



WITHOUT KIDNEY'ING AROUND...
RE PRODUCING THE DOCTOR'ED MALE AND
FEMALE FOCUS ON GOOD
BODY MECHANICS AND ERGONOMICS

...Taking Care
of Your Darn Self!!





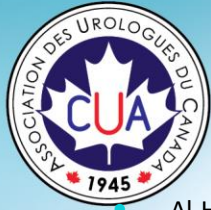
Financial Disclosure

I do not have any affiliation (financial or otherwise) with a commercial organization that may have a direct or indirect connection to the content of my presentation(s).



Learning Objectives

At the end of this session, participants will be able to recognize and incorporate appropriate measures to address biomechanical positioning and ergonomic concerns within an Operating Theatre or Computer Workstation.



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Musculoskeletal Injury

- Definition: Injury or disorder of the muscles, tendons, ligaments, joints, nerves, blood vessels or related soft tissue
- **FOCUS OF THIS PRESENTATION IS ON AVAILABLE RESEARCH/INFORMATION RELATED TO POTENTIAL MSK INJURIES AND ERGONOMIC SOLUTIONS RELATED TO UROLOGY/ONCOLOGY SURGEONS AND THEIR PRACTICES**

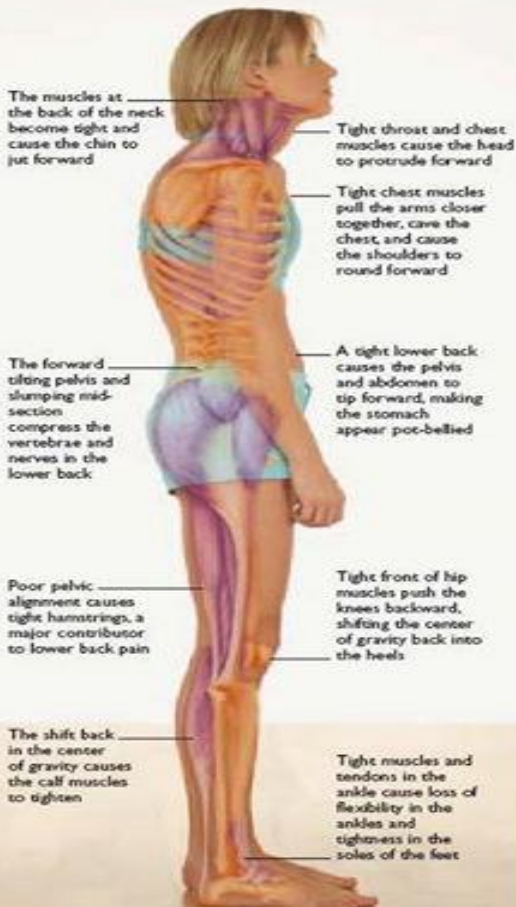




NEUTRALIZE POSTURES

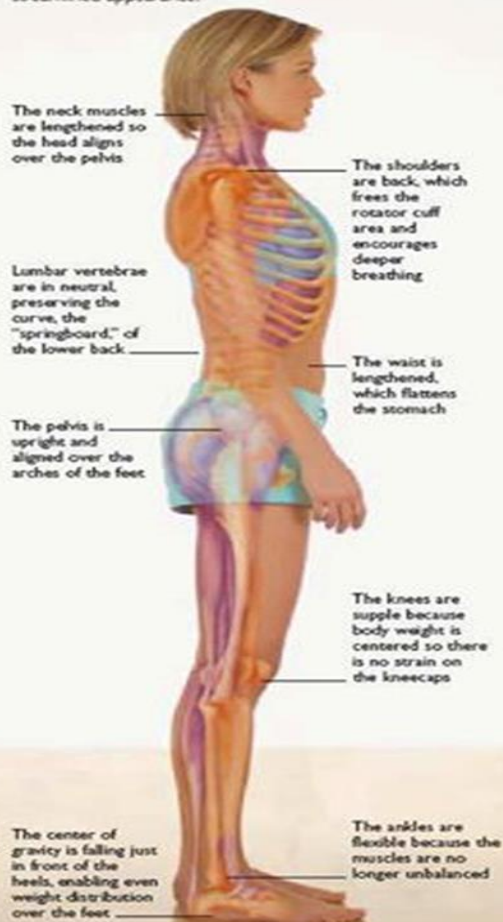
TYPICAL BAD POSTURE

Tight muscles pull the skeleton out of alignment, creating awkward and ungainly posture. Muscle aches and pains are common for this person.



IDEAL POSTURE

The head aligns over the pelvis, the shoulders are back, and the muscles are balanced, giving a sleek, streamlined appearance.

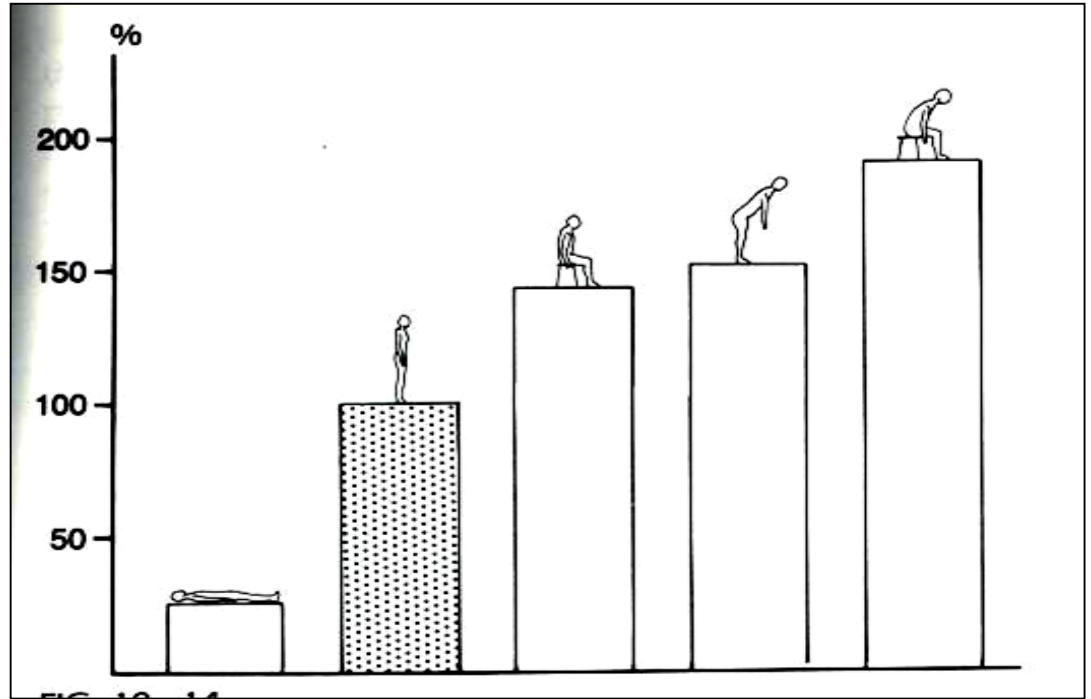




Awkward Postures: Back

- FULL FORWARD FLEXION - 2.5-3 TIMES THAT OF STANDING (250-300% LOADING)
- AS WELL AS PUTS TENSION ON POSTERIOR LIGAMENTS

D I S C L O A D I N G



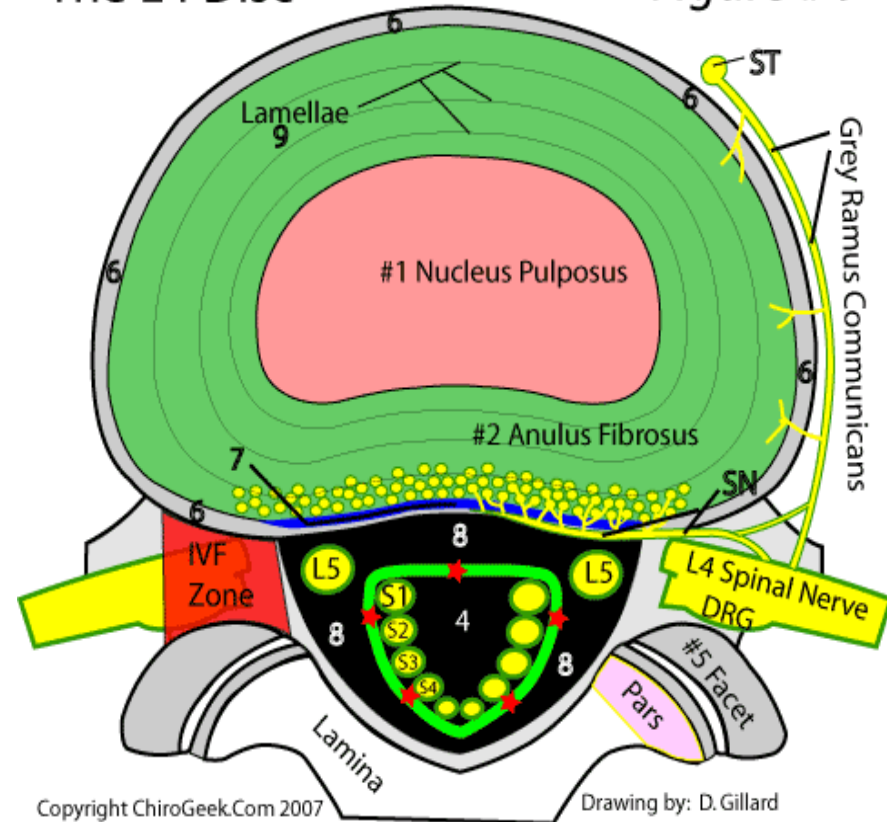
From: Nordin, M., & Frankel, V.H. (1989). Basic Biomechanics of the Musculoskeletal System (2nd Ed.)

Vertebral Disc

- The inter-vertebral discs lie between the vertebral bodies, separated from them by a thin cartilaginous endplate and consisting of two main regions, the nucleus pulposus and an outer, firm, collagenous annulus fibrosus
- The role of the inter-vertebral discs is mechanical. They are the joints of the spine, enabling it to bend and twist in all directions.

The L4 Disc

Figure # 9





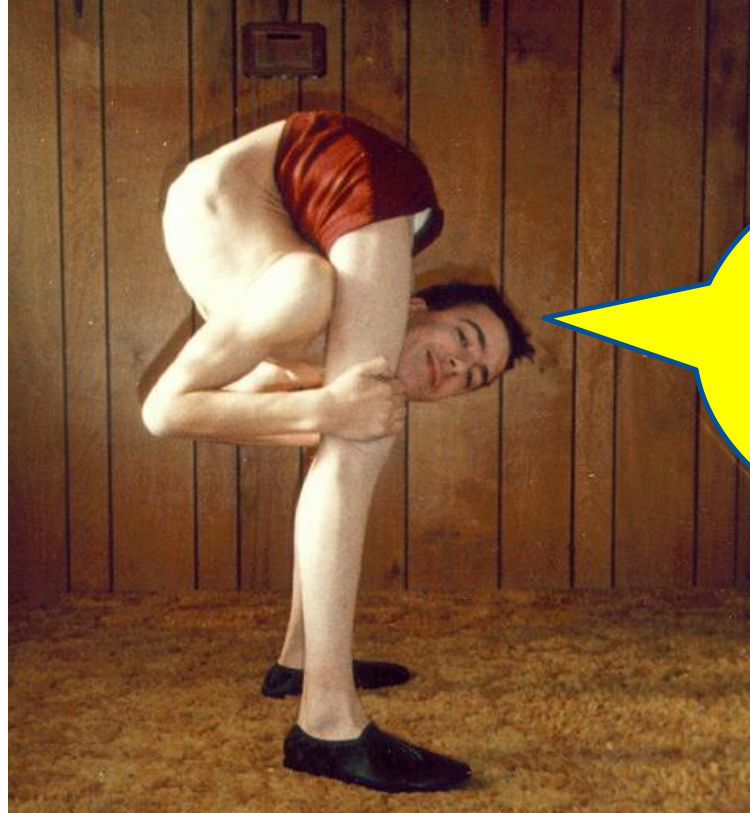
Active Abdominals



- **Helps support your back**
 - **Makes you stronger!**
- **Bring stomach in slightly & contract like you are coughing**
 - **Remember to breathe!**
- **Contract BEFORE moving and HOLD until finished**



Body Mechanics and Ergonomic Positioning



PEEKABOO!!



Identifying Risk Factors

- Static Loading or Sustained Exertions
- Contact Stress
- Poorly Fitted Gloves
- Repetition
- Direct Contact
- Forceful Movement
- Gripping

- Awkward Posture (deviation from ideal working posture)
 - Reaching behind
 - Twisting
 - Working overhead
 - Kneeling
 - Forward/Backward bending
 - Squatting



The...(lack of)... ergonomics of urological endoscopic surgery place urologists at risk for potential injury. The amount of neck flexion or extension performed, the amount of shoulder adduction or abduction used, and stability of the upper extremities during surgery; which are maintained in a prolonged static posture; are the main risk factors. All these constraints may lead to muscle and joint fatigue, pain, and eventual musculoskeletal injury. Furthermore, these issues may impact surgical accuracy.



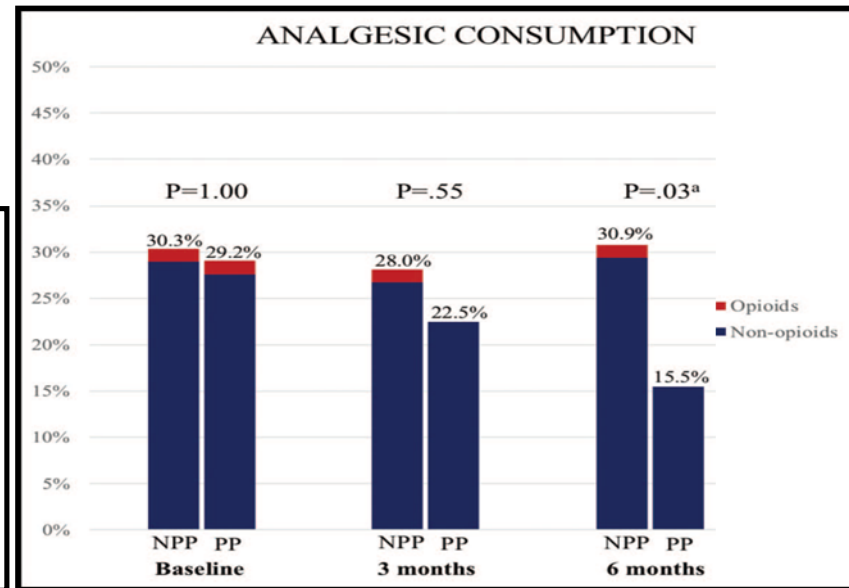
Ergonomics & Exercise

“A Preventative Program for Work-related Musculoskeletal Disorders Among Surgeons” 2015

Silvia Giagio, PT, Giovanni Volpe, PT, Paolo Pillastrini, PT, MSc, y Giuseppe Gasparre, M Antonio Frizziero, MD, and Francesco Squizzato, MDz

- In particular, more than 80% of surgeons worldwide suffer from some form of musculoskeletal distress
- The majority of surgeons take analgesics to relieve symptoms
- Relevant guidelines concerning different parameters in the operating room exist but unfortunately only about 11% are aware of Operating Room Ergonomic Guidelines and only 3% apply them
- No-preventive program (**NPP**) regularly continued the daily working activity without any type of intervention
- Preventive program (**PP**) intervention consisted of planned and supervised exercises. Ergonomic principles applied during surgery and the exercises were performed before and after the surgical procedures.

This randomized trial demonstrated the effectiveness of a global educational program in the prevention of WRMSD among surgeons. The association of simple specific self-treatment exercises and ergonomic education, in collaboration with a Physical Therapist, significantly improved quality of life after 3 months, and decreased low back pain and overall analgesic consumption after 6 months from the beginning of the program.





Ergonomic principles

- Monitor and surgical team position^[15,18]
- Height of the operating table^[16]
- Use and position of foot pedal^[19]
- Footrests^[17]
- Sit/stand stools for micro-breaks^[17]
- Lead aprons^[17]
- Anti-fatigue mats and footwear^[17]

EXERCISE PROTOCOL FOR PP GROUP

Supplemental Digital Content 1,
<http://links.lww.com/SLA/B570>

- SQUATS
- ALTERNATE SHOULDER EXTENSION - WITH ARMS ABOVE/BELOW SHOULDER HEIGHT

Self-treatment exercises	Bodily area	Phase 1	Phase 2
Two-phases-protocol for each bodily area, 5 minutes before and after the procedure	Neck		
	Neck and shoulder		
Phase 1 No-resistance active exercises: 10 repetitions at least	Shoulder and upper back		
	Phase 2 Static stretching: 20 seconds at least	Upper and lower back	
Upper and lower back			

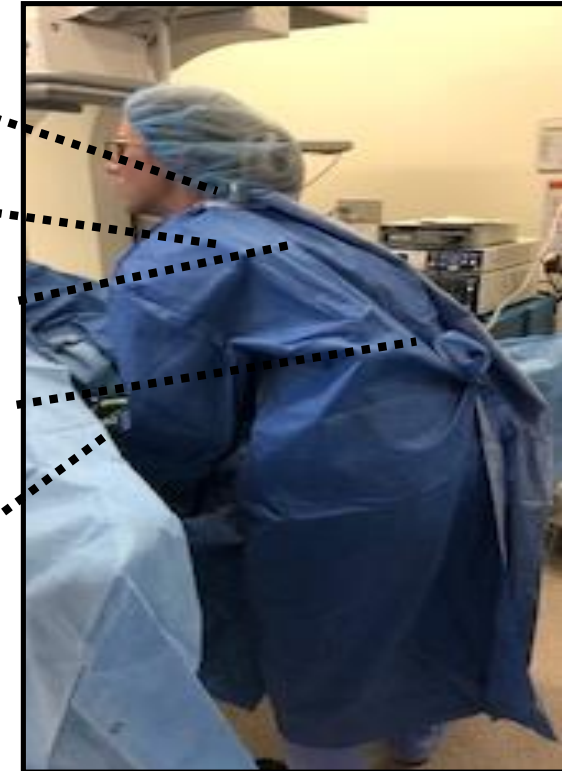


ERGONOMICS & COMMONLY AFFECTED AREAS RECOGNIZED FOR ORTHOPEDIC/MSK DISCOMFORT

Variables For Ergonomic Correction:

- Correct Monitor Height/Position
- Correct Table Height
- Correct Placement/Position/Use of Foot Pedal
- Correct placing of the equipment and the surgical team (tripping/contact overhead equip)
- Correct Lead Apron
- Use of Anti-Fatigue Mats
- Appropriate Footwear
- Use of Footrests, Chairs and Sit/Stand Stools for micro-breaks

Neck 79%
Shoulders 51%
Upper Back 59%
Low Back 75%
Wrist/Hand 26%





ERGONOMIC ISSUES IN THE OPERATING ROOM

Five Ergonomic Problems Mainly Faced by Surgeons in the Operating Room...

1. Hand Held Instrument Design
2. Operating Table Height
3. Number and Placement of Monitors
4. Foot Pedal Use and Placement
5. Body Support to Relieve Static Posture





Questionnaire revealed that from four identified instrument function groups:

- 1) *intensely manipulating tissue*
- 2) electrosurgery
- 3) suction and irrigation
- 4) automatically suturing tissue

Group 1 (dissection forceps, grasping forceps, scissors and needle holders) is recognized as causing the most discomfort

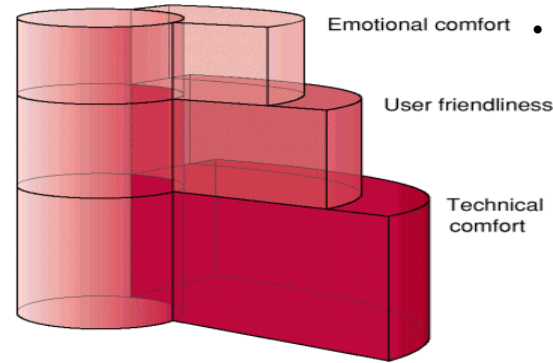
- Scissors Model, Pistol Grip, Thumb Manipulation most commonly used.

- Unfortunately instrument handles are at times designed for multi-functionality resulting in products that are not specifically designed for their main function and therefore may cause ergonomic (physical and cognitive) problems;

-e.g. a scissors handle, which is used for dissection, grasping, cutting and suturing tasks, may cause discomfort in fingers, hand, arm and back

(Van Veelen et al JLAST 2001)

HAND HELD INSTRUMENT DESIGN



In order to attain an optimal human-product interaction, an instrument should be specifically designed for its function as this will satisfy all criteria in the three areas

Van Veelen et al Min Invas Ther & Allied Technol 2001

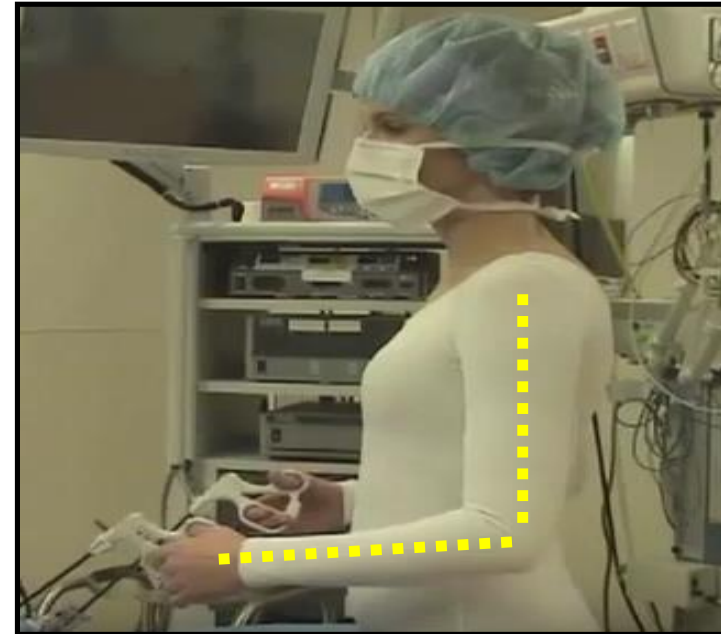
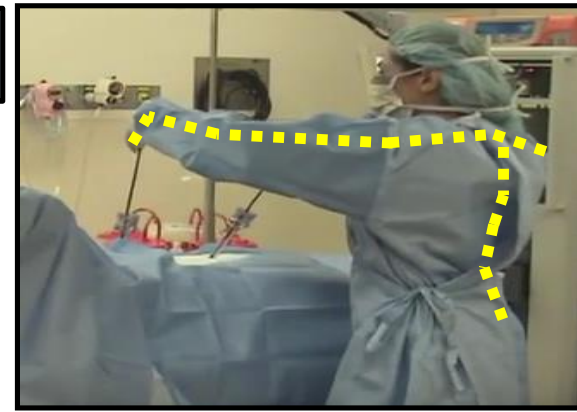
Considerations

- Use foot pedal for diathermic or ultrasonic equipment to reduce repetition and use of hands and to also break up static postures
- With respect to general hand pain, neuropathy or discomfort...Surgeons who preferred counterintuitive Ureteroscope deflection were significantly more likely to have problems (56%) compared with intuitive users (27%) or those with no preference (26%) Kelly A. Healy Nov 29, 2011



OPERATING TABLE HEIGHT

- Too high of a table height places increase load in the shoulder girdle and creates a mechanical disadvantage
- **Shoulder Abduction, Scapular Elevation stresses the Rotator Cuff, Upper Traps**
- In some cases, mechanical compensation can occur at the wrist creating excessive excursion or deviations – nerve compression
- *Table Height* should be adjusted b/t 90-120 degrees of elbow flexion or instrument handles positioned at elbow height of surgeon
- Consider umbilicus/naval height of patient as a reference point when filled with CO2
- Some tables do not provide adequate height adjustments (elevation/lower)
- The use of appropriate step stools (stacking option) be warranted for shorter surgeons when possible

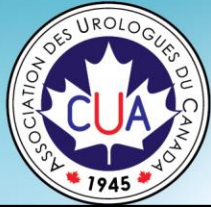




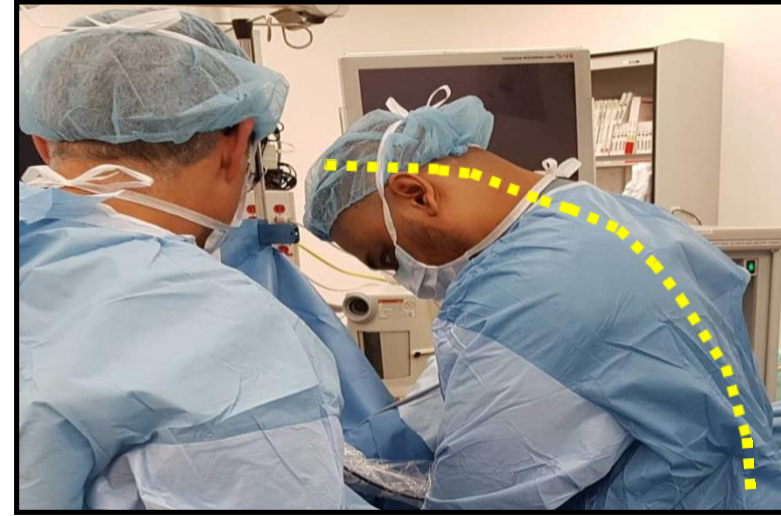
FUNCTIONAL MOVEMENT RELATED TO UROLOGY ONCOLOGY

- **What Functional Movements patterns can be performed to mitigate risk?**
 - **Replicate motions that mimic or work in opposition**
 - **Use reciprocal inhibition to your advantage**





NUMBER & PLACEMENT OF MONITORS

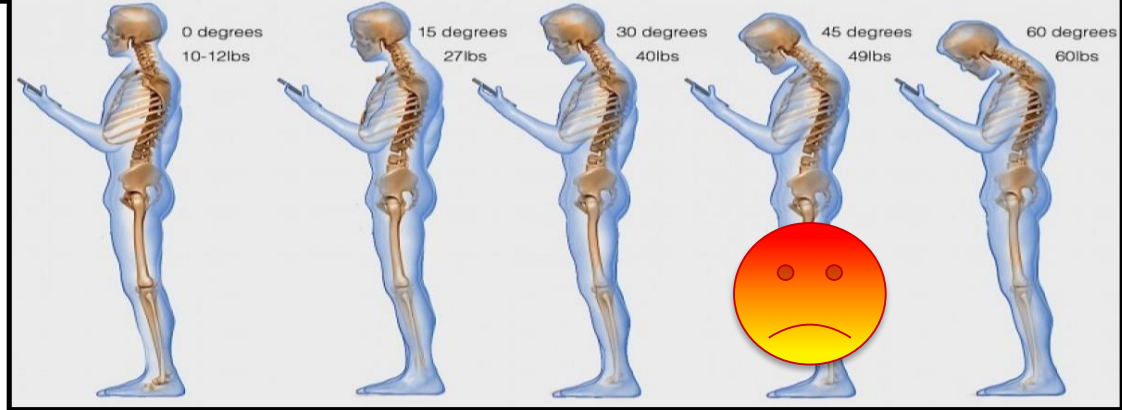


**CONSIDERED ONE OF THE MOST IMPORTANT
ERGONOMIC FACTORS IN THE O.R.**

Location/Height

Assisting surgeon easily at risk

**Maintaining neck flexion greater than
15° to 20° for a prolonged period of
time is an at-risk posture- prolonged
extension is also detrimental**





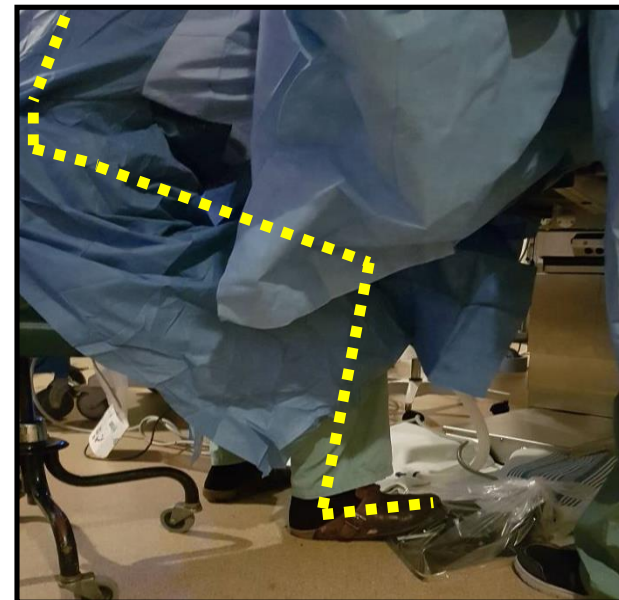
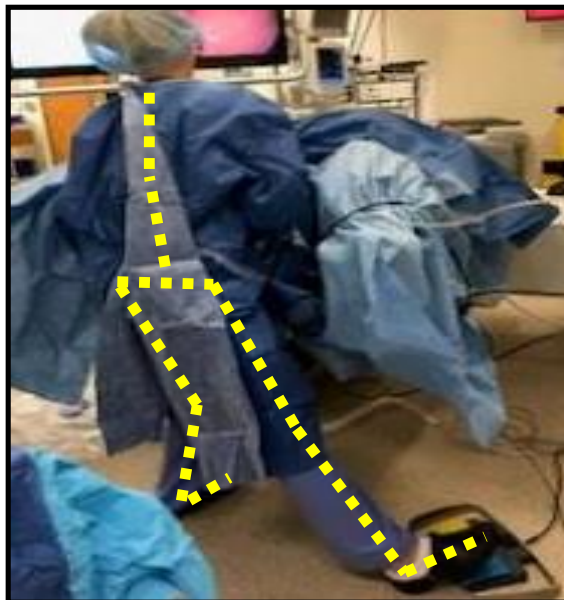
•Of 241 surgeons surveyed, 43.6% were not content with the foot pedal, for the following reasons:

- foot pedal contact was often lost
- a need was felt to look down at the foot pedal before they pushed the switch
- the wrong foot pedal or switch was sometimes activated unintentionally, resulting in potential danger for the patient
- they were forced to stand on one foot while manipulating the foot pedal. Liang et al July 31, 2013 <https://doi.org/10.1371/journal.pone.0070423>

CONSIDERATION:

If sitting in a chair/stool not an option, consider a lean stool or when possible alternate between sitting and standing to use the foot pedal

FOOT PEDAL USE AND PLACEMENT





SURGEON'S BODY SUPPORT

•Albayrak et al 2007

Features

- Height Adjustable Platform
- Support in Semi Stand/Lean
- Anterior Support at Chest
- Ability for use in minimally invasive (MIS) and open procedure

Chest Support-EMG shown to reduce muscle activity

- 44% Erector Spinae
- 20% Semitendinosus
- 74% Gastrocnemius

- Considered ideal for longer duration MIS where there is substantially less body movement and weight shifting and an increase risk of MSK fatigue

BODY SUPPORTS TO RELIEVE STATIC POSTURE

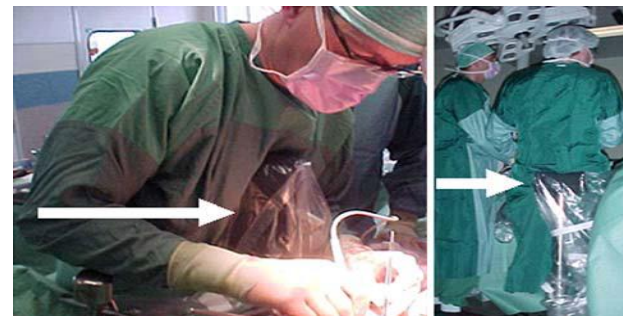
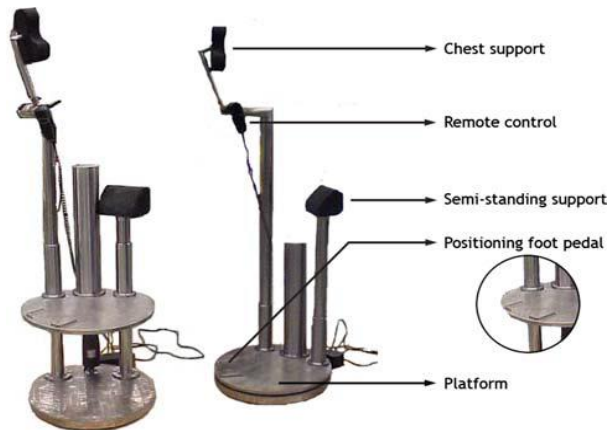


Fig. 3. Feasibility of the prototype during minimally invasive procedures (right side) and open procedures (left side).

The most important design criteria were as follows:

- Support for the surgeon's body in a natural working posture
- Suitable for use during both open and minimally invasive procedures
- Compact construction because of the limited space available around the operating table
- Comfortable and safe use of the product by both the P5 woman (5th percentile of short women) and the P95 man (95th percentile of tall men)
- Height-adjustable platform to solve the problems related to non-optimal working height
- Sufficient space for positioning of foot pedals for electrosurgery
- A product mobile by means of wheels.



“WHO’S GOT YOUR BACK?”

POSTURE is essential in reducing MSK symptoms

- **Static Positioning/AWKWARD POSTURE**
- **Foot Rest-Table Height-Reaching Across Patient**
- **Head Gear can increase load**
- **Recognize Personal Limitations**
- **IS THIS ERGONOMICS FOR ALL?**
 - **ENSURE THE WHOLE TEAM IS ERGONOMICALLY SOUND...**

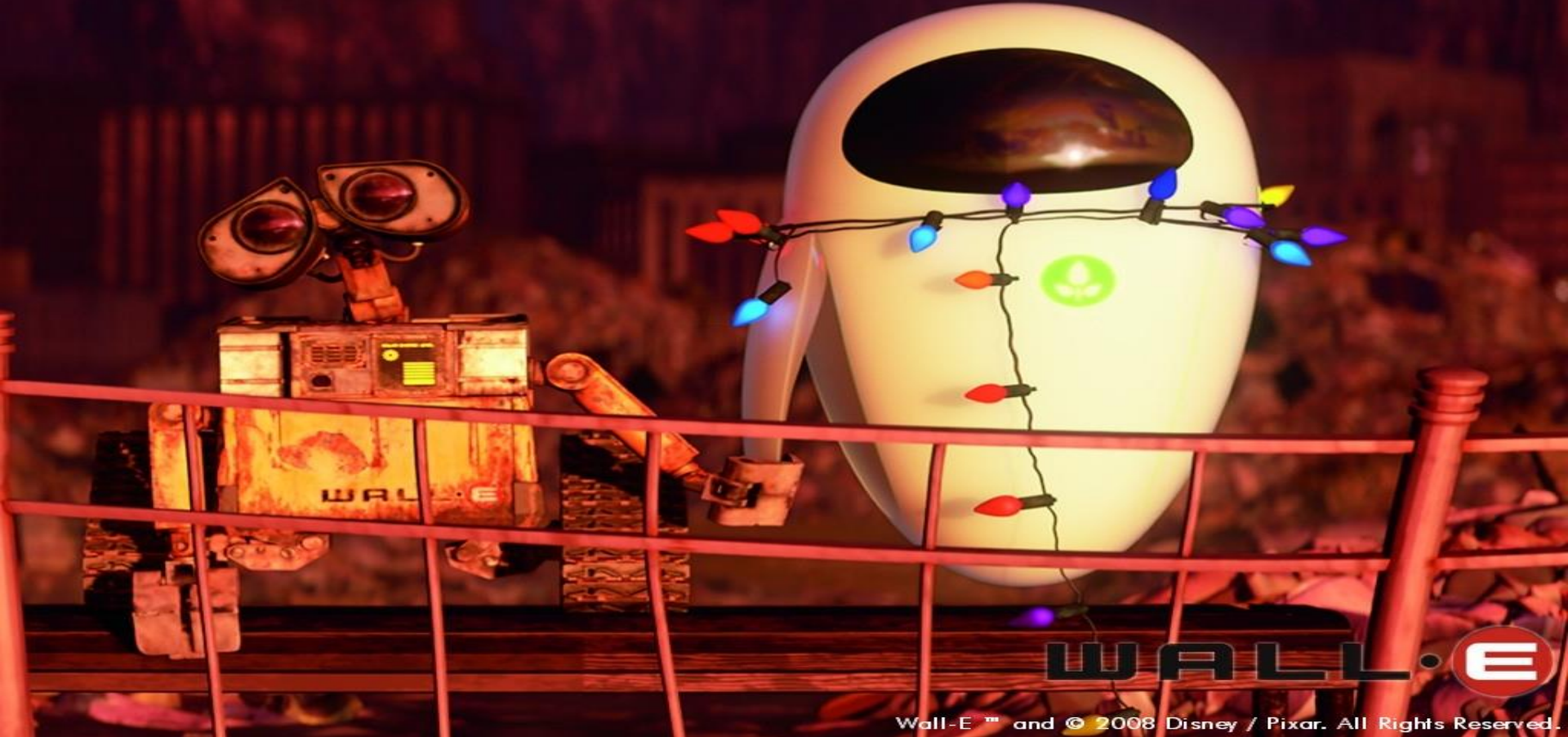




FUNCTIONAL MOVEMENT RELATED TO UROLOGY ONCOLOGY

- **What Functional Movements patterns can be performed to mitigate risk?**
 - **Replicate motions that mimic or work in opposition**
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WALL·E

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DOMO ARIGATO MR. ROBOTO...



Robotic Surgery

ERGONOMIC INTERVENTION

Some of the Ergonomic Advantages

- Sitting position minimizes the physical stress of the surgeon and allows easy use of the foot pedals
- Surgeon sits at a central ergonomic position at the console independent of the situation in the operating field reducing the possibility of sustaining awkward postures
- Surgeon does not need to adapt to the handle of the instrument

Some of the Ergonomic Disadvantages

- Complete lack of tactile feedback – compensated by visual senses
- Assisting surgeon – The interference of the robotic arms significantly reduces the dexterity of the assistant
- A disadvantage of the motion scaling (2:1) is that the surgeon may need to move his arms long distances at the console for certain manoeuvres (e.g., pulling on a thread), which, in contrast, are easily performed during laparoscopy





Robotic Surgery

ERGONOMIC INTERVENTION

Survey based on a questionnaire regarding neck and/or back pain sent out to surgeons performing **prostatectomy**:

OPEN - 50%

LAPAROSCOPIC – 56%

ROBOT ASSISTED - 23% In the robotic group, neck pain was overwhelmingly more common than back pain (21% vs 1%).

This was due to the sitting position at the console while straining to optimally visualize the high resolution display.

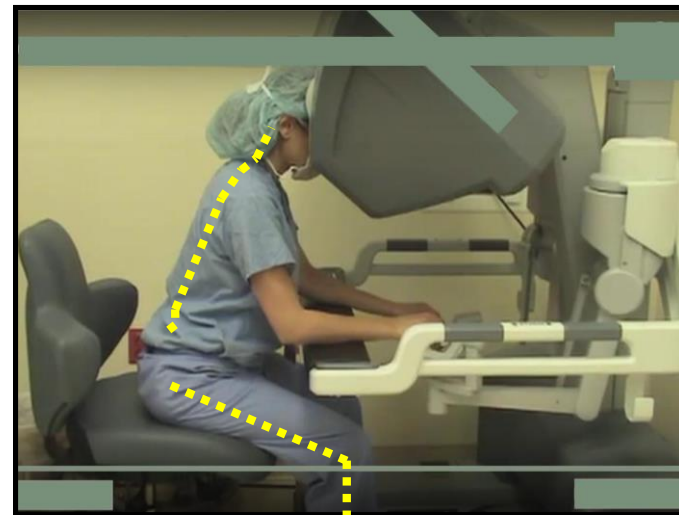
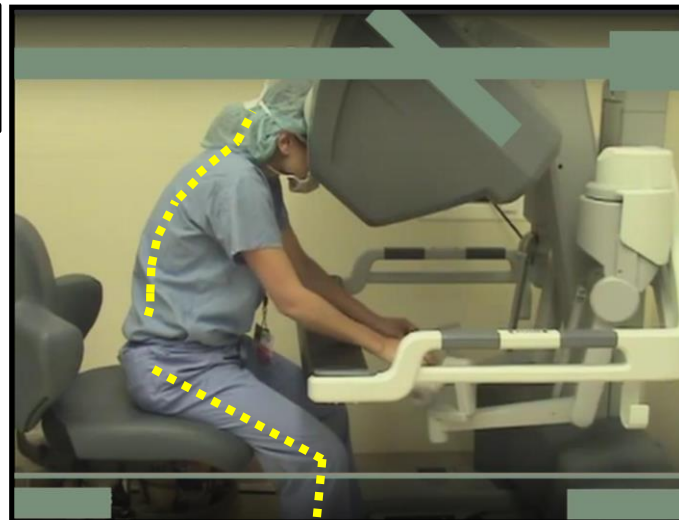
Bagrodia et al J Endourol 2009;23:627–33

Proper Posture

- **Torso erect** – are you using the back rest when possible?
- **Feet comfortably on floor** – can reduce load into low back

Upper Extremity Position

- **Forearm rests comfortably on arm support**





YOUR COMPUTER WORKSTATION



HEDGE'S 3S's IDEAL WORK PATTERN

Sitting Properly to Reduce Risk

Move and gently stretch



Stand in neutral postures



Sit in neutral postures



For a 7.5 hrs day this gives a total of:

- 5 hours/sitting
- 2 hours of standing
- 0.5 hours of moving
- 16 sit-to-stand transitions

■ Sitting ■ Standing ■ Stretching

(<http://ergo.human.cornell.edu/CUESitStandPrograms.htm>)





TEST YOUR KNOWLEDGE...



1. What (along with good body mechanics and ergonomics) can reduce Work-Related Musculoskeletal Disorders among Surgeons?
 1. Exercise (predominantly aerobic) and ROM work
2. Name a RISK FACTOR associated with your profession?
 1. Awkward posture – prolonged static posture
3. Name an ergonomic item that may reduce the potential for an MSK injury that can be used in your profession?
 1. Hand held instruments used for intensely manipulating tissue that are ***specifically designed for their function (i.e. handles)***
4. What is considered one of the most important ergonomic factors in the O.R.?
 1. MONITOR HEIGHT AND POSITION



Fit for Work ...yes I S.A.I.D it!

Surgical procedures can be physically demanding and it is imperative to regularly engage in physical movement in order to perform our jobs safely.



=



OR

