

Clinical Study

Spine surgeons facing second opinions: a qualitative study

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Abstract

BACKGROUND CONTEXT: The social and technological mutation of our contemporary period disrupts the traditional dyad that prevails in the relationship between physicians and patients.

PURPOSE: The solicitation of a second opinion by the patient may potentially alter this dyad and degrade the mutual trust between the stakeholders concerned. The doctor-patient relationship has often been studied from the patient's perspective, but data are scarce from the spine surgeon's point of view.

STUDY DESIGN/SETTING: This qualitative study used the grounded theory approach, an inductive methodology emphasizing field data and rejecting predetermined assumptions.

PATIENT SAMPLE: We interviewed spine surgeons of different ages, experiences, and practice locations. We initially contacted 30 practitioners, but the final number (24 interviews; 11 orthopedists and 13 neurosurgeons) was determined by data saturation (the point at which no new topics appeared).

OUTCOME MEASURES: Themes and subthemes were analyzed using semistructured interviews until saturation was reached.

METHODS: Data were collected through individual interviews, independently analyzed thematically using specialized software, and triangulated by three researchers (an anthropologist, psychiatrist, and neurosurgeon).

RESULTS: Index surgeons were defined when their patients went for a second opinion and recourse surgeons were defined as surgeons who were asked for a second opinion. Data analysis identified five overarching themes based on recurring elements in the interviews: (1) analysis of the patient's motivations for seeking a second opinion; (2) impaired trust and disloyalty; (3) ego, authority, and surgeon image; (4) management of a consultation recourse (measurement and ethics); and (5) the second opinion as an avoidance strategy. Despite the inherent asymmetry in the doctor-patient relationship, surgeons and patients share two symmetrical continua according to their perspective (professional or consumerist), involving power and control on the one hand and loyalty and autonomy on the other. These shared elements can be found in index consultations (seeking high-level care/respecting trust/closing the loyalty gap/managing disengagement) and

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Abbreviation: COREQ, Consolidated criteria for reporting qualitative research

referral consultations (objective and independent advice/trusting of the index advice/avoiding negative and anxiety-provoking situations).

CONCLUSIONS: The second opinion often has a negative connotation with spine surgeons, who see it as a breach of loyalty and trust, without neglecting ego injury in their relationship with the patient. A paradigm shift would allow the second opinion to be perceived as a valuable resource that broadens the physician-patient relationship and optimizes the shared surgical decision-making process. © 2024 Elsevier Inc. All rights reserved.

Keywords: Decision-making; Doctor-patient relationship; Grounded theory; Qualitative study; Referral; Second opinion; Spine surgery; Surgical consultation

Introduction

Requests for a second opinion are frequent in the context of spinal surgery, which is not surprising given its functional nature, its neurological risks and sometimes suboptimal results [1,2]. In addition, there is significant variability in attitudes among physicians [3,4]. Second opinions are also driven by some patients being dissatisfied with a previous treatment proposal, do not appreciate contact with the first physician, or are disappointed with a previous surgery [5].

These requests are also part of the societal mutations of contemporary medicine and the concepts of patient-centered care that influence the classic doctor-patient dyad [6–8].

Therefore, the second opinion is a critical modulating element in the patient's final decision, but it also interferes with the surgeon's professional experience: learning that your patient has gone to seek another opinion, or giving your opinion on a peer's decisions, is often discomfiting [9,10].

Most studies on this topic have focused on patient motivations [1,2,11–13]. We sought to focus on the surgeons' perspective, their experience, and the impact of second opinions on their practices.

To develop an insightful assessment of the surgeons' point of view and given the broad implications of this topic (ego, deontology, ethics, relationship with evidence-based medicine, shared decision making, societal evolution, medico-economic and medico-legal context), we adopted a qualitative approach.

Materials and methods

We aimed to explore surgeons' perceptions on the impact of second opinions on their interactions with their patients; we chose to use the grounded theory approach as a general framework [14].

Participants and sampling

Interviews were conducted between June 2021 and January 2022. Participants were orthopedic or neurosurgeons with an exclusive practice of spine surgery.

According to the grounded theory methodology, a theoretical sampling technique using maximum variation was used [15,16]. We interviewed spine surgeons of different ages, experiences, and geographical locations. We initially contacted 30 physicians, but the final sample size was

determined by data saturation (ie, the point at which no new themes emerged from the interviews) [17].

Data collection and analysis

Data were collected via unstructured phone interviews by a researcher blinded to the surgeons' identity.

Each interview was transcribed and analyzed using thematic analysis. After multiple verbatim readings, emergent themes were established following a series of coding steps. First, initial coding was generated by coding parts of transcripts, keeping them close to the participants' words to isolate the basic units of meaning. Next, we identified the relationships between the initial codes and grouped them into categories according to their similarity. Finally, these categories were organized into themes and subthemes. This inductive process was carried out independently by three researchers with different backgrounds (an anthropologist, a psychiatrist, and a surgeon) in order to triangulate their positions and minimize researchers' bias [18–20]. Consensus was reached through several workgroup meetings. NVIVO software (QSR International, Melbourne, Australia) was used for the analysis.

This study was approved by the local Ethic Committee (IRB : IORG0010765/CER-2023-GL01) and the Data Protection Authority, and follows the Consolidated criteria for reporting qualitative research (COREQ) statement [21].

All participants provided informed consent before inclusion in the study and provided consent for their comments to be published.

Results

Data of participants

Theme saturation occurred after the 24th interview (11 orthopedists and 13 neurosurgeons, 22 men and 2 women). Participants had an average age of 45.5 years (range, 37–62 years) and were working in private institutions (19 physicians, 79.1%) and university hospitals (5 physicians, 20.9%) throughout the national territory. They had been working for an average of 14 years (range, 8–32 years) and declared to operate an average of 350 surgeries per year (range, 200–650).

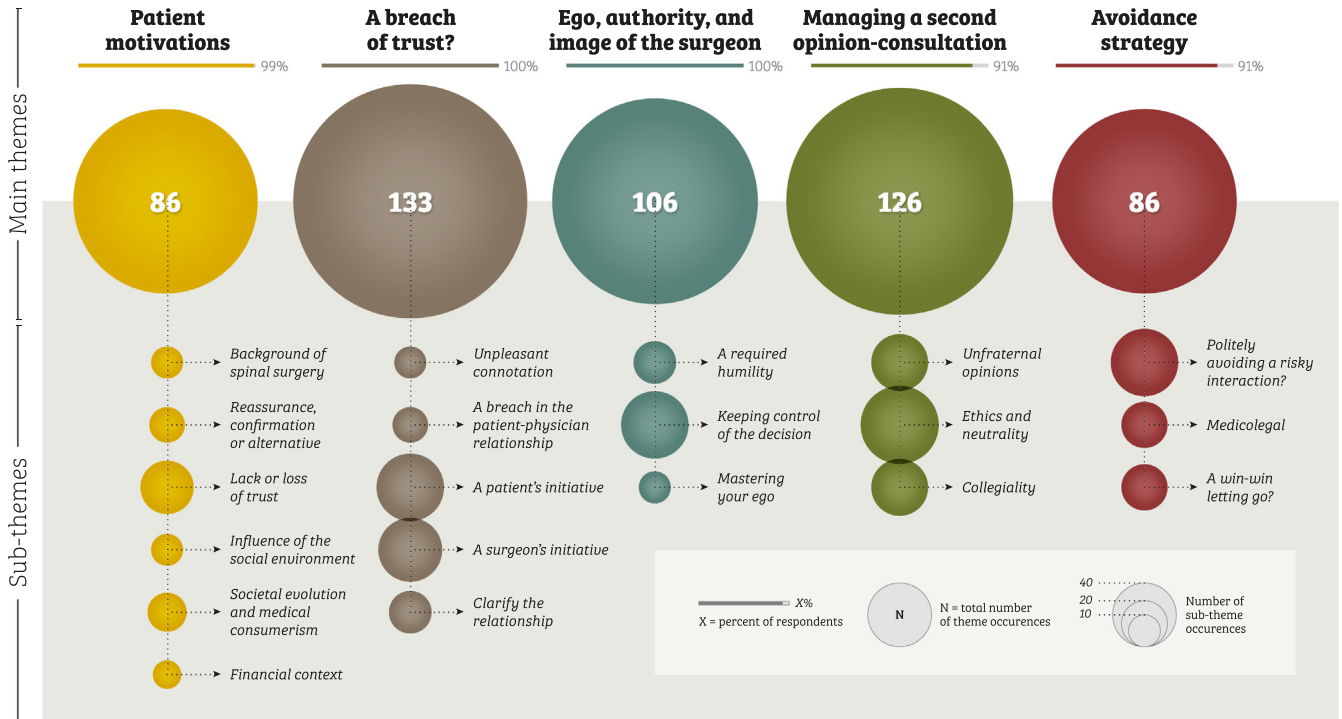


Fig. 1. Description of the main themes and subthemes.

Thematic area

The data analysis identified five main themes based on recurring elements from the interviews (Fig. 1). Themes are discussed in detail in the following section, and selected quotes from the interviews are reported to support our findings. The quotes preserve the pitch of the spoken language.

Theme 1: Patient motivations according to surgeons

Background of spinal surgery

Most respondents perform degenerative spine surgery which often aims to improve quality of life but carries neurological risks. The combination of the elective nature of those procedures and high patients’ expectations can lead to communication problems and questioning of the information given, especially when the literature offers little high-level evidence:

“I can fully understand why people ask for second opinions ... because...well, this type of surgery can be a bit scary, a bit nerve-racking... Patients expect... well... exact science... when they see a surgeon, but unfortunately spinal surgery is not an exact science at all...” E18

Reassurance/confirmation/alternative

Patients’ motivations are initially linked to the need for reassurance as they face high-risk surgery and/or their desire to obtain approval or denial of a given treatment option or seeking a less aggressive proposal:

“Overall... I think that’s what it’s about- seeking reassurance about the opinion, making sure it’s the right decision, that there are no possible alternatives from another surgeon.” E9

Lack or loss of trust

There are also cases in which trust was not established with the first physician, leading the patient to seek a better connection:

“I think you also have to bring the patient on board, sometimes you click and sometimes you don’t... that’s just how human relationships work... and in patient-doctor relationships as well.” E7

Surgeons also mentioned that confidence in a practitioner who was previously in charge of the patient can be lost along the course of treatment, with the legal or ethical medical risks that may result from this situation:

“For post-surgery patients... uh... people who have undergone surgery and it didn’t go very well or the outcome wasn’t great... well, they don’t want to see the same surgeon again, they prefer to see someone else... In any case, giving a second opinion, coming after someone else is always tricky.” E16

Influence of the social environment

The influence of the corresponding physicians’ entourage, networks, and input on a patient facing a complex decision process cannot be neglected.

“Patients also get lots of recommendations from friends, family... doctors telling them to “go see so and so”, so... well,... they prefer to compare several opinions...” E12

Societal evolution and medical consumerism

It also seems necessary to place the patient-doctor dyad in the context of societal evolution: a rapid and global diffusion of information on the internet with numerous information suppliers that could be relevant, useful, or simply false:

“Access to doctors has become... well, a lot more accessible than it used to be, so... it’s sometimes become a sort of commodity, it’s so easy,... and there are so many sources of information- good and bad- that you can find on the internet... all these people communicating with each other on websites... which are easily accessible for the general public, but which are not necessarily providing good clinical information.” E18

Surgeons also cited a consumerist acceptance of the relationship with medicine, as evidenced by the several specialized websites and the ease of obtaining an online appointment today at the click of a button.

“You know, in 2022, surgery has become a bit like... uh... shopping on Amazon. You can compare stuff, book an appointment online and that’s it...” E21

Financial context

Finally, it is no uncommon that sometimes, a request for a second opinion is justified on financial grounds, when the patient is unable to afford the cost of care in private practice and turns to public hospital:

“I’m a public hospital physician and I would say that I do get quite a lot of people seeking second opinions for... well, for financial reasons... not only, but it’s not uncommon at all...” E23

Theme 2: A breach of trust or encouraged step?

Unpleasant connotation

For most participants, learning that a patient asked for a second opinion creates an unpleasant connotation and immediately puts a distinctive spotlight on an interaction previously based on a mutual trust:

“It’s a very unpleasant feeling, whatever the situation... whether I am asked to give a second opinion or whether my patient tells me they’ll be seeking a second opinion elsewhere...” E2

A breach in the patient-physician relationship

Most respondents placed reciprocity of trust as the central element of their interaction and did not appreciate the

incidental discovery that they were entering the second opinion game:

“Yes, I think that medical nomadism... well, it undermines the chances of... uh... successful treatment... because... well, the key to that success lies in the relationship and trust that exists... between surgeon and patient.” E22

Thus, the classic dyad is reshaped by the addition of a new person within this previously sanctuarized relationship:

“It’s often said that the physician-patient relationship is a sort of duo... yet now we’re seeing the emergence of a third party... which can lead to a breakdown of trust on both sides. The patient must trust their surgeon, but the surgeon also must trust their patient... and that two-way trust... well, it’s something that is often overlooked.” E1

A patient initiative

The theme of a consumerist paradigm reemerges with the surgeon feeling caught up in a kind of negotiation, such as a bank loan or competition on a commercial model:

“It’s a bit of a dishonest one in my view... when they don’t tell you that they’ve already been to see someone... well, halfway through the appointment they’ll whip out this sheet of paper and say “ah, but this other person said this, what do you think?” and it makes me feel like saying “hang on a minute, we’re not negotiating here, this isn’t like negotiating a loan with your bank.” E14

A surgeon’s initiative

In contrast, many respondents willingly and routinely offered patients a second opinion as a normal step in the decision-making process:

“When it’s risky with a potential for morbidity, well... patients aren’t necessarily ready to hear that... that it will require this particular operation with these specific risks... so yeah, in those cases I tell them to take their time to think it through and...uh...to go see another colleague... to hear someone else’s opinion.” E10

Some even suggested names of colleagues identified by them for their skills to provide the patient with a valuable second opinion:

“Sometimes I suggest it myself. When patients are a bit hesitant... well, I tell them that they are free to seek another opinion,... I’ll say “listen, you can go and see so and so... they are good, trustworthy...” That’s what I tell them- I see no problem with a patient deciding to seek a second opinion after mine.” E18

Clarify the relationship

Surgeons identify that the patient may be uncomfortable playing both sides of the fence and having conflicting loyalties.

“... you know, strangely, they feel like they are somehow...uh... betraying your trust by going to see someone else, so they don't necessarily want to tell you... well, I say to them... “if you want a second opinion, there's no rush, no problem at all...” E21

Therefore, if exercised in transparent acceptance by both parties, second opinions can become a tool to build trust and ultimately help decision-making within a strengthened dyad:

“... It's difficult to accept at first, but I think that... well, it clarifies your relationship with your patient, uh... if they do ask for a second opinion... well, whether it agrees with yours or not, at least your relationship is clearly defined.” E17

Theme 3: Ego, authority, and image of the surgeon

A required humility

The surgeon must keep in mind that patients are looking for a solution to their conditions or answers to their questions: mastering one's ego and fighting against an overly vertical relationship is paramount:

“I must admit that I am quite stoic about it all... I don't tell myself... “wow... I'm so great, everyone wants to come and ask me for a second opinion”, but likewise, I don't think “hmm... this patient could cause me problems because they are seeking a second opinion”. I... I just see it as a situation where a patient is in pain and searching for... solutions.” E22

Maintaining control of the decision

The irruption of a third actor in the dyad obliges the surgeon to confront a possible questioning of his or her diagnosis or therapeutic proposal, and it is essential to maintain control over his or her decision:

“It's my opinion... that... uh... well, should come first... not the opinion of another surgeon or what the patient asks for based on something they read on some medical forum online.” E12

Most respondents explained that they disregard the first opinion and do not consider it until the end of the consultation, if at all:

“When they start by saying “I'm coming to see you because I went to see another surgeon...”, I stop them right away and say, “don't tell me what they said, I don't want to know, you can tell me afterwards”, but...uh... well, I don't want my judgement to be... swayed by what someone else has said.” E8

Conversely, some surgeons feel it can be relevant to consider the recommendation of the other physician, to refine the final opinion given to the patient:

“... I like to know what the other surgeon suggested, but I don't necessarily apply it because... well... uh... it's just to have an idea of the patients' file... for example I've already... downgraded a procedure where they had proposed multilevel fusion, and I just did a monolevel decompression.” E12

Mastering your ego

Throughout the interviews, the term "ego" was used, which according to most respondents can be an obstacle to the dyad quality if the surgeon feels betrayed, but which he must know how to control:

“I think some people have very big ego and they might...uh... take it badly... well, maybe not when they are asked for a second opinion because that can flatter your ego... but rather... uh... knowing that your patient may potentially challenge your opinion... yeah, I think some surgeons might not take too kindly to that.” E1

The ideal situation repeatedly mentioned would be a relationship without ego:

“I don't think... well, that ego should have anything to do with these types of things.” E9

Theme 4: Managing a second opinion

Disrespectful opinions

Many respondents testified to the existence of malicious colleagues, whose words and/or writings may lead the patient to doubt the actions and/or decisions of the index surgeon.

“Some patients tell me that they've been to see so and so who...uh... told them that it was complete nonsense... basically... sometimes there's a real lack of respect for colleagues and... well, I don't think that's what our job is all about.” E15

Ethics and neutrality

Most respondents strive to be careful and neutral when writing letters, even if they do not agree with the initial management:

“it's important to take a step back, because if you break the trust between your patient and another physician, that means you're attacking a sacrosanct relationship of trust, so I try not to... attack or...uh... challenge what the other surgeon said... I just say... “this is what I think, on this clinical basis and on the basis of the MRI”, but under no circumstances do I refer to another opinion in writing.” E5

Most respondents invoke medical ethics by respecting the spirit of confraternity in any communication with the patient seeking a second opinion.

“That’s the biggest risk, when you give a different opinion, you need to be aware of the malpractice issues that may arise, you need to respect your colleagues, the code of ethics, basically.” E1

Similarly, if a patient wishes to undergo surgery following a second opinion, practitioners tend to allow for a significant period of reflection to avoid any problems or regrets related to the previous opinion.

“If I do have a different opinion, I try to not schedule their operation straight away, even if they are more willing to go with what I’m suggesting. . . because. . . well, I think they really need some time to think things through. If the procedure doesn’t go well then you can bet, they will go back to see the first surgeon and they’ll have something bad to say about you. . .” E1

Collegiality

A relevant option would be to involve collegiality and enhanced communication (eg, team board, messaging platform), support second opinion, and reassure the patient on the seriousness of managing their problem.

“I think second opinions could be a bit more. . . uh. . . institutionalised, especially for the type of surgery we do. . . I think it would be good if the physicians could initiate another request more easily. . . especially nowadays, with all these digital tools, videoconferences, it would be quite easy to do. . . uh. . . you know, something like tumour-boards in cancerology.” E8

Theme 5: Avoidance strategy

Politely avoiding a risky interaction?

Respondents, while avoiding the subject of defensive medicine, identify patient profiles that may generate problems during management and about whom they are cautious:

“For patients who seek loads of different opinions. . . uh. . . it’s actually quite a relief to say you’d prefer they saw someone else, because those are usually eternally dissatisfied, well, at least, that’s how I see it. . . you feel like you might run into problems if you operate on them. . . and they probably won’t be happy with the surgery either!” E19

A medico-legal cover

To some surgeons, suggesting a second opinion may be an alternative way to eliminate a risky profile, in a defensive spirit, to avoid exposing oneself to a problematic relationship or even medicolegal implications.

“You know, if I sense that the patient is a bit suspicious and that they are likely to be. . . querulous. . . well, a pain in the arse, frankly. . . when I don’t want to operate

on that patient, then yeah, I encourage them to go and see someone else, in the hope that they won’t come back to see me, to be honest.” E2

A win-win letting go?

It is necessary to know how to end a deadlocked relationship, and sometimes a second opinion, at the initiative of one or the other parties, can make it possible to leave a toxic or blocked situation:

“I think that a relationship of trust is essential and. . . that means that. . . well, when you lose that trust. . . you have to be able to change. . . I’ve really noticed that and it’s good for both the patient and surgeon. . . as long as you’re not. . . uh. . . vicious towards the other surgeon. . . you need to respect your colleagues.” E4

Discussion

Patient motivation to seek a second opinion

Patients may request a second opinion for various motives: anxiety and fear, skepticism, lack of understanding or confidence, following an online search, or the advice of a relative [1,11]. In most instances, patients want to consolidate the initial findings and confirm the proposed management. The decision is influenced by culture and tradition [22], but also by different national medico-economic systems [9]. Sato et al [23] described ‘doctor-shopping patients’ who symbolize a real medical consumerism (which a few respondents mentioned in our study); however, clinicians often agree on the legitimacy of a second opinion for major decision, particularly for nonvital functional disorders where practices are very heterogeneous, such as degenerative spinal surgery [24].

Patient 2.0: societal shift and medical consumerism

The old-fashioned doctor-patient relationship has changed drastically: strengthening patients’ rights, development of websites and social networks, and social mutations questioning the authority of the experts [25]. The surgeons, “heir of the macho heroes”, are historically endowed with a powerful ego [26,27], and can still be included in a vertical relationship with their patients [28]. Some respondents have trouble accepting the demotion of their social status within an emerging medical democracy [29], while others mention that expertise has become a consumer good and patients “health consumers” [30]. This societal shift seems irreversible and requires significant effort on the part of surgeons to accept that the patient can take control of their own life story, intervene in the decisions that concern them, and eventually decide to hide all or part of a parallel process organized with other surgeons [31,32].

The surgeon between emotion and rationality

These interviews reveal a permanent conflict in the surgeon between professional image and ego vulnerability, between the analytical, scientific, and the person at the mercy of emotions, a duality in which the practitioner must find a balance. This may seem contradictory, accepting the principle of a second opinion but recognizing that the practitioner may be offended by it, not wanting to know the previous opinion without denying its possible influence on their own decision, and recommending a second opinion themselves while criticizing its effects on the patient's subsequent decision. Surgeons may be irritated by these events, but internalize their displeasure and oscillate between their loyalty and the possibility of no longer treating divergent patients [33]. Nevertheless, letting one's ego guide a decision is human and sometimes unavoidable [34]. Notably, the respondents are tempted to resist their ego or refuse to involve it in the issue of second opinions; however, these situations impact their professional self-identity, including objectivity, rationality, and reserve [35]. A kind of 'medical narcissism' can be the response to a feeling of threat that the surgeon feels when questioning his/her clinical judgment or autonomy [36–38]. Dealing with one's fallibility requires a great deal of introspection, but it is essential to avoid professional arrogance [9].

Dyad or triad?

The patient's request for a second opinion implies the addition of a third stakeholder within a consecrated relationship that initially comprised two parties [39,40]. The classic dyad is the immemorial basis of trust between the caregiver and care provider, and it then evolves into a new unbalanced system, since it is not a triad where each actor is involved and synergistic. Greenfield et al discussed a fragmented and disharmonious relationship far from a true triad [31]. Although a triad is seemingly the best option for all, it does not materialize because of the concerns of both parties. Entrenched perceptions of loyalty in conflict with societal developments still create frustration or disappointment on both sides and hinder the legitimacy of a second opinion [32]. However, smoothly and functionally organizing a triad seems to be a demanding challenge in the field of spinal surgery, involving personal and professional relationships, ethical and medico-legal aspects, and a measured approach to the innumerable variabilities of attitude in a discipline with uncodified guidelines.

Ethical and medicolegal context

We have already mentioned the significant variability in indications and attitudes toward spine surgery [1]. Most second opinions disagree with the initial treatment recommended by the initial provider [41]. Moreover, surgeons providing secondary opinions more commonly offer non-surgical approaches [1,42]. The surgeon providing the

second opinion should be cautious when expressing their recommendation, as the situation may be delicate if the recommendation differs from the first opinion while remaining collegial with their peer [43,44].

Several respondents explained to their patients that their assessment of their previous management is an opinion and not a fact; however, the practitioner is operating in a narrow margin because, ethically, they are obligated to warn the patient of an act that would be considered inappropriate and to honestly answer if asked whether a surgical procedure was performed adequately [45–47]. However, physicians do not always have the information they need to fully assess the situation and are not medical-legal experts [2,48,49]. This explains the great reserve claimed by the respondents, who attempt to respond to their patients as best as they can but also try avoid blaming their colleagues [32,50].

A new perspective on shared decision-making?

Following a major societal shift, patients become actors in their condition and treatment [51]. Shared decision-making processes are becoming a central element of medical practice in patient-centered care systems [52,53].

Currently, most secondary opinions remain in a hidden or semi-hidden position, which generates an alteration of communication between the parties. However, the antagonism between autonomy and loyalty could be rebalanced if the second opinion is perceived as legitimate [8,31]. Surgeons could offer it more systematically (there was indeed this type of attitude among several of our respondents), and patients could be more transparent in their approach. The second-opinion surgeon would refer most cases to the first-opinion surgeon, with a report written in an ethical manner [9,11,31].

The two parties do not fall into a simplistic characterization between a paternalistic surgeon and a dissembling patient. Reactions are universal when avoiding offense, embarrassment, or rejection. Greenfield et al recommended incorporating the surgeon's vulnerability and empathy to build trust and partnership [31], and our respondents, like in their inspiring study, also spoke of similar interactions between surgeons and patients, torn between allegiance and independence (Fig. 2). Physicians should embrace the deeper inclusion of the patient in the organization of their care and decision-making process, and thus, publicize the legitimacy and importance of obtaining a second opinion. Secondary opinions could then be seen as strengthening and expanding the patient-physician relationship rather than altering it, thereby the patient-doctor relationship can even evolve into a true positive triad [54].

Limitations

Reading a qualitative study can be disconcerting for readers accustomed to quantified results [14]. The qualitative approach used in our study describes phenomena and allows hypotheses to be formulated but is not designed to

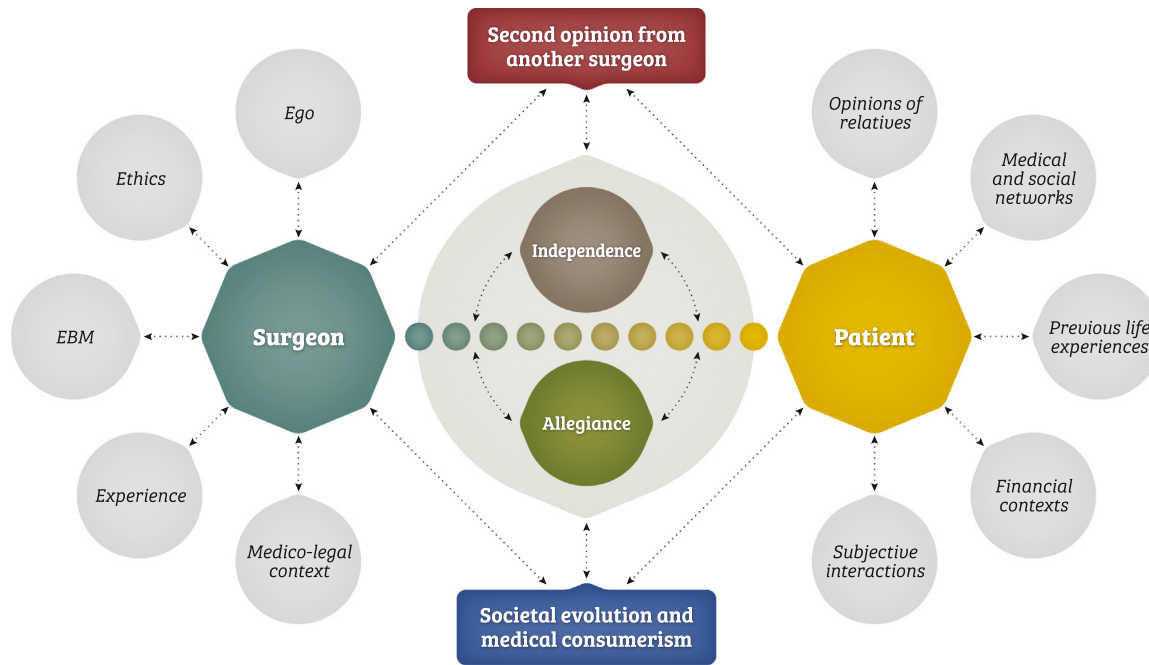


Fig. 2. Overall interactions in second opinion encounters concerning surgeons and patients (surgeons' perspective). EBM: Evidence-based-medicine

confirm them. Nevertheless, we believe that qualitative approaches have their place as a complement to quantitative studies in surgical journals to draft in-depth reflections on the profession of surgeons and the evolution of interactions with patients in the organization of care and shared decision-making processes.

Our sample may be very specific; however, we aimed to assess a group of private and public physicians' representative of our country, orthopedists, and neurosurgeons, with a diversified geographical and age distribution. Therefore, we believe that their experience is similar to that of surgeons in other countries' health systems, and therefore, the expression of their feelings can be transposed [20].

Conclusion

Societal changes and the concomitant increase in patient autonomy drive the expansion of second opinions in spine surgery. This implies a mutation in the classical dyad between the surgeon and the patient. There has been a shift from the paternalistic model to a contemporary medical approach in which the decision is shared, which is not fully acknowledged by all physicians.

Nevertheless, it remains complex to find a balance between ego, professional rationality, independence, and loyalty toward the patient, who is free to manage his/her history and his/her requests for advice autonomously.

Institutionalized secondary opinions could be a relevant and transparent way to optimize patient care, but a large amount of work is required in terms of communication and changing habits.

Beyond the efforts of transparency and loyalty, complex questions remain unresolved: How can a dyad be transformed into a triad? How can we explain to patients the significant variability in practices and beliefs between surgeons? How can the different elements of a file be transmitted transparently to different practitioners for optimal management? It is by answering these questions that the second opinion can be experienced not as an unfair initiative of the patient, but as a constructive element in the difficult elaboration of the surgical management.

CRedit authorship contribution statement

Bertrand Debono: Conceptualization, Formal analysis, Methodology, Project administration, Software, Supervision, Writing – original draft, Writing – review & editing.

Antoine Guillain: Visualization, Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing.

Olivier Hamel: Supervision, Writing – original draft, Project administration.

Vincent Challier: Project administration, Supervision, Writing – original draft.

Bassel Diebo: Conceptualization, Formal analysis, Validation, Writing – original draft, Writing – review & editing.

Declaration of competing interest

One or more of the authors declare financial or professional relationships on ICMJE-TSJ disclosure forms.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.spinee.2024.03.013>.

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