

OUR HEALTH

CCSQ WORLD
USABILITY DAY

LESSONS FROM THE MEDICAL WORLD: OSTEOPATHIC MEDICINE & HUMAN-CENTERED DESIGN

TYLER CYMET, DO, FACP, FACOPF
Provost/Vice President
Maryland College of Osteopathic Medicine
at Morgan State University (proposed)



MY GOAL TODAY

- Discuss what's wrong with people, and what should we do about it
- Go over the basic mechanical rules for the body
- Awareness of when the body is breaking down due to bad design and start thinking of how to design things better



PEOPLE ARE NOT EASY... OR WELL DESIGNED

DESIGN FLAWS IN THE HUMAN BODY

1. The spine of a quadriped
 - a. arched to support organs
 - b. bipeds develop LS pain
2. Inflexible knee with parts that are not easily replaced
 - a. flex and extend
 - b. Better joint needed
3. Poorly packaged brain
 - a. access is hard
 - b. introducing medicines to brain is complicated



PEOPLE ARE NOT EASY... OR WELL DESIGNED (Cont.)

4. Exposed Genitals (male)
 - a. What was the designer thinking
5. Trachea and esophagus open into the same space
 - a. Asking for trouble
6. Allergies
 - a. Should we be able to reject ourselves?
7. Eyes need ability to be modified



NEWTON'S LAWS OF MOTION

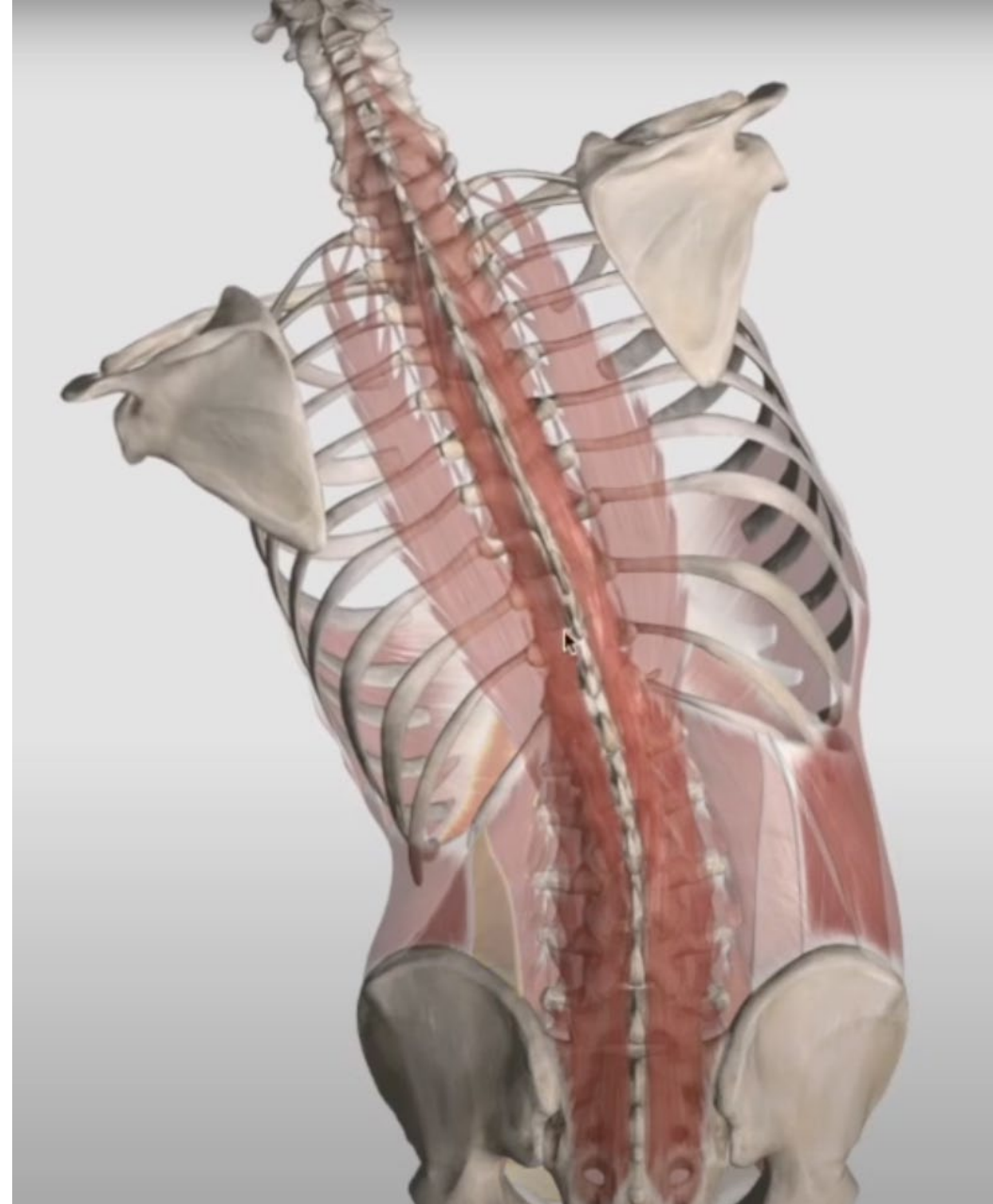
1. A body remains at rest, or in motion at a constant speed in a straight line, unless acted upon by a force.
2. When a body is acted upon by a force, the time rate of change of its momentum equals the force.
3. If two bodies exert forces on each other, these forces have the same magnitude but opposite directions.



FRYETTES LAWS OF MOTION

Law #1 = Neutral Mechanics

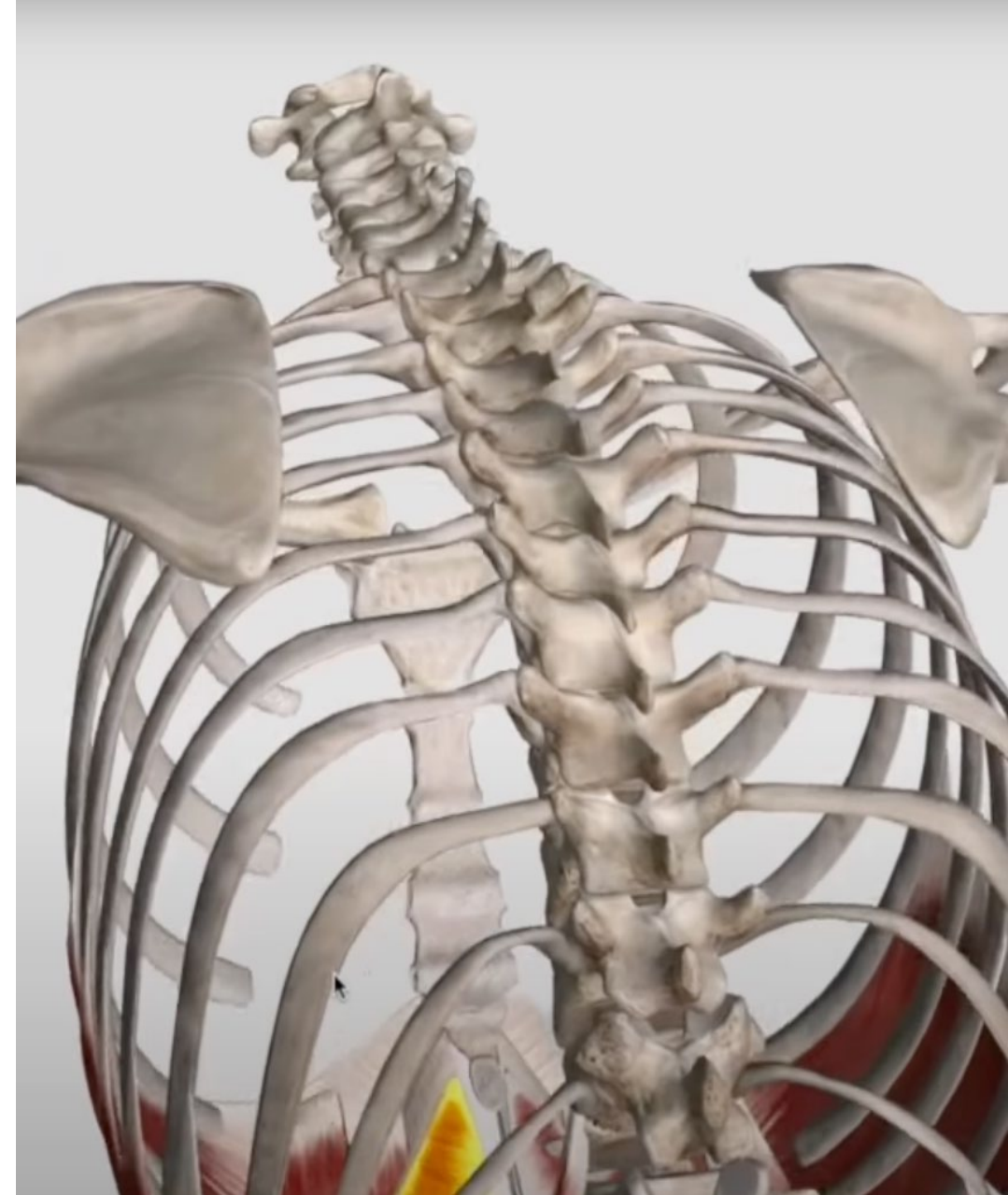
- When the spine is operating in neutral mechanics, side-bending to one side will be accompanied by horizontal rotation to the opposite side.
- Needs to be observed for more than one vertebrae.
 - Can be different for one pair (two) vertebrae, or a bunch of vertebrae.



FRYETTES LAWS OF MOTION

Law #2 = Non-Neutral Mechanics

When the spine is in a flexed or extended position (non-neutral), side-bending to one side will be accompanied by rotation to the same side.

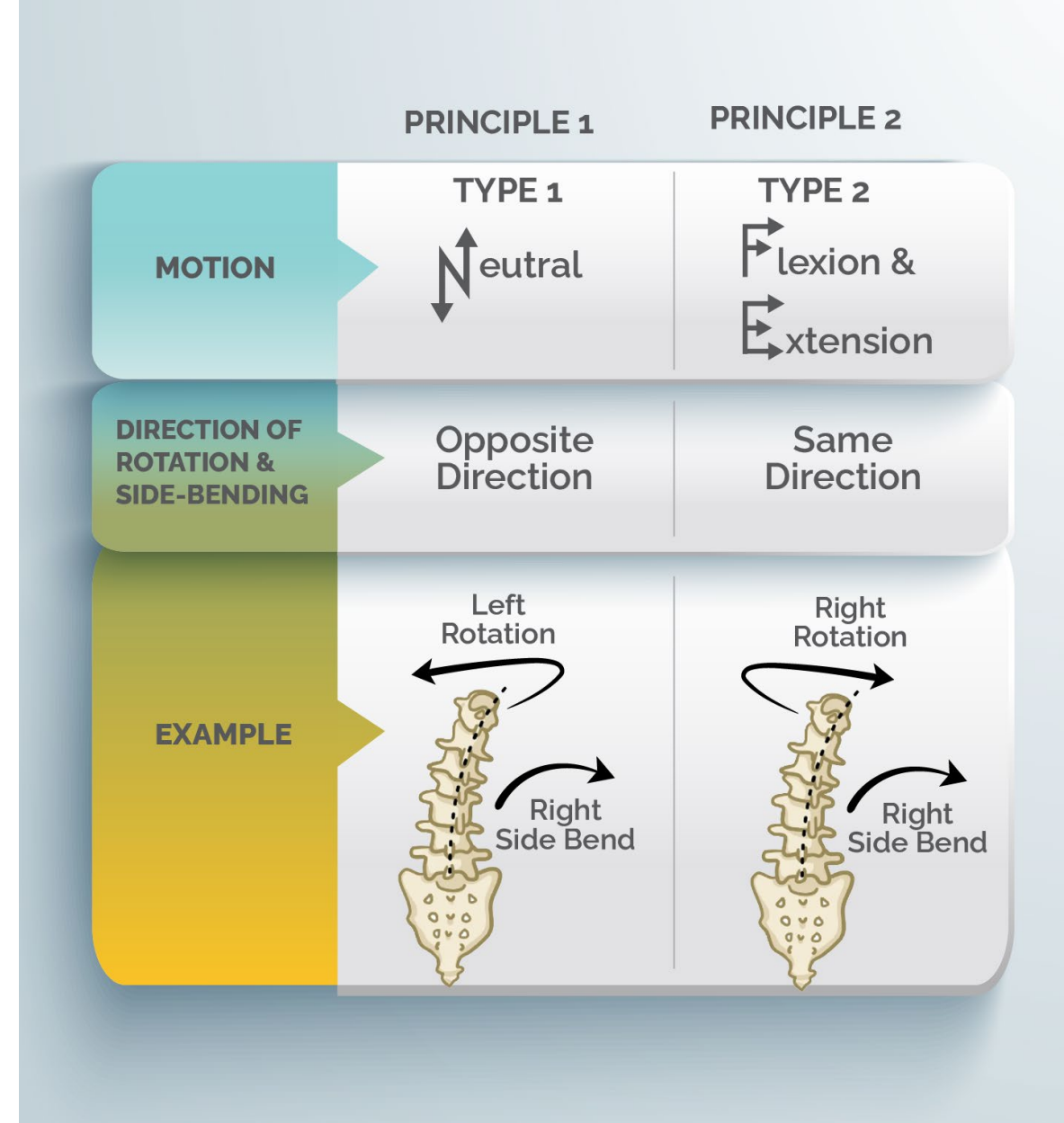


FRYETTES LAWS OF MOTION

Law #3 = Motion in One Plane Limits Motion in Other Two Planes

When motion is introduced in one plane it will modify (reduce) motion in the other two planes. The third principle sums up the other two laws by stating dysfunction in one plane will negatively affect all other planes of motion.

https://www.osmosis.org/learn/Fryette_laws



WHO IS THE BOSS?

- The Nervous System
 - Alpha Motor Neurons
 - Gamma Motor Neurons



WHAT DO I WANT TO FIX?

- Most Common Workplace Injuries
 - Overexertion
 - Trips and Falls
 - Chemical Exposure
- What gets cut?
 - Eye from eyeglasses
 - Hands from work



USING DESIGN TO FIX THINGS



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DATA DRIVEN JOINT SURGERIES JOINT MONITORING DATA: THE TIME HAS COME

Francisco Ward, DO, DNBPAS
PM&R/PM Specialist



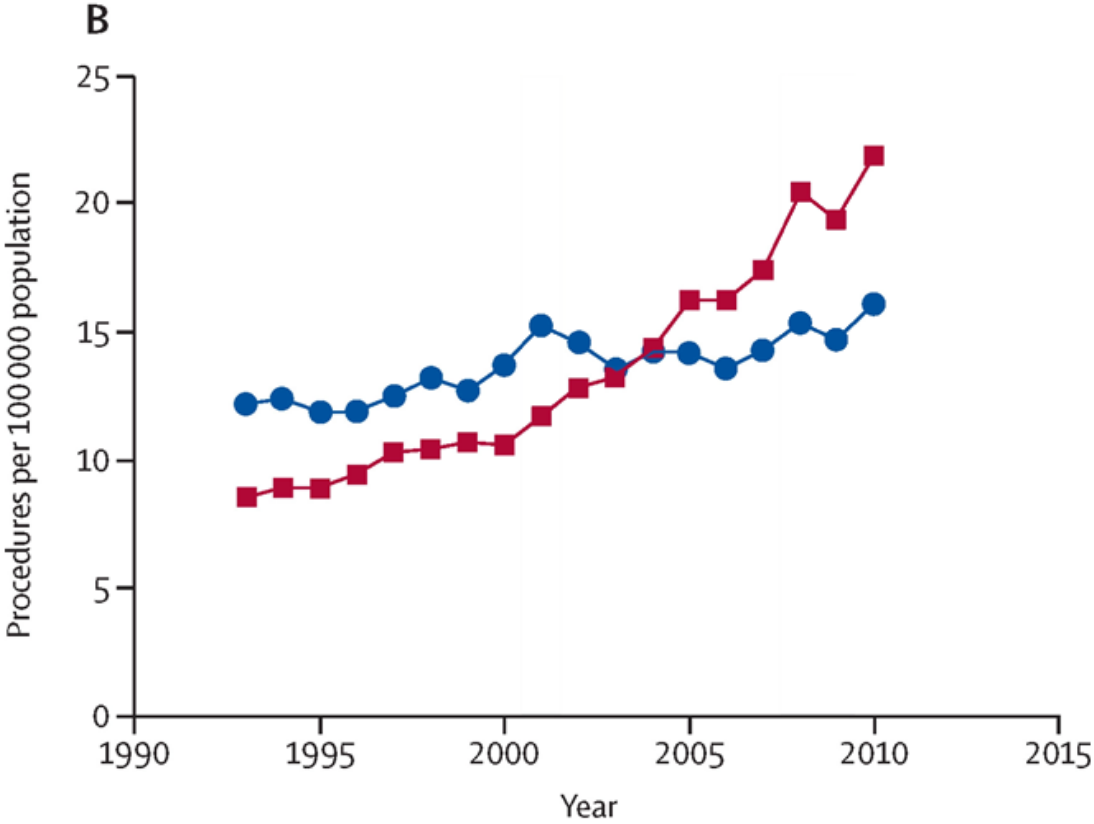
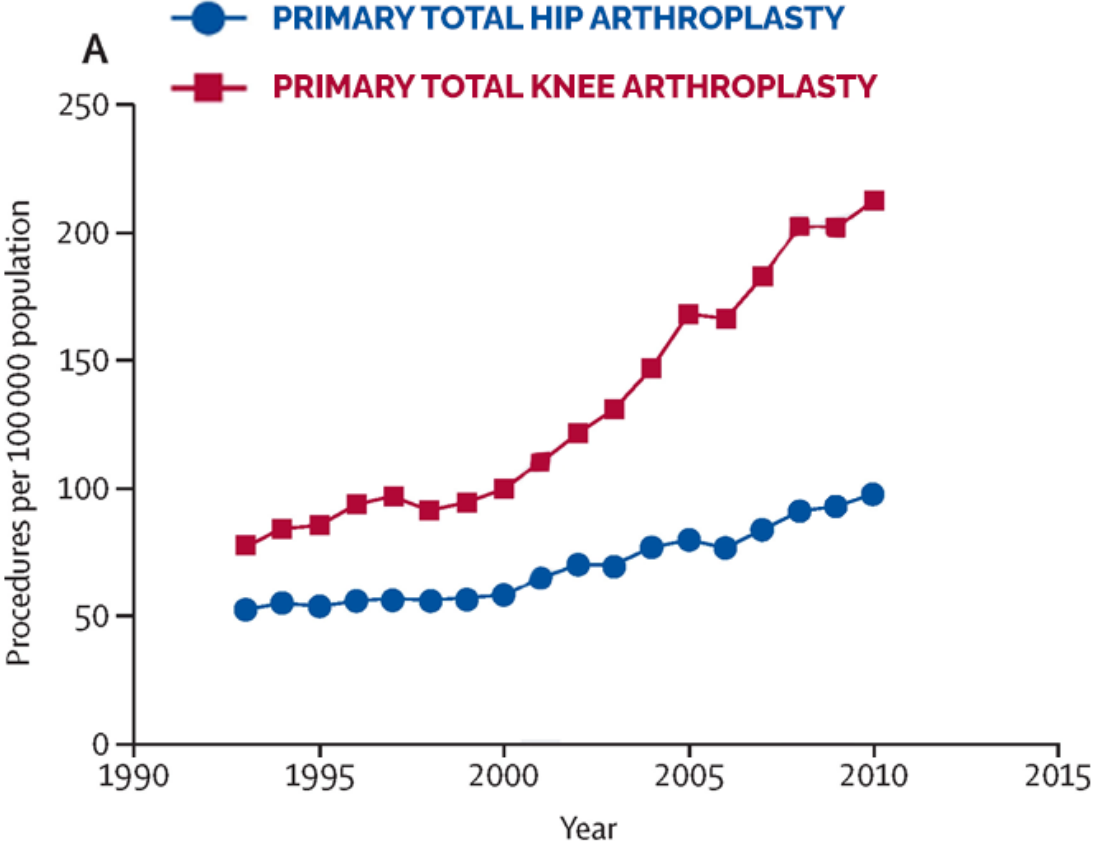
OSTEOARTHRITIS



CONSERVATIVE TREATMENT FOR KNEE PAIN / OSTEOARTHRITIS



GROWTH OF TOTAL KNEE / HIP REPLACEMENT



AGING BABY BOOMERS

HIP AND KNEE REPLACEMENTS ON A RAPID RISE

Expectations:

- Just fix me doctor: Will break the bank
- Growing risk factors: Age, obesity, déconditioning, diabetes
- Rising number of doctors who can perform knee / hip replacements
- Growing access to imaging = greater diagnosis
- Growing number of outpatient rehabilitation facilities
- Growing number of physician owned ASC
- Growing cost of healthcare



DETERMINING WHO IS A GOOD CANDIDATE

- Pain is an imprecise measure
- X-ray / Mri is imprecise measure
- Function is subjective
- Validated surveys as instruments
- Springer BD, Levine BR, Golladay GJ. Highlights of the 2020 American Joint Replacement Registry Annual Report. Arthroplast Today. 2021 Jun 21;9:141-142. doi: 10.1016/j.artd.2021.06.004. PMID: 34195318; PMCID: PMC8239429.

Future:

Compliance in pre-habilitation

Food choices / weight management

Aerobic, mind-body exercise,
strengthening, flexibility

Force coupling optimization & gait

JOINT MONITOR

- Takes the guessing out of pre-surgical function over time.
- Evaluates movement dynamics
- Provides patient feedback during post op period
- Improves goal setting
- Identifies risk before they become a problem
- Quantifiable data with ability to interface machine learning AI

U.S. Patent

May 18, 1998

5,754,121

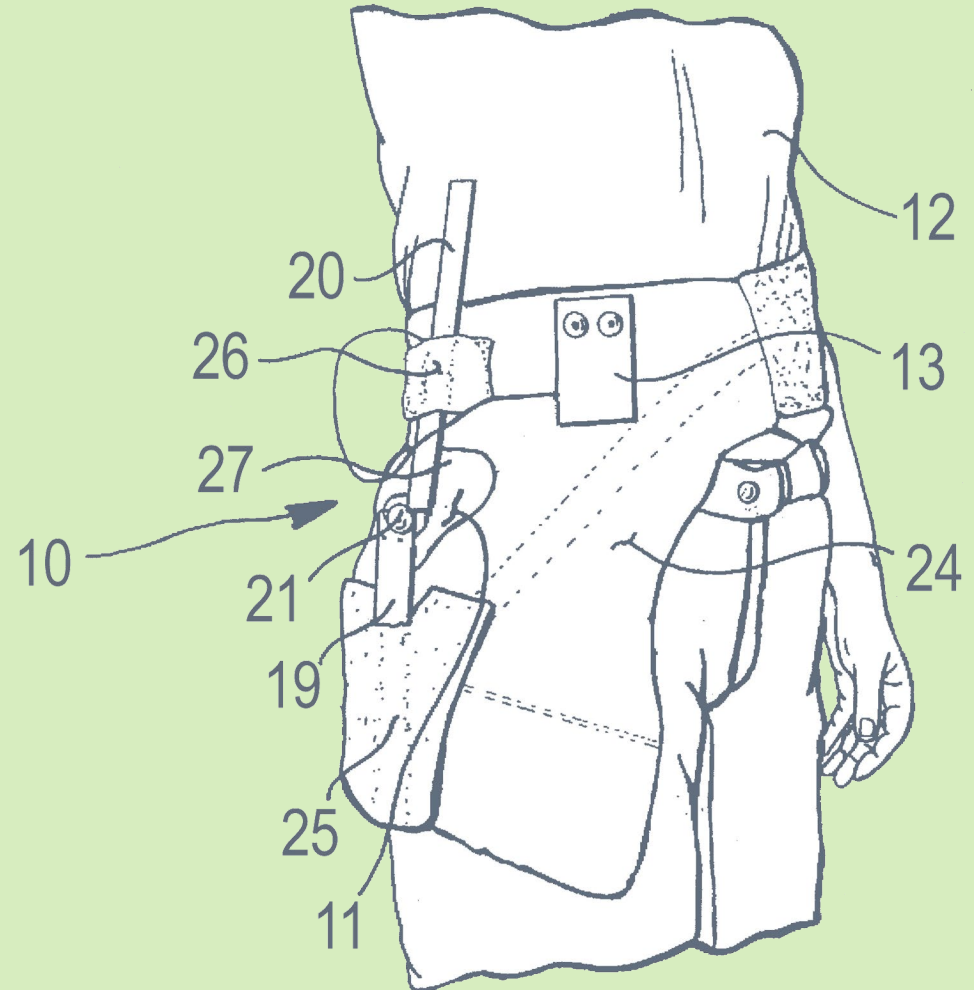
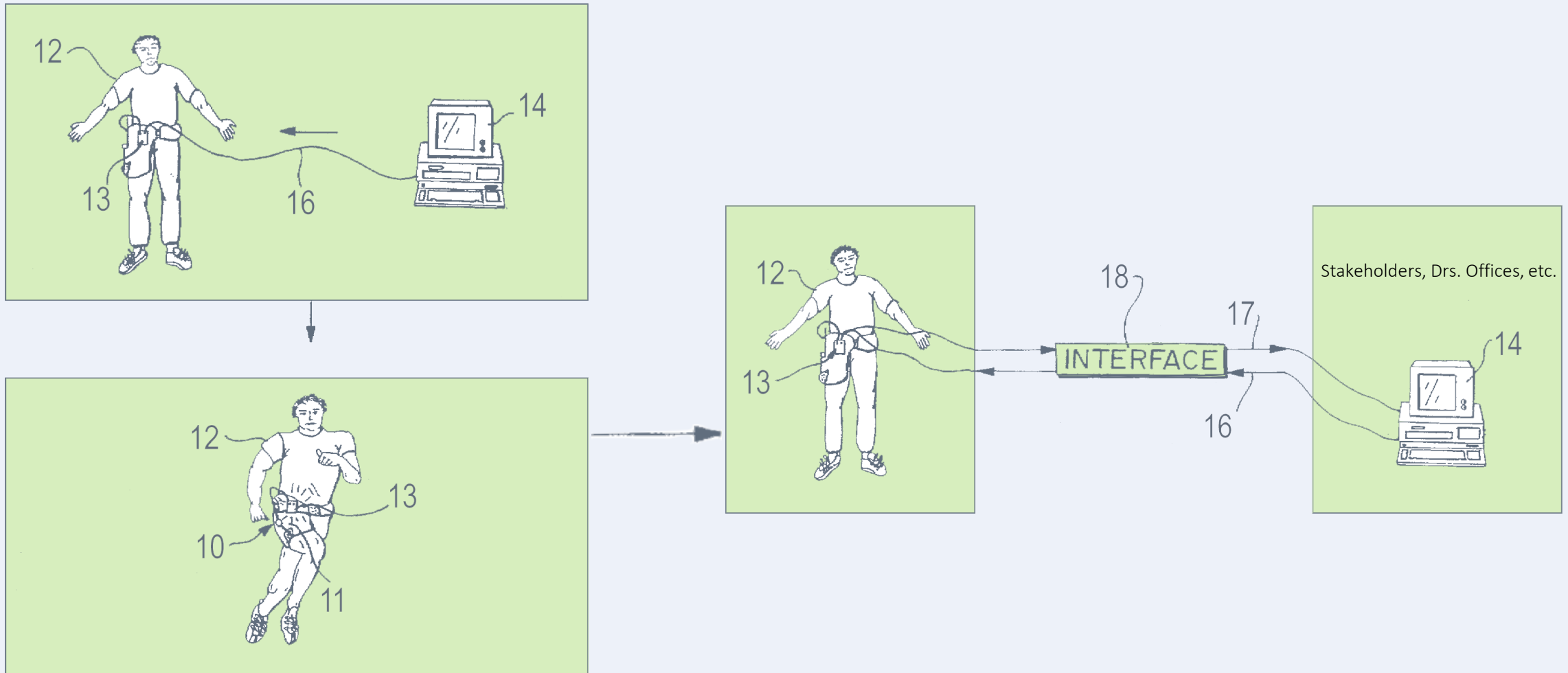


FIG. 2

OPTIMIZING OUTCOMES



TECHNOLOGY AVAILABLE

U.S. Patent May 18, 1998 5,754,121

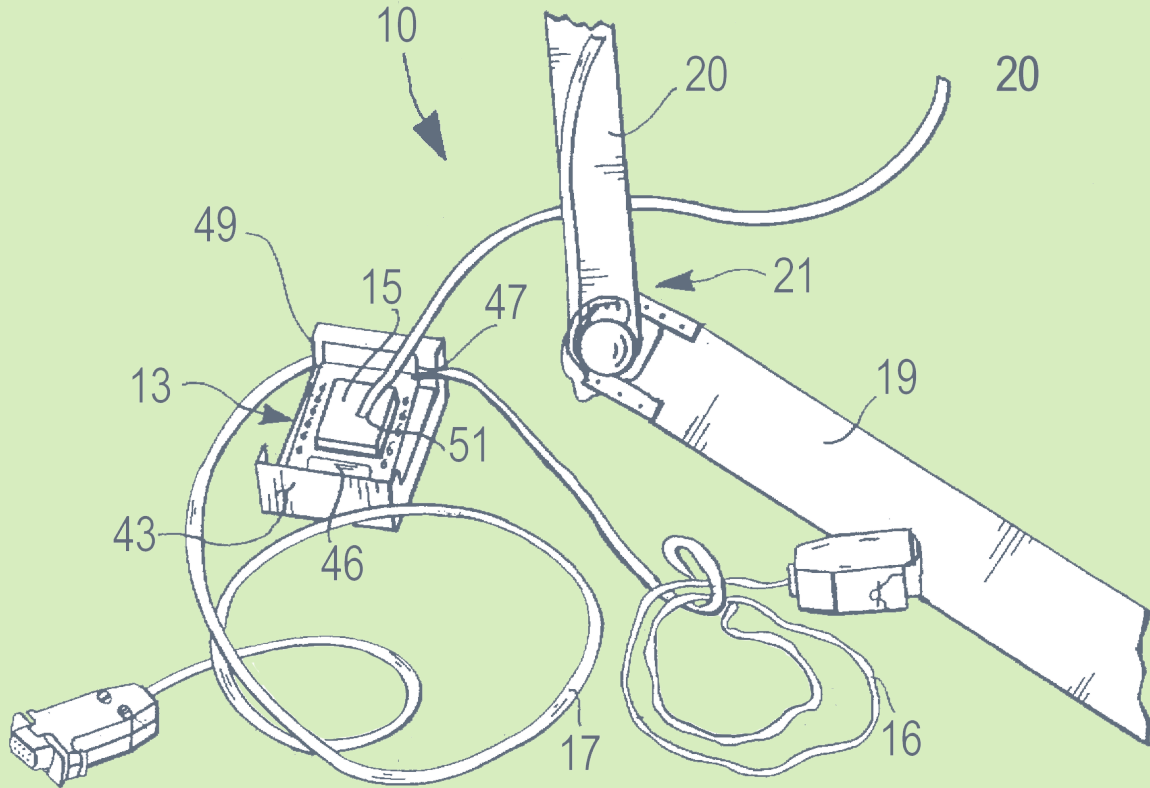


FIG. 5

U.S. Patent May 18, 1998 5,754,121

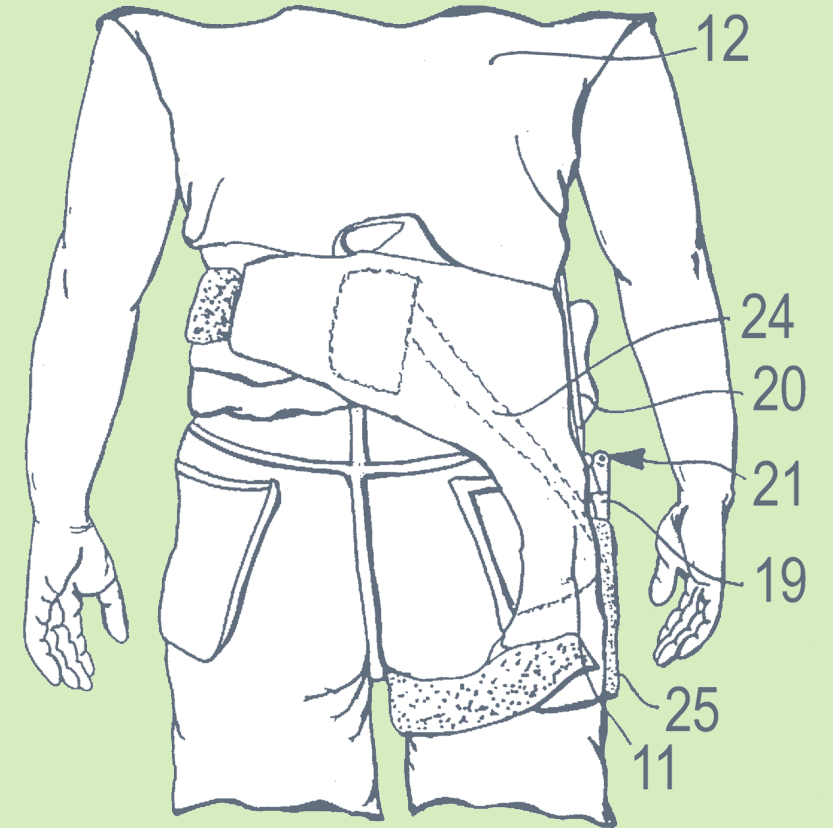
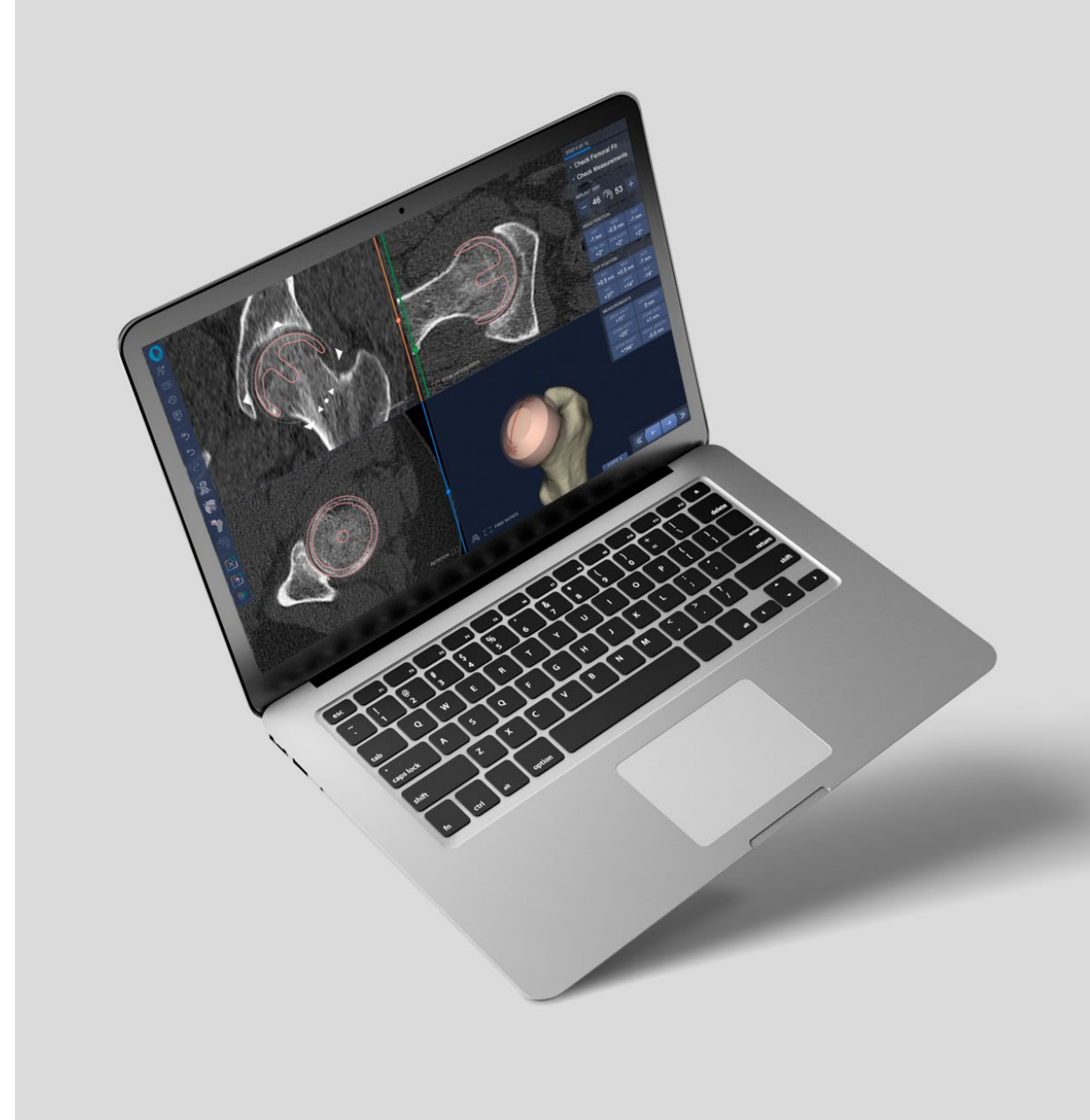


FIG. 4

DISRUPTIVE TECHNOLOGY

BREAKING THE MOLD

- A tool to define the pre-existing baseline
- A means to define failure of conservative measures by quantifying compliance
- To improve expectations regarding post surgery function
- Improve post operative safety and reduce need for revisions
- Optimize rehabilitation intervention strategies: data driven multimodal co-ordination
- Quantify goal progression during rehabilitation
- Determine end point of rehabilitation, Maximal Medical Improvement
- Cost containment through data-driven, evidenced-based care



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thank
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