Ergonomics: Don’t Let Your Patient’s Work be a Pain

How to coach, counsel, and collaborate on your client’s workstation ergonomics without going to their worksite.

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Introduction

- Elisa Marks, MS, OTR/L, CEAS, CHT

- CEAS (Certified Ergonomic Assessment Specialist) vs CEES (Certified Ergonomic Evaluation Specialist) vs. BCPE (Board of Certification Professional Ergonomist)
Impact on workforce

• OSHA reports $20 billion
• According to OSHA/US Bureau of Labor Stats
  – The most common repetitive stress injury is carpal tunnel syndrome (CTS). CTS affects more than 8 million Americans.
  – Nearly half of all carpal tunnel syndrome cases cause workers to miss 31 days or more of work time.
  – An estimated 260,000 carpal tunnel syndrome release surgeries are performed annually; 47% of these cases are considered to be work-related.

Examples of MSDs

• Carpal Tunnel Syndrome
• Tennis/Golfer Elbow
• Tenosynovitis (DeQuervains and Trigger finger)
• Myofascial Pain
• Shoulder tendonitis
• Neck and Back Pain

Media names for MSDs

• SmartPhone Slump
• Cellphone elbow
• Snapping Thumb
• Blackberry Thumb/Texting thumb
• Text Neck
SmartPhone Slump

• Sit, Slump, Slouch
• Muscular Imbalances

Is this the primary diagnosis?

• Are they referred for hand pain?
• Are they referred for wrist pain?
• Double crush?
• Co-morbidities?
• How do we know if it’s office related?

• WE DON’T ALWAYS KNOW!

What is carpal tunnel?

• Carpal tunnel
  – Compression of median nerve in wrist at carpal canal
What is carpal tunnel?

• Carpal tunnel
  — Compression of median nerve in wrist at carpal canal
• What is the impact?
  — Difficulty in handwriting for office workers
  — Numbness in thumb, index, middle finger
  — Dropping of things
  — Sleep disruption

Carpal Tunnel Assessment

• Nerve Conduction Studies
  — High rate of false negative and false positive results
• Some physicians just use physical exam
  • Phalen's and Tinel's test most commonly cited in physical exam but don't have strong correlation

Carpal Tunnel Assessment

• Scratch Collapse Test
Treatment

- **Conservative**
  - Hand Therapy
  - Minimize wrist flex/ext and compression on wrist
    - Use wrist splints/braces
  - Ergonomic modification
- **Surgical**
  - Carpal Tunnel Release

What is tennis/golfers elbow?

- **Tennis/Golfers elbow**
  - Overuse injury of wrist extensors (tennis elbow aka lateral epicondylitis) or wrist flexors (golfers elbow aka medial epicondylitis)
  - Symptoms:
    - Significant pain at bony area in elbow
    - Difficulty and painful to grip or do repetitive forearm rotation (ie using a screwdriver)
    - Pain with lifting heavier packages

Tennis/Golfers Elbow Assessment

- Tenderness to palpation at lateral or medial epicondyle
- Painful with resisted wrist extension (tennis elbow)
- No significant imaging or lab tests
Tennis/Golfers Elbow Assessment

- **Therapy:**
  - Body mechanics education
    - How does someone lift?
    - Is your wrist often in extension during the day?
  - Soft tissue mobilization of extensor mass
  - Nirschl protocol
  - Kinesiotape
  - Modalities
  - Shoulder strengthening – do you find muscular imbalances?

Tennis/Golfers Elbow Treatment

- **Counterforce brace/wrist brace**
  - Fitting
  - Pad or no pad?
- **Cortisone injection**
- **Ergonomic modification**
  - Sports modifications
    - Racquet or club grip
    - Don’t hit off center of racquet

Tendonitis

- **Symptoms:**
  - Ulnar wrist pain – often seen in ulnar wrist (ECU tendonitis)
  - Dorsal hand/wrist pain
    - Extensor Indici Proprious (EIP)
  - DeQuervains
    - Pain in first dorsal compartment
    - Irritation of EPB, APL
**Tendonitis**

- ECU tendonitis
  - Can also have snapping of the wrist
  - Pain with lifting
- Causes:
  - Frequent ulnar deviation the wrist
  - Keyboard positioning
  - Lifting with the palm down

**Tendonitis**

- Dorsal hand/wrist pain
  - Pain over the index metacarpal
  - Painful to fully extend digits
  - Overuse of trackball or mouse

**Trigger Finger/Flexor Tendonitis**

- Trigger finger — inflammation of the tendon sheath complex that gets stuck in A1 pulley.
Trigger Finger/Flexor Tendonitis

- Trigger finger – inflammation of the tendon sheath complex that gets stuck in A1 pulley.
  - Is it the index finger?
    - Too much clicking
    - Repetitive use vs forceful gripping
  - More common in females and diabetics.
    - Harder to treat in diabetics

Trigger Finger/Flexor Tendonitis

- Hand therapy treatments vs Corticosteroid injection
  - Hand therapy includes:
    - STM, Orthosis fabrication, modalities
  - Corticosteroid efficacy
    - 50-75%, less in diabetics

What about devices not at a workstation?

- ‘Text neck’ is becoming an ‘epidemic’ and could wreck your spine
  - Washington Post 11/20/14
  - Smartphone users spend an average of two to four hours per day hunched over, reading e-mails, sending texts or checking social media sites. That’s 700 to 1,400 hours per year people are putting stress on their spines, according to the research. And high-schoolers might be the worst. They could conceivably spend an additional 5,000 hours in this position, Hansraj said.
What about devices not at a workstation?

• ‘Text neck’ is becoming an ‘epidemic’ and could wreck your spine
  ~Washington Post 11/20/14

What about devices not at a workstation?

• College students with high smartphone usage are more likely than those with low usage to experience impaired hand function, thumb pain and other issues, a 2015 study in the journal Muscle & Nerve found. ~Washington Post 6/13/16

What about devices not at a workstation?

• Ipad/Tablets offer many of the same problems
• What solutions can we offer?
  
  • Mix up your schedule
  • Don’t work in bed
  • Prop the device up and use a separate keyboard
Are certain occupations linked to overuse/MSDs?

- What does the scientific research say?
  - Rheumatology Journal 2012 (Barcinilla, et al) showed certain tasks linked to carpal tunnel
    - Occupational exposure to excess vibration, increased hand force and repetition increase the risk of developing CTS.
    - Wrist posture was not statistically significant

Are certain occupations linked to overuse/MSDs?

- What does the scientific research say?
  - Journal of Clinical Biomechanics 2015 (Toosi, et al)
    - Results from this study confirmed a typing task causes changes in the median nerve, and changes are influenced by level of ulnar deviation. Furthermore, changes in the median nerve are present until cessation of the activity. While it is unclear if these changes lead to long-term symptoms or nerve injury, their existence adds to the evidence of a possible link between carpal tunnel syndrome and keyboarding.

Carpal tunnel and Occupation

- Highest to Lowest Numbers of CTS Events by Job.
  - The following is a list of occupations published by the Bureau of Labor Statistics in 2006 rating workers with highest to lowest total numbers of CTS-related events:
    - Laborers and freight, stock, and material movers
    - Customer service representatives
    - First-line supervisors/managers of office and administrative support workers
    - Janitors, maids, and housekeeping cleaners
    - Food service managers
    - First-line supervisors/managers of retail sales workers
    - Automotive service technicians and mechanics
    - Executive secretaries and administrative assistants
    - Financial managers
    - Sewing machine operators
Carpal tunnel and Occupation

• Highest to Lowest Numbers of CTS Events by Job. The following is a list of occupations published by the Bureau of Labor Statistics in 2006 rating workers with highest to lowest total numbers of CTS-related events:
  • Truck drivers
  • Office clerks
  • Accounting and auditing clerks
  • Welders, cutters, solderers, and brazers
  • Sheet metal workers
  • Packers and packagers
  • Computer software engineers
  • Inspectors, testers, sorters, samplers, and weighers
  • Stock clerks and order fillers
  • Tire repairers and changers
  • Packaging and filling machine operators and tenders


Carpal and Tunnel & Occupation

• Most studies have found NO causation between carpal tunnel and keyboarding (i.e Journal of Occupation & Environmental Med 2014)
• Carpal tunnel loosely associated with vibration, increased hand force and repetition
• Far more common in non computer use jobs (assembly line, factory work)

BUT....OUR PATIENTS HURT!

• Is the workstation aggravating a pre-existing condition?
• Is it the workstation or the lack of breaks?
• Is it the societal influence of working extended hours?
• Is it workstation or the mobile devices?
Where do we go from here?

Is equipment change enough?

Keyboards, mice, etc

• What is an ergonomic workstation?
  – A workstation that allows the user to work in an optimal posture without causing undue strain on the body.
  – What factors must be considered?
    • Length of time without a break
    • Angle of wrist/elbows
    • Hip and knee angle
    • Height of monitor
    • Use or non use of arm rests/neck rest/foot rest

Ergonomic Workstation

• There is no right piece of equipment for everyone.
  – Considerations when evaluating a computer workstation for its ergonomics:
    • Injury and pain history
    • Budget
    • Space availability
    • Handedness
    • Demands of the job (does patient need a 10 key for accounting, drawing pad for architecture, multiple screens for international markets)
Ergonomic Workstation

• Study in 2000 (Journal of Occupational and Environmental Medicine, Demure, et al) looked at 273 users of computer workstations. MS risk increased in the following situations:
  -- Wrist and hand pain: females, greater than 7 hours work day, poor keyboard position
  -- Neck and shoulder pain: greater than 7 hours work day, over 40 y.o., infrequent breaks

Ergonomic Workstations

• Study of workers in lab controlled environment
• 8 hr days for 15 days. One group received ergo training, sit to stand option and reminders. Other group received minimal intervention
  -- Trained group varied their postures and had significantly less discomfort

Ergonomic Workstations

• Ergonomic design and training for preventing work-related musculoskeletal disorders of the upper limb and neck in adults. COCHRANE review 2012
  -- Not enough high quality evidence to determine the effectiveness of ergonomic interventions
Ergonomic Interventions

- Internal Archives of Occupational and Environmental Health 2014, Esmaeilzadeh, et al
  - Effects of ergonomic intervention on work related upper extremity musculoskeletal disorders among computer workers: a randomized controlled study
    - 94 subjects with 6 month follow up showed complaints of workplace upper extremity pain decreased significantly compared to control group. Body posture and workstation layout improved (2 interactive sessions, ergonomic adjustments and education brochure)

Is sitting the new smoking?

- Most studies looking at sit to stand workstations are short term
  - Many show positive impact on activity levels and cardiovascular status
  - No loss in productivity found (some show an increase in productivity)
  - Some studies show decreased musculoskeletal complaints.

So what do we know?

- Reports of workplace musculoskeletal discomfort are significant
- Many of the postures used at a seated workstation or with mobile devices put undue strain on the body
- Ergonomic adjustments may help (or not)
- Sit to stand workstations do not decrease productivity and help to decrease the effects of sedentary behavior.
How do we intervene from our clinic office?

• Pictures, pictures, pictures
  
• Best photo taken:
  – Head to toe
  – Monitor included
  – While working

Where to begin?

Where is the client’s forearm in relation to the keyboard?
  – Aim for ≥90° at elbow
  – Shoulders relaxed
  – Do we adjust the keyboard or chair?
    • If we adjust the chair, where are their feet?
    • If we adjust the chair, does the monitor need to change?
If the keyboard is too high...
– Option 1: Keyboard tray or tray system

What are the parts of a system?
– Mechanism
– Keyboard Platform
– Mouse Platform
– Track
– Palm Support

Mechanism
– Best Components
  • Height adjustability
  • Tilt
Keyboard Tray

• Keyboard Platform
  – Can you also fit your mouse or do you need a separate mouse platform
  – What shape platform? Is the desk a corner desk? Curved? L Shaped?

Mouse Platform

• Right or Left?
• Moveable?
• Stable?

How do I get the mouse closer?

• When you have less space on tray on desktop...and you need to bring the mouse closer...ask...
  – Do you use your 10 key?
  – Keyboards without a 10 key OR Mouse Bridge
Track for underdesk

- How does it connect?
  - Glass top desks
  - Antique desks
  - Need one inch for screws
- Length of track
  - Standard length 22 inches
    - Allows full retraction under desk
    - Shorter track okay but may not have full retraction

What type of Keyboards are out there?

- “Ergonomic” Keyboard

What type of Keyboards are out there?

- What do we need to achieve with the keyboard?
  - Wrist neutral (not extended) – flatten the feet!!!
  - Can you balance a pencil on top of your hand/forearm
  - Are you overly ulnarly deviating?
Keyboards

• Key usage
  – Tapping not pounding
  – 10 key yes or no?
  – Keying shortcuts
    • x - keys

Keyboards

• Tenting
  – Horizontal vs. Vertical Tenting

• Negative slope
  – Keyboard vs keyboard tray

Who needs a split keyboard?

• Good for:
  – Obese workers
  – Pregnant workers
  – Broad shoulders

• Benefits of splint keyboard:
  – Ability to adjust and be in line with shoulders
Palm Rests???

• For the PALM! Not the wrist

• PROs:
  • Soft surface
  • Ability to rest
  • Relaxes shoulders if used properly

• CONs:
  • Encourage static positioning
  • May cause user to push the keyboard back out of reach

Where should the keyboard be?

• Placemat positioning

Input Device

• What are types of mice available?
• How do I decide what works best for the patient?
  – Return to the diagnosis
  – What are the tasks they need to complete?
• What’s their budget?
Input Device

• Traditional Choices
  - Contour Mouse
  - OrthoMouse

• Evoluent
  - Vertical Mouse
    - DXT Mouse
    - Penguin Mouse

Non Traditional Mice

• Roller Mouse
• Foot Pedals
Monitor Height/Distance

• General rule:
  – Top of monitor aligns with top of head
  – Straight gaze occurs in top 1/3 of screen

Monitor Height/Distance

• Good positioning for NON Bifocal Users

Monitor Height/Distance

• What to do for bifocals?
  – Bifocal users tend to do well with the screen slightly lower than other users.
  – May be helpful to recline their chair back slightly

• All users (but esp bifocal users) can tilt the screen so bottom end is closer to user (i.e. tilted slightly toward the ceiling)
Monitor Height/Distance

- Monitor should be approximately an arms length reach.
- Especially large monitors may be placed slightly further back
- Is your client leaning forward to see the screen?
  - Move screen closer
  - Enlarge font

Monitor Arms

- Best for adjustability
- Great if more than one user shares a work space
- Can be desk or wall mounted

Chairs!!!

- So many options!
- So many manufacturers!
- So many sizes of people!
- So many price points!

- What is your client’s budget?
Basic Chair Attributes

- Wheeled - 5 point
- Height Adjustable
- Seat Depth Adjustable
- Arm Flexibility
- Tilt mechanism
- Waterfall edge

Headrest: Yea or Nay?

- Yea:
  - Ideal for neck impingement/neck pain
  - Useful when reclining to think
  - Call centers or control rooms
- Nay:
  - When needing to be focused on the screen intensively won’t be used
  - Petite or very tall workers may not fit

Headrest

- What makes a good headrest
  - Height adjustability/Back of chair not too high
  - Articulating
  - Wide

Humanscale Freedom Chair
Seat Depth

- Back of knees should be 2-3 finger widths from edge of chair with client seated all the way back in the chair
- Adjusts via sliding seat pan or back sliding forward and back

Seat Depth

- How to look at a picture and assess seat depth
- Is the patient perched on the edge?
- Is the patient tucking legs under?

Seat Pan Width

- Usually approx 18 inches
- Take into consideration the size of your client
- Take into consideration if you are recommending arm rests
- Wide seat & petite worker = bad combination
Shoulder Cut Away?

Kheilhauer Junior

Hag Capisco

Tilt Mechanism

• Multiple types
  — Multifunction Mechanism
    • Back tilt or seat tilt independently
    • Both tilt together
  — Synchro Tilt
    • Back rest reclines generally 2:1 to seat allowing wider hip angle naturally
  — Is there a tilt lock?

Arm Rests

ALWAYS!
• Give people a chance to relax their shoulders if placed properly (hunching otherwise)
• Better than using the edge of the desk or palm rests

NEVER!
• Doesn’t allow flow of motion from the shoulder
• Compression at cubital tunnel and/or carpal tunnel
Arm Rests

• Larger workers/Mobility Impaired workers
• Do they use the arm rests to push up to stand?

Arm Rests

• If you use them…need adjustability!!!
  – Height
  – Width
  – Angle
  – Forward/Backward

• Where should they be?

Arm Rests

• If you use them…need adjustability!!!
• Where should they be?
Phone

- Heavy Phone Users – many calls OR long calls
  - NEED a headset!
  - Multipoint headset can connect multiple phones
  - If no headset – phone within placemat reach.

What is wrong with this posture?

Sit to Stand Solutions

- Tabletop add-ons that raise workstation

Sit to Stand Desk

- Variety of price points and models. May still need to add a monitor arm or keyboard tray
- Cheap: Crank
- Expensive: Electronic Mechanism, Pre-sets
Sit to Stand Desk

• Problems from Users
  – Leg Fatigue
    • Anti Fatigue Mat: Topo Mat
  – Back Pain
  – Shoe Use?

• What is correct dose of sit vs stand?
  – Apps/Timers

• Foam Rollers?
• Treadmill desks?
• Bicycle desk?

Accessories

• Document Holder
  – Same side as dominant eye
  – Test which is dominant eye
    • Look through finger circle...dominant eye image doesn’t change
Lumbar Supports

• Can add a portable lumbar support if necessary.
  – Can also be used in the car!
  – Can be inflatable to customize for the user.

Homegrown Solutions

• No Cost Alternatives
  – Foot Rest:
    • Books, sideways garbage cans, aerobic step
  – Monitor Riser:
    • Books, Boxes
  – Other locations in House for desk

Ergo Breaks

• 20/20/20 Rule
  – Every 20 min take a 20 second break and look 20 feet away
• Stretching breaks hourly
  – Apps
  – Timer
  – Create a program!
Laptop use

• Is there any laptop use that is SAFE?
  – Short and intermittent intervals
• If the laptop is the primary workstation....
  – Riser
  – Separate keyboard and mouse

Laptop Use

• Must separate screen and keyboard.
• Pick one battle...
• Can’t sacrifice the neck to fix the shoulders/wrists
• Can’t fix the neck without sacrificing the shoulders/wrists

Case Study #1
40 Year Old with Neck and Back Pain
Office Coordinator for Family Pool and Hard Scape Business
4-6 hours per day on phone and computer
What do you notice right away?
Case Study #1
This client would benefit from:
Keyboard Tray
Angled desk
Measure for track and width of space...can you include mouse on tray?
Monitor too high?
  Already on an adjustable bar
  Bring monitor slightly down

Case Study #1
Recommendations for Phone Use?
  1) HEADSET!
  2) Alternate sides
  3) Sit back, don’t lean on elbow

Case Study #2
42 year old female stay at home mother responsible for all family finances and communication
Complains of pain in dorsal hands, lateral epicondyle and extensor mass
Spends several hours at computer everyday
What do you notice right away?
Case Study #2
What do you notice right away?
Desk too high
Pencil drawer under desk
Not sitting back in seat and knees still barely clear seat edge
Monitor too low
Feet don’t touch floor
Trackpad has wrist extended

Case Study #3
50 year old male with significant neck pain
Runs a movie special effects company
On computer 8-10 hours a day
What do you notice right away?
Pitched forward in seat (not using back)
Multiple screens which are all too low
Forward head posture
Elbows/forearms slightly high
Right wrist extended
Case Study #3

Pitched forward in seat (not using back)
• Recommend new chair/consider neck support

Multiple screens which are all too low
• Consider riser

Forward head posture
• Risers should assist and proper chair
• Client also reports poor touch typing

Elbows/forearms slightly high
• Keyboard tray

Right wrist extended
• Alternate mouse suggestions

Case Study #3

Pitched forward in seat (not using back)
• Recommend new chair/consider neck support

Multiple screens which are all too low
• Now on risers

Forward head posture
• Higher computer screens and seated back in chair
• Trial of Dragon software

Elbows/forearms slightly high
• Keyboard tray

Right wrist extended
• Mouse at tray

Case Study #4

Client is a 36 year old photographer.
Experiencing hand pain and numbness.

Alternates between desk and couch. Prefers laptop on couch

What do you see wrong?
Case Study #4
Forward head
Extended wrists, right wrist is leaning on edge of laptop
Knees do not clear the edge of the sofa
Both laptop and mouse are on unstable surfaces

Case Study #4
In lieu of the couch sometimes she works here.....
Points for discussion:
Elbows
Neck posture
Feet
Adaptability of chair
Clutter

Recommendations
• Handouts
• Equipment Lists
• Stretching Exercises for their ergo breaks
• Don’t use the word Safety! (you are not a safety expert)

• Have the client email you a “fixed” picture once adjustments have been made.
Try before you buy

- Have a variety of devices available for the client to try in the clinic
- Have a mock workstation
- Collaborate with a vendor for chair demos
- Have a relationship with a showroom

Ergo Break Stretches

- Wall angel
- Corner Stretch
Questions?

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