Preoperative Neuroscience Education for Lumbar Radiculopathy

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Disclaimers...
We publish books on pain and receive an honorarium for the sales. These are not being specifically promoted in the presentation. The intent is to share our research and not promote products.

We teach for a seminar company offering continuing education for healthcare providers. The session is not designed to promote the attendance of the seminars.

Learning Objectives

Upon completion of this educational session the participants will be able to:

• Understand why a new bio-psycho-social approach was needed to address pain in lumbar surgery
• Understand the development and validation process of the preoperative neuroscience education program for lumbar surgery
• Be able to understand the content and delivery methods for the preoperative neuroscience educational program
• Recognize why the preoperative neuroscience educational program produced superior results to the biomedical model utilized by US spine surgeons for lumbar surgery
• Apply the information from the educational session into clinical practice
What is the biggest predictor of you having Back Surgery in the US?

- Age
- Pain
- Insurance
- Zip Code

Ratio of Rates of CT/MRI scanning to the US Average surgery in the US average


Spinal Surgery in the US

- The likelihood of having spinal surgery in the US is 5 times higher than that of the United Kingdom, and at least twice than the surgery rates of Australia, Canada and Scandinavian countries.

Increased Lumbar Fusions


- **Between 1996 – 2001**
  - Spinal fusions rose by 77%
  - Total hip arthroplasty (THA) and total knee arthroplasty (TKA) rose by 13%

- **Patients with DDD**:
  - Between 1990 – 1993: 9.4% underwent spinal fusion
  - Between 1997 – 2000: 19.1% underwent spinal fusion (>200% increase)

- In addition to a rising rate of lumbar fusion surgery, it seems an increasing proportion of all spine operations include a fusion procedure:
  - For spinal stenosis, spine fusions quadrupled

Fusions with cages increased from 3.6% in 1996 to 58.1% in 2001. *(1500% increase)*

Outpatient Ambulatory Surgery

- Discectomies performed on outpatients rose from 4% in 1994 to 26% in 2000
- 650% increase

Spinal Stenosis: 2002 - 2007

- Rate of complex fusion procedures increased 15-fold
- Life-threatening complications increased
- Re-hospitalization within 30 days
  - 7.8% of patients undergoing decompression
  - 13.0% having a complex fusion
- Mean hospital charges for complex fusion: $80,888


The New York Times

- Recent analyses of research in orthopedic and spine surgery have demonstrated significantly more favorable results in corporate-sponsored studies.
- The surgeons themselves are guilty of being insufficiently critical of products and techniques they are developing. More people are interested in getting “on the gravy train than on stopping the gravy train”
  - Dr. Richard Deyo, MD

Diagnosis & Indication for Surgery?

- Several authors indicate that surgery rates may be linked to a poor consensus of indication for specific surgical procedures and even the increased rates of surgery for geriatric patients.

So What if Surgery Is Increasing?

Patients only care about...

- Loss of Pain
- Improved Function
- No complications


Laminectomy/Laminotomy

- Success rate ~ 80%
- Effective for leg symptoms – pain, neurological, etc.
- Most research – spinal stenosis
- Long-term slightly better than conservative care
- Indicated in neurological deficit

**Discectomy – very well studied**

- The reported success rate of lumbar disc surgery varies from 60% to 90% (Ave 80%)


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**Microdiscectomy**

- Have not yet shown any advantage over traditional discectomy
- Microdiscectomy gives broadly comparable results to open discectomy.

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**Discectomy – Summary**

- 80% success rate
- Predominantly for leg pain due to HNP
- No difference between open vs. microdiscectomy
Fusions

- No conclusions are possible about the relative effectiveness of anterior, posterior, or circumferential fusion.


Fusion – Summary

- At best – coin toss: 50% success rate
- Significant complications
  - Double risks compare to decompression surgery
  - Blood transfusion x 6
  - Double postoperative mortality


They may be getting the message
Total Disc Arthroplasty

- 57% of the patients with disc replacement met all 4 criteria for success
- 64% still using narcotic medications at the 2-year follow-up


Lumbar Disc Replacement

- 2 RCTs, 2 previous systematic reviews, 7 prospective cohort studies, 11 retrospective cohort studies and 8 case series
- To date, no study has shown total disc replacement to be superior to spinal fusion in terms of clinical outcome
- Long-term benefits of total disc replacement in preventing adjacent level disc degeneration have yet to be realized


Disc Replacement

Summary

- Results not as impressive as expected
- Lot’s of “hype”
- Better than fusion (coin toss at best)
- At least 30-40% of patients experience persistent pain and disability

**Summary**

It can easily be stated that at least 1/3 (more likely 40%) of lumbar surgery patients continue to have significant persistent pain, disability and functional loss.

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**So – a Second Surgery will fix it…right?**


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*References*


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**Kypho/Vertebroplasty**

- **Summary**
  - No significant evidence over conservative care or placebo
  - High incidence of fractures above/below
  - Cemented vertebrae fractures also occur
  - AND – various medical concerns: unknowns of cement leakage, intravascular leakage, embolisms, bleeding, etc.
  - US insurance likely won’t cover the procedure
So: No-One Should Have Back Surgery?

- There are VERY DEFINITE indications:
  - Progressive neurological deficit
  - Fractures
  - Cord Compression
  - Pain?
  - Instability?
  - Arthritis?

Postoperative rehab...

- **The good news:**
  1. Cochrane: Intensive PT for 4-6 weeks result in better short term outcomes compared to no rehabilitation.
  3. Filiz et al 2005: Intensive exercise increase lifting from waist to shoulder, abdominal endurance, and disability as measured by the modified Oswestry Disability Index
  4. Danielson 2000: Short term benefit of exercise
  5. Manniche 1993: Short term benefit of exercise

- **The bad news:**
  1. Ostelo et al 2003a: 6-month results of behavioral graded activities versus usual care, showed no difference in regards to functional status, pain, pain catastrophisation, fear of movement, ROM, general health, social functioning or return to work.
  2. Ostelo et al 2003b: One year follow-up: No difference
  3. Danielson et al 2006: Intensive 6-month rehab program in 3 phases vs. "continue normal ADLs" - no difference
  4. Cochrane Review: One year follow-up of PT vs. no treatment show no advantage for rehab.
  5. Christensen et al 2003: No benefit of PT rehab compared to HEP, video and support group meetings.
  7. Danielson 2000 - no long term benefits to exercise
  8. Manniche 1993 - no long term benefits to exercise
  9. Marron et al 2007: No benefit of PT over "act as usual"

Rehabilitation after lumbar disc surgery

Cochrane Database Syst Rev. 2004

- Thirteen studies were included, six of which were of high quality.
- There is no evidence that patients need to have their activities restricted after first time lumbar disc surgery.
- There is strong evidence for intensive exercise programs (at least if started about 4 weeks post-operative) on short term for functional status and faster return to work and there is no evidence they increase the re-operation rate.
- It is unclear what the exact content of post-surgery rehabilitation should be.
- Moreover, there are no studies that investigated whether active rehabilitation programs should start immediately post-surgery or possibly four to six weeks later.
What about preoperative interventions?

In 1975 and 1978 two pioneer studies by Hayward and Boorde demonstrated that structured preoperative education had an effect on postoperative pain, anxiety and recovery.

Preoperative Education: Orthopedics

Preoperative education for orthopaedic patients: systematic review

Journal of Advanced Nursing, 50(2), 212-223

Karin Johansson MSc, RN
Researcher, Department of Nursing Science, University of Turku, Turku, Finland

- **Positive effect**
  - Preoperative anxiety levels
  - Patient knowledge

- **No changes to postoperative outcomes**
  - Pain
  - ROM
  - Function
  - Length of hospital stay

"Little evidence that preoperative education provide superior results in regards to pain, functioning and LOH when compared to "usual care" in total hip and knee replacement patients

Modest effect in decreasing anxiety prior to surgery
Preoperative Education: Orthopedics

- Since the review – several RCT’s
- No significant difference postoperatively


Why is it not helping?

- Procedural information
- Informed consent
- No postoperative benefit


Preoperative Education Lumbar Surgery

- Louw, A., et al 2009:
  - Patients require more preoperative information regarding the surgical procedure, the potential risks, and the limitations and benefits of surgery
  - More information on their pain and how surgery will impact pain.

- McGregor et al 2007:
  - Patients require more preoperative information

- Ronnberg et al, 2007:
  - Patients in general satisfied with the care given to them preoperatively
  - Not with the content of the information regarding the impending spinal surgery.
So where are we at?

- Spine surgery in the US is increasing
- Spine surgery is very expensive
- At least 40% of people following L-Surgery has persistent pain and disability
- Postoperative rehabilitation has not shown any significant ability to decrease postoperative pain and disability
- Surgeons do not readily refer spine surgery patients to rehabilitation
- Nonoperative interventions have not shown any significant effect in decreasing postoperative pain and disability
- Multilevel surgery is not associated with better outcomes

In the meantime...

New understanding of pain
A neuroscience approach to managing athletes with low back pain

Emilio J. Puentedura, Adrián Louw
In the meantime...

The BRAIN should be a major FOCUS in addressing pain and disability in Lumbar Surgery

1. What do lumbar surgery (LS) patients want?
2. What constitutes “usual” preoperative LS education?
3. What does the general population think about LS?
4. Is there any effective preoperative strategy that can be borrowed?
5. Is there any other effective strategy that can be borrowed for complex back patients?
6. What happens when a “surgical” brain understands more?
7. Can we develop a LS program using all of this information?
8. Does such a LS program produce superior results?
1. What do lumbar surgery (LS) patients want?

New questionnaires developed

- Patient study
  - Administered to patients at their first postoperative visit with the surgeon – within 4 weeks postoperatively

- Physiotherapist study
  - 1000 randomized physiotherapists
  - Must treat postoperative L-spine patients
  - 2-years clinical experience


1. What do lumbar surgery (LS) patients want?

Is preoperative education important?

- 100% of patients – YES
- 99% of therapists – YES
- 92% of therapists rated preoperative education more important than postoperative education


1. What do lumbar surgery (LS) patients want?

- 76% of patients underwent surgery for pain

- Although 97% of patients thought their preoperative education was beneficial
  - More than 1/3 felt they did not get enough education on pain

- 50% of patients surveyed at 4 weeks postoperative was afraid pain will get worse

Patients want to know more about (their) pain

2. What constitutes “usual” preoperative LS education?

Design and Setting: Online cross-sectional survey
Participants: Random sample of spine surgeons in the US
Interventions: Spinal Surgery Education Questionnaire developed
Main Outcome Measure(s):

- Descriptive statistics were used to describe the current utilization, importance, content and delivery methods of preoperative education by spine surgeons in the US for patients with lumbar radiculopathy.
- Results: 89/200 (45% response rate) surgeons responded


2. What constitutes “usual” preoperative LS education?

- Average time between decision and surgery = 17 days
- 85% reported education provided at last clinical consult
- Surgeon report educational session last approx. 15 min.


2. What constitutes “usual” preoperative LS education?

- [Bar chart: Education Session Description - 64.20% Formal, 35.80% Informal]
- [Bar chart: Provider of the Educational Session - 75.31% Surgeon, 12.35% Other, 7.41% Physical Therapist, 4.94% Nurse]

2. What constitutes “usual” preoperative LS education?

Importance of preoperative education

<table>
<thead>
<tr>
<th>Score (out of 10)</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.23%</td>
<td>4.94%</td>
</tr>
<tr>
<td>20.99%</td>
<td>19.75%</td>
</tr>
<tr>
<td>44.44%</td>
<td></td>
</tr>
</tbody>
</table>


2. What constitutes “usual” preoperative LS education?

Why is preoperative education important?

<table>
<thead>
<tr>
<th>Importance</th>
<th>Score (out of 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obliged (ethical/leg)</td>
<td>28</td>
</tr>
<tr>
<td>Answer questions</td>
<td>37</td>
</tr>
<tr>
<td>Reduce anxiety</td>
<td>27</td>
</tr>
<tr>
<td>“Better” outcomes</td>
<td>43</td>
</tr>
<tr>
<td>Other</td>
<td>25</td>
</tr>
</tbody>
</table>


Why is preoperative education important?

- Reduces anxiety
- Improves outcomes
- Ensures informed consent
- Increases patient satisfaction
- Reduces medical errors
- Improves communication
- Enhances patient education
- Reduces postoperative complications
- Increases patient compliance
- Enhances surgical outcomes
- Increases patient satisfaction
2. What constitutes “usual” preoperative LS education?

<table>
<thead>
<tr>
<th>Surgical procedure</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar disc surgery</td>
<td>87.9%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Scoliosis surgery</td>
<td>53.8%</td>
<td>46.2%</td>
</tr>
<tr>
<td>Total disc</td>
<td>10.3%</td>
<td>89.7%</td>
</tr>
<tr>
<td>LUMS/TIPS</td>
<td>8.6%</td>
<td>91.4%</td>
</tr>
<tr>
<td>Nerve involvement</td>
<td>2.7%</td>
<td>97.3%</td>
</tr>
</tbody>
</table>

Surgeons follow a stringent biomedical model


Unrealistic Expectations

- Half of the patients expected to become completely leg pain free, and more than three fourths of the patients expected to become unlimited in their walking ability in both groups.
- Even if the clinical expectations were met, some patients were still dissatisfied.


3. What does the general population think about LS?

3. What does the general population think about LS?

- 262 participants
- Mean age = 46.1 ± 16.9 years (range 60-88)
- 91.5% were current residents of Nevada (4.2% from neighboring states and the remainder from various states across the county)
- 76.3% non-Hispanic, 10.7% Hispanic, 8.8% other


3. What does the general population think about LS?

The general population has a negative/ambivalent view of Lumbar Surgery and expecting a long recovery.

4. Is there any effective preoperative strategy that can be borrowed?

- **Systematic Review: Johansson, Nuutila et al. 2005**
  - 11 randomized controlled trials involving 1044 hip and knee arthroplasty patients.
  - Preoperative education has a positive effect on preoperative anxiety levels and patient knowledge.
  - No changes in postoperative outcomes including pain, ROM, function or length of hospital stay.

- **Cochrane - McDonald, Hetrick et al. 2004**
  - 9 studies involving 782 patients with knee or hip arthroplasty.
  - Little evidence that preoperative education provide superior results in regards to pain, functioning and length of hospital stay when compared to “usual care” in total hip and knee replacement patients.
  - Modest effect in decreasing anxiety prior to surgery.
4. Is there any effective preoperative strategy that can be borrowed?

- The educational content centred on a description of preoperative preparation, hospital stay, surgical procedure, immediate and intermediate experiences and expectations following surgery, rehabilitation, encouragement and reassurance and answering common question associated with the surgical experience

- Only one study, utilizing pain education was able to reduce postoperative pain


4. Is there any effective preoperative strategy that can be borrowed?

**Preoperative Education for Orthopedics**

- No changes to postoperative outcomes including pain, ROM, function or length of hospital stay.
- Only one study, utilizing pain education was able to reduce postoperative pain.


5. Is there any other effective strategy that can be borrowed for complex back patients?

Emerging research shows that explaining to patients their pain experience from a biological and physiological perspective of how the nervous system/brain’s processes pain allow patients to move better, exercise better, think different about pain, push further into pain, etc.

5. Is there any other effective strategy that can be borrowed for complex back patients?

Conclusions: For chronic MSK pain disorders, there is compelling evidence that an educational strategy addressing neurophysiology and neurobiology of pain can have a positive effect on pain, disability, catastrophization, and physical performance.

Also clarified content and educational delivery methods

Pain Neuroscience Education could potentially help Lumbar Surgery patients


5B. Is there any other effective strategy that can be borrowed for complex back patients?

The Efficacy of Therapeutic Neuroscience Education on Musculoskeletal Pain – An Updated Systematic Review of the Literature

- Adriaan Louw, PT, PhD
- Kory Zimney, PT, DPT
- Louie Puentedura, PT, PhD
- Ira Diener, PT, PhD

The results of this updated systematic review of TNE for MSK pain provides strong evidence for TNE improving pain ratings, pain knowledge, disability, pain catastrophization, fear-avoidance, attitudes and behaviors regarding pain, physical movement and healthcare utilization.

Submitted for publication

6. What happens when a “surgical” brain understands more?

The Efficacy of Sham Surgery in Orthopedics: A Systematic Review of the Literature*

Louw A, Diener I, Puentedura L and Fernandez de-Las Penas C.

Submitted for Publication 2012 - 2015

* Rejected by all major spine and orthopedic journals
6. What happens when a “surgical” brain understands more?

Conclusion: Although care should be taken…sham surgery has been shown to be just as effective as actual surgery in reducing pain and disability.

Louw, A; Puentedura EJ, Diener I, et al 2015 – submitted for publication

7. Bringing it all together...

<table>
<thead>
<tr>
<th>L-Surgery Issues</th>
<th>Neuroscience</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Expectations for Surgery</td>
<td>• No reference to anatomical or patho-anatomical models</td>
</tr>
<tr>
<td>• Surgery-specific issues</td>
<td>• Nociception and nociceptive pathways</td>
</tr>
<tr>
<td>• Making peace with having surgery</td>
<td>• Neurones</td>
</tr>
<tr>
<td>• Hospital procedures</td>
<td>• Synapses</td>
</tr>
<tr>
<td>• Recovery after surgery</td>
<td>• Action potential</td>
</tr>
<tr>
<td>• Different medical people encountered</td>
<td>• Spinal inhibition and facilitation</td>
</tr>
<tr>
<td>• Postoperative medical procedures and timeline</td>
<td>• Peripheral sensitization</td>
</tr>
<tr>
<td></td>
<td>• Central sensitization</td>
</tr>
<tr>
<td></td>
<td>• Plasticity of the nervous system</td>
</tr>
</tbody>
</table>
Clinical Application

- Physical therapist
- One-on-one verbal format
- Pictures, examples, metaphors and drawings as needed
- Conversational and personal approach rather than a lecture format
- Standardized NE program: checklist
- The educational sessions averaged 30 minutes.
- Provided with a preoperative NE booklet; asked to read the NE booklet at least one time before and one time after their surgery.

1. The decision to have LS

2. The nervous system’s physiology and pathways

3. Peripheral nerve sensitization
4. Surgical experiences and environmental issues effects on nerve sensitivity

5. Calming the nervous system

6. Recovery after LS
Which story works best?

1. Overall concept that pain after surgery is normal
2. Extra sensitive alarm system
3. The body's living alarm system
4. How to calm extra sensitive nerves
5. Surgical experience ramping nerves up

Louw, A 2015 – in preparation

Does it work?

1. Who does it best?
2. Comparative Language
3. Case Series – Immediate effect
4. Brain changes – fMRI
5. RCT 1 year
6. PT after RCT
7. RCT 3 years

1. Who does it best?

Analyzing 1 year RCT data

Other therapists
5 years clinical experience
NPO > 90%
PNET > 90%
Go through tutorial of PNET
Have taken 15h CEU on TNE
2. Comparative Language: Some Background

ISSLS Prize Winner: Function After Spinal Treatment, Exercise, and Rehabilitation (FASTER)

A Factorial Randomized Trial to Determine Whether the Functional Outcome of Spinal Surgery Can Be Improved

Alison H, McGregor, PhD; Caroline J. Davis, BSc; Tim P. Morris, BSc; Steve Morris, PhD; Konrad Jamrozik, PhD (on behalf of the FASTER team)

SPINE Volume 36, Number 21, pp 1711–1720

RANDOMIZED TRIAL
2. Comparative Language: Some Background

CONCLUSION:
- Cost-effectiveness evidence does not support use of booklet over no booklet or rehabilitation over no rehabilitation for the postoperative management of patients after spinal surgery.


2. Comparative Language

- An expert review panel
- Identifying and highlight ‘provocative’ words
- Reviewers were blinded to title and authorship of the booklets.
- Seventeen reviewers from 7 different countries participated


2. Comparative Language

- Booklet A had almost 3 times as many provocative terms as Booklet B.
- Booklet A had an average of 67.2 provocative terms per reviewer compared to only 22.6 terms for Booklet B.

3. Case Series – Immediate effect

• 10 Patients scheduled for Surgery for L-Radiculopathy
  – Ave. age 47 years; 7 females
  – Ave. duration of leg pain 7 months
  – Ave. time till surgery 9.5 days
  – Ave. LBP rating 4.6/10
  – Ave. leg pain 4.1/10
  – Ave. Oswestry 40.8%
  – Pain Catastrophization Scale: 25.4
  – FABQ-W: 15.8
  – FABQ-PA: 18.7
  – Pain knowledge: 12/19
  – SLR: 50 degrees
  – Active trunk flexion 21cm
  – Numerous poor beliefs about surgery

3. Case Series – Immediate effect

- Physical Measurements (after education only):
  - Passive SLR increased 9 degrees
  - Active trunk flexion increased 5 cm

4. Brain changes – fMRI


4. Brain changes – fMRI

Immediately following TNE straight leg raise increased by 7° and forward flexion by 8 cm

5. RCT - 1 Year


No statistical significance:
- Back Pain
- Leg Pain
- Catastrophization
- Fear Avoidance
- Pain Knowledge

But...

Surgical Experience

5. RCT - 1 Year
45% less on medical tests and treatments...


6. PT After RCT

Study Design: This was a multicenter, randomized, controlled trial (RCT) analyzing physical therapy (PT) utilization following lumbar surgery (LS) for radiculopathy.

Objective: We sought to determine the referral patterns, utilization and indications for postoperative PT for lumbar radiculopathy.

Louw, Puentedura and Diener – accepted for publication

Did you attend PT?
6. PT After RCT

- 45% of the patients who did not attend PT after LS were of the opinion they would have benefited from PT after LS.
- 62.5% of these patients reported the surgeon not discussing postoperative PT after LS.

- Back pain
- Leg pain
- Disability
- Fear-avoidance,
- Pain catastrophization
- Pain knowledge
- Various LS beliefs and experiences

7. RCT 3 years

- No statistical significance:
  - Back Pain
  - Leg Pain
  - Catastrophization
  - Fear Avoidance
  - Pain Knowledge

3 Years

No statistical significance:
- Back Pain
- Leg Pain
- Catastrophization
- Fear Avoidance
- Pain Knowledge
7. RCT 3 years: Cost

Louw, Puentedura, Landers, Diener and Zimney 2015 – submitted for publication

\[ p = 0.007 \]

1 Year Cost Difference 40%

3 Year Cost Difference 60%

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Thank you & acknowledgements...

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- David Butler
- Merrill Landers
- Steve Schmidt
- ISPI staff and faculty
References


