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“It’s hard to trust an individual, it’s easier to trust an image”—patients with low back pain want imaging as a means of coping with uncertainty

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Abstract

Background Evidence-based guidelines for low back pain recommend against routine imaging. Despite these guidelines, many patients still seek imaging. We sought to understand why patients with low back pain may want imaging, using a qualitative approach grounded in the Common-Sense Self-Regulation Model (CSSRM), a model that frames how patients’ beliefs and actions are shaped by their past experiences and understanding of an illness.

Methods We interviewed 28 patients from a larger study in Ontario, Canada. Participants were recruited by family physicians (n=8), chiropractors (n=10), and physiotherapists (n=10), and most (82.1%) had previous episodes of low back pain. Participants completed intake questionnaires and semi-structured interviews that explored their experiences with low back pain care and perspectives on imaging. We analyzed the interview transcripts using the CSSRM.

Results The CSSRM domains were represented in patients’ narratives: *Stimuli and Illness Representations*, *Coping Procedures*, and *Appraisal of Outcomes*. Within *Stimuli and Representations*, patients described perceptions of the causes of their pain, and they associated obtaining an image with gaining a sense of control over their diagnosis. Within *Coping Procedures*, *Cognitive Reappraisal* emerged as the construct with the most discourse, reflecting how patients interpreted and reassessed their low back pain over time. Many patients expressed the belief that imaging would resolve uncertainty, validate their experience, and confirm that nothing serious had been overlooked. Patients emphasized that imaging would “show what’s going on,” or help them “feel taken seriously”. Within *Appraisal of Outcomes*, patients described the self-limiting nature of their LBP; the limited discourse about emotional outcomes was often linked to frustrations and fears. The beliefs expressed in interviews were not consistent with participants’ questionnaire answers from months previously, suggesting that beliefs may shift over time.

Conclusions Many patients believed imaging for low back pain was important to gain certainty in diagnosis and reassurance that treatment was appropriate. However, their beliefs about the value of imaging may not be stable

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over time, as they are influenced by ongoing experiences and reappraisals. To reduce unwarranted imaging, clinicians should consider providing consistent and contextualized messaging that meets the patient's ongoing illness experience.

Keywords Low back pain, Imaging, Patient perspectives, Common-Sense Self-Regulation Model

Background

Low back pain affects millions of individuals worldwide and is a significant burden on healthcare systems [1]. In Ontario, many individuals experience recurrent or chronic low back pain episodes that can severely impact their quality of life, often persisting for years or decades. This prolonged pain can lead to ongoing discomfort, limited mobility, and psychological distress [2, 3].

Spinal imaging for low back pain has not been shown to provide advantages in subsequent pain relief, functional improvement, quality of life, or overall patient outcomes [4]. Clinicians adhere to guidelines by refraining from pursuing imaging unless there are clinical reasons to suspect serious underlying pathology [5]. Nevertheless, many patients still seek imaging, believing that imaging is necessary to understand the cause of their pain, confirm the severity of the problem, or obtain validation of their pain experience [6, 7]. Jenkins et al. [7] demonstrated that prior imaging reinforces the belief that imaging is needed, creating a cycle in which previous exposure to imaging strengthens expectations for future episodes. This misalignment between patient expectations and clinical recommendations underscores the need to understand why patients expect or want images [3, 8, 9]. To address this critical gap, a deeper understanding of patient perspectives is required, as existing qualitative evidence identifies a multitude of reasons for a patient's desire for imaging.

Two reviews of qualitative research highlight several reasons that underpin the desire for imaging [10, 11]. Patients frequently express a strong desire for imaging, associated with the belief that imaging is useful for locating the source of their pain and providing a definitive diagnosis to guide treatment [10, 11]. For those with chronic low back pain, imaging is valued as it can provide pathoanatomical findings that serve as evidence their pain is real, offering legitimization to a source of their pain experience [11]. While clinicians may believe that negative imaging results are reassuring, patients may express frustration when imaging 'shows nothing,' or conversely, experience increased distress from inconclusive or degenerative findings [11]. This desire for imaging is further influenced by various factors, including the clinical presentation (e.g., persistent or worsening pain), past experiences (such as family history or prior imaging), and dynamics of their relationships with healthcare professionals, where patients may initiate requests for imaging due to a perceived inadequacy of clinical examination alone [10]. Patients focus on the perceived

benefits of imaging and may not fully consider potential harms such as radiation exposure or increased anxiety [11]. The findings of a recent study of medical doctors and patients in Brazil also concluded that patient beliefs drive imaging, including beliefs that imaging is important for understanding the source of pain and tracking progression [12]. Building on these themes from the literature, our study aims to delve into the specific, nuanced drivers of patients' perceived need for imaging, exploring how these multifaceted factors interact and inform patient expectations.

As part of the Back ON study [13], we aimed to better understand the factors that prompt imaging even when guidelines would indicate it is not warranted. We interviewed a sample of clinicians in Ontario primary care settings as well as a sample of their patients. Our interviews with clinicians revealed that they generally believed they adhered to low back pain imaging guidelines; however, some clinicians identified circumstances that posed challenges to their strict adherence to guidelines [14]. The focus of this report is to describe our findings from interviewing patients about their perceptions and understanding of the role of imaging in managing low back pain. We aimed to describe patients' behaviors and beliefs about imaging that may influence clinicians' responses and actions.

Materials and Methods

Study Design

Participants were selected and recruited in accordance with the larger prospective cohort study, the Back ON study [13]. In this study, we adhered to the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines [15]. Our approach to analysis, guided by Braun et al. [16], is further detailed in the Analysis section below.

Participants & recruitment

Our patient participants with low back pain were recruited by community-based family physicians, chiropractors, and physiotherapists in Ontario in the periods of October 2019 to February 2020, and June 2020 to January 2021 (recruitment closure period in 2020 was due to Ontario COVID-19 pandemic restrictions). At entry into the larger study, participating patients were given an information letter and consent form. Subsequently, they completed an intake questionnaire with questions about demographics, pain and pain-related disability, and

beliefs about care. The intake questionnaire incorporated the Roland-Morris Disability Questionnaire [17], the STarTBack tool [18], two questions about patient beliefs regarding the use of imaging for low back pain [7], and a single-item measure of patient confidence that their pain would be gone or improved in 3 months (0–10 scale) [19, 20].

We used purposive sampling [21] to recruit patients for interviews with a range of ages, male and female sexes, a range of self-reported pain intensity at intake to the study, and a mix of whether their study records indicated that imaging had, or had not, been ordered or sought in their case. We also aimed to interview approximately the same number of patients recruited by each type of clinician and no more than one patient per study clinician. Thus, we recruited 10 patients from 10 chiropractors, 10 patients from 10 physiotherapists, and 8 patients from 6 family physicians for a total of 28 patient participants. We interviewed 2 patients each from 2 family physicians due to the low number of patient participants from this clinician group. Recruitment for interviews occurred after the episode of care for low back pain was completed with the recruiting clinician. To minimize recall errors, we aimed to minimize the time between the end of the care episode and the interview, provided that we achieved the purposive sampling criteria to the greatest extent possible. We contacted the prospective interviewees to reconfirm their consent, and if they agreed, they were invited to the interview, which would be conducted over the telephone or via Zoom (Zoom Video Communications, Inc.). Interviews were conducted from February to May 2021.

This research was approved by the Health Sciences and Affiliated Teaching Hospitals Research Ethics Board at Queen's University (REH-736–18), and all participants gave informed consent.

Interview guide

We developed the interview guide (Supplementary File 1) to elicit aspects of patients' understanding of their low back pain. Specifically, we explored the patient's history of low back pain, any experiences they had with imaging related to their low back pain, and their perspectives on selecting a practitioner and how practitioners helped them manage their low back pain. After completing five pilot interviews, we met to review the interview guide for flow and to clarify secondary probing questions.

Common-Sense Self-Regulation Model

The Common-Sense Self-Regulation Model (CSSRM, also called the Common-Sense Model (CSM) of Illness Self-Regulation), provides a framework for considering how a person's perception of a recurrent or chronic condition influences their behaviors [22–24]. Patients with low back pain often present to clinicians with established

perceptions and beliefs about their health needs, wanting to understand their condition, and to have their pain and distress addressed [6, 7]. These perceptions are shaped by personal experiences, as low back pain is a condition that many patients experience more than once and know others who have similar experiences. These factors underscore the importance of using a framework that accounts for how a patient's belief is shaped by their sociocultural interactions, past experiences, and understanding of the condition. Bunzli et al. [25] have used the CSSRM to interpret interview data on pain-related fear in patients with low back pain and Enthoven et al. [26] demonstrated how the BetterBack model of care aligns with CSSRM constructs in managing low back pain. To explore patients' beliefs and behaviors regarding imaging, we adopted the CSSRM; this framework is established in this field of literature for explaining how symptom perceptions influence health-seeking actions. Accordingly, we mapped our interview guide to the CSSRM and used it to analyze the patient narratives.

The CSSRM has three broad categories. The first category, Stimuli and Representations, reflects how people perceive their low back pain based on personal experiences, external information, or knowledge shared by others. These perceptions shape an individual's understanding of the causes, consequences, and controllability of their low back pain. The second category, Coping Procedures, includes strategies that people may use to manage their low back pain, ranging from behavioral actions and emotional expression to cognitive reappraisal and seeking support. This category highlights how individuals behave in response to their low back pain, including what they seek to obtain from their primary care clinicians. Finally, Outcomes and Appraisal of Outcomes refers to how individuals assess the outcome of their recent low back pain episode, including both emotional and functional outcomes. In the CSSRM, all categories are linked to one another, as individuals repeatedly process, cope with, and evaluate their experiences with low back pain and their beliefs about what their low back pain is and what they need.

The Figure illustrates our adaptation of the CSSRM for this study, along with our definitions for each construct.

Data analysis

We transcribed all interviews verbatim using NVivo (Version 11, QSR International, 2015) transcription software, with one author (K.E.N.) verifying accuracy. Thematic analysis, as outlined by Braun et al. [16], was employed to identify, analyze, and report patterns within the qualitative data. Initially, two authors (L.H.–L. and I.M.T.) independently analyzed and coded the narratives deductively, using the CSSRM as a guiding framework. Concurrently, we engaged in an inductive process,

allowing unanticipated themes to emerge directly from the data, ensuring that participant perspectives were fully captured within the CSSRM categories. Following initial coding, L.H-L., K.E.N., and I.M.T. met to review and refine the categorization of utterances within the model constructs. For constructs with extensive discourse, we collectively identified themes within each construct. We verified our coding strategy to ensure alignment with the model definitions in consultation with our team's behavior scientist (A.M.P.). Subsequent group discussions achieved consensus in resolving any coding discrepancies for individual utterances.

To present our findings using illustrative quotes, we altered the participant identifier codes so that patients would not be identifiable to the clinicians who recruited them. The altered code numbers retain letters signifying the profession of the recruiting clinician: fp for family physician, ch for chiropractor, pt for physiotherapist.

Results

Forty-six patients were invited; 7 did not respond, 11 declined, and 28 agreed to participate in the interview. Among the 28 patients, 15 (53.6%) were female, 22 (79.5%) had at least a college or undergraduate education, and 23 (82.1%) had had at least one prior episode of low back pain. At the time of recruitment, 13 (46.4%) had rated their pain intensity at least 7 on a 10-point scale. Patients were interviewed a median of 7 months (range 2 to 17 months) since their last clinician visit. The audio-recorded interviews ranged from 13 to 73 min (mean 42 min). Table 1 describes other patient characteristics.

Our analysis revealed discourse in all three major categories of the CSSRM. Within Stimuli and representations, most of the discourse is related to Cause or Control constructs. We mapped a significant portion of the total discourse to Coping procedures, which is unsurprising given our interview guide. We also identified some discourse that we mapped to Outcomes and appraisal of outcomes, although in smaller quantities compared to the other two categories (Fig. 1).

Stimuli and representations

Representative quotes for components in this category are shown in Table 2. Unsurprisingly, the discourse had little to no connection to imaging because of the nature of the questions that elicited this discourse. These questions aimed to elicit the patient's account of their back pain, including how it developed and their beliefs about it. We identified three themes within the Cause construct: *daily or occupational-related activities*, *physical injuries*, and *recurring back pain*. Quotes within these themes demonstrate how vividly patients can recall the onset of their pain and, in some cases, that it is recurrent. We identified five themes within the Control construct:

opinions about what is needed for diagnosis and future care to control back pain; expectations of how long it will take to have back pain under control; hope or confidence of ultimately regaining control of back pain and having overall recovery; perception of clinician's impact on control of their back pain; and back pain not likely ever to be fully controlled. Only the first of these five themes is connected to imaging. Quotes in all themes included words like "eventually," "at some point," and "on an ongoing basis," indicating that many of our patients view their back pain as an ongoing concern. Overall, our interviews suggest that when patients recounted the story of their back pain episode, they focused on what they believed had caused it and how they wished to have or sought control over it. Although a role for imaging did not appear strongly in cause or control of their low back pain, these beliefs by patients foreshadowed the coping procedures they then described.

Coping procedures

Much of the discourse in Coping Procedures was associated with two constructs: Coping Behavior and Cognitive Reappraisal. The distinction between them is that Coping Behaviors represent the actions patients described taking, whereas Cognitive Reappraisal encompasses the opinions and reflections patients have about their experience. Representative quotes for components in this category are shown in Table 3.

Within Coping Behaviors, we identified four themes for the types of actions patients described to cope with their pain: *following recommendations from clinicians*, *self-management strategies (e.g., managing pain)*, *seeking imaging*, and *preventing recurrence*. In the *seeking imaging* theme, we noted discourse related to the specific action of seeking imaging (in contrast to the discourse about the value of imaging which we associated with the Cognitive Reappraisal construct (see below). In the other three themes, patients described actions they undertook with or without clinician advice to manage pain and prevent it from returning that did not include imaging.

We identified five themes within Cognitive Reappraisal: *perception that imaging reveals needed information*, *imaging boosts confidence in a diagnosis*, *imaging boosts confidence in treatment*, *fear of missing something (fear of uncertainty 'trumps' fear of harm)*, and *recollections of discussions with clinicians about imaging*. Across all five themes, there were common threads about the perceived necessity of imaging, that they "know" it will reveal something, and the associated belief that it will provide reassurance and certainty in diagnosis and treatment.

Outcomes and appraisal of outcomes

Our interviews yielded relatively low discourse associated with the constructs within Outcomes and Appraisal

Table 1 Patient participant characteristics

	Characteristic	n (%)
Personal features at initial recruitment	Recruiting clinician type	
	Family physician	8 (28.6%)
	Chiropractor	10 (35.7%)
	Physiotherapist	10 (35.7%)
	¹ Age (years)	
	18–44 years	10 (35.7%)
	45–64 years	11 (39.3%)
	65 + years	6 (21.4%)
	Sex	
	Female	15 (53.6%)
	Male	13 (46.4%)
	¹ Education	
	High school or less	5 (17.9%)
	College or undergraduate degree	16 (57.1%)
	Graduate degree	6 (21.4%)
	¹ Reported having had previous episodes of low back pain (in lifetime)	
Yes	23 (82.1%)	
No	4 (14.3%)	
² Quantity of reported episodes of low back pain in previous year		
1 or 2	8 (28.6%)	
3 or more	5 (17.9%)	
Time from study intake to interview	Time from study intake to interview	
	2 to 6 months	14 (50.0%)
	7 to 12 months	7 (25.0%)
	13 to 17 months	7 (25.0%)
Patient's self-reported health status, reason for visit, and status of back pain and disability at initial recruitment	¹ Patient reported general health	
	Excellent or Very good	14 (50.0%)
	Good, Fair or Poor	13 (46.4%)
	³ Patient selected item(s) from a list of potential reasons for coming to the clinic at initial visit	
	"To find out what is wrong"	19 (67.9%)
	"To get some imaging"	2 (7.1%)
	¹ Back pain intensity (0 to 10 scale)	
	No Pain 0 to 3	7 (25.0%)
	4 to 6	7 (25.0%)
	7 to 10 Worst Possible Pain	13 (46.4%)
	¹ Response to "Is your current back pain episode more severe than is usual for you?"	
	Yes	24 (85.7%)
	No	3 (10.7%)
	¹ Roland-Morris Disability Questionnaire (/100)	
	0–50	6 (21.4%)
51–75	15 (53.6%)	
76–100	6 (21.4%)	
¹ STarT Back risk category		
Low	9 (32.1%)	
Medium	8 (28.6%)	
High	10 (35.7%)	

Table 1 (continued)

	Characteristic	n (%)
Patient's beliefs at initial recruitment	¹ Agreement with "X-rays or scans are necessary to get the best medical care for low back pain"	
	Completely agree or Agree	5 (17.9%)
	Neutral, Disagree or Completely disagree	22 (78.6%)
	¹ Agreement with "Everyone with low back pain should have spine imaging (e.g., X-ray, CT or MRI)"	
	Completely agree or Agree	7 (25.0%)
	Neutral, Disagree or Completely disagree	20 (71.4%)
	¹ Confidence that pain will be gone or better in 3 months (0 to 10 scale)	
	Not confident 0–3	3 (10.7%)
	4–6	6 (21.4%)
7–10 Very confident	18 (67.3%)	

Abbreviations: n Number, CT Computerized tomography, MRI Magnetic resonance imaging

¹ Numbers sum to less than 28 (100%) for variables with missing data

² Question was only presented to participants who said yes to question about any previous episodes, and only non-zero data are reported here

³ Participants could choose to check more than one box if they agreed with more than one statement; categories are thus not exclusive

of Outcomes. Representative quotes for components in this category are shown in Table 4. Much of the discourse about illness outcomes reflected the usual outcome from back pain episodes, which is that they are self-limiting and also some praise for clinicians' skills. However, the limited discourse on emotional outcomes was often linked to frustrations and fears. Some of the frustrations and fears were specifically related to not having undergone imaging and therefore not knowing what the results might have revealed, while others were more general concerns about patients' uncertainty regarding diagnosis, prognosis, or treatment, echoing the themes in the first two CSSRM categories.

Overall, we found that the quotes most resonant within these categories emphasized the patient's desire for certainty, reassurance, and validation, which were often conveyed through statements about wanting to "see" the situation more clearly. They voiced a desire for certainty, in statements like "Imaging would make me feel like we've investigated it thoroughly" (P11pt) and "I just really wanted something to be done" (P27fp). As one participant said, "It's hard to trust an individual; it's easier to trust an image" (P13ch), underscoring the legitimacy that patients may associate with imaging.

Discussion

Our results show that when low back pain patients are asked about imaging when reflecting on past healthcare management, many of them placed high value on imaging that they wish had occurred. Their cognitive reappraisal of the experience indicates that many wanted greater certainty, often using words associated with seeing and expressing belief that imaging would validate and legitimize their condition. This perception, where imaging is believed to be a valuable tool for clinicians to "see" the cause of low back pain, is consistent with findings from other studies [10, 27]. The act of obtaining imaging

reassures the patient that their pain is being taken seriously and allays their fears that something important may be missed. Our participants expressed a sense of limited confidence in the clinician without imaging, as they believed that if the clinician could review the imaging, the source of their pain would be visibly apparent, or it would rule out something dire. The perspectives on imaging were generally framed in the context of seeking to be heard, to be validated, and to obtain definitive answers about diagnosis and treatment. Many participants made statements consistent with the idea that obtaining certainty about its cause, control, and resolution was what they sought from providers.

Our results are consistent with previous research findings. A scoping review by Chou et al. [28] and a more recent Canadian study by Madani Larijani et al. [29] demonstrated that patients often seek a definitive diagnosis for their low back pain from their clinicians. The definitive diagnosis is often intertwined with imaging in the patient's mind. Participants in both studies believed that imaging was necessary to determine the cause of their pain accurately. In a meta-ethnographic study of people with multiple forms of chronic pain, Toye et al. [30] described that patients often embark on a 'quest' for imaging, viewing the diagnosis as the 'holy grail'. Meyer et al. [31] highlighted several areas in which a patient may encounter uncertainty during any diagnostic process, ranging from the relevance of information received from the clinician to the confidence in the clinician's diagnosis. Any lingering ambiguity or uncertainty about their condition may reinforce the belief that imaging is necessary to provide additional clarity.

A patient's strong desire for definitive answers often implicitly or explicitly reflects a concern about diagnostic error, for example, the fear that something serious might be missed without imaging. However, the basis of the guidelines is that serious pathologies underlying low back

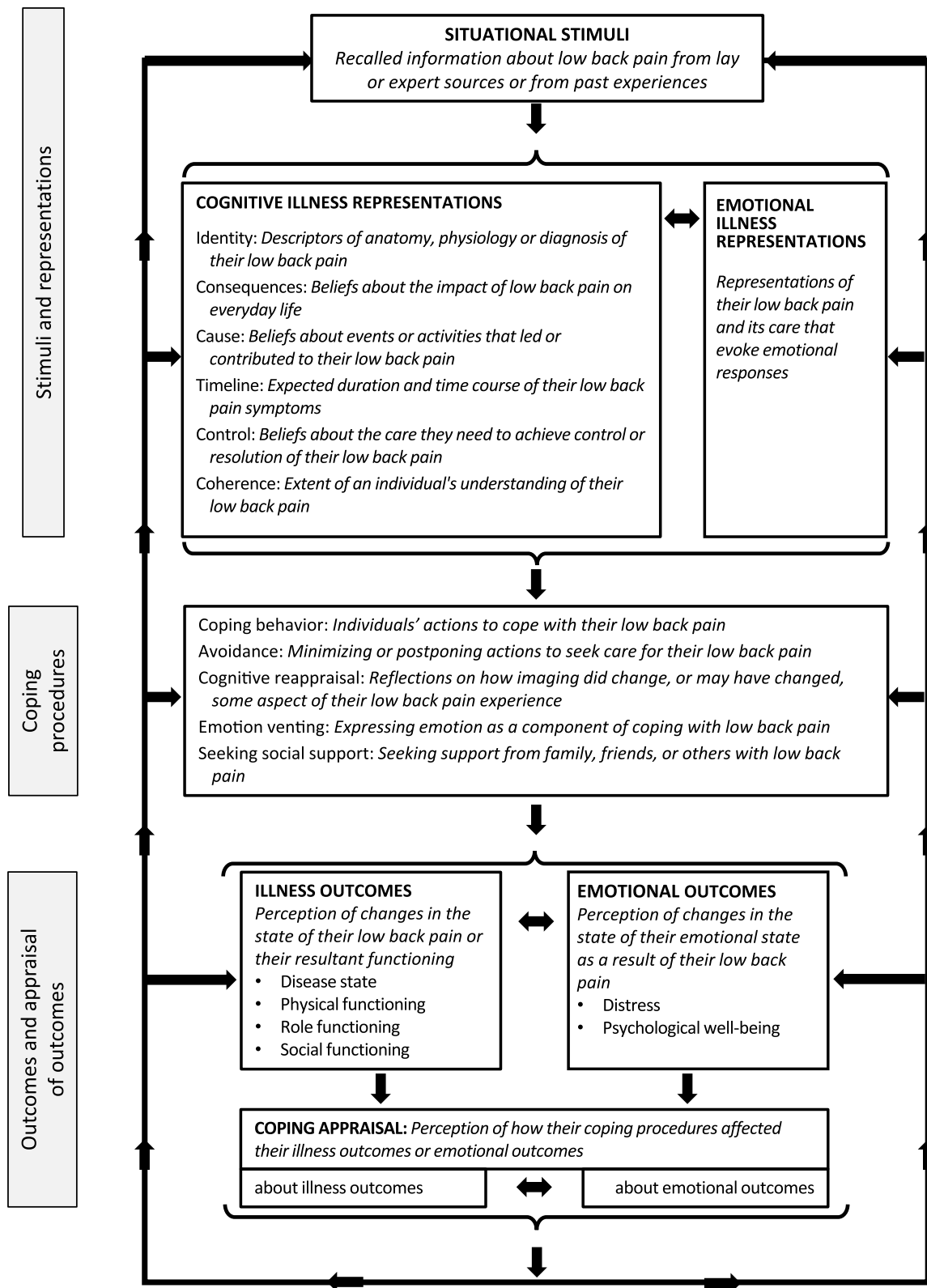


Fig.1 The Common-Sense Self-Regulation Model as adapted for the current study. Modified version of the Common-Sense Self-Regulation Model (CSSRM), adapted from Fig. 1 in Hagger et al. [24]. Items in normal font appeared as components of the CSSRM in the version presented by Hagger et al. [24]. Items in italics are definitions of the components adapted to the context of the current study

Table 2 Situational stimuli, Cognitive illness representations, and Emotional illness representations

First-level and second-level model components, and themes (where emergent)	Representative quotes from participants¹
Situational stimuli	I can't deny that when I started having back pain I'd take a look at the Internet, to see if any of my symptoms look like something kind of abnormal. (P19ch) I did some research online... Google, I guess, however much you can trust that. Not too many people I know have the same situation that I was in. Mostly just a few books, stuff from work. Just some random reading online. (P05pt)
Cognitive illness representations	
Identity	I had the MRI and that showed a bulging disc in ... I think it's the L4 or L5. And then also some arthritis starting down below. (P21ch) I have scoliosis of the spine. I've had that all my life, and every once in a while, it flares up and is quite painful. (P10pt) I've had x-rays and various things, and everybody confirmed that I had damage to my L5 area. (P18pt)
Consequences	It was getting kind of like just progressively worse and was very difficult to sleep. (P14ch) Honestly, when I think back to that time it really was crippling. I couldn't do anything at all. (P09fp) I was paralyzed for 2 weeks, I ... could not get out of my bed. (P27fp) I was starting to get numbness. [...] I said, 'oh this isn't good'. ... I need help, and I want to get it, I want to start it now, before it gets worse. (P06pt)
Cause <i>Theme: Daily or occupation related activities</i>	I do housework and grocery shopping and then I cook at the church ... maybe it was just doing too much over a short period of time that caused it to flare up. (P10pt) I had spent 3 or 3 1/2 h sitting in an exam supervising [students]. I was sort of sitting askew in the chair. (P08pt) It literally was bending down to tie my shoes and I guess I pulled something and... it was a herniated disc at the end of the day. (P27fp) I got an office position so 8 h of my day was sitting all of a sudden. I guess my posture wasn't great, I was wearing heels, business attire... so I guess that sort of put a strain on me and I wasn't in a very good chair. (P07ch) I feel like the reason could have been because of my job at the time. [It involved] a lot of pushing and pulling movements, a lot of up and down. (P09fp)
Cause <i>Theme: Physical injury</i>	When I was young, I was skating, and I fell, and I broke my tailbone. (P17pt) What happened to me was an injury. I fell at work. (P12pt)
Cause <i>Theme: Recurrent</i>	It was snowing, I shoveled and then I felt it coming back. (P04fp) It will spasm after I've done something that I probably shouldn't have, or I've stretched in a funny way, or I slipped on the ice and fell, and things went skedaddle like maybe they shouldn't. (P03fp)
Timeline	I really didn't pay a lot of attention to it because I do get lower back pain but then it goes away after a couple of days. (P23ch) I've been doing [my current job] for 14 years and just the wear and tear on my body, I feel it's been getting worse. (P26fp)
Control <i>Theme: Opinions about what is needed for diagnosis and future care to control back pain</i>	I think to properly treat somebody with back pain requires that kind of imaging to get good information. (P22ch) I should have this MRI to see what's really going on and to confirm what we know and so I know what I'm dealing with. (P27fp) I think if you've got back pain, you need a picture of what's going on in there with the structure of the bones and everything else. You never know what's going on in there. (P12pt)
Control <i>Theme: Expectations of how long it will take to have back pain under control</i>	I still thought I could get better in 3 months (laughing); cause it's certainly never taken that long before to get better. (P24ch) But probably within the next year I hope to fully regain what I used to be like. (P13ch)
Control <i>Theme: Hope or confidence of ultimately regaining control of back pain and having overall recovery</i>	Overall, I do feel good about my chances of recovery, based on the chiropractic work that I've done. (P19ch) My expectation was that I was going to be able to walk out of there at some point without pain. (P23ch) I started to get some confidence and feel better about myself. And feel better that that I was going to hopefully get my lifestyle back. (P20pt)
Control <i>Theme: Perception of clinician's impact on control of their back pain</i>	I still felt that going back was the solution and continuing to see the doctor was going to help eventually. (P24ch) But yes, I do think that some people really want that reassurance, but I think it could be solved with education. (P24ch) I was getting really bad very quickly, so he could potentially help me, but he was worried that his process would take a really long time. So, if you want the instant relief, go to a chiropractor. (P14ch) There's nothing really that could be done at the time, except for rest and she did tell me to rest. (P09fp)
Control <i>Theme: Low back pain not likely to ever be fully controlled</i>	My back thing, I guess, will never go away. It will come and go, and it's something that I live with. (P22ch) I suspect there will never be any full recovery, unless there's some kind of surgery on it, and I don't seem to need that, not yet anyways. (P02fp) Yes, I realize I may have a lifelong... [pauses] I'm gonna have to be very careful with it. But I can do that. I know what I have to do. (P21ch) I think it's probably something I'm going to have on an ongoing basis. (P05pt)

Table 2 (continued)

First-level and second-level model components, and themes (where emergent)	Representative quotes from participants ¹
Coherence	They have a little chart of the human body. They showed the muscles and walked me through what nerve runs from where, and where it's pinching, and my posture contributing to that. It was very well explained and how I was sitting poorly and how I wasn't stretching or moving enough, and I was contributing to my pain." (P07ch)
Emotional illness representations	I was very scared that it would never go away. And it was so painful. (P23ch) As far as an x-ray or an MRI, I don't feel those would be scary at all. (P03fp) I was wondering if I was going to be paralyzed... I didn't know what exactly was going on with my back, I just knew that I was in a lot of pain, and I wanted to relieve that pain. (P10pt)

Note: ¹ After analysis of transcripts, patients were given scrambled numbers from P01 to P28 to preserve confidentiality, because their original identification numbers would be recognizable to the clinicians who recruited them to the study. The suffixes ch, fp, or pt indicate whether the patient participant was recruited to the study by a chiropractor, a family physician or a physiotherapist, respectively

pain are rare, and clinical assessment is generally effective in screening for 'red flags.' In addition, recent systematic reviews [32, 33] have shown that imaging frequently reveals incidental findings, such as degenerative changes. While these changes are common with increasing age, they are not often associated with the patient's low back pain and, more importantly, often do not guide clinician treatment for the current episode of low back pain. In such cases, findings may be present but spurious rather than causal to their current pain. Nevertheless, anecdotes of missed diagnoses from personal associations appear to be a powerful influence on patient perceptions. These narratives contribute to patients' beliefs that imaging provides a crucial safeguard against overlooking severe conditions [10, 11].

In applying the CSSRM framework, our findings highlight how, in a recurrent condition such as low back pain, a patient's beliefs can evolve in response to ongoing experiences. The feedback loop depicted in the CSSRM framework models how the patient's beliefs, behaviors and reappraisal are susceptible to ongoing modification. Modification can occur as the patient experiences new or altered symptoms, is influenced by external sources of information, or continues to ruminate about their health [24].

The shift in beliefs is evident in our data, as reflected in the contrast between questionnaire data gathered 2 to 17 months prior to the interview data. Specifically, at intake 78.6% of our interviewees had initially indicated being neutral or disagreeing that imaging was necessary to get the best medical care for their low back pain, and 71% of our interviewees were neutral or disagreed that everyone with low back pain should have spine imaging, which appeared to contrast with their perspectives of the importance of imaging in the interviews. At the time of filling out the questionnaire, participants had very recently had an encounter with a clinician who may have explained why imaging was not immediately warranted, as reported in their recollections of discussions about imaging with the clinicians. Clinicians thus potentially served as "situational stimuli" in the context of the

CSSRM framework, which shaped their patients' beliefs expressed in their questionnaire answers. When participants professed beliefs in later interviews that imaging would have been valuable, their encounters with the clinicians were long past. As time went on, they were potentially exposed to additional stimuli from family, friends, and colleagues and may have engaged in ongoing cognitive reappraisal, leading to a shift in their beliefs. Our participants' beliefs at the time of questionnaires are in contrast with those of Jenkins et al. [7] and Diniz et al. [34] who reported that just over half of all patients agreed or strongly agreed that imaging is necessary to manage low back pain. We speculate that if we had administered the questionnaire again at the time of the interviews, the results might have been more similar to those of these two studies.

Our data also show that some patients' perspectives about their low back pain treatment are stable over time, as several of our participants were able to recollect successful treatment strategies. We posit that the ongoing reinforcement of utilizing successful strategies, such as exercise, acts as a situational stimulus that retains the importance of this behavior in the patient's narrative of their low back pain.

Implications

Overall, our findings suggest that clinicians are part of a patient's situational stimuli, which are especially important at the onset of a new episode of low back pain. The clinician's inputs consequently influence how the patient represents low back pain in their mind and what they believe about the value of imaging in reducing uncertainty. Others have noted that when the clinician provides a clear explanation of the patient's history and examination findings, linking them to a definitive source of their low back pain, it helps reduce ambiguity [35]. We propose that when patients feel heard, understood, and well informed by their clinician, it boosts the patient's confidence in the diagnosis and treatment plan. This confidence counterbalances, at least temporarily, the other stimuli that underpin their belief in the value

Table 3 Coping procedures

Second-level model components within Coping procedures and themes (where emergent)	Representative quotes ¹
Coping behavior Theme: <i>Following recommendations from clinician</i>	<p>She gave me some tips and I constantly... it eventually became second nature. But for a month or so I was consciously reminding myself all the time, if I was walking properly or not. (P16ch)</p> <p>They will help you with some basic exercises that you need to do every day to keep your back strong and healthy. (P21ch)</p> <p>I promised the chiropractor [to] continue with the exercises, but I do them once a day now, just stretching. (P23ch)</p> <p>I was still in pain, and I thought, 'well, I'm gonna try' and then the physio at this other place just gave different stretches, different exercises. (P17pt)</p>
Coping behavior Theme: <i>Self-management strategies (e.g., managing pain)</i>	<p>But we did some yoga. We did some exercise [...] daily doing those stretches helped me as well. (P09fp)</p> <p>[M]edication, the physio, acupuncture and then also the stretching, ... do my heating pad at home and then some things like hot bath. Just everything together, I think, helped me a lot and then that's how I got better. (P01fp)</p> <p>The hot tub is part of my regular therapy. (P03fp)</p> <p>I subsequently have [initiated] self-treatment, ... I do the physio stuff like put heat on it, I take Advil when I need to bend my knees, instead of bending by my waist and bending my lower spine. I just take care of myself better. (P02fp)</p> <p>I sometimes will smoke a little bit of marijuana and that just kind of relaxes me and my muscles aren't all tense and tight. (P11pt)</p> <p>I took the medication and stayed at home for 2–3 days just to let my back muscles be relaxed. (P04fp)</p> <p>I had to be walking. If I wasn't walking the pain was excruciating, so that's when I went to see him. (P21ch)</p>
Coping behavior Theme: <i>Seeking imaging</i>	<p>I wanted that confirmation. I also wanted to make sure, knowing that I have hip issues, and I wasn't comfortable with my leg being numb for [length of time]. I think there was some worry there about my leg and I just really wanted something to be done. I expressed that to my doctor; I said 'you know I really do want to get an MRI'. (P27fp)</p>
Coping behavior Theme: <i>Preventing recurrence</i>	<p>I really had to change how I moved. I couldn't just bend to pick something up, I had to squat. (P15ch)</p> <p>Whenever I got back pain I tried to relax, I mean not to move very fast. (P04fp)</p> <p>Putting stress on the back in a particular way to wash dishes in a sink creates discomfort in the upper part of my back. I've learned that so I try to be careful and walk away from the sink and then come back. (P25pt)</p>
Avoidance	<p>I was concerned that it wasn't going to go away. I was concerned that it was going to get worse, right? I knew that it needed to be fixed ASAP [as soon as possible]. I should have fixed it months ago. I let it go too long. (P26fp)</p>
Cognitive reappraisal Theme: <i>Perception that imaging reveals needed information</i>	<p>X-ray that shows that you have some damage, well,... I kind of felt better about that. Now I know I'm not nuts. There is a problem. (P11pt)</p> <p>I would like to know more (laughs) about what was occurring and why it occurred. I suppose the imaging would just, for me, would make me feel like we've investigated it thoroughly. (P08pt)</p> <p>I think there's other benefits because MRIs can discover something else that you're not looking for. (P27fp)</p> <p>I want an MRI (laughs)'cause I want to see what's going on. I need to know, I need this information, what's happening to me. (P27fp)</p> <p>With the imaging the patient is going to know for sure that the person has no problems on their backs. (P28fp)</p>
Cognitive reappraisal Theme: <i>Imaging boosts confidence in diagnosis</i>	<p>You can have all the physio, do all these things, but until they can actually get an understanding of what's really happening, then you're not going to move forward without an MRI. (P06pt)</p> <p>I think, in my case, the reason is [that] I had so much nerve issue that you don't see that on anything, right? And past history and stuff like that. So that's the only reason why I think MRIs are important, if you have something like that. (P06pt)</p> <p>It seems to be a more essential part than any other thing... I think that should be the first thing they do, is send you for some kind of imaging to find out what you have. (P12pt)</p> <p>It's hard to trust an individual, it's easier to trust an image. (P13ch)</p>
Cognitive reappraisal Theme: <i>Imaging boosts confidence in treatment</i>	<p>If you don't know what's going on, then how can you treat it, how can you deal with it? (P21ch)</p> <p>It would maybe lend toward being more confident in how we would proceed with my treatment. (P08pt)</p> <p>[in response to question about imaging typically not needed] Even the statement itself says where in most cases it's not needed, but I personally would feel like in my case it's needed (laughs). (P14ch)</p> <p>I literally was doing whatever I could to survive the pain until I got that MRI. I put everything, all of my hope, in that MRI. (P21ch)</p> <p>I think to properly treat somebody with back pain requires that kind of imaging to get good information. (P22ch)</p>
Cognitive reappraisal Theme: <i>Fear of missing something (fear of uncertainty trumps fear of harm)</i>	<p>Because once you know what you're dealing with you can accept it and go on. I think it's [...] the fear of the unknown that can really bother you and upset you. (P10pt)</p> <p>Paying less than one thousand bucks [out of personal funds] to identify what's wrong and remove the fear... I, to me, at the time, I felt like 'Sure, why not?' (P14ch)</p>

Table 3 (continued)

Second-level model components within <i>Coping procedures</i> and themes (where emergent)	Representative quotes ¹
Cognitive reappraisal <i>Theme: Recollections of discussions with clinicians about imaging</i>	If the doctor told me if this happens again, we should probably do a scan, that reassurance would have been really comforting for me. (P09fp) They said there's no need for x-rays or anything because it wouldn't really show up on x-rays or MRIs a lot. They were curious if that would show up an MRI, but would take a long time to get it, so they said it doesn't need to be done. (P14ch) They didn't explain why it's not needed. They just said that we're not doing it. I'm like 'Are you guys not seeing what's happening here?' (laughs). (P14ch)
Emotion venting	I think I'm really nervous about it happening again. (P27fp) I don't think a lot of people really understand back pain, unless they've been through it... They say 'look, you seem to be walking ok. You can't have a back problem; you can't be in pain!' But they don't understand. (P11pt)
Seeking social support	That would have helped. When you are alone with it, you don't really know... it felt like a very painful, scary moment. I'm not sure what to call it, but support group is probably a good word for it. (P14ch) It was just nice to talk to other folks that are kind of going through something similar to what you're going through. (P11pt)

¹ For explanation of patient code numbers, see note in Table 2

of diagnostic imaging. Nevertheless, situational stimuli, such as new or worsening symptoms or input from other sources, can undermine their confidence and prompt renewed concern that imaging may be necessary.

We found evidence in our clinician interviews that many were well aware of the importance of reassurance and patient education in reducing the demand for unwarranted imaging [14]. These interviews also revealed that the fear of missing a critical finding influenced the clinicians' beliefs about when they would be more confident if they could rely on imaging [14]. Together, these findings imply that clinicians can provide sufficient education and reassurance to reduce patients' wish for imaging. Still, they do not succeed every time, and the effect may be transient.

As we acknowledge the transient nature of reassurance, a potential solution may lie in integrating a structured, evidence-based patient education component into every clinical visit. Our findings, combined with those of Traeger et al. [36], support that reassurance and education can reduce healthcare visits related to ongoing low back pain. Empowering clinicians with evidence-based and communication tools may help to address both the patient's fluctuating confidence and everyone's concern about missing a serious diagnosis.

As highlighted by Martin et al. [37], an essential component of clinician reassurance is the careful use of diagnostic language, which can shape a patient's understanding and emotional response. Their review emphasized that while patients value a diagnosis, the terms used to convey this diagnosis are important, as biomedical labels can unintentionally trigger fear, anxiety, or a belief that their pain is due to irreversible damage, potentially increasing the demand for unwarranted interventions. The review cited primary literature including research

by O'Keeffe et al. [38, 39] which demonstrated that diagnoses like "disc bulge", "arthritis", or "degeneration" may evoke negative perceptions, fear, anxiety, and increased likelihood of believing imaging is necessary. Therefore, the communication tools should be based not only in the evidence about low back pain management but also in the evidence about which forms of reassurance are most effective. This patient-centred approach may guide understanding, support self-management, and reduce the perceived need for imaging.

Strengths and limitations

The strengths of our study include the diversity of our participants, who span a wide age range and present various risk factors for chronicity of low back pain, as well as their recruitment by multiple types of clinicians. Although the time gap between their initial presentation to their clinician and their interview for this study contributed to our findings, our participants may have had varied experiences. For example, they may have had resolution or worsening of their low back pain, or a new episode altogether, or they may have seen multiple clinicians. Any of these experiences could have influenced their situational stimuli or altered their perception of the value of imaging. Additionally, our study design did not fully incorporate the CSSRM from the outset. In applying the model retrospectively, we analyzed interviews that had not been structured to fully address all constructs within the model. However, like other researchers [25, 26], we view the CSSRM as a suitable approach for understanding a health condition that is prevalent and often recurrent.

We did not capture whether our participants had long-standing relationships as patients with the clinicians who recruited them or with any other clinicians. Continuity

Table 4 Illness outcomes, Emotional outcomes, and Coping appraisal

First-level and second-level model components	Representative quotes
Illness outcomes	
Disease state	You know, my back thing I guess will never go away. It will come and go and it's something that I live with. (P22ch) Then I was able to work it off and get into his office. But I think he said I was probably one of the worst that he's ever seen. (P23ch) Over time it eventually did heal and go away. (P20pt)
Physical functioning	I said I will continue with the exercises, but I do them once a day now, just stretching. And it really ... it makes a heck of a difference. (P23ch) Now I find that I live most days of the week, with some degree of pain. (P18pt)
Role functioning	I missed, actually, a lot of stuff with my kids and stuff, going out, because my back was sore. (P26fp)
Social functioning	It has kept me from social events. Even with some people I decide: 'Well, you know what? I just don't even want to go explain my whole situation to these people 'cause they're not getting it.' So, I'm not even going to go. (P11pt) I've got grandchildren so I try to be a little active with them... well, when I can be, you know. (P20pt)
Emotional outcomes	
Distress	I definitely think that's something I think about and would only get imaging done or tests like that done if it was absolutely necessary and I had a reason to. I felt like my experience was pretty traumatic and I wanted answers. (P27fp)
Psychological well-being	It's one of my pet peeves with the whole thing. So, I think, yes, having some testing... having any kind of definitive test that tells a person what's wrong so that they can go and get the right treatment and support, will absolutely help their emotional health and mental health. (P21ch) <i>[responding to question about potential negative consequences of imaging such as radiation exposure]</i> I believe most of us are aware of that. So, some people would prefer not to in that respect, I guess. Or the fact that if the scans don't show anything it might lead to more anxiety, and uncertainty. (P08pt)
Coping appraisal	
Coping appraisal on illness outcomes	I was only seeing [the chiropractor] and even after my first treatment with her I felt like it improved dramatically. (P15ch) [The chiropractor] gave me exercises to do and the exercises really, really helped. (P23ch) [The chiropractor has] always been able to dramatically change the outcome. (P22ch) I feel [the family doctor] did all the proper steps to get me to where I needed to go. (P26fp) Right now... it's much better than it was, but it does... it tweaks every now and then. So, I have seen [the chiropractor] since [name of month] for some adjustments. (P15ch) I do believe [the chiropractor] did help. It's just that I had so much inflammation in there that it just kept coming back. I would be great for a few days, and then it would be terrible again. (P21ch) Typically, one [to] three treatments from the clinic relieves that acute experience and I can get back to 'okay, it's just sore.' I can live with 'just sore.' (P18pt) Within a few sessions, the pain went away... really, really quickly. (P14ch)
Coping appraisal on emotional outcomes	I felt frustrated... because I was very, very certain that [there] was a problem. And [I] felt like people didn't... I mean I understand they're experts and everything, but I felt like people weren't listening to me. (P14ch) The [chiropractor] was constantly communicating with me, explaining what she was doing, explaining what the exercises she was giving me were going to do... [she was] very open and straightforward and pleasant and honest and reassuring. (P16ch) But I, I wish I could have at least seen [an image such as x-ray] ... If they told me 'No, there's nothing wrong with you' that would have been great for me, because I can live with ... knowing that there's nothing wrong instead of [leaving] me hanging a little bit. (P09fp)

¹ For explanation of patient code numbers, see note in Table 2

of care may be associated with recurring recommendations for imaging, which could play a significant role in patients' beliefs. Additionally, we reflect that our interview guide focused strongly on imaging and therefore participants who had strong beliefs about, or frustrations with respect to, imaging may have contributed more to our corpus of data. As such our dataset may be biased toward the views of patients who were not fully satisfied with respect to clinician trust and continuity of care.

We also acknowledge the limitations of having fewer patients recruited by family physicians rather than by chiropractors or physiotherapists, and of not achieving our aim of seeking to have every patient in this interview

component recruited by a unique clinician. The larger study from which these patients were recruited had far fewer patients recruited by family physicians than by members of the other professions, arising out of the timing of the larger study. Recruitment had started before the COVID-19 pandemic, was paused during primary care restrictions in Ontario, and resumed slowly after the restriction period. Many more family physicians than chiropractors or physiotherapists declined to re-start recruitment in the post-restriction period.

Conclusion

Our participants showed evidence of having a strong internal story about their experiences with low back pain. When asked about imaging, many of them linked imaging to certainty about diagnosis and their treatment plan. Patients' internal stories and beliefs change over time and are continually reshaped by their symptoms and worries, as well as the input of friends, family, and public sources of information. Subsequently, each opportunity for a clinician to provide education and reassurance should ensure the patient feels heard and that the clinician addresses the patient's current uncertainty, reinforcing the reasons why imaging is not warranted.

Abbreviations

CSSRM	Common-Sense Self-Regulation Model
CSM	Common-Sense Model
Fp	Family physician
Ch	Chiropractor
Pt	Physiotherapist

Supplementary Information

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Supplementary Material 1

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Authors' contributions

K.E.N. and S.F. developed the interview guide, which all authors then reviewed. I.M.T., L.H.-L., and K.E.N. reviewed transcripts and developed the coding strategy. I.M.T. and L.H.-L. coded the interview transcripts. K.E.N., A.M.P. and S.F. reviewed preliminary coding and themes. L.H.-L. and K.E.N. wrote the main manuscript text, and K.E.N. formulated the tables and figure. The manuscript was reviewed by I.M.T., A.M.P., M.G., J.G., J.A.H., J.H., N.M.I., H.J. and S.F., who contributed to revisions of the manuscript and reviewed the final manuscript.

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Data availability

The dataset generated and/or analyzed during the current study is not publicly available due to privacy and ethical restrictions, but is available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This research was approved by the Health Sciences and Affiliated Teaching Hospitals Research Ethics Board at Queen's University (REH-736-18) was conducted in accordance with the principles of the Declaration of Helsinki, and all participants gave informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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