Expectations of recovery and functional outcomes following thoracolumbar trauma: an evidence-based medicine process to determine what surgeons should be telling their patients

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OBJECT The aim of this study was to define the expected functional and health-related quality of life outcomes following common thoracolumbar injuries on the basis of consensus expert opinion and the best available literature. Patient expectations are primarily determined by the information provided by health care professionals, and these expectations have been shown to influence outcome in various medical and surgical conditions. This paper presents Part 2 of a multiphase study designed to investigate the impact of patient expectations on outcomes following spinal injury. Part 1 demonstrated substantial variability in the information surgeons are communicating to patients. Defining the expected outcomes following thoracolumbar injury would allow further analysis of this relationship and enable surgeons to more accurately and consistently inform patients.

METHODS Expert opinion was assembled by distributing questionnaires comprising 4 cases representative of common thoracolumbar injuries to members of the Spine Trauma Study Group (STSG). The 4 cases included a thoracolumbar junction burst fracture treated nonoperatively or with posterior transpedicular instrumentation, a low lumbar (L-4) burst fracture treated nonoperatively, and a thoracolumbar junction flexion-distraction injury managed with posterior fusion. For each case, 5 questions about expected outcomes were posed. The questions related to the proportion of patients who are pain free, the proportion who have regained full range of motion, and the patients' recreational activity restrictions and personal care and social life limitations, all at 1 year following injury, as well as the timing of return to work and length of hospital stay. Responses were analyzed and combined with the results of a systematic literature review on the same injuries to define the expected outcomes.

RESULTS The literature review identified 38 appropriate studies that met the preset inclusion criteria. Published data were available for all injuries, but not all outcomes were available for each type of injury. The survey was completed by 31 (57%) of 53 surgeons representing 24 trauma centers across North America (15), Europe (5), India (1), Mexico (1), Japan (1) and Israel (1). Consensus expert opinion supplemented the available literature and was used exclusively when published data were lacking.

For example, 1 year following cast or brace treatment of a thoracolumbar burst fracture, the expected outcomes include a 40% chance of being pain free, a 70% chance of regaining pre-injury range of motion, and an expected ability to participate in high-impact exercise and contact sport with no or minimal limitation. Consensus expert opinion predicts reemployment within 4–6 months. The length of inpatient stay averages 4–5 days.

CONCLUSIONS This synthesis of the best available literature and consensus opinion of surgeons with extensive clinical experience in spine trauma reflects the optimal methodology for determining functional prognosis after thoracolumbar trauma. By providing consistent, accurate information surgeons will help patients develop realistic expectations and potentially optimize outcomes.

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KEY WORDS patient expectations; thoracolumbar trauma; functional prognosis

ABBREVIATIONS GRADE = Grades of Recommendations Assessment, Development and Evaluation; HRQOL = health-related quality of life; MeSH = Medical Subject Headings; ODI = Oswestry Disability Index; PCS = Physical Component Summary; RMDQ = Roland Morris Disability Questionnaire; ROM = range of motion; SF-36 = 36-Item Short Form Health Survey; STSG = Spine Trauma Study Group.

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PATIENTS, their families, and society as a whole look to surgeons and other health care professionals for information on the predicted functional outcomes following thoracolumbar injuries. Without guidance, such injuries can often be incorrectly considered life- and career-altering by the lay public due to the aura surrounding spinal column pathology. The predictions provided to the patient by the surgeon and caregivers fundamentally influence a patient's recovery expectation.

Studies have repeatedly shown that patient expectations can significantly influence outcome. A systematic review—titled “Does how you do depend on how you think you'll do?”—found that positive expectations were associated with better health outcomes in 15 of 16 studies covering various medical and surgical conditions.⁴¹ A connection between expectation and outcome has also been demonstrated during the treatment of lumbar spine disorders, including low-back pain,^{25,28,29} disc herniation,^{37,45} and stenosis.¹⁹ This relationship has been less frequently examined after musculoskeletal trauma. Although initial expectations have been shown to influence subsequent disability following hip fracture¹⁰ and soft tissue¹⁷ and whiplash injuries,²⁷ the association has been lacking in other clearly defined musculoskeletal injuries (e.g., other fractures and dislocations).²⁵

To investigate the potential relationship between patient expectations and outcomes in spinal trauma we have initiated a multiphase study. Part 1 demonstrated substantial variability in the prognostic information spine surgeons were communicating to patients with spine injuries.¹⁸

The purpose of this study (Part 2) was to define the expected functional outcomes following common thoracolumbar injuries. To achieve this, we performed a literature review and supplemented the resulting data with consensus opinion of surgeons with extensive clinical experience in spine trauma, thus gathering expert opinion. The same methodology has been used to determine expected outcomes following cervical spine trauma.³³ This information will help surgeons shape appropriate patient expectations following thoracolumbar injuries. It will also facilitate further assessment of the relationship of patient expectations and functional outcomes following spinal trauma.

Methods

Cases and Questionnaire

A questionnaire was created comprising 4 cases representative of common thoracolumbar injuries. These are summarized in Table 1. The cases included burst fractures, with varied location, patient demographic characteristics, and treatment strategies, and a flexion-distraction injury. For each scenario, 5 questions about anticipated functional outcomes were posed. These varied between cases but included pain, range of motion (ROM), restrictions in recreational activities, social life and personal care (all 1 year post-injury), timing of return to work or sports, and length of hospital stay.

All patients were assumed to be neurologically intact with single-system injuries, without major medical comorbidities, with adequate health care coverage, and with normal family or social support. Each recovery was pre-

sumed to have occurred without local or systemic complications. The cases were kept as “straightforward” or “clean” as possible to minimize variability and enhance generalizability.

Expert Opinion

Questionnaires were distributed to the members of the Spine Trauma Study Group (STSG), a group of academic neurosurgical and orthopedic spine surgeons from Level 1 trauma centers worldwide with a subspecialty interest and significant practice in thoracolumbar trauma. Surgeons were asked to have their answers reflect “what they currently tell patients or their family when presented with such questions.” Means for numerical values and modes for categorical answers from the survey data were used to represent consensus expert opinion.

Systematic Literature Review

A systematic review was performed to identify literature pertaining to the 4 scenarios. MEDLINE and EMBASE electronic databases were searched using Medical Subject Headings (MeSH) and key words pertinent to each case (Table 2). Inclusion and exclusion criteria were applied to identify data specific to each case. The search was limited to 1980–October 2010. A total of 750 English language abstracts were reviewed by the primary or secondary author, and potentially appropriate manuscripts were read in full. References from these manuscripts were analyzed to identify other articles containing relevant information. Original studies evaluating patient-specific outcomes were included with review articles, and studies devoid of relevant functional outcomes omitted.

For each case, the overall quality of evidence was assigned one of 4 ratings according to the Grades of Recommendations Assessment, Development and Evaluation (GRADE) Working Group framework.

Synthesis of Literature and Expert Opinion

A systematic and hierarchical approach was used to synthesize the data extracted from the systematic review with consensus expert responses regarding the same injuries and outcomes to define the functional prognosis of common thoracolumbar injuries. When adequate answers to an outcome question were available in the literature, these results were used. Where available, high-level evidence was used in preference to low-level or very low-level evidence. When published data were lacking, expert opinion was used exclusively. When literature and expert opinion differed significantly, published data were used preferentially unless these differences conceivably resulted from methodological limitations. Final numbers were often rounded to the nearest 5% to aid clinical use.

Results

Expert Opinion

The survey was completed by 31 (57%) of 53 surgeons representing 24 trauma centers across North America (15), Europe (5), India (1), Mexico (1), Japan (1), and Israel (1). Opinions around the expected time for return to work

TABLE 1. Summary of the clinical scenarios and outcomes studied

Injury	Patient Description	Treatment	Outcomes Analyzed
L-1 burst fracture	31-yr-old male heavy laborer	Cast or brace	Pain-free status at 1 yr; ROM recovery at 1 yr; exercise/sports participation at 1 yr; timing of RTW; LOS
L-1 burst fracture	20-yr-old male college football player	Open short-segment posterior pedicle screw instrumentation	Pain-free status at 1 yr; ROM recovery at 1 yr; ability to return to contact sports; timing of RTW; LOS
L-2 flexion-distraction injury	30-yr-old male accountant	Posterior instrumented stabilization (L1–3)	Pain-free status at 1 yr; ROM recovery at 1 yr; exercise/sports participation at 1 yr; timing of RTW; LOS
L-4 burst fracture	50-yr-old female homemaker	Treated nonsurgically (5° kyphosis)	Pain-free status at 1 yr; ROM recovery at 1 yr; personal care/social life profile at 1 yr; activity profile at 1 yr; LOS

LOS = length of hospital stay; ROM = range of motion; RTW = return to work.

following specific injuries and occupations are detailed in Table 3.

Systematic Literature Review

A total of 38 publications were deemed appropriate. Reasons why studies were omitted included a lack of functional outcome measures, failure to separate results for patients with and without neurological injury, and an inability to distinguish data for thoracolumbar or low lumbar injuries from a more general cohort. Studies were also restricted to those that employed the selected treatment modality. While an attempt was made to select literature with outcome data corresponding to the follow-up interval in the survey, the paucity of data for most scenarios precluded this approach. A variety of outcome measures were used including many nonvalidated subjective self-reported scales.

The majority of studies reporting on thoracolumbar burst fractures involved data that were prospectively collected (overall GRADE quality rating: low). In comparison, outcomes following flexion-distraction injuries and low lumbar fractures were of lower quality, comprising almost exclusively retrospectively collected data (overall GRADE quality rating: very low).

Synthesis of Literature and Expert Opinion

The systematic review identified data for all 4 injuries; however, 6 (30%) of 20 of the outcomes under investigation were not addressed by any of the available published literature. These outcomes were related to regaining ROM and return to sport or work. Expert opinion was used exclusively to predict the expected results for these 6 outcomes. Length of hospital stay was frequently influenced by concomitant injuries^{14,16} and thus expert opinion was used preferentially to reflect the anticipated inpatient stay following isolated spinal injuries. The *Appendix* (Tables 1–4) details the data extracted from the selected studies and expert opinion consensus for each case. Commentary on the information available for each individual scenario is presented below.

Thoracolumbar Junction Burst Fracture Managed Nonsurgically

Nine publications fulfilled the predetermined inclusion criteria for this scenario (overall GRADE quality rat-

ing: low).^{1,2,8,14,16,30,48,49,51} The mean duration of follow-up ranged from 12 to 113 months.

The literature noted pain-free status at final follow-up in 80 (38%) of 208 amalgamated patients.^{1,2,14,16,30,49,51} The survey responders predicted a mean 61% (range 25%–90%) chance of a patient's being pain free 1 year post-injury. No studies assessed ROM recovery; the mean value for likelihood of regaining pre-injury ROM at 1 year after injury based on the experts' survey responses was 68% (range 25%–90%).

At final follow-up, published studies noted "little or no restriction" in recreational activities in 67%–77%^{14,16} of patients, while reported Roland Morris Disability Questionnaire (RMDQ)⁴⁴ and Oswestry Disability Index (ODI)²¹ scores reflect low levels of functional disability.^{8,30,51} SF-36 Physical Component Summary (SF-36 PCS) scores of 45⁸ and 47.4³⁰ were also recorded, both below population norms. The majority (68%) of experts predicted that patients should be able to participate in high-impact exercise and contact sports 1 year post-injury; 39% expected no limitations, and 29% "some limitations."

In the report of their prospective randomized controlled trial, Wood et al.⁵² commented on the timing of re-employment, stating that 17 (71%) of 24 of conservatively treated patients with thoracolumbar burst fractures returned to work within 6 months. Thirty-nine percent of experts expected re-employment within 2 to 4 months, and 45% predicted a return to work between 4 and 6 months.

The length of inpatient stay reported in the literature ranged from 3 to 11 days.^{1,2,8,48,49,51} Forty-eight percent of experts anticipated a 2- to 3-day inpatient stay, while 35% predicted a 4- to 5-day stay.

Thoracolumbar Junction Burst Fracture Treated With Posterior Instrumented Stabilization

Twelve studies (overall GRADE quality rating: low) detailed relevant outcomes following posterior short-segment transpedicular stabilization of neurologically intact thoracolumbar (T-10 to L2–3) burst fractures. The mean duration of follow-up ranged from 12 to 68 months.^{6,11,13,20,26,31,34,35,46,48,50,51}

Pain-free status at final follow-up was noted in 33 (45%) of 73 patients pooled from 5 studies.^{13,20,31,34,35} The mean survey response predicted a 62% (range 12%–90%) chance of being pain free 1 year post-injury. No literature

TABLE 2. Literature search characteristics for each scenario

Case	MeSH & Key Words	No. of Abstracts Reviewed	Inclusion Criteria	Exclusion Criteria	No. of Studies Included*	GRADE Quality of Evidence
L-1 burst fracture in 31-yr-old male heavy laborer treated w/ brace or cast	Spine fracture/ or spine injury, vertebral fracture, thoracolumbar spine, "burst" w/in 5 words of (fractur\$ or injur\$), "thoracolumbar" w/in 5 words of "burst"	456	TL (T10–L3) burst fracture, neurologically intact, managed w/ brace or cast	Bed rest >2 wks	9	Low
L-1 burst fracture in 20-yr-old male college football player treated w/ short-segment posterior pedicle screw instrumentation (open midline approach)	Spine fracture/ or spine injury, vertebral fracture, thoracolumbar spine, "burst" w/in 5 words of (fractur\$ or injur\$), "thoracolumbar" w/in 5 words of "burst"	456	TL (T10–L3) burst fractures, neurologically intact, posterior short-segment transpedicular instrumentation w/ or w/o fusion w/ or w/o transpedicular augmentation	Anterior approaches, kyphoplasty, percutaneous fixation, monosegmental fixation	12	Low
L-2 flexion-distraction injury in 30-yr-old male accountant treated w/ ORIF w/ successful L1–3 fusion	Spine fracture/ or spine injury, flexion distraction, "chance" w/in 3 words of "fractur\$"	178	TL flexion-distraction or Chance injury, neurologically intact, surgical treatment—posterior short-segment stabilization (hooks or pedicle screws)	Exclusively managed conservatively	7	Very low
L-4 burst fracture in 50-yr-old female homemaker treated nonsurgically (5° kyphosis)	Spine fracture/ or spine injury, vertebral fracture, "low" w/in 3 words of "lumbar", "L3", "L4", "L5", "burst" w/in 3 words of "fractur\$"	116	L2–5 burst fractures only, neurologically intact	Pathological injuries, <5 patients, exclusively surgical management	10	Very low

GRADE = Grading of Recommendations Assessment, Development and Evaluation; ORIF = open reduction and internal fixation; TL = thoracolumbar.

* Number of studies included in systematic review.

TABLE 3. Expert opinion for the anticipated time to return to work after a thoracolumbar junction burst fracture (in a manual laborer) and a thoracolumbar junction flexion-distraction injury (in an office worker)*

No. of Mos	L-1 Burst Fracture (treated w/ brace or cast) in a Manual Laborer	L-2 Flexion-Distraction Injury (treated w/ posterior short-segment stabilization) in an Office Worker
<1	0%	3%
1–2	0%	29%
2–4	39%	48%
4–6	45%	19%
>6	16%	0%

* Percentage values represent the proportion of experts favoring the specified time interval.

assessed post-treatment ROM, and expert opinion forecast a 57% (range 0%–90%) chance that patients would regain their pre-injury ROM.

Sparse literature recorded the recreational activity profile of patients after short-segment instrumentation of neurologically intact thoracolumbar burst fractures; however, studies detailing health-related quality of life (HRQOL) outcomes often reported limitations, albeit minimal in the majority of cases.^{6,11,20,46,48,50,51} Experts most commonly (48%) envisioned a return to “high impact exercises and contact sports with some limitations” 1 year after surgical treatment. Twenty-nine percent predicted a return to recreational activities “without limitations.”

No published literature addressed return to contact/collision sports after short-segment stabilization of a thoracolumbar level burst fracture. Over two-thirds of experts expected a return to high-level athletic pursuits (i.e., college football). Thirty-five percent anticipated this would take longer than 6 months, while 32% forecast a return within 4–6 months. Thirty-two percent predicted this injury would end a college football career.

The average duration of hospital stay ranged from 8 to 12 days.^{26,34,35,46} The mode from the expert opinion survey predicted a 4- to 5-day inpatient stay (35%).

Thoracolumbar Junction Flexion-Distraction Injury Treated With Posterior Instrumented Stabilization

Seven studies (overall GRADE quality rating: very low) reported relevant functional outcomes following flexion-distraction injuries at follow-up intervals ranging from 12 to 85 months.^{5,22,24,32,36,40,43} Four reported on the results obtained following contemporary posterior short-segment stabilization (pedicle screws or hooks).^{22,36,40,43}

Two studies presenting pain outcomes in 27 neurologically intact patients following contemporary short-segment posterior stabilization noted that 48% reported no pain.^{36,43} The mean response of those surveyed predicted a 56% (range 10%–90%) chance of being free of back pain and stiffness 1 year post-injury.

No studies assessed post-injury ROM recovery, whereas experts estimated a mean 44% (range 0%–90%) chance of a patient regaining pre-injury spinal ROM post-injury.

Although exercise and sports participation were rarely specified, studies using a variety of scoring systems typically reported “full function” or “minimal disability” in more than 85%–90% of patients, while SF-36 PCS scores averaged below age- and sex-matched norms.^{5,22,36,40,43} Of those experts surveyed, 32% proposed that patients would regain the ability to participate in low-impact exercise and sports without limitations, while 29% forecast that high-impact exercise and contact sports with some limitations would be possible.

None of the selected studies assessed the timing of re-employment, but all experts predicted a return to work within 6 months—29% between 4–8 weeks and 48% within 9–16 weeks.

An average inpatient stay of 5 days (range 3–10 days) was quoted for neurologically intact patients in one study.⁴³ A 4- to 5-day admission was the most common prediction (42% overall) from the surgeons surveyed.

Low Lumbar Burst Fracture Managed Nonsurgically

Relevant patient-specific outcomes of neurologically intact, conservatively managed low (L2–5) lumbar burst fractures could be extracted from 10 retrospective case studies (overall GRADE quality rating: very low), with the average follow-up ranging from 29 to 79 months.^{3,4,7,9,12,15,23,30,39,47}

Pooled data revealed that 27 (26%) of 102 patients rated themselves as pain free or “completely recovered” at final follow-up.^{3,4,7,9,12,15,23,39,47} The mean survey response estimated a 59% (range 20%–90%) chance of being free of low-back pain 1 year after an injury that was treated nonsurgically.

No published literature assessed post-injury recovery of ROM. Expert opinion anticipated a 65% (range 0%–90%) chance of recovering pre-injury ROM.

The activity profile and personal care and social life limitations following low-lumbar fractures were inferred from articles that employed diverse outcome instruments. Studies recorded minimal limitations in recreational activity and a “return to previous activities” with “no” or “mild/minor” limitations reported for 60% to 90% of neurologically intact patients.^{4,7,12,15,47} Others reported “no significant change in activities of daily living” or “full function” in all patients combined.^{3,9,39} In comparison, 97% of experts expected patients to regain the ability to manage all “personal cares” 1 year post-injury. Half of these experts expected no limitations, and half expected “few” limitations. Equally, 97% of experts predicted “a normal social life” 1 year post-injury, with 58% anticipating “no limitations” and 32% expecting outdoor activity restrictions.

Protocols involving early protected mobilization resulted in a mean length of hospital stay ranging from 13 to 19 days.^{12,30,39} Alternatively, 61% of the surgeons surveyed anticipated a 2- to 3-day admission.

Discussion

The purpose of this study was to define the expected functional outcomes following common thoracolumbar injuries. This was accomplished by blending the best available evidence within the published literature with consensus expert opinion gleaned from a survey presented

to spine trauma experts, i.e., members of the STSG. This study represents Part 2 of an investigation of the impact of patient expectation on outcomes following spinal trauma.

Different theories have been proposed to explain the association of expectations with outcomes. One recognized rationale suggests that “fulfilling expectations” is critical and advocates that minimizing the mismatch between what is expected and what is obtained is essential to optimizing satisfaction and global outcome.^{38,42} Others suggest that high baseline expectations per se yield superior outcomes.^{10,17,25,27} Regardless of which theory best represents the role of expectations in predicting treatment outcome, an accurate knowledge of expected outcomes is a necessary baseline to allow further investigation. To achieve a valid baseline, an evidence-based medicine methodology must be used.

From our comparisons, the only discernible disconnect between the literature and clinical expertise was in the proportion of patients expected to be pain free 12 months post-injury. For all injuries, published data reported fewer patients to be pain free compared with the mean percentage values for the opinion of the experts. This mismatch may represent an area where, due to unrealistic surgeon predictions, outcomes do not meet patients’ expectations. It was also noted that the mean percentage values for expert opinion were remarkably similar for expectations regarding pain freedom regardless of injury, with predictions falling within a narrow range of 56%–62%, despite wide individual variation.

Although the synthesis of best available literature and expert opinion reflects the optimal evidence-based medicine methodology for determining functional prognosis after thoracolumbar trauma, there are many limitations inherent to this study. These outcome predictions are limited by the quality and quantity of the research available. They also evolved from very specific case scenarios, with the specificity representing an effort to reduce variability and enhance generalizability. The validity of extrapolation to similar, but still different, cases encountered in clinical practice has not been established and will be guided by the clinician’s expertise and experience. Issues concerning complications, neurology, and associated injuries could not be addressed in this study. In addition, many patients in the literature had premorbid conditions and concomitant injuries that may have negatively influenced their overall functional performance independent of their spinal pathology. While many studies quoted numbers of patients returning to work and sport, the retrospective nature of data collection often precluded information on the timing of these outcomes. Expert opinion was used almost exclusively for these domains. The follow-up interval in most published studies exceeded the 12-month time point investigated in this report. This variance in time to assessment may have introduced bias; nevertheless, experience suggests outcomes plateau after 1 year.

Only 57% of the members of the STSG completed the questionnaire. Although a group of experts tend to bias toward the null hypothesis, it is unknown whether the opinions of those that did not return the survey differed. The surgeons responding to the questionnaire, however, are experienced with thoracolumbar trauma and have established

a strong research background in this area. The questionnaire was developed by the authors for the purpose of this study and therefore has not been validated. Although the STSG received funding from Medtronic, the content of this study limited any potential for this to bias the conclusions.

Conclusions

This synthesis of the best available literature and consensus opinion of surgeons with a subspecialty interest in spine trauma reflects the optimal methodology for determining functional prognosis and HRQOL outcomes after thoracolumbar trauma. By providing consistent, accurate information to patients, surgeons will help them develop realistic expectations and potentially optimize outcomes. This hypothesis will be the focus of further research.

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Supplemental Information

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Appendix

Definitions were constructed from the combined results of data from the selected literature and consensus expert opinion for each of the 4 scenarios (Tables 1–4).

APPENDIX TABLE 1. An L-1 burst fracture (“stable pattern”) in a 31-year-old heavy laborer, treated with cast or brace

Question	Evidence	Guidelines
What is the percent chance of being free of low-back pain 1 year after injury?	<i>Literature</i> 0/10 on VAS pain scale: 8/23 (35%) ⁵² “no pain” (P1 on Denis Pain Scale): 72/185 (39%) ^{1,2,14,16,30,49} <i>Survey</i> mean 61% (range 25–90%)	~40%
What is the percent chance of patient regaining pre-injury range of motion?	<i>Literature</i> no published data <i>Survey</i> mean 68% (range 25–90%)	~70%
Post-injury exercise and sports participation?	<i>Literature</i> “active” lifestyle w/o restrictions: 14 (77%) ¹⁶ “little or no restrictions” in recreational activities: 16 (67%) ¹⁴ mean RMDQ scores 2.4–3.9 ^{8,30,52} mean ODI 10.7 ⁵² mean LBOS 50.2 ³⁰ mean SF-36 PCS 45, ⁸ 47.4 ³ <i>Survey</i> high-impact exercise & contact sports w/o limitation: 12 (39%) high-impact exercise & contact sports w/ some limitations: 9 (29%)	High-impact exercise & contact sports w/ no or minimal limitations
How long will it take to return to work?	<i>Literature</i> w/in 6 mos: 17/23 (71%), further 2 btwn 6 & 24 mos ⁵² <i>Survey</i> 4–6 mos: 14 (45%) 2–4 mos: 12 (39%)	Typically w/in 4–6 mos, although 39% of experts expect 2–4 mos
How long will patient be in hospital?	<i>Literature</i> “isolated spine injuries”: 5.9 days ¹⁶ patients meet discharge criteria at mean 3 days post-randomization ⁸ average inpatient stay 7.9–10.5 days ^{1,2,14,16,48,49,52} <i>Survey</i> 2–3 days: 15 (48%) 4–5 days: 11 (35%)	3–5 days*

LBOS = Low Back Outcome Scale; ODI = Oswestry Disability Index; RMDQ = Roland-Morris Disability Questionnaire (0 = no disability, 24 = maximum disability); SF-36 PCS = SF-36 Physical Component Summary; VAS = visual analog scale.

* For isolated spine injuries.

APPENDIX TABLE 2. An L-1 burst fracture in a 20-year-old college football player, treated with short-segment pedicle instrumentation

Question	Evidence	Guidelines
What is the percent chance of being free of low-back pain 1 year after injury?	<i>Literature</i> "no pain" (Denis Pain Scale): 28/59 (47%) ^{13,31,34,35} SF-36 bodily pain scores 100: 5/14 (36%) ²⁰ <i>Survey</i> 62% (range 12–90%)	~45%
What is the percent chance of patient regaining pre-injury range of motion?	<i>Literature</i> no published data <i>Survey</i> 57% (range 0–90)	~55%
Post-injury exercise and sports participation?	<i>Literature</i> "good" average LBOS (n = 80) ^{48,50,51} "excellent" LBOS: 12/24 (50%) ⁴⁶ average activity score (range 1–7): 4.92 (pre-injury 5.42, p < 0.01) ⁶ Hannover score: 82 (pre-injury 98.5, p < 0.01) ⁶ mean SF-36 physical functioning index 75 ²⁰ mean SF-36 physical functioning index 69 (controls 89) ¹¹ <i>Survey</i> high-impact exercises & contact sports w/ some limitation: 15 (48%) high-impact exercises & contact sports w/o limitations: 9 (29%)	High-impact exercise & contact sports w/ limitations
How long will it take to return to college football?	<i>Literature</i> no published data <i>Survey</i> <26 wks: 10 (32%) >26 wks: 11 (35%) "never": 10 (32%)	2/3 expect return to college football (1/3 at less than 6 mos, 1/3 at more than 6 mos) 1/3 expect injury to be career ending
How long will patient be in hospital?	<i>Literature</i> mean 8–12.4 days (range 1–35) ^{26,34,35,46} <i>Survey</i> 4–5 days: 11 (35%) 2–3 days: 8 (26%) 6–7 days: 8 (26%)	~4–7 days*

* For isolated injuries.

APPENDIX TABLE 3. An L-2 flexion-distraction injury in a 30-year-old accountant, treated with L1–3 posterior fusion (successful fusion)

Question	Evidence	Guidelines
What is the percent chance of being free of low-back pain and stiffness 1 year after injury?	<i>Literature</i> “no pain” (back pain rating): 13/27 (48%) ^{36,43} <i>Survey</i> 56% (range 10–90)	~50%
What is the percent chance of patient regaining pre-injury range of motion?	<i>Literature</i> no published data <i>Survey</i> 44% (range 0–90%)	~45%
Exercise and sports participation?	<i>Literature</i> work & recreation “full function” (Back Pain Rating): 34/35 (97%) ^{5,36,43} mean ODI score 11.5, 15 (88%) “minimal disability” ²² mean SF-36 PCS 39 ± 11, mean NASS PDS 38 ± 11 (both below age- & sex-matched norms) ⁴⁰ <i>Survey</i> low-impact exercises & sports w/o limitations: 10 (32%) high-impact exercises & contact sports w/ some limitations: 9 (29%) high-impact exercises & contact sports w/o limitations: 8 (26%)	High-impact exercise & contact sports possible w/ limitations
How long will it take to return to work?	<i>Literature</i> no published data <i>Survey</i> 9 to 16 wks: 15 (48%) 4 to 8 wks: 9 (29%)	Typically w/in 2–4 mos, although 29% of experts predict 4–8 wks
How long will patient be in hospital?	<i>Literature</i> 5.4 days (range 3–10) ³⁶ <i>Survey</i> 4–5 days: 13 (42%)	~5 days*

NASS PDS = National American Spine Society Lumbar Outcome Assessment Instrument pain/disability score.

* For isolated injuries.

APPENDIX TABLE 4. An L-4 burst fracture in a 50-year-old homemaker, treated nonsurgically

Question	Evidence	Guidelines
What is the percent chance of being free of low-back pain 1 year after injury?	<i>Literature</i> 27/102 (26%) patients rated as "pain-free" or "completely recovered" ^{3,4,7,9,12,15,23,39,47} <i>Survey</i> 59% (range 20–90%)	~25%
What is the percent chance of patient regaining pre-injury range of motion in her back?	<i>Literature</i> no published data <i>Survey</i> 65% (range 0–90%)	~65%
Personal care limitations/assistance 1 year post-injury?	<i>Literature</i> "no significant change in ADLs" (Denis Pain Scale): 12/12 (100%) ^{4,9} "return to previous activities" (Smiley-Webster Scale): 15/22 (68%) ^{3,47} activity returned to "pre-injury levels": 18/20 (90%) ¹⁵ "full function": 3/3 (100%) ³⁹ <i>Survey</i> manage all personal cares w/o limitations: 15 (48%) manage all personal cares w/ few limitations: 15 (48%)	Able to manage all ADLs independently w/ few limitations
Social life/activity profile 1 year post-injury?	<i>Literature</i> "return to previous activities" (Smiley-Webster Scale): 15/22 (68%) ^{3,47} activity returned to "pre-injury levels": 18/20 (90%) ¹⁵ "full function": 3/3 (100%) ³⁹ LBOS "excellent" or "good": 3/5 (60%) ³⁰ SF-36 PCS 46.2 ± 14.6 ³⁰ RMDQ 6 ± 7.9 ³⁰ returned to pre-injury level of recreational activity: 6/10 (60%) ¹² returned to pre-injury occupation & recreational levels: "no limitations" 13/28 (46%), "minor limitations" 10/28 (36%) ⁷ <i>Survey</i> normal social life w/o limitations: 18 (58%) normal social life w/ outdoor activity limitations (e.g., hikes): 10 (32%)	~2/3 expected to regain a normal activity profile; ~1/3 may experience limitations w/ more energetic activities
How long will patient be in hospital?	<i>Literature</i> 12.5–18.6 days ^{12,30,39} <i>Survey</i> 2–3 days: 19 (61%) 4–5 days: 9 (29%)	2–5 days*

ADLs = activities of daily living.

* For isolated injuries.