Mechanism of Injury
How to Drive Excellent Outcomes in Physical Therapy

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Overview

• Mechanism of Injury:
  – 4 Factors
  – Laws of Motion & Energy

• Patient & Clinical Factors
  – Obesity
  – Aging workforce
  – Co-morbidities

• Things to Consider
  – Questions to ask or investigate by body part to help determine MOI
Why Do We Need to Know?

Case study:

– 48 y/o female
– Medical Diagnosis: Cervical Pain
– Clinical Presentation:
  • Pain
  • Stiffness
  • Trigger Points
  • Lack of Motion
  • Abnormal Posture
  • Radiating pain/numbness down right arm to wrist/hand
– What is the suspected pathology?
– What was the mechanism of injury?
  • Validate clinical evidence for MD

This information will drive the treatment plan and expectations for response to therapy treatments.
Mechanism of Injury Defined
Mechanism of Injury (MOI) Definition

- The Mechanism of Injury (MOI) refers to the way damage to skin, muscles, organs and bones happen
  - Helps clinicians determine injury severity
  - To develop treatment plan and goals
  - Validates clinical findings for MD (diagnostics, differential diagnosis, other treatments)
  - Manage/monitor clinical progress
  - Determine clinical outliers
  - Helps payors determine compensable injuries
BASIC LAW OF MOTION:

- "Energy cannot be created or destroyed, but it can change in form or be absorbed"

- Motion injury is basically caused by the body’s absorption of energy
- Twists, falls, hit by object
Four Factors of MOI

Mechanism of injury (MOI) is the force or forces that cause injury when applied to the human body.

• Forces have characteristics such as speed, size and direction.
• There are four factors to consider when assessing a mechanism of injury.
  – Work area factors
  – Force and speed
  – Force and size
  – Direction of force
1: Work Area Factors

- Slippery Floors
- Moving equipment/objects: vehicles, forklifts, conveyor belts, carts
- Trip hazards: electric cords, rugs, anti-fatigue mats
2: Force & Speed Factor

- Fall from standing
- Height of fall
- Surface: landing on concrete floor or padding?
3: Force Type & Size Factor

- Automobile collision
- Air-powered nail gun (1-inch nails)
4: Direction of Force Factors

- Joint flexed outward
- Joint hyperextension
- Joint dislocation
Mechanism of Injury: Time Sequence

• In sports it is often very easy to identify the Mechanism of Injury: immediate, traumatic
• In workplace it is often hard to identify the Mechanism of Injury: develops overtime, cumulative trauma, due to exposure to multiple or repeated ergonomic risk factors
Workplace Risk Factors
Why Do Work Injuries Happen?

- Clinically, cumulative trauma disorders occur when there is inadequate blood flow or tissue recovery time due to work cycles or exposure to ergonomic risk factors.

- Tissue damage can lead to inflammation, degeneration, loss of function (ROM, Strength), impairment, disability
Risk Factors

- Personal protective equipment
- Worker behavior
- Body mechanics
- Body morphology
- Environment
Awkward Postures & Grip Strength

- Neutral joint posture:
  - least amount of stress on tendons, ligaments and joints
  - strongest
- Working outside of neutral:
  - loss of strength of 50% or more
- Gloves:
  - 10% more strength required
Patient & Clinical Factors

Factors that impact injury rates and healing process
• Affect injury rates, contribute to injuries and delayed healing:
  – Poor level of fitness / General de-conditioning
  – Overweight - high BMI
  – Advanced age
  – Pregnant
  – Blood thinners
  – Smoking
Trend: Impact of Obesity on WC Claims

- **Moderately Overweight, BMI 25-29.9:**
  - 7% more WC claims
  - Missed 3.5x more work days
  - Medical costs 1.5x higher
  - Indemnity costs 2x greater

- **Morbidly Obese, BMI 40+:**
  - 45% more WC claims
  - Missed 8x more work days
  - Medical costs 5x higher than normal weight workers
  - Indemnity costs 8x greater

- **37% of obese individuals represent 61% of all costs**

Ref: [https://today.duke.edu/2010/10/workobese.html](https://today.duke.edu/2010/10/workobese.html)
Trend: Aging Workforce (55+)

- Represents 23% of U.S. workforce in 2017, nation’s fastest growing segment
- Longest duration of work related absences
- Higher severity of work injuries
- Mechanism of Injury:
  - Most common: Falls on same level
- Injury Types:
  - Strain, sprain, soft tissue injuries low
  - Fractures, multiple injuries, co-morbidities higher prevalence
- Longer recovery times, extended P.T. durations

Ref: U.S. and state government researchers (CDC, BLS and several state agencies)
Blood Thinners (Prescribed and Other)

• “Low mechanism injuries like ground level falls become serious life threatening events.”
• Alcohol thins blood; less likely to clot
• Liver or kidney disease can thin blood
• Prescription medications

Ref: https://www.verywellhealth.com/mechanism-of-injury-1298672
• Lack of oxygen to wounds
• Raises blood sugar levels
• Sensation of increased pain

Ref: https://advancedtissue.com/2017/03/smoking-negatively-impacts-wound-healing/
Things to Consider

Additional questions to ask or investigate to help you solve the MOI puzzle.....
General MOI Questions to Ask:

- Was onset slow or sudden?
- Has this condition occurred in the past?
- How long have you had this condition? Duration? Frequency?
- Is duration/frequency increasing?
- Pain constant or intermittent?
- What makes better? Worse? Activity? Rest?
- Has pain moved or spread?
- Is pain localized? Or diffuse over several or large area? How far does pain go?
- Do you have joint locking? Giving way? Instability?
- Any changes in color of skin? Swelling?
MOI Questions to Ask: Shoulder

- What are you unable to do functionally with arm?
- What movements/activities make pain worse?
- Any positions that relieve pain?
- Do you need to support arm? or use sling?
- Does arm tire easily?
MOI Questions to Ask: Elbow

- What is your usual past time or activity?
- Numbness or tingling?
- **What activities or movements are restricted?**
- Prior history of injury to hand or arm?
MOI Questions to Ask: Forearm, Wrist & Hand

- What is your usual past time or activity?
- Any abnormal sensations?
- What activities or functions are you unable to do?
- **Is this your dominant arm/hand?**
- Any problems pinching? Gripping? Tying shoes? Buttoning?
MOI Questions to Ask: Thoracic Spine

- Any difficulty breathing?
- Any problems with digestion?
- Any numbness or tingling? Radiating pain?
- Particular posture more painful?
- Which hurts more bending or straightening?
- Is pain affected by coughing or sneezing?
MOI Questions to Ask: Lumbar Spine

• What is usual past time or activity?
• Did lifting cause your pain?
• If yes: what was object? Did you lift over head? Did you bend your knees?
• **Any pain down your leg? Which leg? How far down?**
• Pins or needles or lack of feeling? Where?
• How does sleeping positions affect pain?
• Increase in pain with coughing or sneezing?
• Any postures that increase or decrease pain?
• **Is pain altered by changing position?**
• Pain worse in morning or evening?
• Any bowel/bladder problems?
MOI Questions to Ask: Knee

- Is there catching sensation?
- Pain behind knee cap?
- Stiffness in morning?
- Do you have clicking or was there a pop?
- **Did you twist your knee? Inward or outward?**
- Did your knee lock or give away? Does it feel unstable?
- Does it hurt to kneel?
- Can you walk normally?
- Does leg feel weak?
- Can you bear all of your weight on your leg?
- Were you weight bearing during injury?
- Is knee swollen? Did you have fluid removed?
- Is there any grinding of the knee cap?
- What shoes do you wear?
- Are you wearing a knee brace? Does it help?
MOI Questions to Ask: Lower Leg, Foot & Ankle

• What shoes do you wear most of day?
• Do you have orthotics?
• Does walking on different terrains increase your pain?
• Did you twist ankle? inward or outward?
• Is there a deformity of foot or ankle?
• Swelling or pitting edema?
• **Were you able to continue activity after you hurt your foot or ankle?**
• Any swelling or bruising?
MOI Questions to Ask: Cervical

- Are there any positions you hold for long periods of time?
- Do you frequently look up or overhead?
- **Do you wear glasses?** bifocals?
- **Did you hit your head or lose consciousness?**
- Does pain go down arms?
- What sleeping positions affect pain? what pillow size and type feels best?
- Do you have headaches? describe:
- Do you have dizziness or fainting?
- Is pain affected by laughing or coughing or sneezing?
MOI Questions to Ask: Hip & Pelvic

- **When does pain occur? specific movements?**
- Do you feel weakness in legs?
- Recent pregnancy?
- Recent falls?
- **What is habitual working stance? Sitting or Standing? Twisting?**
Industrial Rehab Programs
Industrial Rehab Programs

- Specialty industrial rehab programs can help prevent injuries, re-injuries & promote prompt RTW
- Can address mechanism of injury related to worksite/work area factors
- Review patient’s RTW/SAW status and appropriateness for specialty industrial rehab services:
  - Functional Capacity Evaluation
  - Work Hardening/Conditioning
  - Ergonomic Services: addresses work related forces, safety of work area, tissue recovery times
When to Consider RTW Program

- Mechanism of Injury Tied To:
  - Endurance component
  - Body mechanics
  - Worker behavior
  - Repetitive tasks
  - Heavier physical demands

- Strong focus on prevention of future injuries
“You do not get injured workers well to put them back to work. You put them back to work to get them well.”

- Richard Pimenthal
Thank you!

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