

## Original article

# How people with lumbar spinal stenosis make decisions about treatment: A qualitative study using the Health Belief Model

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## ABSTRACT

**Objective:** Surgery rates for lumbar spinal stenosis (LSS) have increased despite inherent risks, high reoperation rates, and a lack of evidence for benefit over conservative treatment. Scant research has investigated how people make decisions about treatment, which may help clinicians better support patients during the course of care. The purpose of the present study was to explore the beliefs of people with LSS and how they make decisions about treatment.

**Design:** Cross-sectional qualitative study.

**Methods:** Semi-structured individual interviews were conducted with participants who had LSS (based on diagnostic imaging and recent symptoms). Transcribed interview data was analyzed using directed content analysis informed by the Health Belief Model.

**Results:** Twelve patients (mean age 75.3 years, range 63–87 years, 9 female, 6 with previous LSS surgery) participated. The Health Belief Model appeared useful for explaining decisions about treatment. Perceived threat of LSS was higher in those who had surgery. Patients who decided on surgery perceived themselves as more susceptible to surgery, often because of pathoanatomical beliefs. These patients had lower perceived control over symptoms and the treatment decision itself. Although patients saw benefit in conservative treatment because of its lower risk and ability to foster self-management, many had no or poor education and reported previous experiences with ineffective conservative treatment.

**Conclusion:** Patients with LSS make decisions about treatment by weighing the perceived threat of LSS against the perceived barriers and benefits of conservative treatment. Consistent and nonthreatening educational messages from clinicians may help these patients during their decision-making process.

## 1. Introduction

Lumbar spinal stenosis (LSS) is a common condition among older adults and has an estimated prevalence of 30% (Kalichman et al., 2009). Characterized by narrowing of the lumbar spinal canal or lateral foramen, patients present with neurological symptoms, such as lower extremity numbness and pain, that are classically worse on standing and walking and relieved with sitting or bending forward (Lynch et al., 2018). In older populations, LSS is the most common reason for spinal surgery (McCarthy et al., 2020). Recently, surgery rates for LSS have increased (Deyo et al., 2010; Grotle et al., 2019; Grøvlø et al., 2019), despite success of surgery estimated at about 60% (McCarthy et al.,

2020; Junge et al., 1996; Mannion et al., 2010; Martin et al., 2007). Side effects from surgery are experienced by 10%–24% of people (Zaina et al., 2016), and 1 in 4 people having lumbar decompression surgery will undergo a second operation within 4 years (Kim et al., 2013). However, evidence suggests surgery has no clinically important benefit over more conservative options, such as physical therapy (PT), exercise, or steroid injections (Zaina et al., 2016; Delitto et al., 2015; Machado and Ferreira, 2017). Carrignan et al. (2020) found only 34.1% of people having lumbar spine surgery had a PT visit in the year before surgery, suggesting people may not be getting referred for more conservative management. Of those who did, only 14.6% attended PT for at least 6 visits, despite evidence recommending more intensive PT (Minetama

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et al., 2020). Underutilization of PT has been identified in other musculoskeletal conditions, such as knee osteoarthritis and femoroacetabular impingement syndrome. (Iversen et al., 2018; Young et al., 2019) It is unclear why conservative treatment options for LSS are underutilized before surgery.

There is little understanding of the factors that drive behavior and treatment decisions of individuals with LSS. A theoretical framework of human behavior, like the Health Belief Model (HBM), may advance understanding of these factors (Herrmann et al., 2018). Initially developed to explain why people do not adopt disease prevention strategies, the HBM has since been applied to other health behaviors, such as decision-making about total joint arthroplasty (Ang et al., 2008). According to the HBM, people considering a recommended health behavior are more likely to take action when they perceive a serious threat from a health risk (perceived susceptibility and severity of the condition) and when engaging in the health behavior has fewer costs than benefits (Laranjo et al., 2016). The HBM also accounts for perceived self-efficacy in performing the health behavior and internal and external cues prompting action. These so-called “cues to action” can include exposure to advertisements or advice from others (Jones et al., 2015).

Despite LSS being the most common reason for spinal surgery in older adults, to our knowledge, no studies have investigated the decision-making process of these people. However, qualitative research guided by the HBM may explain this process (Herrmann et al., 2018). Understanding patient decision-making for treatment of LSS may provide clinicians with information to better support people during the course of care. The purpose of the present study was to explore the beliefs of people with LSS and how they make decisions about treatment.

## 2. Methods

### 2.1. Study design

This was a qualitative study using directed content analysis to explore the beliefs and decision-making processes of individuals with LSS. Semi-structured individual interviews were conducted by the primary investigator (SP) a novice, male clinical researcher. Informal training on qualitative interviewing and structured question development occurred prior to study initiation in consultation with LB, an experienced qualitative researcher. Ethical approval was granted by [BLINDED] Institutional Review Board.

### 2.2. Participants and recruitment

An initial focus group of 14 individuals with self-reported LSS recruited from a local health fair allowed the researchers to refine the research question and determine the compatibility of the HBM model for the decision-making processes of individuals with LSS. Following review of the data from the focus group, the decision to collect data using individual interviews was made because individual preferences influence healthcare decisions when the best treatment option is unclear (Kassirer, 1994; Wilson and Probe, 2020).

Participants for individual interviews were recruited from the primary investigator’s outpatient physical therapy private practice in Tucson, Arizona. Individuals with a diagnosis of LSS who had receive physical therapy services during the past year were invited to participate via email by the primary investigator (SP). Those with a prior history of lumbar surgery were not excluded, as it was believed they might provide valuable insights into decision-making about treatment. The diagnosis of LSS had been confirmed by their primary physician through magnetic resonance imaging (MRI). Additionally, included participants had to report symptoms in the past year consistent with a clinical diagnosis of LSS (lower extremity radiating pain worse on standing or walking relieved with sitting or bending forward), which was confirmed by the primary investigator (SP) (de Schepper et al., 2013). Individuals who responded to the email indicating their interest were contacted by phone

to provide information about the purpose and goals of the study. Participants were scheduled for the interview by the primary investigator (SP) after consenting to participate. After the sixth interview, the initial analysis phase suggested there may be differences in the decision-making processes of those who had (surgical group) or did not have surgery (nonsurgical group). Therefore, purposive sampling was used to recruit the remaining participants (Portney and Watkins, 2009). All individuals who were invited agreed to participate and none dropped out. All participants knew the primary investigator as a result of the care they received at his clinic.

### 2.3. Patient and public involvement

Patient and public involvement was sought throughout the study (Table 1). Collaboration with 2 patients (1 with LSS and 1 with social science research experience) led to formulation of the research question and the pilot focus group. After analysis, an infographic of results was e-mailed to participants to obtain their input on relevance and dissemination.

### 2.4. Data collection

Interviews lasting approximately 35 min (range 24 min–43 min) were conducted by the primary investigator (SP) using Zoom (Zoom Video Communications, San Jose, CA) videoconferencing technology and were video and audio recorded. Videoconferencing technology allowed for face-to-face interaction and observation of nonverbal communication (Archibald et al., 2019; Nehls et al., 2015). An interview guide included an initial open-ended question asking participants to describe their experiences with LSS and additional questions addressing components of the HBM (appendix 1). Descript (Descript, San Francisco, CA), a cloud-based speech-to-text technology, was used to transcribe interviews. Field notes were taken by the interviewer. Follow up interviews were not planned or used.

### 2.5. Data analysis

Researchers (BH or AM) verified transcripts for accuracy with the audio recording and began to note data consistent with the HBM. In directed content analysis, an existing theory is used as the framework for analysis (Hsieh and Shannon, 2005). During this initial phase definitions for each of the 6 components of the HBM were clarified (Table 3). Researchers (BH and AM) coded each transcript independently using Microsoft® Word and Excel. Following completion of data coding, the primary investigator reviewed the coding with these 2 novice researchers. The group compared the assigned codes of each researcher and the primary investigator served as a tie breaker if there was disagreement between the researchers. New themes were identified as

**Table 1**  
Patient engagement during the present study.

Research Phase	Patient Engagement
Formulation of the question	Two patients were involved in formulation of the question.
Initial exploration of the question	A focus group of 14 patients with lumbar spinal stenosis was used to verify importance of the clinical question, explore important concepts related to patient decision-making, and determine whether the Health Belief Model was likely to be compatible.
During data collection	At the end of the individual semi-structured interviews, participants were invited to provide feedback on the question.
Importance and dissemination of results	An infographic was created and sent to all participants to inform them of results. Participants were asked to provide feedback on the importance of the results, and advice and recommendations were solicited regarding dissemination of results.

**Table 2**  
Participant pseudonyms and demographic characteristics.

Pseudonym <sup>a</sup>	Age, y	Sex	Surgery (Y/N)	BMI
Ava S	84	F	Y	30.4
Ivy NS	70	F	N	29.6
Valerie NS	64	F	N	20.8
Margaret S	72	F	Y	23.6
Lisa S	72	F	Y	28.2
Andrew NS	81	M	N	23.6
Allison NS	71	F	N	34.2
Wade S	87	M	Y	23.2
Emily S	74	F	Y	24.9
Stewart NS	79	M	N	20.6
Judy S	76	F	Y	28.2
Cindy NS	73	F	N	26.0

Abbreviations: BMI, body mass index; F, female; M, male; N, no; NS, no surgery; S, surgery; Y, yes.

<sup>a</sup> Pseudonyms were given by using a random name generator and are presented in the order in which they were interviewed.

they arose after discussion and agreement by researchers (BH and AM) and the primary investigator (SP). Participants were consulted for context as needed, but transcripts were not routinely sent to them. Fig. 1 provides additional details about the data analysis process.

### 2.6. Data saturation and trustworthiness

Criteria for data saturation were defined a priori as no new codes or concepts for 2 consecutive interviews. Saturation was met at 6 participants in each group. Several strategies were used to ensure the trustworthiness of data collection and analysis, including triangulation, peer debriefing, member checks, an inquiry audit, and use of thick description (APPENDIX 2). The study used the Consolidated Criteria for Reporting Qualitative research (COREQ) (Tong et al., 2007) to direct reporting of their findings.

## 3. Results

### 3.1. Participants

Twelve people diagnosed with LSS participated (9 female, mean age  $75.3 \pm 6.5$  years). Of the 6 participants in the surgical group, 4 had an instrumented fusion of at least 1 vertebral level. All participants identified as White. Patient pseudonyms and demographics are presented in Table 2.

### 3.2. Applicability of the HBM

All components of the HBM (perceived susceptibility, perceived severity, perceived barriers, perceived benefits, and cues to action) except perceived self-efficacy were clearly identified through directed content analysis (Fig. 2). During analysis, it was decided that participants were describing perceived control over pain rather than perceived self-efficacy, a highly related but nonetheless slightly distinct concept. (Vanceleef, Peters) Whereas perceived self-efficacy relates to exerting control over one's environment, even executing a procedure meant to reduce pain, perceived control over pain is one's sense of their ability to control the pain itself. (Vanceleef, Peters) Perceived susceptibility and severity are often collectively referred to as perceived threat (Herrmann et al., 2018). In the present study, these components were independently defined, despite often overlapping in patient descriptions. Differences were found in the decision-making processes of people in the 2 groups. Table 3 includes definitions for each component of the HBM and additional exemplars.

**Table 3**  
Additional exemplars for each component of the Health Belief Model.

Model Component and Descriptor	Exemplars
<b>Perceived susceptibility</b> Beliefs about the likelihood of having surgery or that their condition would worsen with time.	<p>“But when the MRI, the MRI came back, it was like, oh aha. There it is. That’s the problem. And the surgeon said that it’s a simple fix. It was literally what he was showing me. As he explained to her, as I remember it, something had been pushed out of the spine. I think it was between the fourth and fifth. And, um, it had created a hard surface that was literally, he showed it to me. It’s tickling this, this vein, the nerve here. So it’s like, I just go in and I get rid of it. And so for me it was like, well, that’s a very simple process because it’s literally, there’s a very small incision. I think it was like a snip and I’m done.” (Margaret S)</p> <p>“Because if it had kept up, I wouldn’t be sitting and I wouldn’t be walking and my life would be pretty well shot for all practical purposes. It was to the point where . . . if it had gotten worse, I wouldn’t have the quality of life that I wanted. So yes, I was very concerned, but at the same time without surgery, the same risk was there. I could end up not being able to walk anymore.” (Emily S)</p> <p>“Well I was in the hospital [name omitted] and the neurosurgeon I had, I had 12 days in the hospital and the surgeon said to me, he says if we don’t operate on you, eventually you’ll lose the use of one leg. That’s what he said. And I was convinced that he was right because it was so painful.” (Wade S) (Patient later clarified he believed this meant the leg might later be amputated)</p>
<b>Perceived severity of LSS</b> Feelings about the seriousness of LSS, including beliefs about the effect of leaving it untreated or its impact on one’s life.	<p>“I had no choice. It was so painful. I mean, I mean dying was an alternative. It was really painful. As you know back problems could be, can be, very painful.” (Wade S)</p> <p>“I just couldn’t let it go the way it was going, because otherwise, I don’t know, maybe I’d wind up in a wheelchair or something like that, but I really had to do something because, uh, just walking or standing for 10 min. And it had kept on getting worse and worse. So, you know, potentially, I mean, I, I often, I would see people walking around with a walker or a cane or something like that, and I said this, I’m not going to do that. (Andrew NS)</p> <p>“In the extreme case, um, spinal stenosis can be debilitating, and I didn’t feel debilitating, I didn’t feel as if I was debilitated yet.” (Andrew NS)</p> <p>“It was to the point where. If it had gotten worse, I wouldn’t have the quality of life that I wanted. So yes, I was very concerned.” (Emily S)</p>
<b>Perceived control over treatment decision</b> Degree to which the person feels capable of controlling the treatment decision	<p>“So my decision was I was going to be really as diligent as I possible could be . . . with the physical therapy. And I also reasoned that one of the reasons that the previous times I had done physical therapy it was not terribly effective, is that I really did not develop an effective in-home program. Because . . . I also reasoned that . . . what I had was a chronic condition and I really had to do something, okay? Every day.” (Andrew)</p>
<b>Perceived control over pain</b> Degree to which the person feels capable of controlling their pain	

(continued on next page)

Table 3 (continued)

Model Component and Descriptor	Exemplars
	NS) "Oh, I was, I was, going for it. Like I said we are not doing surgery. We've got to do something and so I did." (Ivy NS)
	The amount of pain and how I can have it managed, it just got worse and I wasn't able to keep it under control. So I knew that whatever I was doing was not, not doing the trick. (Ava S)
	It [the pain] was a temporary. Temporary. I didn't think of it long term. I would come [to the PT clinic] and the pain level would go down a little bit, a little bit, you know, keep going down. (Ivy NS)
	My back got stronger for a while, but I wouldn't be talking to you if it weren't chronic. It can get better for a while, and then it would flare up, and then the pain was so bad that after on and off PT and exercise I was still trying to figure out what it would be like to be pain free or not have reoccurrences. Pain was the driver, you know, it was just excruciating. (Lisa S)
<b>Perceived barriers to conservative treatment</b>	Interviewer: Okay, so it sounds like there was kind of a, maybe not as much education about the condition.
Beliefs about the costs of the advised action, which can be tangible or psychological.	"Correct. The education was about the therapy, but you're right, it wasn't about the condition." (Lisa S)
	Interviewer: Do you feel like you got education of what the recovery would be like?
	"Yeah, I think I got education, but I didn't understand it." (Lisa S)
	Interviewer: So prior to that first round of PT, did you get any education about your back?
	"Nope. Nothing. And they really didn't give me a whole lot of education on any of it." (Ivy NS)
	"I came home and they sent me to another physical therapist up here to finish it, but that didn't help too much. It hurt more than it helped ... all they were interested in was, you know, giving me the exercises too ... but some of them, just, in some cases I hurt more afterwards than I did before." (Wade S)
<b>Perceived benefits of conservative treatment</b>	"The only risk brought up was the possibility of having an infection as a result of having this surgery. And, um, uh, the one thing that he didn't touch on, which, uh, I was very disappointed when I learned about this myself is his definition of success. And my definition of success is really quite a bit different. The, the definition of success, uh, that these, this particular surgeon said is if the pain would be alleviated for about a year." (Andrew NS)
Beliefs about the benefits of conservative treatment.	"Well, medications, it could be, you know, something like an aspirin for goodness sake, that's not very invasive. And physical therapy is, is not invasive, and it may help in relation to managing the way you're walking, standing and the exercise you take, etc." (Ava S)
<b>Cues to action</b>	"Anyway between these, these two physicians, they said they did not recommend that I have surgery. And I said, okay, that's fine with me. I really liked to hear that." (Andrew NS)
Anything that prepares the individual for the desired action, such as doctor's referrals, web searching, educational materials, or a friend's recommendation.	Interviewer: So how did those people

Table 3 (continued)

Model Component and Descriptor	Exemplars
	influence the decisions that you make, you think?
	"Well, uh, I would say that it did not make me afraid of having surgery that way, but I've always, you know, you always hear stories about people that have back surgeries or multiple back surgeries and they wind up no better than they were before. So I was not just anxious to jump in." (Stewart NS)
	"I read my own books, I looked up anything I could. I'm a nurse, so I, you know, I have access to some information and so yeah, I looked up as much as I could about that ... and I think people I talked with recommended, 'make sure you go to physical therapy.'" (Ava S)

Abbreviations: LSS, lumbar spinal stenosis; MRI, magnetic resonance imaging; NS, no surgery; PT, physical therapy; S, surgery.

### 3.3. Perceived susceptibility

All participants discussed perceived susceptibility. Beliefs about susceptibility to surgery were a major factor in decision-making patterns between groups. Participants in the surgical group reported feeling that surgery was inevitable; the nonsurgical group rarely expressed this. The reason for susceptibility was usually described in terms of pathoanatomy, and beliefs about the importance of pathoanatomy were almost always reinforced during consultation with a spinal surgeon.

Well, I did have, you know, a weakened spine system, the pain came from that piece of whatever material that was, it was hitting the nerve ... and that if I didn't get it out of there, it wasn't going to stop. (Margaret S)

The surgical group also believed their disability was likely to worsen without surgery. Participants in the nonsurgical group recognized that increased disability and surgery were possible, and this sometimes worried them. However, they did not consider it inevitable and expressed fewer concerns about susceptibility overall. As explained by one participant:

It's a possibility, but not an inevitability. I never thought I would eventually need surgery. I just dealt with the way it was in the moment. (Valerie NS)

### 3.4. Perceived severity of LSS

Perceived severity of LSS was discussed by every participant. They described LSS as something that could cause substantial pain and severely impact one's life. Participants in the surgical group described LSS as disabling more often, and most reported not being able to walk just before surgery. Some had attempted multiple conservative treatments and had symptoms for years before surgery. One participant shared how she made the decision to have surgery:

But the longer I went without any improvement month after month, it [surgery] became more and more likely. The amount of pain and how I can have it managed, it just got worse and I wasn't able to keep it under control. I couldn't crawl around for the rest of it, my life, that's for sure. (Ava S)

Participants in both groups described symptoms as occasionally severe and disabling. However, many participants in the nonsurgical group did not perceive symptoms as severe enough to warrant surgery and were less likely to express a negative impact on quality of life.

### Directed Content Analysis

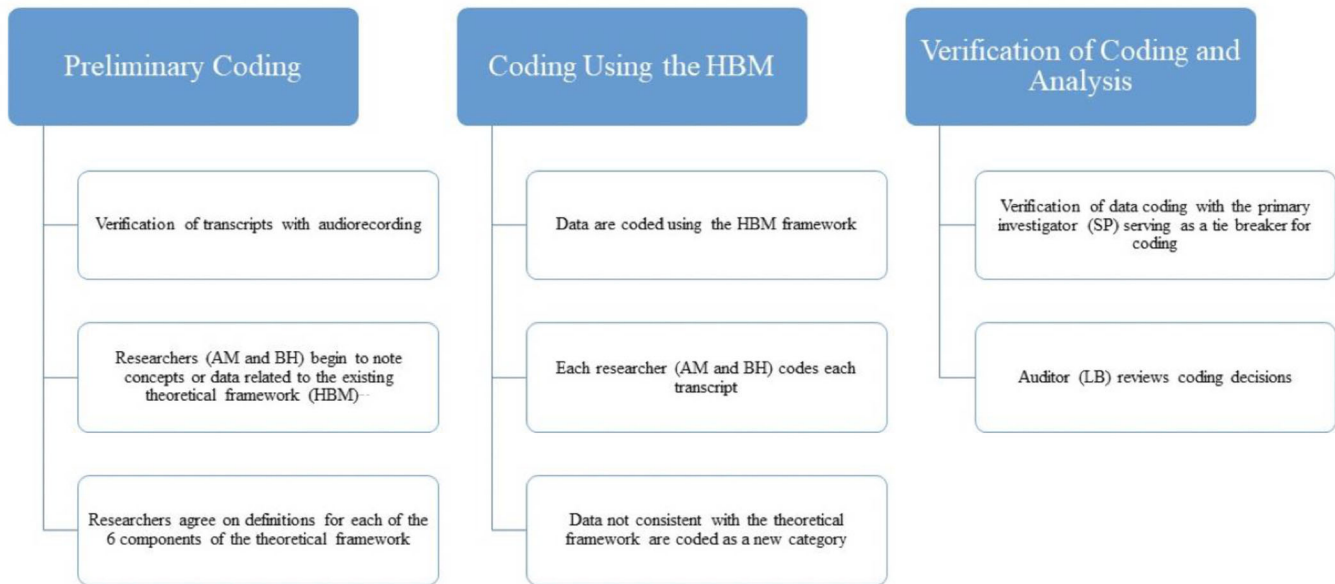


Fig. 1. Procedures for data analysis  
Abbreviation: HBM, Health Belief Model.

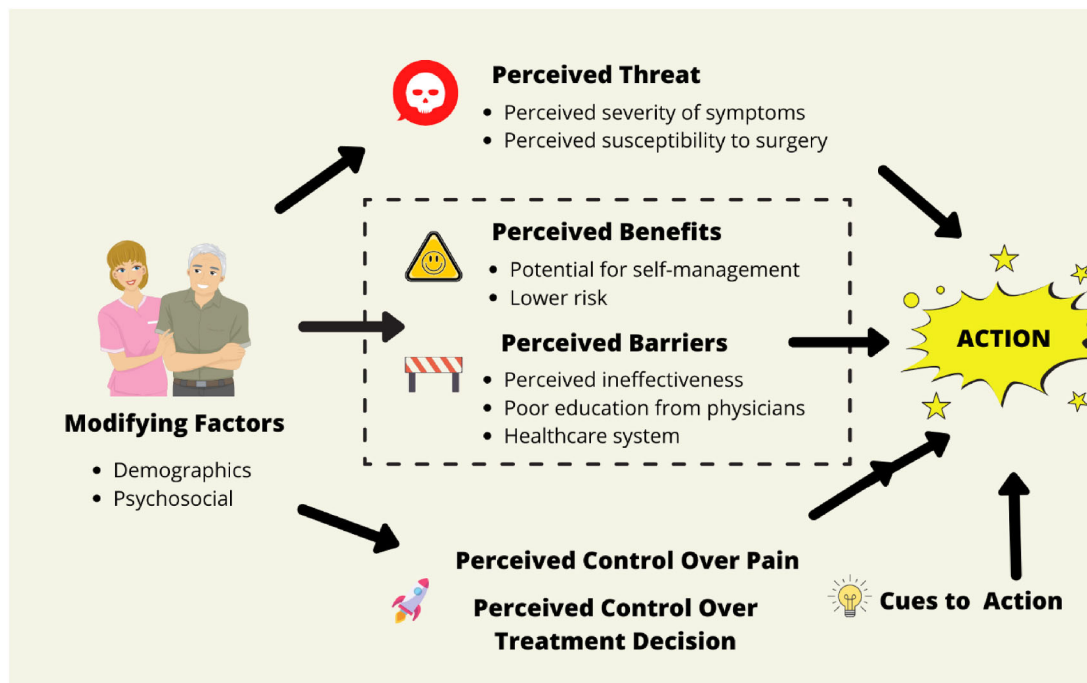


Fig. 2. Visual representation of the Health Belief Model and themes identified in the current study describing decision-making about treatment in patients with lumbar spinal stenosis.

I just haven't been convinced that I see that the odds are good enough having surgery and I'm not disabled enough yet to resort to it. (Andrew NS)

"I couldn't determine when it [the pain] was going to happen or what I did or didn't do that caused it." A similar sentiment was expressed by Emily S: "There's no real way to get rid of it. It's just there. It's going to be there, and that was depressing—that there wasn't—I found out there was nothing I could do at that point." Lower perceived control over pain often occurred alongside higher perceived threat. In other words, if participants didn't feel they could control their pain, the condition was viewed as more threatening.

#### 3.5. Perceived control over pain and treatment decisions

Every participant discussed thoughts related to perceived control over pain. Participants in the surgical group expressed having little perceived control over their pain prior to surgery. Margaret S explained,

That was my own evaluation of how the pain was being managed. And you know, I tried everything to manage the pain medication, injections, PT, and then when I couldn't walk I thought, well, that's it. I'll have to go to surgery. My, I was very reluctant to go to surgery, I put it off as long as possible. I thought surgery might be inevitable, but I didn't want it. (Ava S)

Participants in the nonsurgical group, in contrast, expressed greater perceived control over their pain. They often did this in a way that implied a lower perceived threat of their LSS.

I also have arthritis and stuff like that, and it feels a little stiff when I wake up in the morning. But then after starting to do the stretches...I feel pretty loose and...it feels pretty good... you know endorphins play a role in that too, but during the time when I'm exercising, I can exercise rather aggressively, and there's no problem at all. (Andrew NS)

Participants in the nonsurgical group expressed a more intense desire to avoid surgery. They often sought other sources of information and were prepared with questions for the surgeon. They also described being willing to modify their lifestyle to adhere to a home program and avoid surgery. This is in contrast to those in the surgical group, who expressed feeling that they were unable to influence their pain or influence the treatment direction. As a result, participants in the nonsurgical group expressed a greater sense of control over their symptoms and the eventual treatment decision.

I think in the end, the ball's in my court, I feel. Doing the exercises and not piling over on my body to do stuff. The ball is in my court, that's how I feel. Nobody else...I don't worry about things that you can't (control). That it doesn't do any good to worry about. You've got to do stuff and take steps to do something to make it better. (Valerie NS)

### 3.6. Perceived barriers to conservative treatment

Identified barriers were ineffective treatment, poor education, and the healthcare system. Ineffective treatment was mentioned by all participants. Many described being dissatisfied at some point with the quality of received PT, specifically exercises they felt they could do independently, exercises that caused pain, or inattentiveness of the physical therapist. Ineffective treatment was considered a waste of participant time and resources.

Nearly all participants described receiving no education or limited during interactions with healthcare providers. They often indicated physicians did not provide information about LSS or available conservative treatment options or that physician's explanations of treatment options were unclear. Many believed that receiving this education earlier would have impacted treatment decisions. The desire for better education is evident in the following statement:

Back then, you didn't have computers where you'd go look it [the diagnosis] up and see what it was later on. When all of a sudden, now you can say, well, gee, I wonder what those words mean .... Maybe if I had understood it better, I probably would have taken better care of my back. (Emily S)

The third barrier was related to the healthcare system. Participants reported having to see multiple providers before any conservative treatment was suggested. Several participants in the nonsurgical group described a physician who did not provide an early referral to PT and was dismissive of PT's ability to help. Participants in the surgical group were more likely to view healthcare system barriers as something they did not have control over. As one participant stated, "I felt like I didn't have a choice. I had to do what the system required me to" (Margaret S). Participants reported loss of time as the primary cost. No participants

reported barriers related to payment or accessing PT.

### 3.7. Perceived benefits of conservative treatment

Perceived benefits of conservative treatment, in particular the low risk and positive past experiences, were mentioned by all participants, but nearly twice as often by the nonsurgical group.

The perceived lower risk of conservative treatment options was often mentioned by participants when describing the decision-making process, particularly as a starting point for management of LSS. Concern about risks of surgery were more common in the nonsurgical group. The long recovery time for surgery and lack of assurance that symptoms would improve were major decision-making factors for the nonsurgical group.

So, you know, there's positives and negatives to surgery, but surgery for me is very difficult to recover from .... There's no guarantee that the surgery would help me. There's some chance it could make me worse. And surgery is so hard to recover from—for me anyway, I don't know if it is for everyone, but it is for me. (Valerie NS)

Participants also described positive past experiences with conservative treatment as a perceived benefit. Many had both positive and negative experiences with conservative treatment. The majority of positive experiences for PT in the surgical group were experiences after surgery. Participants in the nonsurgical group who had been to multiple PTs often defined a "good" PT experience as one in which they were given exercises they could not do on their own. They primarily valued exercises and self-management strategies, which they did not receive from other healthcare providers. Those in the surgical group also reported value in exercises or strategies learned during PT.

I had confidence in the fact that, I exercise a lot anyway and I'm aware of the conditioning effect and to some extent, you know, the idea that of treating back pain as a system of nerves, vertebrae, muscles, made a hell of a sense to me. So anyway, as I started doing the various exercises that were recommended, after a couple of weeks, I definitely started seeing some results that were very positive. (Andrew NS)

Steroid injections were almost exclusively described as a temporary solution when the pain was bad.

I knew my brother had spinal stenosis ... and he got an injection .... He was able to work out and strengthen his core after that. And as far as I know, he was didn't have an issue for years after that because he was able to work out .... So maybe that sort of made me want to do the injection. (Valerie NS)

### 3.8. Cues to action

Every participant was aided in their decision-making by information from inside and outside the healthcare system. In part because of a perceived lack of information received from physicians, participants reported consulting other sources for information. However, interactions with physicians influenced treatment decisions since physicians referred participants to other practitioners. Participants in the nonsurgical group were more likely to have early interactions with their primary care physicians during which surgery was discouraged.

Recommendations from friends or experiences of others were influential cues to action. Participants in the nonsurgical group more often described being aware of individuals who had not had success with back surgery, which dissuaded them from having surgery.

We have a good friend in San Diego that had a pretty serious back surgery and he, you know, it took him almost two years to recover from there. He had so many complications after the surgery or

complications from pain meds and or other things. ... So, um, that was a pretty big influence for me not to do it. (Allison, NS)

Participants also sought information from the Internet, television, and books; but none of these were mentioned often.

#### 4. Discussion

The purpose of the present study was to explore the beliefs of people with LSS and how they make decisions about treatment. We found people with LSS make decisions about treatment by weighing the perceived threat of LSS against the perceived barriers and benefits of conservative treatment.

##### 4.1. Applicability of the HBM

The present study suggested that the HBM provides an appropriate theoretical framework to understand patient decision-making about LSS treatment. As suggested by the HBM, participants' beliefs of the perceived threat of the condition (severity of their LSS and susceptibility to surgery), the benefits and barriers of conservative treatment, and cues to action influenced their decision to act. Participants in this study spoke more often about perceived control over pain than perceived self-efficacy. However, these concepts are highly related, and their technical distinction is unlikely to influence the applicability of the HBM.

##### 4.2. Clinical implications

Pathoanatomical beliefs about LSS often led to greater perceived susceptibility to surgery, despite a lack of evidence supporting an approach based on pathoanatomy alone (Zileli et al., 2020). Participants in the surgical group who had this higher perceived susceptibility to surgery also felt they had less control over the treatment decision. As a result, it appeared that beliefs about susceptibility negatively impacted perceived control over the treatment decision. This is similar to the finding that illness representations are related to self-efficacy in patients with osteoarthritis when using the common sense model of illness (Knowles et al., 2016). Overall, participants reported education about the treatment options for LSS was limited or even threatening in nature, leading participants to believe their leg might be amputated or they may end up in a wheelchair (Table 3). Lack of education regarding the risks, benefits, complications and alternatives to surgery from healthcare providers has also been reported by people undergoing surgery for LSS (McCarthy et al., 2020) and disc herniation (Andersen et al., 2019). This lack is concerning given clinical practice guidelines emphasize education (National Institute for Health, 2020) and evidence suggests people with low back pain want clear and personalized messages (Lin et al., 2020). Therefore, clinicians should strive to implement education that is nonthreatening and personalized and encourages self-management.

In the present study, perceived severity of LSS was also a factor in decision-making about treatment and was discussed more in the surgical group. Lower perceived control over pain also appeared to be related to higher perceived threat, which was particularly evident in the surgical group. The connection between perceived control over pain and perceived threat has been suggested by others (Arntz et al., 1989). Our finding that participants with higher perceived severity chose surgery may be caused by higher expectations for pain relief after surgery (Canizares et al., 2020). Previous research has shown that people with sciatica find a compressive pathological model particularly easy to understand (Goldsmith et al., 2019). During the educational process, efforts should be made to educate people on the multidimensional nature of pain and the lack of evidence for better pain reduction after surgery than with conservative treatment (Zaina et al., 2016; Delitto et al., 2015).

When weighing benefits and barriers to conservative treatment, participants with LSS considered the lower risk and individualized self-

management of PT as a benefit. This finding was consistent with studies that showed people with low back pain and stenosis valued individually tailored education and exercise (Lynch et al., 2018; Lin et al., 2020; Chou et al., 2018). A barrier to conservative treatment was perceived ineffectiveness of previous PT; therefore, clinicians should prioritize evidence-informed strategies in this population (Lynch et al., 2018; Lin et al., 2020; Chou et al., 2018). Perceived barriers of conservative treatment also included factors related to the healthcare system, such as visiting multiple physicians before beginning conservative treatment. Ryan et al. (2020) found that healthcare system barriers forced people to be more independent and proactive, similar to the higher perceived control over the treatment decision seen in the nonsurgical group of the present study.

Given these results, exit interviews with people withdrawing or crossing over from conservative management to surgery should be included in LSS trials. To our knowledge, no such protocols currently exist. Additionally, it may be important to determine which messages or educational interventions are most meaningful to people with LSS to increase attempts at conservative treatment.

##### 4.3. Limitations

There are several limitations to the present study. During interviews, participants retrospectively reflected on their decision-making process and may not have recalled that process clearly. However, establishing criteria for data saturation created transparency and mitigated bias during data analysis. Participants were also recruited from the same geographic area and had a similar racial background, so results may not be generalizable to other populations or healthcare systems outside of the United States. Patients were recruited from an outpatient physical therapy setting, which also might affect generalizability.

#### 5. Conclusion

For participants in the present study, the decision to have surgery seemed to be heavily influenced by the perceived threat (perceived susceptibility and perceived severity), often increased by pathoanatomical beliefs, and by their perceived control over pain. Improving delivery of nonthreatening education, empowering patients with effective self-management, and delivering individualized care may improve conservative treatment of LSS.

#### 6. Key points

**Findings:** The Health Belief Model was useful for understanding how people with LSS made decisions about treatment. A greater perceived likelihood of having surgery—because of pathoanatomical beliefs or belief that the condition may worsen—decreased the participant's perceived control over the condition or treatment decision. Poor education, ineffective treatment, and the healthcare system were barriers to conservative treatment.

**Implications:** Healthcare professionals can influence patient decision-making, potentially reducing unnecessary spinal surgeries. Our findings suggested clinicians should focus on nonthreatening, individualized educational messages and provide opportunities for high-value conservative treatment.

**Caution:** Participants retrospectively reflected on their decision-making process during the semi-structured interviews and may not have recalled that process clearly.

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## Contributorship statement

All authors substantially contributed to the conception or design of the work, or the acquisition, analysis, or interpretation of data; drafted or revised the work critically for important intellectual content; gave final approval of the version published; and agreed to be accountable for all aspects of the work.

## Institutional review board statement

The A.T. Still University-Arizona Institutional Review Board considered the current study exempt (#2020-081).

## Declaration of competing interest

All authors declare that they have no financial disclosures or conflicts of interest to report.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.msksp.2021.102383>.

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