



OVERVIEW OF PROSTHETICS & ORTHOTICS

Emperion | Shirley Ryan AbilityLab



Clinical Solutions by Line of Insurance

Clinical Solutions	Workers' Comp	Auto	Disability	General Liability
Independent Medical Exams (IME)	✓	✓	✓	✓
Peer Review	✓	✓	✓	✓
Physician Advisor Reviews (PA)	✓	✓	✓	✓
Functional Capacity Evaluation (FCE)			✓	
Fitness For Duty / RTW Evaluation (FFD)			✓	

Today's Presenter

Diana Pressney, MPO, CPO

- Certified Prosthetist Orthotist
- Strong background in clinical care, research, and innovation in orthotics and prosthetics.
- Patient-centered, evidence-based approach to her work.





PROSTHETICS

PROSTHETIC TRENDS IN WC, AUTO & DISABILITY CLAIMS

Industry Trends

- Rising numbers of microprocessor knees and myoelectric arms in claims
- Claimants living longer with limb loss, driving lifetime care costs
- Device costs increasingly outpacing standard fee schedules
- Increased demand for specialized amputee programs with multidisciplinary care
- Growing frequency of replacement and upgrade requests

Why It Matters for Adjusters

- Distinguish medical necessity from patient preference or convenience
- Evaluate appropriateness of high-cost components before authorizing
- Coordinate confidently with P&O providers, physicians, and case managers
- Reduce disputes, delays, and unnecessary appeals
- Support fair, timely outcomes for injured workers and claimants

LEVELS OF LIMB LOSS

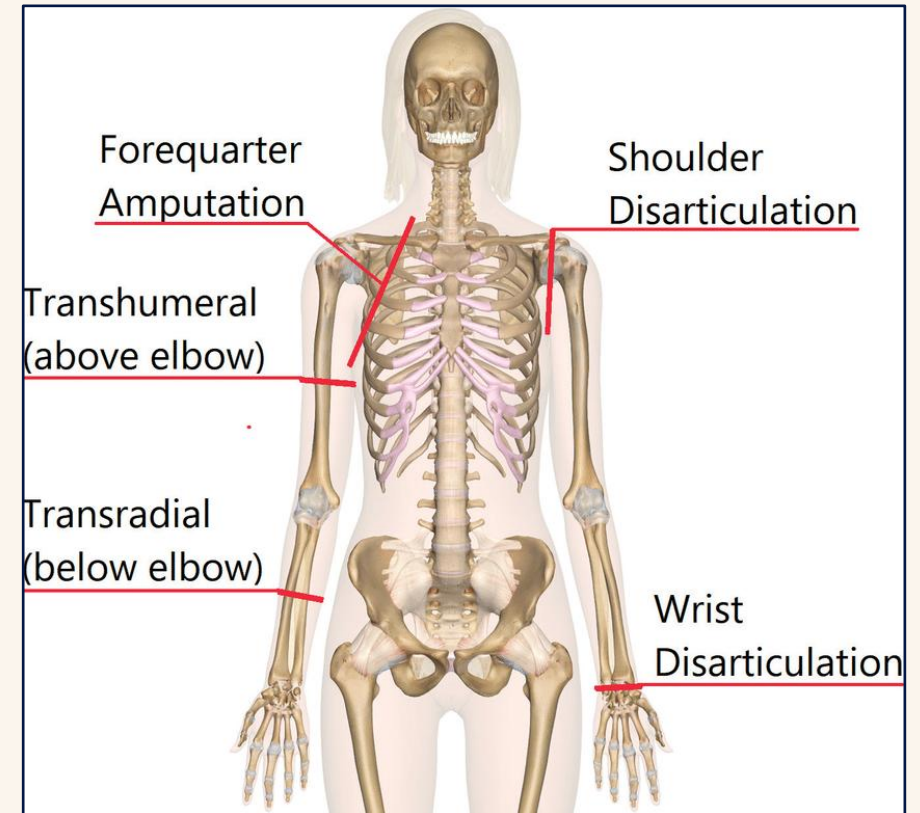
Amputations are named for the primary bone that was cut

- Trans humeral
- Trans radial
- Transfemoral

Disarticulation = separate bones at a joint (bones not cut)

- Shoulder disarticulation
- Elbow disarticulation
- Ankle disarticulation (i.e., “Symes”)

Amputation incidence decreases as level moves proximally



PROSTHESIS TERMINOLOGY

Socket: structural shell surrounding residual limb and transferring load between device and patient

Prosthetic Joint: prosthetic congruent to the anatomical joint (knee, elbow, shoulder, hip, etc.)

Pylon: connect one component to another

Terminal device: hand or hand replacement on upper limb prostheses

SOCKET

KNEE

PYLON

FOOT



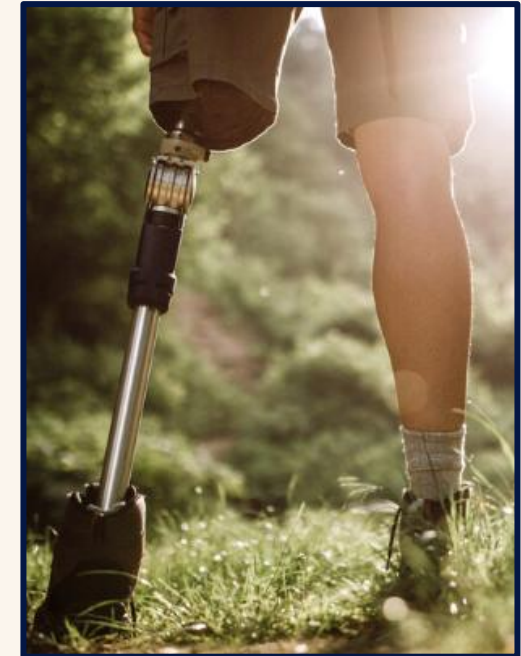


LOWER LIMB PROSTHETICS

LOWER LIMB PROSTHETICS

Patient goals tend to be similar: stand and walk

- Environmental factors play big role in component selection
- Fitting evolves over time as residual lower limbs experience changes



COMPONENT SELECTION

Feet

- Selected based on limb length, activity level, body weight, patients' goals
- Features: stiffness, energy return, multi-axial, torsion

Knees

- Selected based on limb length, activity level, body weight, patients' goals
- Features: manual lock, extension assist, stance flexion, hydraulic or pneumatic speed control, polycentric center of rotation, microprocessor control

Suspension

- Examples: pin locking, suction, vacuum, anatomical, lanyard
- Some patients may need a secondary suspension

LOWER LIMB PROSTHETICS: MICROPROCESSOR CONTROL

Microprocessor control allows the prosthesis to adjust its own settings in real time as user moves

- Components include sensors to detect what prosthesis/patient are doing and react accordingly
- Different modes and settings available to offer wide array of functions
- Enhances safety and efficiency, especially in unpredictable or changing situations



BILATERAL TRANSFEMORAL PROSTHESES



Walking with bilateral transfemoral prostheses is very difficult

- Energy cost

Foreshortened prostheses (“stubbies”)

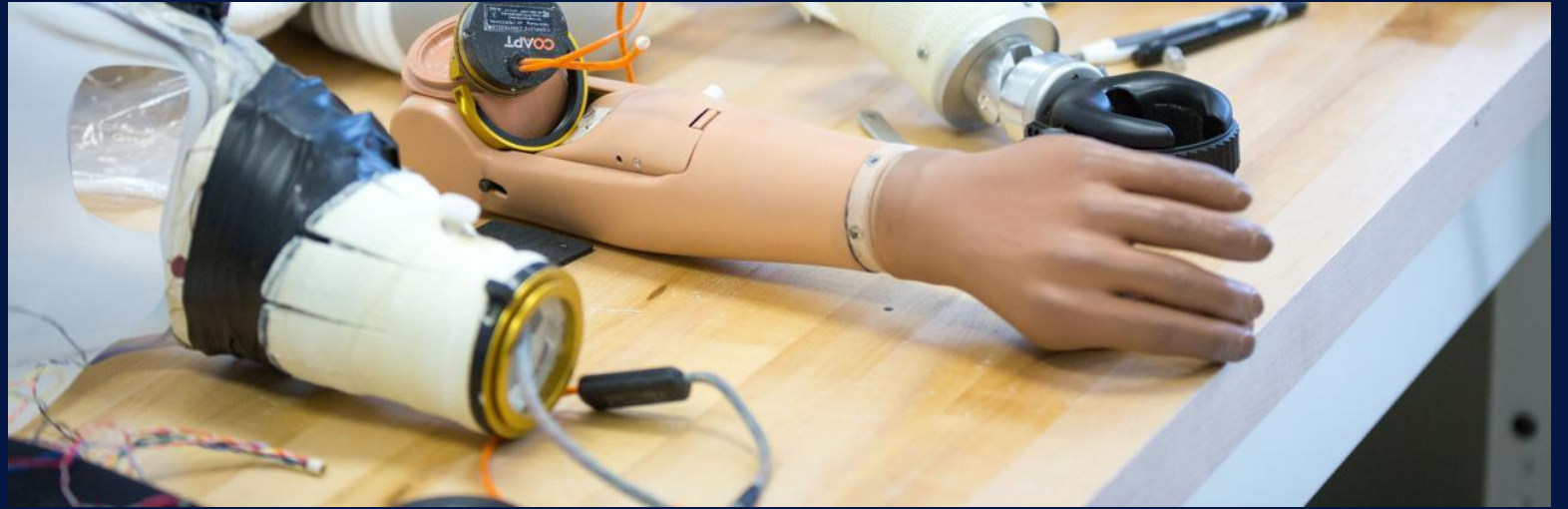
- Lower center of mass -> balance
- No knee units to control -> safety
- Modify assistive devices



Graduated length protocol

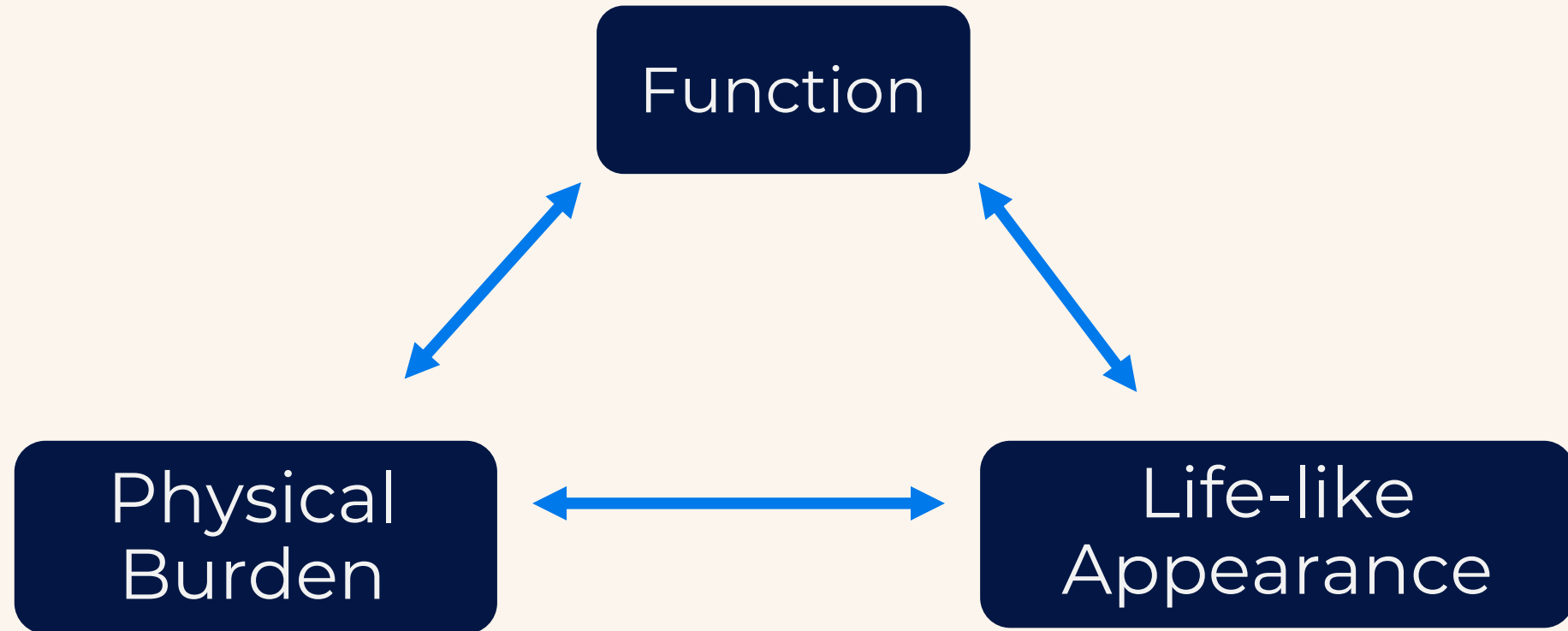
- As walking improves, height increased
- May start with locking knee joints, progress to MPKs





UPPER LIMB PROSTHETICS

CONSIDERATIONS FOR UPPER LIMB PROSTHESES



Patient goals and priorities vary widely compared to lower limb

PROSTHESIS TYPES

Passive



Body Power



Hybrid Power

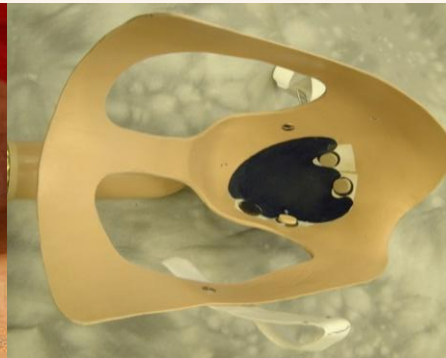


External Power

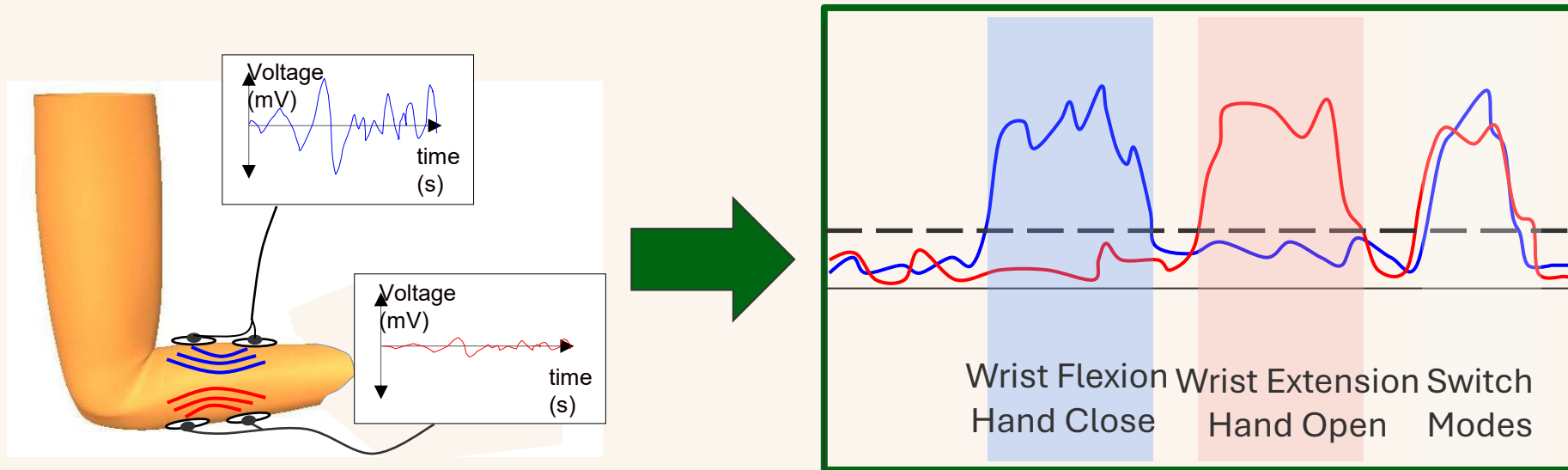


EXTERNALLY POWERED PROSTHESES

- Prosthesis contains electric motors and batteries to move
- Myoelectric
 - Surface EMG sensors record muscle activity -> microprocessor interprets signals and activates motion
 - All “Myo's” are externally powered but not vice versa!



MYOELECTRIC CONTROL



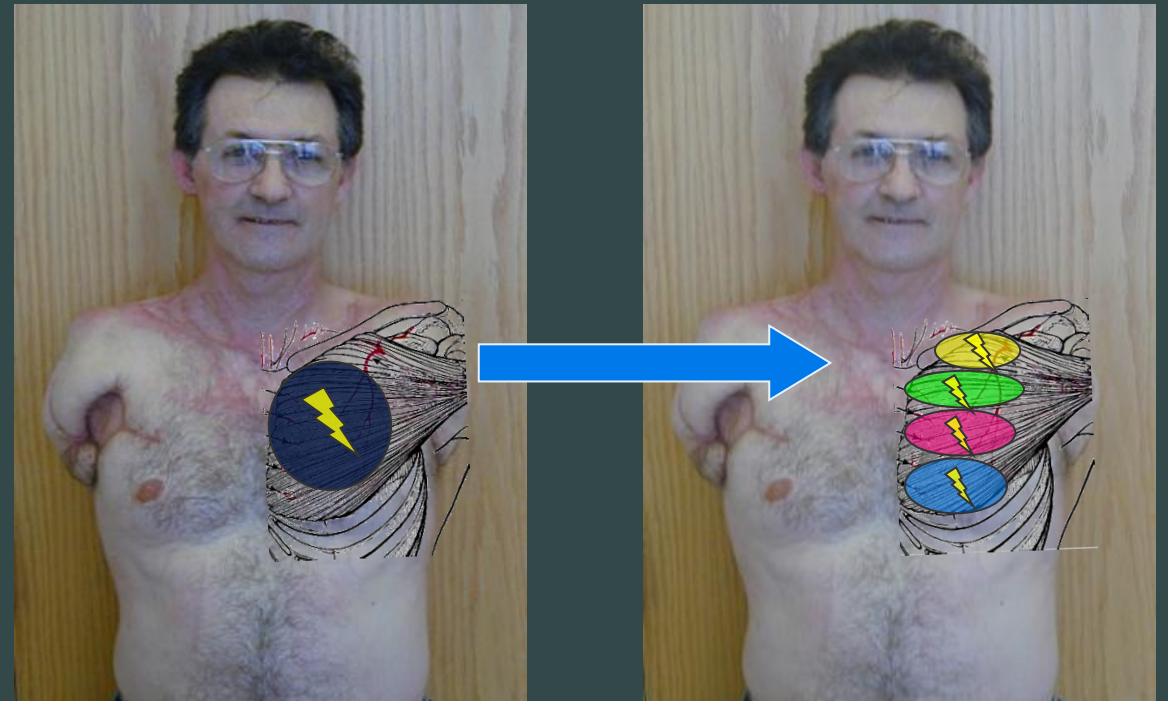
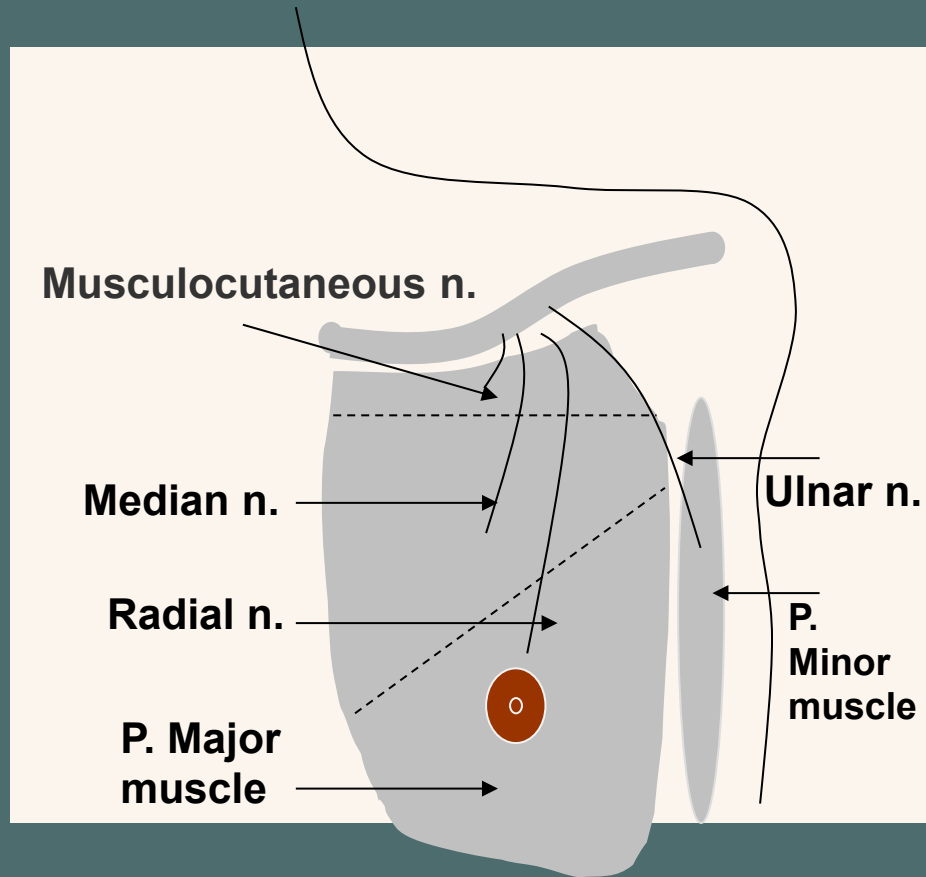
- Surface EMG sensors placed on antagonistic muscle bellies
- 2 input signals = 2 motions
 - Must switch modes to operate more motions (e.g. hand + wrist, elbow + hand)

MYOELECTRIC CONTROL

- Requisite “mode switching” with 2-site myoelectric control can be cumbersome and unintuitive for patients
- Example order of operations to raise arm and grasp item:
 - Co-contract biceps and triceps -> switch to elbow control
 - Flex biceps -> elbow up (flexes)
 - Co-contract -> switch to hand control
 - Flex triceps -> hand opens -> place around item
 - Flex biceps -> hand closes
 - Co-contract -> switch to elbow control
 - Flex triceps -> elbow down (extends)
- *Wouldn't it be nice to have more input data to work from?*



TARGETED MUSCLE REINNERVATION



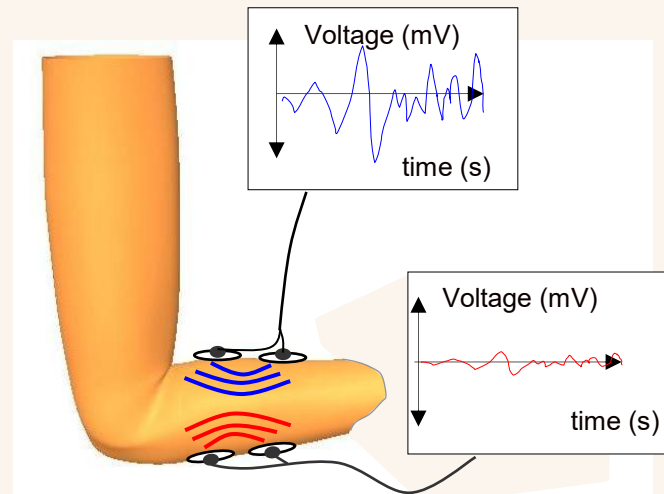
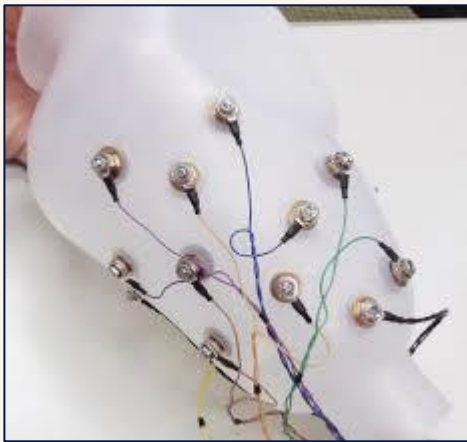
PATTERN RECOGNITION CONTROL

Advanced signal processor takes in all EMG data and “decodes”

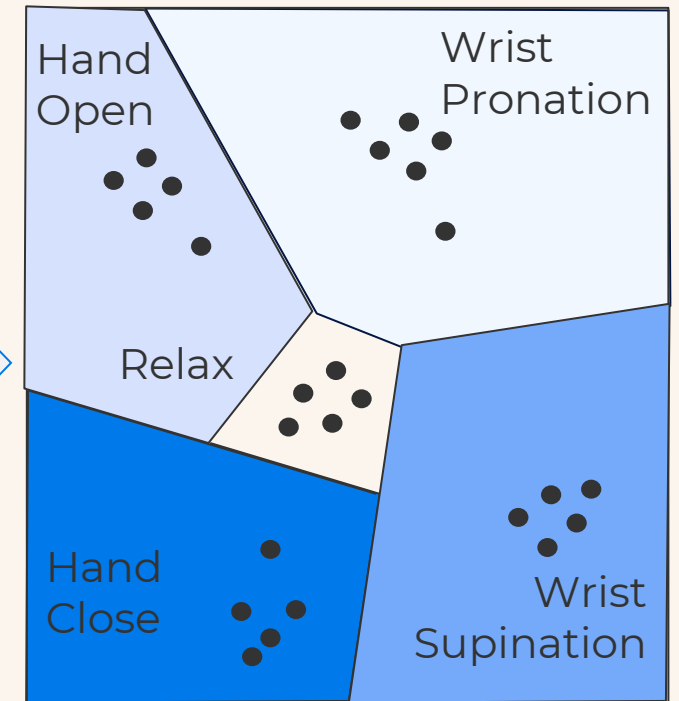
- More intuitive: think about the joint you want to move

Can be used in conjunction with TMR at any amputation level

- Works without TMR at trans radial level



Pattern
Recognition
Algorithm



EXTERNALLY POWERED TERMINAL DEVICES



**SINGLE DOF
HAND**

MULTI-ARTICULATING HAND



POWERED HOOK

MULTI-ARTICULATING HANDS

Multi-articulating hands DO:

- Have motors in each digit that move independently
- Have pre-programmed grip patterns for variety of functions

Multi-articulating hands DO NOT:

- Move in infinite combinations of patterns the way real hands can
- Allow patient to move individual digits on command outside of grip patterns

HOW A PROSTHESIS IS MADE:



Cast



Modify



Pull



Adjust



Align



Laminate



ORTHOTICS

ORTHOTIC TRENDS IN WC, AUTO & DISABILITY CLAIMS

INDUSTRY TRENDS

- Increased use of custom fabricated orthoses for complex spinal and limb injuries
- Rising adoption of advanced bracing materials and 3D printed designs
- Increased claims involving long-term or lifetime orthotic needs
- Coding complexities for orthotics versus DME
- Increased use of advanced technologies (microprocessor KAFO, FES)
- Rising considerations for custom fit versus off the shelf orthoses

WHY IT MATTERS FOR ADJUSTERS

- Verify medical necessity for custom fabricated vs. custom fit vs. off-the-shelf orthoses
- Understand expected replacement cycles and device lifespan
- Ensure billing and coding align with the orthosis prescribed
- Partner effectively with orthotists, physicians, and case managers to validate treatment plans
- Manage costs while ensuring functionally appropriate outcomes

ORTHOTIC TERMINOLOGY

- Orthoses help align or support a weak part of the body
- Goals of orthoses:
 - Provide balance and stability
 - Reduce pain
 - Improve posture and alignment
 - Reduce risk of injury
 - Aid in mobility and activities of daily living
- Named after the joints they cross
 - AFO: Ankle Foot Orthosis
 - KAFO: Knee Ankle Foot Orthosis
 - TLSO: Thoracic Lumbar Sacral Orthosis



LOWER LIMB ORTHOSES

Goals of AFOs and KAFOs

- Control motion
- Compensate for weakness
- Correct deformity/prevent further deformity

Many design options

- Materials: plastic or carbon fiber
- Can include joints or no joints
- Trimlines will determine how much stability the AFO provides



KAFO



AFO – Articulated



AFO – Static Progressive



AFO – Solid Ankle



GRAFO



AFO – Carbon

SPINAL ORTHOSES

- Goals:
 - Stabilization
 - Alignment correction
 - Pain reduction
- Different designs based on level of injury
- Off the shelf options and custom fabricated options



Flex Foam TLSO



Cervical Collar

UPPER LIMB ORTHOSES

Goals:

- Stabilization
- Reduce deformity
- Correct alignment or subluxation
- Assist in ADLs

Different designs based on patient goals:

- Static/positional
- Static progressive
- Dynamic

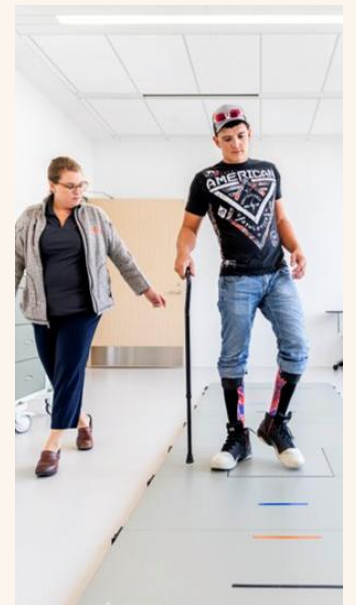


WHO



Resting Hand Splint

HOW A CUSTOM FABRICATED ORTHOSIS IS MADE



Cast



Modify



Pull



Fit/Adjust



Deliver



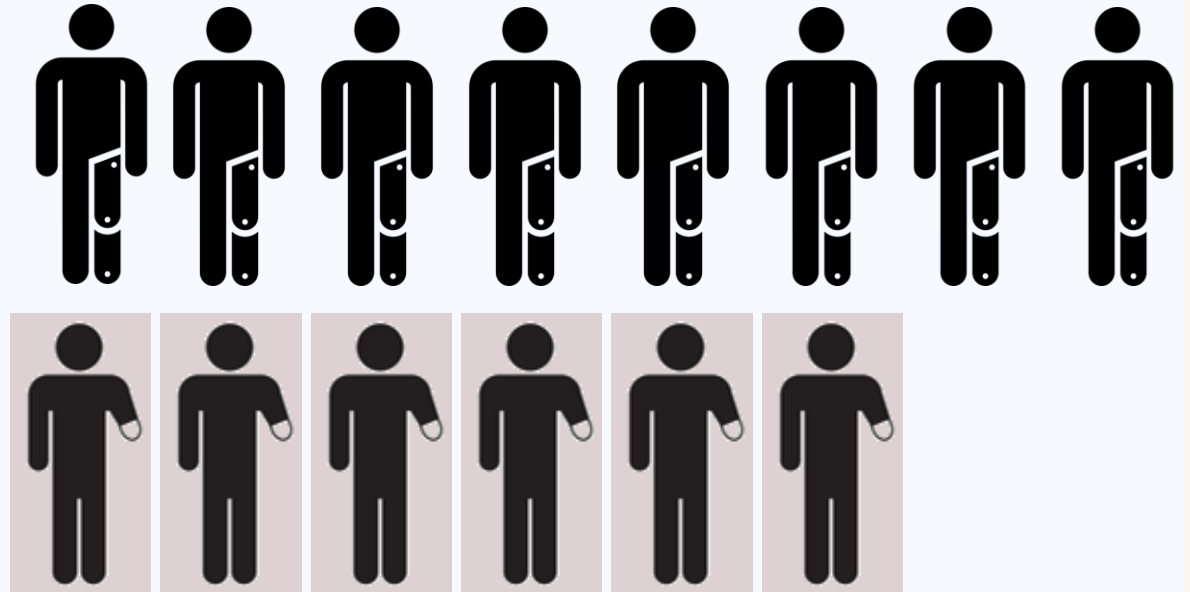
MULTI-DISCIPLINARY MODEL OF CARE

What To Look For In A Prosthetics And Orthotics Program

Collaborative Care



Relevant Experience



ADDITIONAL FACTORS TO CONSIDER:

PEER SUPPORT, PATIENT & FAMILY EDUCATION

- Care of the whole patient
- Family involvement

INTEGRATED RESEARCH AND CLINICAL CARE

- Evidence Based Practice
- Contribution to the body of knowledge
- Focus on solving unmet patient needs

EXPERIENCE CARING FOR NON-LOCAL PATIENTS

- On site care manager (appointments, housing, transportation, communication)
- Schedule tailored to patient/family needs
- Comfortable spaces



OVERVIEW OF THE REHABILITATION PROCESS



Multidisciplinary
Evaluation



Plan of Develop
Care



Authorization
for Device
-
Pre-Prosthetic
Therapy



Integrate
Device(s) into
Therapy
Treatment



Meet Goals
-
Finalize
Device(s)



Deliver Device
-
Discharge
-
Follow up

CONTINUUM OF CARE

In-patient

Day Rehab

Outpatient



DIAGNOSTIC PROSTHESIS: A COLLABORATIVE PROCESS

- A diagnostic prosthesis is built for the patient to use in occupational or physical therapy
- The device is regularly adjusted and tuned to allow improved function
- The PT, OT, CPO, and patient **collaborate** and determine when the prosthesis is fully optimized



THERAPY IN REAL- WORLD ENVIRONMENTS

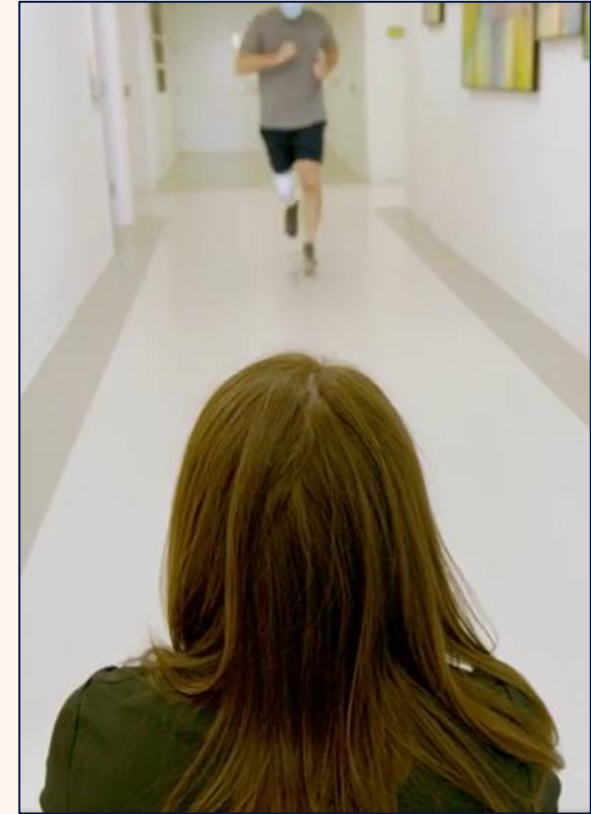
Therapy spaces designed to practice ADLs

- Kitchen
- Living spaces
- Laundry
- Bathroom
- Simulated work environments
- Community outings



COMPLEX CASE CONSIDERATIONS

- Multi-articulating hands
- Custom silicone
- Bilateral Upper Extremity Limb Loss
- Multiple limb loss involving upper and lower limbs
- Burns
- Sepsis
- Multiple trauma, e.g. TBI, SCI
- High-level amputation
- Occupation-specific prostheses
- Partial hand prostheses
- Targeted Muscle Reinnervation (TMR)
- Pattern Recognition
- Body-powered devices



Referral Options

We work as one team, providing customers with the technology, people, and data needed for deeper insights, greater efficiencies, and exponential value across the entire ecosystem.

Secure Email



referrals@emperion.com

Call



Website Form
& Portal



emperion.com

Thank You