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A Qualitative Study of Factors That Influence Older Adults' Work on the Arduous Path to Spine Surgery

Andrea L. Strayer^{1,2,3}   | Samantha Bjornson¹ | Nicole E. Werner^{4,5} | Anna Krupp¹ 

¹College of Nursing, University of Iowa, Iowa City, Iowa, USA | ²Department of Neurosurgery, Carver College of Medicine, University of Iowa, Iowa City, Iowa, USA | ³Department of Veterans Affairs, Veterans Health Administration, Office of Academic Affiliations VA Quality Scholars Advanced Fellowship Program, Iowa City VA Medical Center, Iowa City, Iowa, USA | ⁴Department of Anesthesiology, Vanderbilt University School of Medicine, Nashville, Tennessee, USA | ⁵Center for Research and Innovation in Systems Safety, Vanderbilt University Medical Center, Nashville, Tennessee, USA

Correspondence: Andrea L. Strayer (Andrea-strayer@uiowa.edu)

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ABSTRACT

Background and Aims: Older adults worldwide are increasingly diagnosed with degenerative spine disease (DSD). Although older adults are frequently interacting with the healthcare system, clinicians are likely not aware of the many health-related activities, or patient work that older adults engage in to achieve their health goals. An understanding of patient work is needed to guide patient-oriented healthcare improvements for older people having surgery for DSD to achieve their desired health outcome. Our aim was to define factors in the patient work system that influence the patient work of older adults in the preoperative phase of spine surgery.

Methods: Secondary analysis of data (28 interviews) from older adults who underwent spine surgery, using deductive and inductive qualitative content analysis to describe patient work system factors. Components from the Systems Engineering Initiative for Patient Safety (SEIPS) 2.0 human factors ergonomics framework (person, organization, task, internal and external environments, tools/technology) guided 2-member independent coding, codebook evolution, and team analysis.

Results: We identified 16 patient work system factors that influenced older adults' patient work during the preoperative time before spine surgery. The primary work system influencers included: severely limited physical function; inability to socialize; multiple providers and appointments; self-management knowledge; emotions and mental state; active decision making; explaining treatment options; inability to complete household chores and self-care; physical and emotional care and monitoring (by family); family coordinating care; household duties relinquished; complex scheduling of healthcare; home layout; insurance requirements; waiting for care; and devices to manage symptoms (medications; mobility hardware).

Conclusions: Factors that influence patient work are often a result of debilitating symptoms causing loss of independence, isolation, and confusion of how to meet their health goals. The influencing factors warrant research and process improvement initiatives. Thus, lessening the patient work burden and improving health outcomes.

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Summary

- Patient work is the physical effort and dedication of time that patients complete at home and across health settings to meet their health goals.
- Person-specific factors that influence older patient work on the long journey to spine surgery are often a result of debilitating symptoms causing loss of independence, isolation, and confusion of how to meet their health goal of “having a normal life again.”
- A system-based framework identified several factors that influence patient work during the preoperative period and may be useful in designing future improvements.

1 | Introduction

The global burden of degenerative spine disease (DSD) impacts approximately 266 million people [1]. In the United States alone, Medicare beneficiaries are diagnosed with lumbar DSD at an alarming annual incidence of 31.5% [2]. Degenerative changes in the spine often result in a progressive, protracted course of pain, impaired function, loss of independence, and exacerbation of aging syndromes [2–4]. Striving to relieve debilitating symptoms and improve quality of life [5, 6], increasingly older adults around the world are undergoing spine surgery [7–9].

Beginning with symptom onset, older adults experience an extensive journey, often multiple years, before spine surgery [6]. Pain and functional loss in combination with comorbidities can be additive during a prolonged time course, and possibly lead to poor outcomes from symptom duration [3, 10]. Research indicates that older adults’ perceptions of the preoperative phase are misaligned with those of healthcare clinicians. While clinicians’ perspective is that the preoperative phase begins with the decision to have surgery, older adults perceive this as a multi-year process [6] and often find themselves navigating their symptom management without clear direction. This misalignment results in a healthcare quality gap for older adults and the outcome they wish to achieve.

One aim healthcare organizations support is a person-centered quality aim which includes patients’ preferences, needs, and values to meet their health goals. However, despite older adults increasingly electing spine surgery to manage their symptoms, little is known about the goal-directed, person-centered health-related activities that older adults engage in at home and across healthcare settings during the preoperative time course. The symptom management, often arduous, experienced by older adults can be conceptualized as a type of work—patient work. Patient work is the physical effort and dedication of time that patients complete at home and across health settings to meet their health goals [11], and it is shaped by the dynamic patient work system (PWS). Patient work is often invisible or under-recognized by healthcare providers [12]. A recent state-of-the-science review reinforces understanding that the PWS provides important opportunities for enhancing patient-centered care by supporting patients in achieving their health goals and improving patient work [13]. Understanding the PWS also provides important foundational guidance for improving the

quality and outcomes for older adults who are planning to have spine surgery. By placing the person (patient) in the center of all the interacting components, SEIPS 2.0 recognizes the person is central and of primary importance (Table 1; Figure 1) [13, 18]. Therefore, we designed this study to understand the goal-directed, person-centered health activities that older adults engage in at home and across healthcare settings during the preoperative time course before spine surgery. Thus, our aim was to identify the factors in the PWS that influence the patient work of older adults in the preoperative time before spine surgery using the SEIPS 2.0 model.

TABLE 1 | Description of the conceptual framework, the patient work system, and the components that comprise the patient work system.

Conceptual framework
The Systems Engineering Initiative for Patient Safety (SEIPS) is a group of human-factors engineering, sociotechnical system models that have been used extensively in understanding healthcare work systems and are increasingly being applied to understand PWS [13, 14]. Each SEIPS model applies Donabedian’s (1998) Structure–Process–Outcome model for assessing quality [15]. SEIPS operationalizes “structure” as the work system, which is comprised of interacting components that influence processes that produce an outcome [13]. For this study, the work system is patient-focused, with the process being patient work, leading to the outcome of spine surgery.
The patient work system
The SEIPS 2.0 model is used in this study to analyze the PWS and thus, how the PWS shapes the work that patients do in relation to achieving their health outcomes [14–17]. In SEIPS 2.0, the work system components (person, organization, tasks, tools and technologies, and physical and external environments) each have characteristics or defining elements [16, 17].
The patient work system components
Person: The characteristics of the person component include concepts such as their knowledge, skills, physical characteristics, and motivation. Organization: The characteristics of the organization component include concepts such as coordination, communication, and social relationships. Organization can be within a work or a family setting. Tasks: The characteristics of the tasks component include physical and cognitive tasks, such as the degree and number of demands, cognitive load, and the content of the tasks. Tools and Technology: The characteristics of the tools and technology component include items such as medical devices, medications, and computers. Also included is the usability of a tool or technology. Physical Environment: The characteristics of the physical environment component include structural items such as the layout of the home, what the lighting is like, and stairs. External Environment: The characteristics of the external environment component includes items such as insurance coverage and decisions the person feels they have no control over.

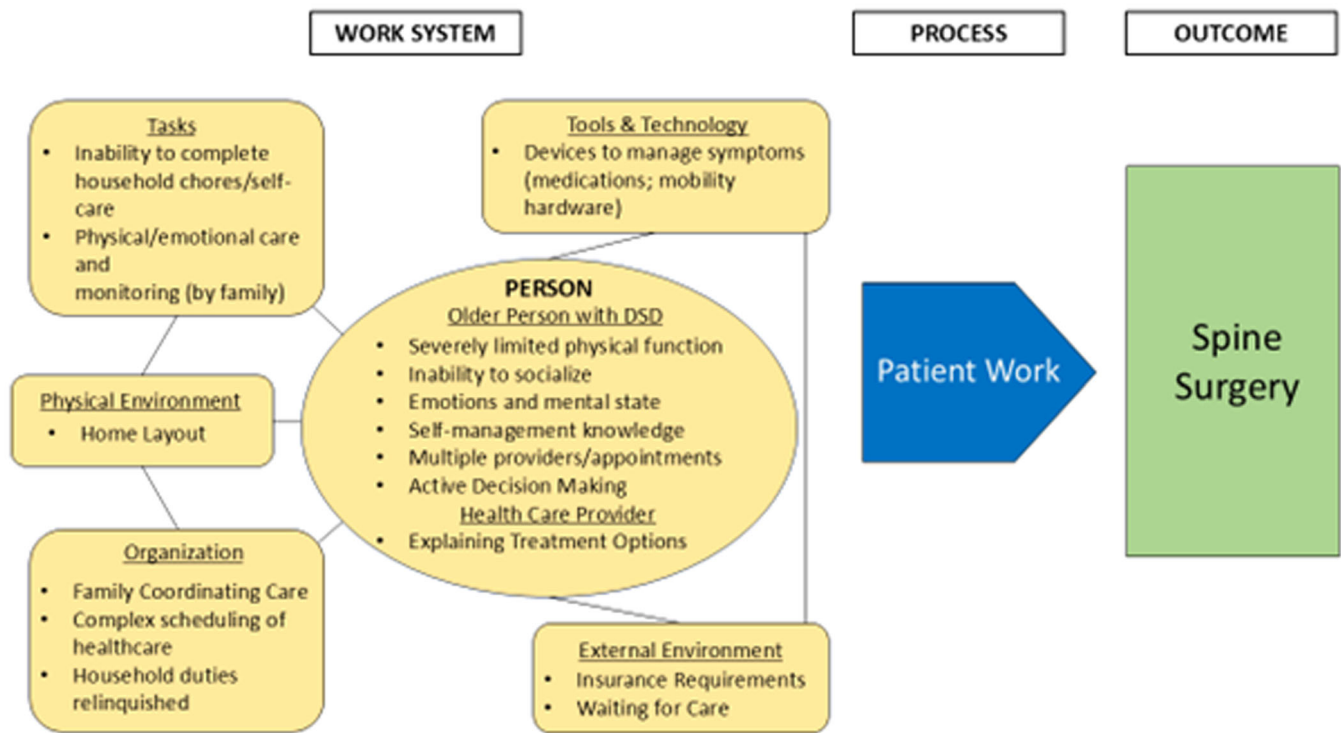


FIGURE 1 | The patient work system with influencing factors found in this study. The patient work system with the influencing factors of patient work (process) of the older adult getting to spine surgery (outcome).

2 | Methods

2.1 | Secondary Qualitative Data Analysis

We conducted a secondary qualitative analysis of interview data using deductive and inductive content analysis deemed exempt by the University institutional review board (#202210470). A full description of the design, recruitment, and data collection methods of the parent study is reported elsewhere [6]. In brief, the parent study used qualitative grounded theory methods to understand the trajectory of older adults who were hospitalized after spine surgery. Eligibility requirements included people aged 65 years and over who had undergone elective surgery for degenerative spine disease. Fourteen participants completed two interviews (T1 and T2) between December 2020 and September 2021. T1 interviews were completed in the patient's hospital room after surgery and before discharge and ranged from 12 to 50 (mean = 30.6) min. T2 interviews were completed 1–3 months following discharge and ranged from 19 to 65 (mean = 40.2) min. Participants consisted of 8 females and 6 males with an age range from 65 to 84 years (mean 73.9 years).

2.2 | Data Analysis

First, the SEIPS 2.0 model guided a deductive content analysis [19–21] to identify work system components in the PWS. A codebook using the SEIPS 2.0 components of person(s), organization, tasks, physical and external environments, and tools and technology was developed. The person component was further specified to describe the patient, healthcare provider, or family and friends.

To ensure coding rigor, initial coding was completed in face-to-face sessions. The team used consensus discussion to refine codebook definitions and identify codebook exemplars. The team coded a total of 8 transcripts together to achieve consistency, and then two team members (ALS, SB) initiated independent coding. The team met weekly to compare independent coding until group consensus was reached. Next, the coded segments were analyzed inductively [21] to synthesize elements within each SEIPS component into specific factors in the PWS that influence the patient work of older adults in the preoperative time before spine surgery. We defined an influencing factor in the PWS as a factor that could be a barrier or a facilitator, hence, it was influencing patient work. Finally, our team identified a primary and a secondary work system component associated with each influencing factor using group consensus, given the dynamic and interactive nature between the work system components [16]. For instance, severely limiting physical function primarily influences the person (patient) to do the secondary component of the task. We used MAXQDA qualitative data software to organize the coding process [22].

2.3 | Trustworthiness

Strategies to assure trustworthiness included a team with expertise in human-factors engineering (HFE) and/or gerontology nursing for data coding and analysis (credibility). If any disagreement occurred, the data were revisited and discussed as a team until consensus was reached. Memo-writing to record researchers' insights was utilized (dependability). The team assured the data supports the findings (confirmability), results are the participants' range of perspective (authenticity),

and readers can see the findings in their own healthcare environments (transferability).

3 | Results

We identify the factors in the PWS that influence the patient work of older adults in the preoperative time before spine surgery using the SEIPS 2.0 model (Figure 1). We identified 16 influencing factors of the PWS of older adults during the spine surgery preoperative time (Tables 2–5). The influencing factor attributes (*italics*) of patient work are described within each of the primary PWS components (**bold**).

3.1 | Influencing Factors by Patient Work System Component

3.1.1 | Person

The person component is situated in the center of the work system and interacts bidirectionally with the other work system components [16]. We identified two person components: the patient with DSD and the healthcare provider (HCP). A full description follows.

3.1.1.1 | Person-Patient With DSD. The **person-patient** influencing factors were substantial and arose from all aspects of their personhood. For example, participants discussed approaches to coping (psychological factor) with pain by altering their activity level (physical factor) to lessen the severity of the symptoms they were experiencing. Further detail follows (*influencing factors in italics*).

Physical factors: For all participants, having *severely limited function/mobility* influenced their ability to attend *multiple appointments*, conduct their normal activities, and caused great distress. Participants discussed trying to “deal with” the limited function and pain with walking, and vocalized that it kept getting worse, with many stating “I couldn’t do anything”.

Psychological factors: Participants described *motivating or negative emotions and mental state*. Many participants seemed to have an emotional dichotomy within them, as if being on a roller coaster of emotions. This emotional variability led to indecision about what to do about their symptoms or whether they should have surgery or not. For others, they seemed to either exhibit negative or motivating emotions. Negative emotions might be exhibited in difficult interactions with friends or family, while motivating emotions were often verbalized as “hope”.

TABLE 2 | Primary work system component: Person.

Primary work system component	Secondary work system component	Influencing factor	Exemplar quote
Person-patient	Task	Severely limited physical function	“my pain was in my legs and butt...I could not ...be on my feet too long at all.” P14T2
	Task	Inability to socialize	“...they don’t even invite you anymore... they know you can’t go... it’s like you kind of lost contact with everybody.” P8T1
	Organization	Multiple providers and appointments	“...there’s nothing we can do...I went to pain clinic...they weren’t working... I’d go to another pain clinic... from clinic to clinic...giving me different doctors and everyone canceled... they sent me here and said I think I can help you.” P10T1
	Task	Self-management knowledge	“I figured I would never be able to return to running... but that’s okay because I can still bike, swim, and hike, so. I’ll be able to return to a higher activity level again.” P6T1
	Task	Emotions and mental state	“It was very disappointing and discouraging. Because - I mean for mostly because I knew I would have to endure all that pain for two more months. But it was 2 months longer that I wouldn’t have a life.”P4T1
	Task	Active decision making	“I just had to wait to get in. Yeah. Once I made up my mind that I was going to have it done. It was, I just went ahead with it.” P14T1
Person-HCP	Organization	Explaining treatment options	“ I guess for, with my situation, there’s two ways you can do the surgery... he said, no, I think you’re going to require the, the more complicated one, because your, your spine will be too weak after I take the bone, the necessary amount of bone out.”P7T1

Note: This table describes the influencing factors for the primary work system component of “Person.” Described with each influencing factor is the secondary work system component and an exemplar quote.

TABLE 3 | Primary work system component: Organization.

Primary work system component	Secondary work system component	Influencing factor	
Organization	Person-family/friends	Family coordinating care	“You should be talking to my daughter... I don’t do any of it... She makes my appointments, does my, uh, running me wherever I must go.” P5T1
	Person-family/friends	Household duties relinquished	“Well, my husband is great. I assigned him to cook, chief cook and bottle washer, and he’s been doing all of that. He was doing that before surgery because I couldn’t stand. I couldn’t do anything.” P10T2
	Person-HCP	Complex scheduling of healthcare	“I had one appointment...a mistake by his secretary...he was on vacation...so we had to change that date...there was a date before that too that was changed.” P12T2

Note: This table describes the influencing factors for the primary work system component of organization. Described with each influencing factor is the secondary work system component and an exemplar quote.

TABLE 4 | Primary work system component: Tasks and tools/technology.

Primary work system component	Secondary work system component	Influencing factor	
Tasks	Person-patient	Inability to complete household chores, self-care	“Even simple household tasks of taking something out and moving something over I could not at all do.” P1T1
	Person-family/friends	Physical and emotional care and monitoring	“I couldn’t do much exercising. But I would—I have a really best friend be in the circle we live in. And she would walk around with me—round and round the circle. Me with my walker and her just walking with me. And that helped.” P4T1
Tools and technology	Task	Devices to manage symptoms (medications; mobility hardware)	“I went to the Emergency Room because it hurt so bad. And he gave me some medicine, and it just didn’t do nothing. I mean, I walked. I couldn’t sit down, I hurt so bad, I walked, and walked.” P9T2 “...there’s been some nerve damage...it makes my leg a little weak, and it makes my foot particularly weak... more like aching... it was a real problem in walking. I got an ankle brace, which helped a lot...it makes your foot stay up instead of letting it sag.” P7T1

Note: This table describes the influencing factors for the primary work system components of Tasks and Tools/Technology. Described with each influencing factor is the secondary work system component and an exemplar quote.

In addition to emotions, the *self-management knowledge* participants possessed and being an *active decision maker* in the process influenced the work system. Some participants had knowledge from prior general surgery, prior spine surgery, or from family who had undergone surgery. Other participants had very little self-management knowledge. All participants discussed being an *active decision maker* as to whether they were or were not going to have surgery. Some, however, felt they had no choice but to have surgery, they had to do something, they could not live like this.

among participants. Participants described functional isolation as staying home because of pain and immobility. Socialization loss included the inability to travel (even short distances), hobbies, or social events with friends. Some had to give up jobs, which were both a social outlet and a financial asset. They could not participate in activities outside the home as they once had, even if they had a spouse/person living with them. Those without a spouse discussed loneliness. On the other hand, one participant described COVID as equalizing socialization. Now, she was no different from her friends, everyone had to stay home.

Social factors: The *inability to socialize* with friends and family because of pain and *functional isolation* was a common point

3.1.1.2 | Person-Healthcare Provider. The **person-healthcare provider** describes factors that healthcare personnel

TABLE 5 | Primary work system component: Physical and external environments.

Primary work system component	Secondary work system component	Influencing factor	
Physical environment	Task	Home layout	<p>“The other problem is we have a two-story home. The bathroom in the basement. Bathroom upstairs. So, you got to go up or down.” P5T1</p> <p>“Our house is handicap accessible. Because I want to make sure that if something goes wrong, I can remain in my home.” P2T1</p>
External environment	Organization	Insurance requirements	<p>“So, I called my insurance company... they said, no, you don’t have to jump through those hoops.” P6T1</p>
	Organization	Waiting for care	<p>“...that was the bad part...almost 5 weeks before I could get in here. So, I don’t think that helped... the longer you wait... the worse it gets... So. I didn’t decide, the doctor, he was that backed up. So, no, it wasn’t my decision. I wanted to do it the next day. But they said I had to wait...” P11T1</p>

Note: This table describes the influencing factors for the primary work system component of Physical and External Environments. Described with each influencing factor is the secondary work system component and an exemplar quote.

exhibit when interacting with participants. The healthcare provider *explaining the disease and the treatment options* influenced the participants to go ahead with surgery. Some discussed the detailed explanations they received; others stated they were only told surgery would help them. Even though there was evident dichotomy in the information they received, participants verbalized what they were told was a help to them to decide about surgery. Not all participants felt their provider was knowledgeable about what was needed from insurance or the healthcare system. Those who did not, felt they had more barriers during the preoperative phase of spine surgery.

3.1.2 | Organization

Organization describes the structures to organize resources, time, activity, and space in a patient’s home or other setting [16]. *Complex scheduling* made it difficult for participants to move forward during the preoperative phase of surgery. On the other hand, because scheduling their healthcare needs was so complex, some used a family member to coordinate care. *Family coordinating care* was not seen with all participants. Those without family support discussed the frustration of trying to figure out scheduling. For some participants, a social network was available and took over *household chores* that the participants reluctantly relinquished. When participants did not have a social network to relinquish to, chores were incomplete or left undone.

3.1.3 | Tasks

Tasks are the specific physical or cognitive actions that patients perform [16]. Tasks were influenced by *the inability to complete household chores/self-care*. This inability seemed to promote the participants wanting to undergo surgery. Some participants noted family and friends were there for them, providing

physical/emotional care and monitoring. The care and monitoring ranged from spouses being present for them throughout each day, to friends and distant family checking in both in-person and remotely to provide meals, pet-care, shopping, and transportation, as well as regular telephone interaction.

3.1.4 | Tools and Technology

Tools and technology are the objects used to assist people in doing work [16]. The tools used by participants that influenced their work were *devices to manage symptoms* such as *medications* and *mobility devices*. Participants described that *medications* did not help their symptoms, and they did not like the side effects. Medication side effects influenced participants to schedule surgery. Participants hoped they would no longer need these medications after surgery. *Mobility devices*, while on the surface seem helpful for mobility and independence, to participants they influenced the need for surgery because they did not want to rely on mobility devices.

3.1.5 | Physical Environment

Physical environment describes where participants live. Especially for an older adult in pain with mobility issues, their *home layout* and *safety features* are a key feature. Very few participants discussed these practical, yet critical influences. Those who did, described a range of home features or needs, from handicap accessible living to a two-story home with the only bathroom up a flight of stairs.

3.1.6 | External Environment

The external environment includes policy, economic, ecological, and societal impacts [16]. Knowing and meeting *insurance*

requirements and *waiting for care* were major factors. Insurance requirements were confusing to participants. Some stated the HCP knew what was required, giving the participant relief. All participants experienced long delays for surgery. Some were due to a backlog of cases from COVID, some because of mis-scheduling, and some because they decided to wait to have surgery. Most indicated that once they finally decided to have surgery, they wished they could have had it sooner.

4 | Discussion

We identified 16 factors in the PWS influencing patient work during the preoperative time before spine surgery. Severely limited physical function and inability to socialize seemed to be most significant and the crux of all factors for the participants. Participants experienced repetitive risk for adverse quality and safety occurrences because of the long preoperative time and complexities in the PWS.

A recent literature review of HFE work system analysis of patient work found a scarcity of patient-centered surgical research and none during the preoperative phase of care [13, 23]. Safety risks when transitioning from hospital to home (e.g., poor communication, coordination, resource needs not met) [18, 24, 25] are similar to our findings during the preoperative time. However, unlike the relatively short hospital-to-home transition, the preoperative time is quite lengthy with increased potential for repetitive safety risks for the older adult navigating their progressive symptoms and healthcare complexity [6].

Preoperative optimization strategies before spine surgery, such as improving comorbidity management, weight loss for spine and general health, smoking cessation, physical activity in any form, and patient counseling regarding degenerative changes in the spine as well as the indications for surgical consultation, reduce postoperative complications [26]. However, these strategies may be challenging for geriatricians and primary care physicians to implement given the pain and mobility changes that plague older adults during the protracted preoperative period. Future work is needed to better understand how clinicians and patients work together to individualize and optimize preoperative care within the context of existing patient work.

Our participants experienced multiple appointments with a variety of clinicians and a lack of a clear plan for progressing towards their health goal. Our findings support the need for preoperative care coordination between primary and specialty care [27]. Our findings broaden the scope of current literature to an understudied and burgeoning older patient health issue and identify important opportunities for improving care coordination in the preoperative period.

Interestingly, family involvement in the PWS was not a primary component. Family/friends factors (i.e., family/friends coordinating care, household duties relinquished; physical and emotional care and monitoring by family) were secondary components under the primary components of organization and tasks. This finding contrasts with older adults' perspective of family/friends' involvement during hospitalization, transition from the hospital, and postoperative recovery [6, 24, 28]. Quality improvement

investigation to untangle the role of family/care partner/friends and recommend best practices during the preoperative time may decrease the burden on older adults. Importantly, many older adults do not have friends or family to help decrease their burden. Thus, individualized patient-centered interventions are needed.

4.1 | Implications for Policy, Practice, and Research

Insurance requirements and waiting for care directly impact high-quality care, requiring policymakers and healthcare organizations to intervene so that patient as well as organizational burden is decreased. A possible contributing factor to waiting for care is ageism influencing the PWS. Ageism is defined by the World Health Organization as the stereotypes, prejudice, and discrimination directed toward people based on their age and is associated with a shorter life and slower recovery from a new disability [29]. A global systematic review of ageism's impact on health (422 studies; 45 countries) noted ageism was associated with worse outcomes, including a poor quality of life, devalued lives, denied access to health services and treatments, and physical illness [30]. Ageism is costly, occurring from structural (healthcare system) as well as an individual level (ageism self-perception) [29, 30]. Our findings are consistent with negative aging biases of older adults requiring spine surgery (e.g., ongoing pain, feelings of hopelessness) and positive aging attitudes (e.g., motivation to return to the previous level of function, participation in PT, and wanting to be normal again). The association between ageism self-perceptions and health [31] as well as structural ageism warrant discovered mechanisms to change negative attitudes and promote positive. Doing so would positively impact older adult outcomes.

Maximizing education for older adults and healthcare clinicians to improve quality and safety is warranted to impact factors influencing this PWS. For instance, policy and practice changes providing age-appropriate education [32–34] through multimedia sources regarding degenerative spine conditions [35], when to seek medical attention, treatment options [36], meeting their age-specific spine health needs [37], and anti-ageism messages may help decrease older patient burden. Unfortunately, recent evidence brings to light concerns about the readability of current spine resources [38] and calls for resource standardization [39]. Older adults having access to appropriate resources afford the opportunity for increased health literacy. In younger cohorts, low patient resilience has been associated with higher levels of disability from neck and back pain [40]. Further, preoperative high patient resilience has been associated with improved postoperative outcomes following spine surgery [41, 42]. Additionally, in total hip and knee replacement, increased patient knowledge and resilience were also associated with improved postoperative outcomes [43–46].

Resilience may be advantageous for managing symptoms during the prolonged preoperative time, impacting many elements in the patient work system. Thus, patient education and resources that lead to health literacy, as well as resilience coaching during their preoperative journey, may help with symptom management as well as postoperative outcomes. These concepts are scarcely discussed in the spine (nonoperative or operative) literature and warrant further investigation. Ideally,

national and global geriatric, primary, and spine care societies will collaborate, developing interdisciplinary, evidence-based, holistic patient education tools that are widely accepted and accessed. Societies will also collaborate to scientifically answer patient-pertinent questions, so that knowledge gaps can be filled. Implementation of geriatric comanagement models in the preoperative time has the potential to improve postoperative outcomes [47–49] and are relevant to quality improvement projects.

Also aimed at postoperative improvement during the preoperative period is the use of surgical risk assessments. A plethora of measurement tools and indices (e.g., frailty indices [50, 51], Charlson comorbidity index [CCI] [52, 53], American Society of Anesthesiologists physical status classification system [ASA] [54], patient-reported outcome measures [55, 56]) as well as physical function measures [57] (e.g., hand grip strength [58], timed walking test, and The Up and Go [TUG] test [59]) may be used during the preoperative period to quantify risk for adverse outcomes (e.g., postoperative complications), aid in surgical outcome prediction, and inform decision-making. These tools, measures, and classification systems focus on patient-level biopsychosocial factors (e.g., comorbidities, physical function, social determinants) and not the patient work associated with these patient-level measures. Future research should explore how patient work system factors, combined with patient-level preoperative risk assessment, can inform decision-making and guide patients during the long preoperative period.

4.2 | Strengths and Limitations

This study's strengths include use of SEIPS 2.0, an HFE framework designed for healthcare quality and safety which adds to our understanding of invisible older patient work [12, 60]. Using SEIPS 2.0 in the preoperative time is novel and resulted in a rich patient-centered perspective of the factors influencing the PWS and opportunities to focus future quality improvement and research projects.

Study limitations include a secondary analysis of previously obtained qualitative data whose participants had undergone elective spine surgery at one institution in a moderate-sized United States Midwestern city.

5 | Conclusions

Patient work system factors that influence patient work are often a result of the debilitating nature of the symptoms, causing loss of independence, isolation, and confusion of how to meet their health goals. The influencing factors warrant research and process improvement initiatives so that the PWS is improved, thus lessening the patient work burden and improving the path to health outcomes.

Author Contributions

Andrea L. Strayer: conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, supervision, visualization, writing – original draft, writing –

review and editing. **Samantha Bjornson:** formal analysis, investigation, visualization, writing – review and editing. **Nicole E. Werner:** conceptualization, formal analysis, investigation, methodology, supervision, writing – review and editing. **Anna Krupp:** conceptualization, formal analysis, funding acquisition, investigation, methodology, supervision, writing – original draft, writing – review and editing.

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Conflicts of Interest

Andrea Strayer discloses royalties from Wolters Kluwer, Thieme Publishers, and Taylor & Francis Publishers. These financial relationships were not involved in the concept, design, analysis, interpretation of data, or manuscript preparation of this study. Samantha Bjornson, Nicole Werner, and Anna Krupp declare no conflicts of interest.

Data Availability Statement

The analytic methods are explained in the manuscript. This is a secondary analysis of data collected that consisted of 1:1 interviews that are not available for public use or viewing. The study was not preregistered.

Transparency Statement

The lead author Andrea L. Strayer, affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

References

1. V. M. Ravindra, S. S. Senglaub, A. Rattani, et al., “Degenerative Lumbar Spine Disease: Estimating Global Incidence and Worldwide Volume,” *Global Spine Journal* 8, no. 8 (December 2018): 784–794, <https://doi.org/10.1177/2192568218770769>.
2. Z. Buser, B. Ortega, A. D'Oro, et al., “Spine Degenerative Conditions and Their Treatments: National Trends in the United States of America,” *Global Spine Journal* 8, no. 1 (February 2018): 57–67, <https://doi.org/10.1177/2192568217696688>.
3. B. Buehring and S. Barczy, “Assessing the Aging Patient,” In *Spine Surgery in an Aging Population*, eds. N. P. Brooks and A. L. Strayer (Thieme Publishers, 2019), 208.
4. L. S. Hwang and E. C. Benzel, “Age-Related Changes in the Spine,” In *Spine Surgery in an Aging Population*, eds. N. P. Brooks and A. L. Strayer (Thieme Publishers, 2019).
5. E. Williamson, M. T. Sanchez Santos, A. Morris, et al., “The Prevalence of Back and Leg Pain and the Cross-Sectional Association With

- Adverse Health Outcomes in Community Dwelling Older Adults in England,” *Spine* 46, no. 1 (January 2021): 54–61, <https://doi.org/10.1097/brs.00000000000003719>.
6. A. L. Strayer and B. J. King, “Older Adults’ Experiences Living With and Having Spine Surgery for Degenerative Spine Disease,” *Gerontologist* 63, no. 7 (August 2023): 1201–1210, <https://doi.org/10.1093/geront/gnac184>.
7. V. T. Ponkilainen, T. T. Huttunen, M. H. Neva, L. Pekkanen, J. P. Repo, and V. M. Mattila, “National Trends in Lumbar Spine Decompression and Fusion Surgery in Finland, 1997–2018,” *Acta Orthopaedica* 92, no. 2 (April 2021): 199–203, <https://doi.org/10.1080/17453674.2020.1839244>.
8. M. Grotle, M. C. Småstuen, O. Fjeld, et al., “Lumbar Spine Surgery Across 15 Years: Trends, Complications and Reoperations in a Longitudinal Observational Study From Norway,” *BMJ Open* 9, no. 8 (2019): e028743, <https://doi.org/10.1136/bmjopen-2018-028743>.
9. T. N. Mann, R. N. Dunn, A. J. Vlok, and J. H. Davis, “Incidence of Spine Surgery in the South African Private Healthcare Sector: Ten-Year Trends Within a Large Open Medical Scheme,” *European Spine Journal* 32, no. 9 (September 2023): 3015–3022, <https://doi.org/10.1007/s00586-023-07816-z>.
10. D. Cushnie, K. Thomas, W. B. Jacobs, et al., “Effect of Preoperative Symptom Duration on Outcome in Lumbar Spinal Stenosis: A Canadian Spine Outcomes and Research Network Registry Study,” *Spine Journal* 19, no. 9 (2019): 1470–1477, <https://doi.org/10.1016/j.spinee.2019.05.008>.
11. A. Strauss, *Continual Permutations of Action* (Aldine de Gruyter, 1993).
12. R. K. Gorman, C. A. Wellbeloved-Stone, and R. S. Valdez, “Uncovering the Invisible Patient Work System Through a Case Study of Breast Cancer Self-Management,” *Ergonomics* 61, no. 12 (December 2018): 1575–1590, <https://doi.org/10.1080/00140139.2018.1503339>.
13. N. E. Werner, S. Ponnala, N. Doutcheva, and R. J. Holden, “Human Factors/Ergonomics Work System Analysis of Patient Work: State of the Science and Future Directions,” *International Journal for Quality in Health Care* 33, no. S1 (January 2021): S60–S71, <https://doi.org/10.1093/intqhc/mzaa099>.
14. P. Carayon, A. Wooldridge, P. Hoonakker, A. S. Hundt, and M. M. Kelly, “SEIPS 3.0: Human-Centered Design of the Patient Journey for Patient Safety,” *Applied Ergonomics* 84 (April 2020): 103033, <https://doi.org/10.1016/j.apergo.2019.103033>.
15. A. Donabedian, “The Quality of Care. How Can It Be Assessed?,” *JAMA: Journal of the American Medical Association* 260, no. 12 (September 1988): 1743–1748, <https://doi.org/10.1001/jama.260.12.1743>.
16. R. J. Holden, P. Carayon, A. P. Gurses, et al., “SEIPS 2.0: A Human Factors Framework for Studying and Improving the Work of Healthcare Professionals and Patients,” *Ergonomics* 56, no. 11 (2013): 1669–1686, <https://doi.org/10.1080/00140139.2013.838643>.
17. P. Carayon, A. Schoofs Hundt, B. T. Karsh, et al., “Work System Design for Patient Safety: The SEIPS Model,” *Quality in Health Care* 15, no. S1 (December 2006): i50–i58, <https://doi.org/10.1136/qshc.2005.015842>.
18. N. E. Werner, M. Tong, A. Borkenhagen, and R. J. Holden, “Performance-Shaping Factors Affecting Older Adults’ Hospital-To-Home Transition Success: A Systems Approach,” *Gerontologist* 59, no. 2 (March 2019): 303–314, <https://doi.org/10.1093/geront/gnx199>.
19. S. Elo and H. Kyngäs, “The Qualitative Content Analysis Process,” *Journal of Advanced Nursing* 62, no. 1 (April 2008): 107–115, <https://doi.org/10.1111/j.1365-2648.2007.04569.x>.
20. H. F. Hsieh and S. E. Shannon, “Three Approaches to Qualitative Content Analysis,” *Qualitative Health Research* 15, no. 9 (November 2005): 1277–1288, <https://doi.org/10.1177/1049732305276687>.
21. B. M. Lindgren, B. Lundman, and U. H. Graneheim, “Abstraction and Interpretation During the Qualitative Content Analysis Process,” *International Journal of Nursing Studies* 108 (August 2020): 103632, <https://doi.org/10.1016/j.ijnurstu.2020.103632>.
22. “MAXQDA 2022, Computer Software. VERBI Software, 2021,” accessed May 19, 2025, <https://www.maxqda.com>.
23. A. W. Acher, T. J. LeCaire, A. S. Hundt, et al., “Using Human Factors and Systems Engineering to Evaluate Readmission After Complex Surgery,” *Journal of the American College of Surgeons* 221, no. 4 (October 2015): 810–820, <https://doi.org/10.1016/j.jamcollsurg.2015.06.014>.
24. D. Liebrecht, L. Bratzke, M. Boltz, S. Purvis, and B. King, “Getting Back to Normal: A Grounded Theory Study of Function in Post-Hospitalized Older Adults,” *Gerontologist* 60, no. 4 (2019): 704–714, <https://doi.org/10.1093/geront/gnz057>.
25. D. Liebrecht, R. Rutkowski, A. I. Arbaje, B. Fields, and N. E. Werner, “A Scoping Review of Interventions for Older Adults Transitioning From Hospital to Home,” *Journal of the American Geriatrics Society* 69, no. 10 (October 2021): 2950–2962, <https://doi.org/10.1111/jgs.17323>.
26. T. Y. Wang, M. Price, V. A. Mehta, et al., “Preoperative Optimization for Patients Undergoing Elective Spine Surgery,” *Clinical Neurology and Neurosurgery* 202 (March 2021): 106445, <https://doi.org/10.1016/j.clineuro.2020.106445>.
27. K. A. Wozniak, S. K. Jindal, S. Munro, et al., “Lessons From the Department of Veterans Affairs: A Continuum of Age-Friendly Care for Older Adults,” *Journal of the American Geriatrics Society* 73 (October 2024): 358–366, <https://doi.org/10.1111/jgs.19228>.
28. A. L. Strayer and B. J. King, “COVID-19 and Elective Spine Surgery: The Older Persons’ Experience of Going It Alone,” *Journal of Neuroscience Nursing* 55, no. 4 (August 2023): 113–118, <https://doi.org/10.1097/jnn.0000000000000707>.
29. World Health Organization, “Ageing,” World Health Organization, accessed December 29, 2022, https://www.who.int/health-topics/ageing#tab=tab_1.
30. E. S. Chang, S. Kannoth, S. Levy, S. Y. Wang, J. E. Lee, and B. R. Levy, “Global Reach of Ageism on Older Persons’ Health: A Systematic Review,” *PLoS One* 15, no. 1 (2020): e0220857, <https://doi.org/10.1371/journal.pone.0220857>.
31. R. X. Hu, M. Luo, A. Zhang, and L. W. Li, “Associations of Ageism and Health: A Systematic Review of Quantitative Observational Studies,” *Research on Aging* 43, no. 7–8 (August 2021): 311–322, <https://doi.org/10.1177/0164027520980130>.
32. A. Zeki Al Hazzouri, M. Elbejjani, M. A. Chahine, R. Sadana, and A. M. Sibai, “Late-Life Learning and Health: Challenges, Opportunities, and Future Directions,” *Lancet Healthy Longevity* 2, no. 10 (October 2021): e613–e614, [https://doi.org/10.1016/s2666-7568\(21\)00207-5](https://doi.org/10.1016/s2666-7568(21)00207-5).
33. K. Zhang, C. Kan, Y. Luo, et al., “The Promotion of Active Aging Through Older Adult Education in the Context of Population Aging,” *Frontiers in Public Health* 10 (2022): 998710, <https://doi.org/10.3389/fpubh.2022.998710>.
34. C. Goodman and K. Lambert, “Scoping Review of the Preferences of Older Adults for Patient Education Materials,” *Patient Education and Counseling* 108 (March 2023): 107591, <https://doi.org/10.1016/j.pec.2022.107591>.
35. Y. K. C. See, H. E. Smith, L. T. Car, J. Protheroe, W. C. Wong, and B. Bartlam, “Health Literacy and Health Outcomes in Patients With Low Back Pain: A Scoping Review,” *BMC Medical Informatics and Decision Making* 21, no. 1 (July 2021): 215, <https://doi.org/10.1186/s12911-021-01572-0>.
36. M. Sardareh, H. Matlabi, A. R. Shafiee-Kandjani, R. Bahreini, S. Mohammaddokht, and S. Azami-Aghdash, “Interventions for Improving Health Literacy Among Older People: A Systematic Review,” *BMC Geriatrics* 24, no. 1 (May 2024): 911, <https://doi.org/10.1186/s12877-024-05522-z>.

37. S. Weiser, H. C. Mowery, M. Campello, V. Chytas, and C. Cedraschi, "What Do Older Adults Want From Spine Care?," *Brain and Spine* 4 (2024): 102844, <https://doi.org/10.1016/j.bas.2024.102844>.
38. J. Baumann, S. Marshall, A. Groneck, S. J. Hanish, T. Choma, and S. DeFroda, "Readability of Spine-Related Patient Education Materials: A Standard Method for Improvement," *European Spine Journal* 32, no. 9 (September 2023): 3039–3046, <https://doi.org/10.1007/s00586-023-07856-5>.
39. A. M. Luciani, B. K. Foster, D. Hayes, and E. M. DelSole, "Readability of Online Spine Patient Education Resources," *World Neurosurgery* 162 (June 2022): e640–e644, <https://doi.org/10.1016/j.wneu.2022.03.091>.
40. S. A. Ahmed, G. Shantharam, A. E. M. Eltorai, D. A. Hartnett, A. Goodman, and A. H. Daniels, "The Effect of Psychosocial Measures of Resilience and Self-Efficacy in Patients With Neck and Lower Back Pain," *Spine Journal* 19, no. 2 (February 2019): 232–237, <https://doi.org/10.1016/j.spinee.2018.06.007>.
41. M. Daher, D. Alsoof, M. Balmaceno-Criss, et al., "Preoperative Resilience and Improvement in Patient-Reported Outcomes After Lumbar Spinal Fusion," *World Neurosurgery* 186 (June 2024): e531–e538, <https://doi.org/10.1016/j.wneu.2024.03.168>.
42. K. J. DiSilvestro, D. Bond, D. Alsoof, et al., "Preoperative Resilience and Early Postoperative Outcomes Following Lumbar Spinal Fusion," *World Neurosurgery* 163 (July 2022): e573–e578, <https://doi.org/10.1016/j.wneu.2022.04.030>.
43. A. Bumberger, K. Borst, G. M. Hobusch, et al., "Higher Patient Knowledge and Resilience Improve the Functional Outcome of Primary Total Knee Arthroplasty," *Wiener Klinische Wochenschrift* 133, no. 11–12 (June 2021): 543–549, <https://doi.org/10.1007/s00508-021-01829-8>.
44. A. Bumberger, K. Borst, M. Willegger, et al., "Specific Knowledge and Resilience Affect Short-Term Outcome in Patients Following Primary Total Hip Arthroplasty," *Archives of Orthopaedic and Trauma Surgery* 142, no. 6 (June 2022): 1229–1237, <https://doi.org/10.1007/s00402-021-03967-0>.
45. A. G. Kim, P. Sanghvi, A. A. Rizk, A. Ahn, T. J. Pumo, and A. F. Kamath, "Resilience as a Psychiatric Factor Affecting Outcomes After Total Joint Arthroplasty: A Systematic Review," *Arthroplasty* 6, no. 1 (April 2024): 16, <https://doi.org/10.1186/s42836-024-00240-8>.
46. S. J. Lynskey, F. Ling, A. M. Greenberg, J. C. Penny-Dimri, and A. G. Sutherland, "The Influence of Patient Resilience and Health Status on Satisfaction After Total Hip and Knee Arthroplasty," *Surgeon* 19, no. 1 (February 2021): 8–14, <https://doi.org/10.1016/j.surge.2020.02.007>.
47. K. E. Zietlow, S. Wong, M. T. Heflin, et al., "Geriatric Preoperative Optimization: A Review," *American Journal of Medicine* 135, no. 1 (January 2022): 39–48, <https://doi.org/10.1016/j.amjmed.2021.07.028>.
48. T. S. Jones, X. Peters, and T. N. Robinson, "Clin-STAR Corner: Practice-Changing Advances at the Interface of Surgery and Geriatrics," *Journal of the American Geriatrics Society* 72, no. 7 (July 2024): 1959–1963, <https://doi.org/10.1111/jgs.18783>.
49. S. Gupta, L. Walke, M. Simone, A. Michener, and I. Nembhard, "The Perceived Value of a Geriatrics-Surgery Co-Management Program: Perspectives From Three Surgical Specialties," *Journal of the American Geriatrics Society* 72, no. 1 (January 2024): 48–58, <https://doi.org/10.1111/jgs.18636>.
50. K. Alare, S. Afolabi, G. Adenowo, et al., "Prognostic Utility of Modified 5-Item Frailty Index on the Outcomes of Spine Surgeries: A Systematic Review and Meta-Analysis," *World Neurosurgery* 194 (January 2025): 123549, <https://doi.org/10.1016/j.wneu.2024.12.008>.
51. W. Baek, S. Y. Park, and Y. Kim, "Impact of Frailty on the Outcomes of Patients Undergoing Degenerative Spine Surgery: A Systematic Review and Meta-Analysis," *BMC Geriatrics* 23, no. 1 (November 2023): 771, <https://doi.org/10.1186/s12877-023-04448-2>.
52. K. Shinonara, R. Ugawa, S. Arataki, S. Nakahara, and K. Takeuchi, "Charlson Comorbidity Index Is Predictive of Postoperative Clinical Outcome After Single-Level Posterior Lumbar Interbody Fusion Surgery," *Journal of Orthopaedic Surgery and Research* 16, no. 1 (March 2021): 235, <https://doi.org/10.1186/s13018-021-02377-7>.
53. M. E. Charlson, D. Carrozzino, J. Guidi, and C. Patierno, "Charlson Comorbidity Index: A Critical Review of Clinimetric Properties," *Psychotherapy and Psychosomatics* 91, no. 1 (2022): 8–35, <https://doi.org/10.1159/000521288>.
54. N. T. Ondeck, D. D. Bohl, P. Bovonratwet, et al., "Discriminative Ability of Commonly Used Indices to Predict Adverse Outcomes After Poster Lumbar Fusion: A Comparison of Demographics, Asa, the Modified Charlson Comorbidity Index, and the Modified Frailty Index," *Spine Journal* 18, no. 1 (January 2018): 44–52, <https://doi.org/10.1016/j.spinee.2017.05.028>.
55. A. Beighley, A. Zhang, B. Huang, et al., "Patient-Reported Outcome Measures in Spine Surgery: A Systematic Review," *Journal of Craniovertebral Junction and Spine* 13, no. 4 (October/December 2022): 378–389, https://doi.org/10.4103/jcvjs.jcvjs_101_22.
56. T. Z. Issa, Y. Lee, T. W. Henry, et al., "Values Derived From Patient Reported Outcomes in Spine Surgery: A Systematic Review of the Minimal Clinically Important Difference, Substantial Clinical Benefit, and Patient Acceptable Symptom State," *European Spine Journal* 32, no. 10 (October 2023): 3333–3351, <https://doi.org/10.1007/s00586-023-07896-x>.
57. K. L. Kowalski, J. Mistry, A. Beilin, M. Goodman, M. J. Lukacs, and A. Rushton, "Physical Functioning in the Lumbar Spinal Surgery Population: A Systematic Review and Narrative Synthesis of Outcome Measures and Measurement Properties of the Physical Measures," *PLoS One* 19, no. 8 (2024): e0307004, <https://doi.org/10.1371/journal.pone.0307004>.
58. J. W. Kwon, B. H. Lee, S. B. Lee, et al., "Hand Grip Strength Can Predict Clinical Outcomes and Risk of Falls After Decompression and Instrumented Posterolateral Fusion for Lumbar Spinal Stenosis," *Spine Journal* 20, no. 12 (December 2020): 1960–1967, <https://doi.org/10.1016/j.spinee.2020.06.022>.
59. N. Maldaner, M. Sosnova, A. M. Zeitlberger, et al., "Responsiveness of the Self-Measured 6-minute Walking Test and the Timed Up and Go Test in Patients With Degenerative Lumbar Disorders," *Journal of Neurosurgery. Spine* 35, no. 1 (May 2021): 52–59, <https://doi.org/10.3171/2020.5.SPINE20547>.
60. M. Melles, A. Albayrak, and R. Goossens, "Innovating Health Care: Key Characteristics of Human-Centered Design," *International Journal for Quality in Health Care* 33, no. S1 (2020): S37–S44, <https://doi.org/10.1093/intqhc/mzaa127>.