Knowing Unknowns: Innovation of Clinical Decision Making Under Conditions of Stress and Uncertainty: Case Studies of Low Back Pain

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Neurological Surgery

Humboldt Park Health

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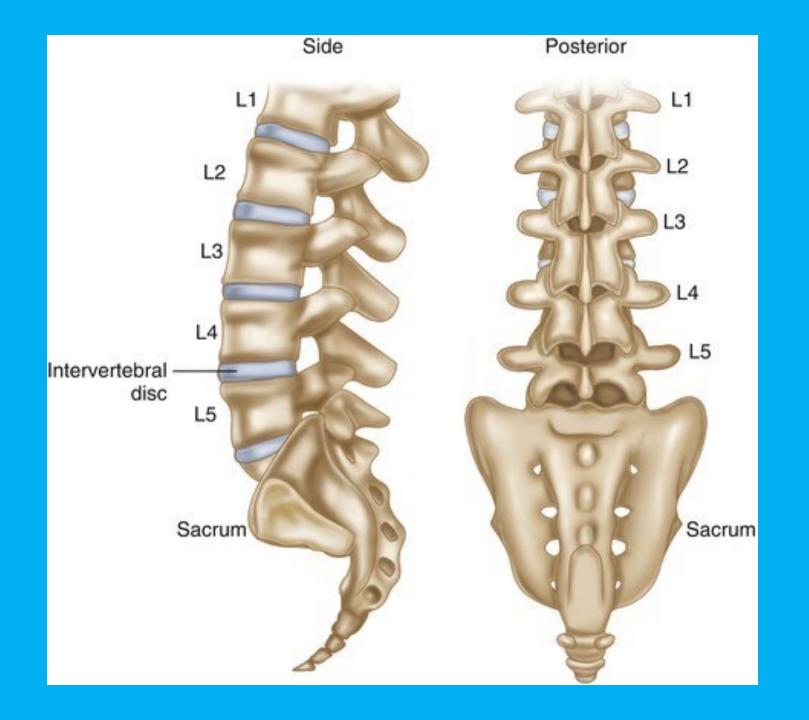
Financial Disclosure:

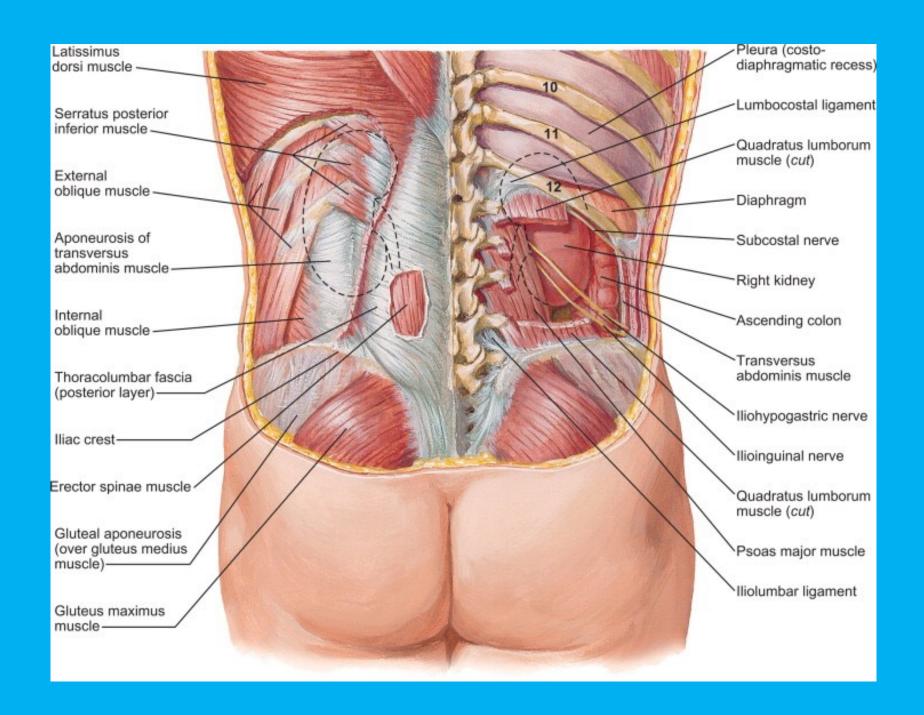George R. Cybulski, M.D. is the author of the # 1 Best Seller on Amazon: "Can We Manage To Save Healthcare?"

Nothing further to disclose.

Questions:

1. **What are the most common conditions causing low back pain?**

2. **What are methods for diagnosing low back pain and how can we improve upon them?**

Side

Posterior

L1
L2
L3
L4
L5

Intervertebral disc

Sacrum

L1
L2
L3
L4
L5

Sacrum

Latissimus dorsi muscle

Serratus posterior inferior muscle

External oblique muscle

Aponeurosis of transversus abdominis muscle

Internal oblique muscle

Thoracolumbar fascia (posterior layer)

Iliac crest

Erector spinae muscle

Gluteal aponeurosis (over gluteus medius muscle)

Gluteus maximus muscle

Pleura (costo-diaphragmatic recess)

Lumbocostal ligament

Quadratus lumborum muscle (*cut*)

Diaphragm

Subcostal nerve

Right kidney

Ascending colon

Transversus abdominis muscle

Iliohypogastric nerve

Ilioinguinal nerve

Quadratus lumborum muscle (*cut*)

Psoas major muscle

Iliolumbar ligament

10

11

12

- **Low back pain**

  Only exceeded as a reason for seeking medical care by upper respiratory tract infections

  Yet ………..

While low back pain may be common, the variability of successful outcome after diagnosis and treatment remains a mystery in many cases and results leading to <u>NOT ONLY</u> significant overuse of resources (imaging, specialist consultation) but also treatment (medication, injections, physical therapy, surgery, etc. etc.).

So despite its common occurrence low back pain emphasizes the critical need for improved decision making.

That's due to the fact that the present state of diagnosis and treatment of low back pain reflects both the state of knowledge complicated by perverse incentives of treaters who influence decision making about diagnosis and treatment of low back pain.

As a result:

The state of diagnosis and treatment of low back pain = a billion dollar industry with very mixed results

But also:

A great opportunity to create value for care of low back pain

Dubious examples of treatment of "degenerative" low back pain:

Facet Injections

Lumbar Spine Instrumentation and Fusion

(Based upon assumptions regarding "degenerative" changes of facets and discs of the lumbar spine)

Low Back Pain

Diagnosis - History

      - Imaging (x-rays, MRI, CT Scans)

      - Referral to Specialists?

    (Protocol vs Informal Decision Making)

      - Absurdity of "Guidelines"

    (Person on the Scene Makes the Call)

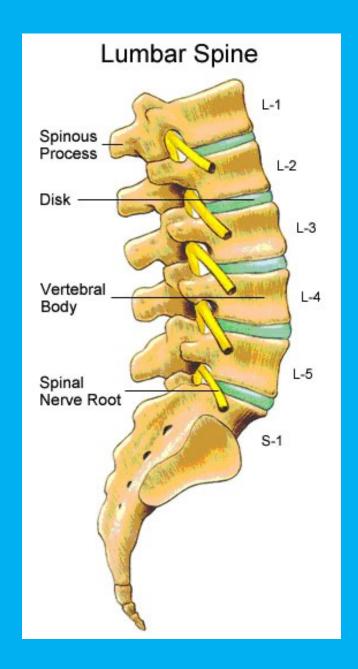# Lumbar Spine

Vertebral Body

Intervertebral Disc

Facet Joints

Lamina

Spinous Processes

Nerve Roots

Ligaments / Paravertebral Muscles

Lumbar Spine

Spinous Process
Disk
Vertebral Body
Spinal Nerve Root

L-1
L-2
L-3
L-4
L-5
S-1

Time Course of Onset of Low Back Pain

Decision-making under stress and uncertainty; Don't be fooled by acute presentation of low back pain or lulled into complacency by prolonged nature of symptoms.
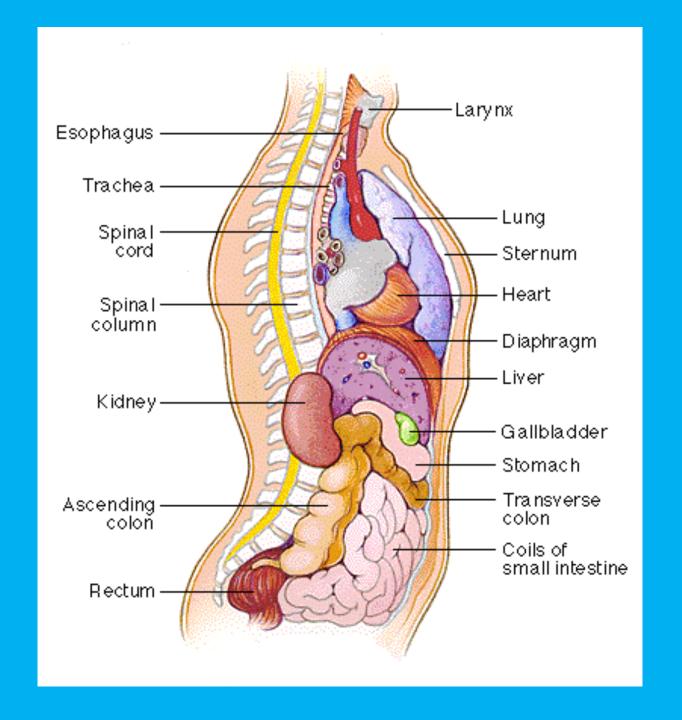
Acute

vs

Chronic

Age

(Young people have tumors of the spine but older people have them more often)

Quality of pain with Low Back Pain

    - Sharp, dull, radiating, etc.
       (Challenges of Health Literacy)

Esophagus

Trachea

Spinal cord

Spinal column

Kidney

Ascending colon

Rectum

Larynx

Lung

Sternum

Heart

Diaphragm

Liver

Gallbladder

Stomach

Transverse colon

Coils of small intestine

Neurological Symptoms / Signs

Weakness / Numbness / Loss of Sensation / DTRs

Case Example:

31-year old Professional athlete involving a sport of sudden twists, turns, and rolls gives a history of onset of low back pain followed by radiation into the buttocks on the right with radiation down the back of leg, pins and needles feeling on top of foot with trouble walking
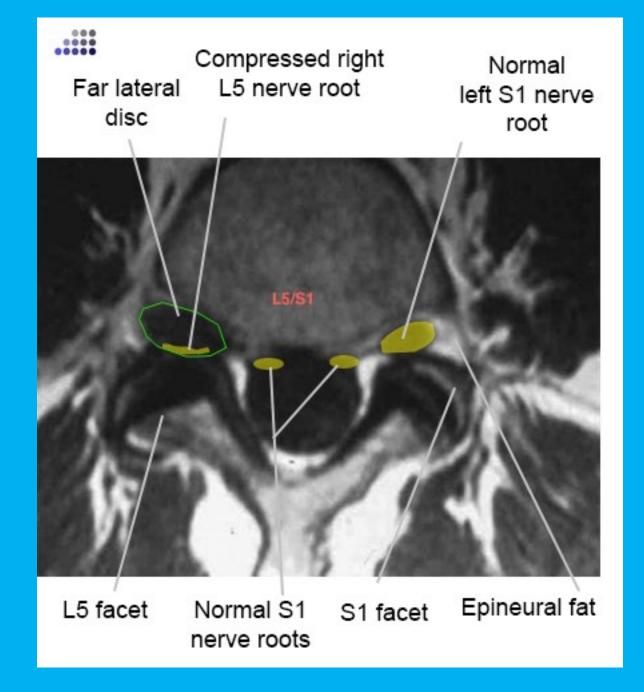
Diagnosis

Weakness / Numbness of Foot

Herniated Disc

Treatment -   ? Physical Therapy

? Epidural Steroid Injections

? Microdiscectomy

Far lateral disc · Compressed right L5 nerve root · Normal left S1 nerve root · L5/S1 · L5 facet · Normal S1 nerve roots · S1 facet · Epineural fat

Treatment

Physical Therapy; Epidural Steroid Injections; Lumbar Microdiscectomy

The Trap:

Spine "care" has become more focused on treatment and less on diagnosis

Shoot – Ready - Aim

"There may be a place for diagnostic aids that provide a framework for generating ideas about diagnoses."

Hamilton Bailey

1894-1961

Emergency Surgery

Hamilton Bailey's Surgical Sieve

- **Congenital**

- **Traumatic**

- **Infections – Inflammatory**

- **Degenerative**

- **Neoplastic**

- **(Iatrogenic*)**

*Failed Lumbar Spine Surgery

Case Example:
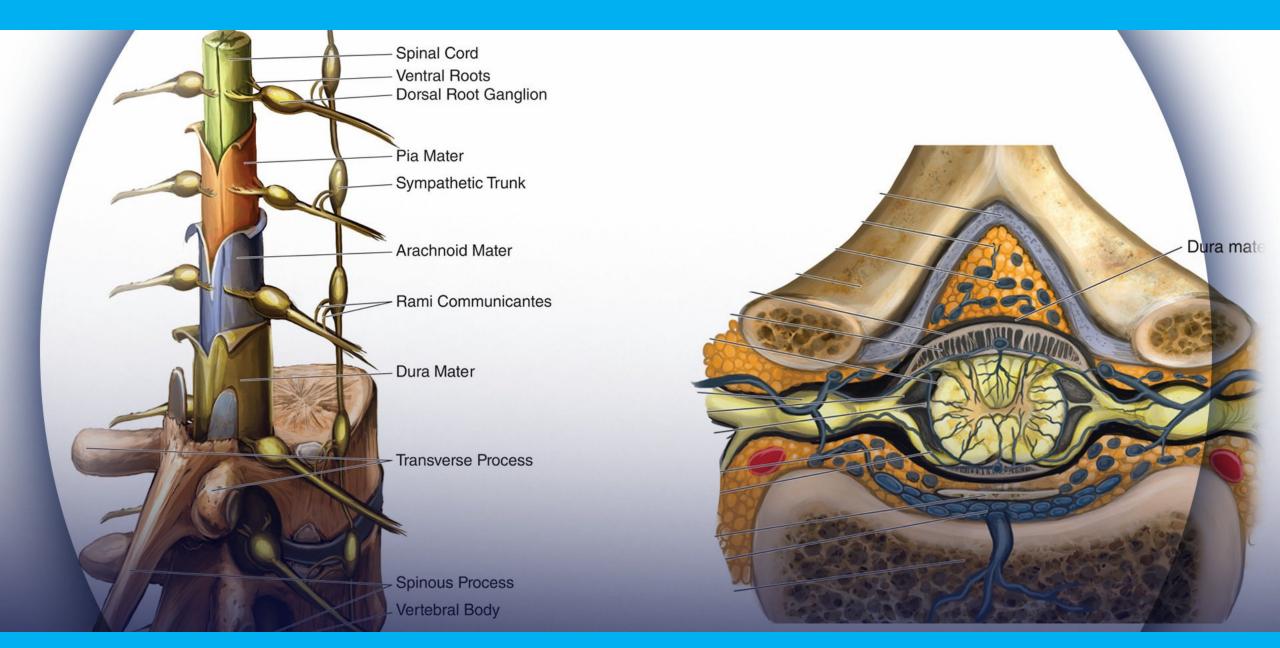
A 51-year-old woman referred with a history of back pain for many, many years.

The pain is centered over her lower back, and constant but increases with walking, bending, and sneezing.

No radiation of pain into her buttocks or legs with any of these activities. Occasional tingling in her legs with bending at the waist.

Occasional urgency of urination.

Additional Questions?

Exam?

Spinal Cord
Ventral Roots
Dorsal Root Ganglion

Pia Mater

Sympathetic Trunk

Arachnoid Mater

Rami Communicantes

Dura Mater

Transverse Process

Spinous Process

Vertebral Body

Dura mate

Case Example:

Elderly man observed hunched over his shopping cart in Menards ……… after polite introduction of myself ………

Questions / Diagnosis

Recommendations

Clinical Decision Making Under Conditions of Stress and Uncertainty

Uncertainty

– **Conscious Awareness of Not Knowing**

– **Usually Mundane But May Become Existential**

…… as we know, there are <u>Known</u> <u>Knowns</u>; these are things <u>we</u> <u>know</u> <u>we know.</u>

      (e.g. lumbar herniated disc)

<u>Known</u> <u>Unknowns,</u> that is to say we know there are some <u>things</u> <u>we</u> <u>do</u> <u>not</u> <u>know</u>.

      (e.g. occult tumors of the pancreas, kidneys; aneurysms of the abdominal aorta)

But there are also <u>Unknown Unknowns</u>

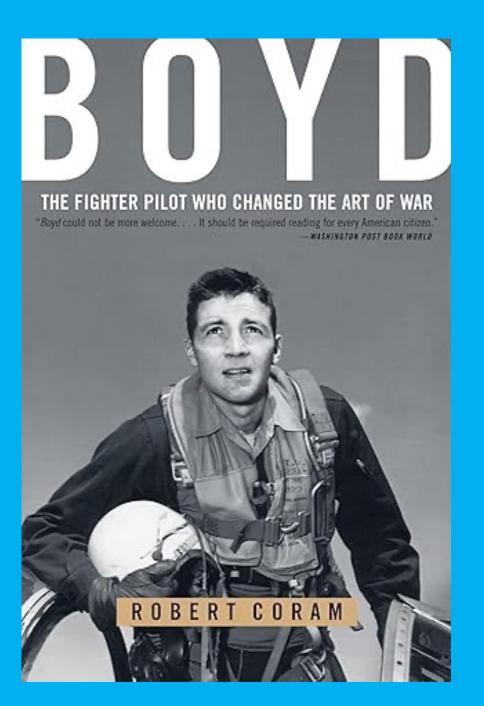**The ones we don't know we don't know (e.g. many people with chronic low back pain)**

Donald Rumsfeld, 2002

The objective of decision making under conditions of stress and uncertainty is to turn unknown unknowns into knowns or at least acknowledged unknowns.

(The Art of Uncertainty, Spiegelhalter, 2024)

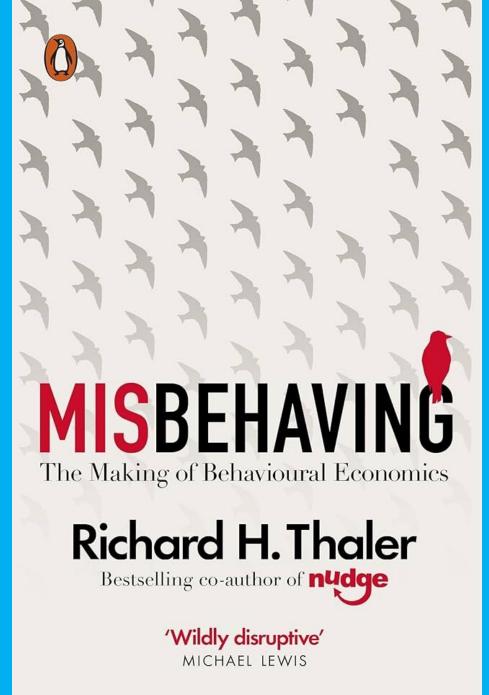**This is the essence as well of our mission in healthcare.**

OODA Loop

O

O

D

A

Observe

Orient

Decide

Act

Behavioral Economics of Decision Making

Heuristics / Bias

Incentives ("Nudge")

Vices vs Virtues

MISBEHAVING

The Making of Behavioural Economics

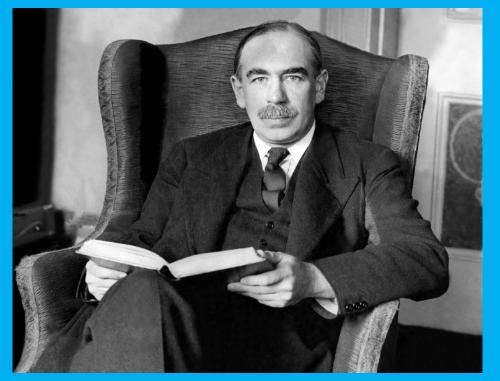# Richard H. Thaler

Bestselling co-author of **nudge**

'Wildly disruptive'
MICHAEL LEWIS

A Spine Surgeon Must Be A Mind Surgeon

(There is no bad surgery (mostly), just bad decision-making - judgment of indications for spine surgery).

When the facts change, I change my opinion.

What do you do?

John Maynard Keynes

Economist

What Role for Artificial Intelligence Enabling Diagnosis and Treatment of Low Back Pain?

VERITY
HARDING

One of *TIME*'s 100 Most Influential People in AI

AI
NEEDS
YOU

HOW WE CAN
CHANGE AI'S FUTURE AND
SAVE OUR OWN

Artificial Intelligence?

- Machine Learning

- Natural Language Processing (Large Language Models – LLMs)

- Deep Learning/Neural Networks

- Computer Vision

- Robotics

- "Point" Solutions or "Disruptive Innovation" for the Status Quo (i.e. ordering off the spine care menu – meds, shots, etc.)   or

Creating Meaningful Measures (e.g. Expected Value) That Improve the Probability of Improved Clinical Decision Making

Virgil Carter,
NFL 1967-1976

Where AI for Diagnosis and Treatment of Low Back Pain is Right Now:

Data that Artificial Intelligence is trained on for diagnosis and management of low back pain is data influenced by the biases inherent in the existing data (literature) and agendas of health insurance companies.

e.g. "SPORT" Study for treatment of lumbar disc herniation (circa 2000)

A Great Opportunity Exists:

Behold the turtle. He makes progress only when he sticks his neck out.

James B. Conant

What AI-aided Support of Clinical Decision Making Will Not Replace:

- **Judgment (Critical Thinking)**

- **Communication**

- **Commitment to Treatment (Confidence)**

- **"Risk" Intelligence (Dynamic Assessment of Patient's Response)**

- **Resilience (Philosophy-Seneca)**

There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.
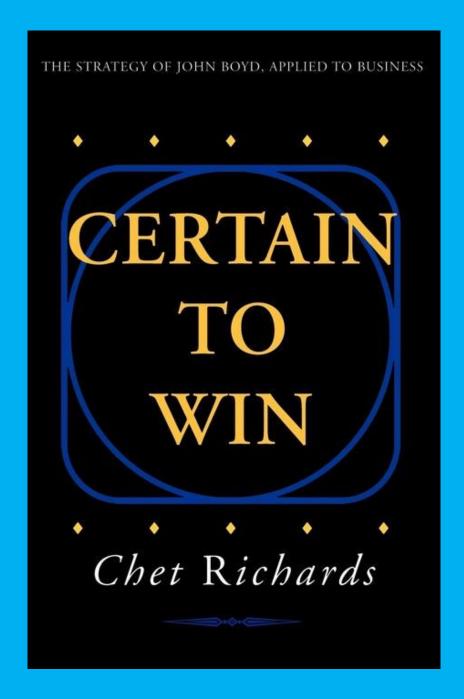
Niccolo Machiavelli

Lessons From the Zombie
(Coronavirus) Apocalypse

CAN WE MANAGE TO SAVE HEALTHCARE?

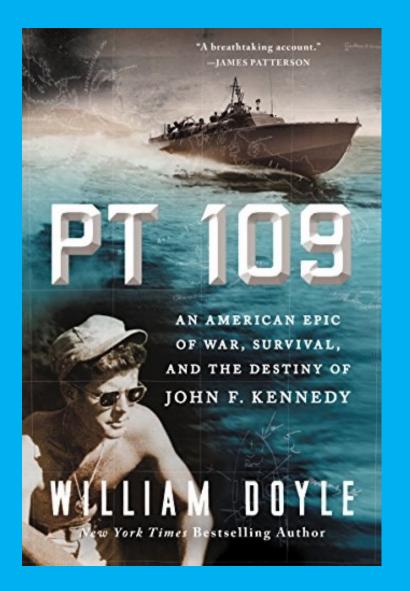**#1 BEST SELLER**

George R. Cybulski, MD, MBA

Remember

The essence of ultimate decision-making remains impenetrable to the observer – often, indeed, to the decider ……

There will always be the dark and tangled stretches in the decision-making process. Mysterious even to those who may be intimately involved.

John F. Kennedy

"My own nightmare is that I shall disregard the moans of an old chronic and that he will die on me before I realise he's really in danger."

Dr. George Castleby

(Fictional Doctor in ECR Lorac Novel, 1946)

Remember

" What is needed is a vision rooted in human nature so noble so attractive …….. that it acts as a catalyst or beacon."

John Boyd

(Father of the OODA Loop and 'Top Gun'

School of Air Combat)

Thank You !!!