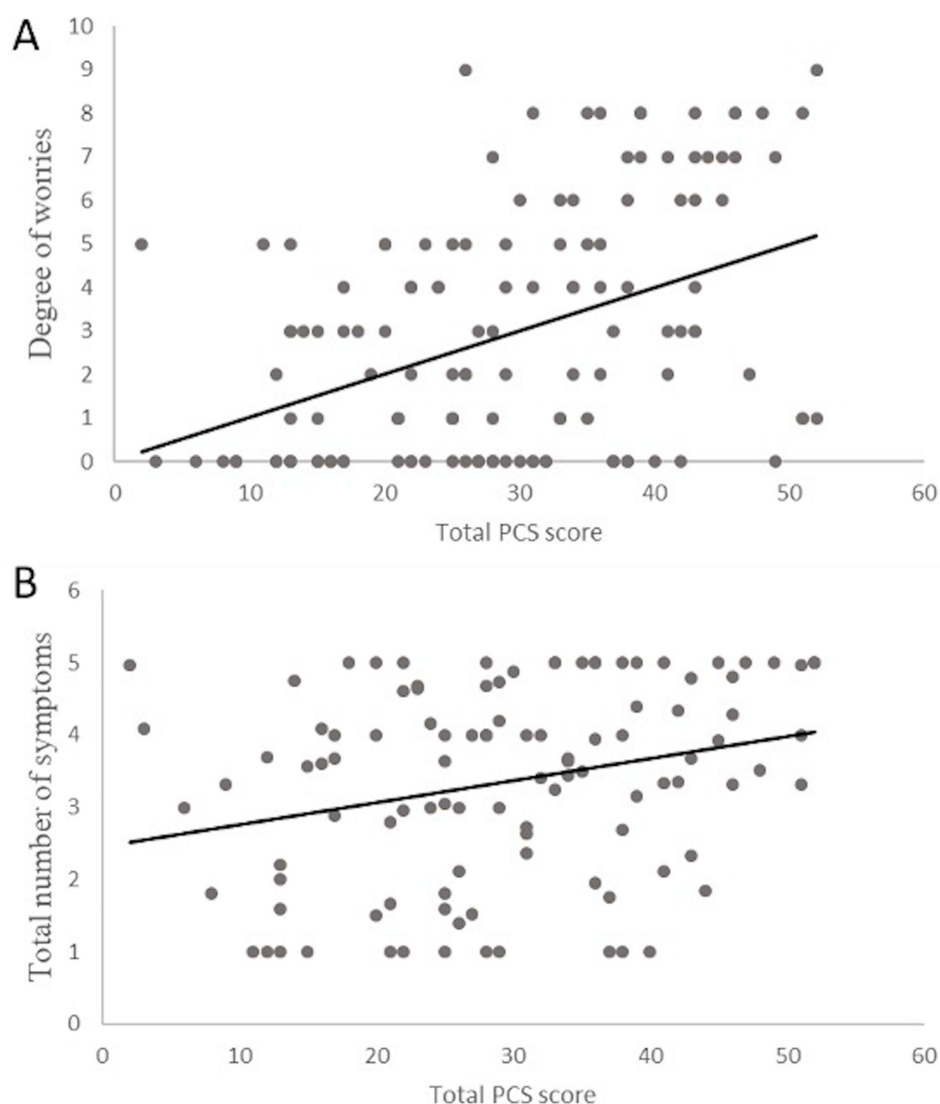


Figure 2 (A) Correlation Between the Total Pain Catastrophizing Scale and the Perceived Degree of Worry Associated with the Medical Terms in the Imaging Report. **(B)** Correlation Between the Total Pain Catastrophizing Scale and Total Symptoms Experienced After Reading the Report.

concerns and the number of symptoms reported were significantly associated with the Pain Catastrophizing Scale (Figure 2A and B) and its subscales.

No differences in pain catastrophizing and anxiety-related symptoms were found between the three age categories nor between genders.

Discussion

Magnetic Resonance Imaging (MRI) and CT scans are common tools for evaluating patients with neck and back pain. Over two-thirds of all adults experience back pain at some point in their lives, making back pain one of the leading reasons for primary care physician visits.¹⁰

The field of medical imaging is facing a complex set of challenges. As part of the “patient-centric care approach” patients are given immediate electronic access to their health records including radiological images and reports.

The “classic model” by which radiologists relayed their findings only to the referring physician, who in turn interpreted the relevant findings to the patient, has been altered. Nowadays, the patients often arrive to the follow-up

meeting with a set of perceptions regarding the medical condition after reading the radiology report and acquiring medical information from wide range of sources.

Therefore, it is important to explore current communication practices used in the diagnosis and treatment of back pain before, during and after the official consultation visit.

Previous studies have found that there is a demand from patients for full access to their diagnostic radiological images⁶ and many prefer to receive a detailed report of both normal and abnormal examination results rather than a brief summary in lay terms.¹¹ Our study found similar result. Most patients stated a strong desire to review their radiology report before meeting with their treating physician and felt that reading the report without the mediation of the treating physician helped them gain better understanding about their medical condition. Moreover, the vast majority of patients stated that having access to the report helped improve communication with their treating physician and contributed to the strength of the relationship and sense of trust with physician. These findings echo a previous study that found that direct access to radiology images online, positively supported patient–doctor communication, as well as promoting patient involvement, empowerment, and healthy behavioral changes.³

However, direct access to medical reports has several downsides. Firstly, the potential incomplete and sometimes misleading understanding of these imaging findings. We found that patients tended to exaggerate the clinical importance of common radiological findings that have little-to-no clinical significance or relevance to the cause of their back pain such as disc bulge, ligamentum flavum hypertrophy or osteopenia. In contrast, significant clinical findings, such as spinal cord signal changes, received less clinical importance by patients compared to that given by the spinal surgeons control group. Our findings might be partially explained by the assumption of Yi et al that spine MRI reports are written at too high of a level for the average patient to comprehend.¹² In a study done by Garry et al, it was found that only one of every six patients who had an MRI or CT scan reported having a clear understanding of their results when the results were first received through a web portal.¹³ Further, Mervak et al evaluated radiology-related inquiries from a web-based patient portal and found that a common subject was related to clarifying the meaning of advanced (CT and MRI) imaging study reports.¹⁴

Typically, a radiological report is written by a radiologist who examines only the imaging, usually without direct interaction with either the patient or treating physician and, more importantly, without reference to the patient's symptoms or medical history. Considering this, and due to concerns regarding the possibility of malpractice claims, spinal radiology reports include extensive descriptions of all abnormal findings regardless of whether the findings are relevant to the presenting symptoms, pathological or age-related findings. As a result, patients exposed to their radiology report seldom have the knowledge or experience to adequately understand the significance of the findings described. This may cause misunderstandings that can lead the patient to believe the test reveals extensive pathological conditions of the spine. This development, combined with the popular usage of the internet as a medical reference tool, may contribute to unwarranted distress before they even meet with their treating physician.

Previous studies offered several solutions to this problem, among them, web-based patient educational materials,¹⁵ printed information leaflets¹⁶ and direct communication between the radiologist and the patient.¹⁷ However, limited readability of some of these patient education materials as well as limited availability to communicate directly with a radiologist upon getting the report have limited the availability and acceptance of these solutions.

A second downside is the potential to elicit negative emotional responses from exposure to unfiltered medical information, as well as incomplete understanding of the medical terms used in the report. This can lead to misconception of these terminologies which can convince patients that there is possibly serious structural damage to their spine. The negative perception of having spine damage can lead to a persistence of pain and an inadequate response to treatment by the amplifying mechanism of catastrophizing. In this study, approximately half of the patients reported experiencing at least one anxiety-related symptom while reading the report. As a result, patients reported increased preoccupation with their pain leading to a potential nocebo effect. Similarly, Rajasekaran et al found that radiology reports can produce a nocebo effect as they often describe incidental changes with alarming terminologies, which lead the patient and surgeon to feel that some intervention is required for the spine.⁷ In the past two decades, catastrophizing is acknowledged as one of the most important psychological predictors of pain experience.¹⁸ Higher levels of catastrophizing elicit a correspondingly higher level of emotional response to pain.¹⁸ Catastrophizing has been linked to opioid misuse,

increased frequency of healthcare usage and internet searches.¹⁹ In the patient's view, these actions might offer immediate pain relief and reduce negative emotions, but in fact, these behaviors can result in greater distress and aggravation of pain.²⁰

In this study, both the degree of concerns expressed by patients and the number of anxiety-related symptoms resulting from exposure to the report were significantly associated with catastrophizing, potentially leading to increased apprehension and debilitation caused by back pain. Rajasekaran et al suggested that changing the conventional report methods to one that is more clinically focused and avoids potential catastrophizing terminologies could significantly decrease negative perception and catastrophization.⁷ However, larger clinical interventional studies that consider specific subsets of patients' pathology, personality traits and cultural differences are still required in order to successfully implement this change.

The current study is not free from limitations: 1) data about participants who were invited to participate in the study but refused was not documented nor the reasons for refusing. This could potentially introduce recruitment bias which could negatively impact the generalizations of our conclusions. 2) Information about literacy was not collected. Literacy could be a potential confounding factor affecting patients' perceptions regarding their radiology reports. Future investigations on this topic should include additional information about patient's education and its possible role. 3) The patient population in this study consisted solely of acute patients treated in a tertiary clinical setting. As such, a spectrum bias should be considered that may affect adopting our findings to other low back pain patient populations.

This work addresses a common practice, with patients who receive expected and trivial imaging findings that, nevertheless, cause a great deal of distress and even enhanced dysfunction. Our results support the need for a revision in the current standard of medical imaging information delivery. We should address imaging technology results in the same attentive manner we were taught to address history taking and conduct physical exams. Our hope is that by raising awareness amongst spinal clinicians and radiologists about possible risks associated with direct access to radiology reports, we could contribute to preventing patients' misconceptions and unnecessary anxiety regarding their medical condition.

Conclusion

In summary, our findings imply that although patients stated a strong desire to review their radiology report without the mediation of their treating physician, they tended to over exaggerate the severity of the reported radiological findings that provoked unnecessary anxiety symptoms, especially in patients with a tendency for catastrophic thinking.

Ethics Statement

The study received the approval of the Research Ethics Board of our institution, the Tel-Aviv Souraski Medical Centre. Research, Development, and innovation division, Helsinki committee, Trial registration number: TLV-0727-20.

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Disclosure

The authors report no conflicts of interest in this work.

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