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Upper Limb Prosthetic Rehabilitation

for
Occupational Therapists: An Introduction

Debra Latour
M.Ed. Advanced Practice of Occupational Therapy,
OTR/L

Disclosures

» Consumer
» Clinician
» Contributor
» Consultant
Disclosures

Financial:
- Receives payment for this series
- Owner, Single-Handed Solutions, LLC
- Inventor of record of patented prosthetic technology and method of use
- Business relationship with TRS, Boulder, CO
- Business relationship with Handspring, Middletown, NY
- Business relationship with Liberating Technologies Inc., Hopkinton, MA
- Business relationship with Shriners Hospitals for Children
  - owner of patented technology mentioned in the series

Non-financial
- Member, Upper Limb Advisory Council, Amputee Coalition of America (ACA)
- Member, Association of Children’s Prosthetic Orthotic Clinics (ACPOC)
- Member, American Occupational Therapy Association (AOTA)
- Member, American Telemedicine Association (ATA)

Learning Objectives

- By the end of the course, the participant will be able to identify diverse presentations of individuals with upper limb loss.

- By the end of the course, the participant will be able to list the levels of amputation.

- By the end of the course, the participant will be able to recognize the difference between congenital and acquired amputations.
OT

- Critical component of UL prosthetic rehabilitation
- Rarely see an individual with an UL amputation
- Often unfamiliar with UL prosthetic technology
- Specialty training is beneficial

OT

- Limb preparation
- Adjustment-Accommodation
- Prosthetic training
  - specific tasks
  - motor skills
  - positioning
  - posture
- Accelerates the rehabilitation process
- Essential to success in functional independence and achieving quality of life.
INTRODUCTION

It is the first in a series building upon a foundation of understanding

• the types of limb deficiency/loss
• the diverse technologies available
• approaches to evaluation and management
• patient education and consumer advocacy

Course SERIES Overview

▷ Course 1: Overview and Introduction
▷ Course 2: Understanding Technology
▷ Course 3: Evaluation
▷ Course 4: Management and Resources
Management and Resources

- Phases of Treatment
- Treatment Methods
- Adaptive Strategies
- Assistive Devices
- Team Approach
- Psych-Social Aspects
- Case Studies
- Resources and References

Evaluation

- Clinical Assessment
- Outcomes Measures and Tools
- Developing a Plan of Care
- Contributing to Medical Necessity
- Collaborating with Prosthetist
- Case Study
- Resources and References
Technology

Technology
- No Technology
- Passive Aesthetic
  - Functional
- Activity-Specific
- Body-Powered
- Externally-Powered
- Hybrid

Interventions
- Transplants
- Targeted Muscle Re-Innervation
- Pattern Recognition
- MORPH
- Other

- Case Study
- Resources and References

INTRODUCTION

- Understanding the Industry
  - Terminology
- Understanding the Population
  - Etiology
  - Presentations
- Resources and References
BASIC TERMINOLOGY

- Amputee
- Limb Deficiency
- Residual Limb
- Prosthetist
- Prosthesis
- Prosthetic Rehabilitation/Training
- Technology/Components
- Body-Power
- External Power
- Passive Aesthetic Functional
- Suspension
- Terminal Device

DEMOGRAPHICS AND ETIOLOGY

- Children
- Congenital
- Acquired
- Adults
- Unilateral
- Bilateral
- Multi-membra
Statistics: Levels

- Through Shoulder (Shoulder Disarticulation) / Forequarter 1.5%
- Above Elbow (Transhumeral) 4%
- Through Elbow (Elbow Disarticulation) 0.5%
- Below Elbow (Transradial) 8%
- Hand amputations 2%
- Through Hip (Hip Disarticulation) and hemipelvectomy 2%
- Above Knee (Transfemoral) 31%
- Through Knee (Knee Disarticulation) 1%
- Below Knee (Trans Tibial) 47%
- Through Ankle (Symes or Ankle Disarticulation) 3%

Statistics: Frequency

- 1988: Clinical Pediatrics 2-8/10,000 births
- 1992: National Institute on Disability & Rehabilitation Research 85,000-90,000
- 2005: Amputee Coalition of America
  - 0.3 to 1 per 1,000 live births in US
  - ~1,500 to 4,500 children per year
  - 58.5 % UL
  - < 50 % LL
Statistics: Cause

Amputation Statistics by Cause, United States, 1998 to 1996

- Congenital: 41.5% lower limb, 38.5% upper limb
- Cancer: 23.3% lower limb, 12.8% upper limb
- Trauma: 51% lower limb, 39.7% upper limb
- Dysvascular: 3% lower limb, 0.8% upper limb

Etiology of UL Loss

- Pediatric
  - Congenital: 9%
  - Trauma: 2%
  - Disease: 89%

- Adult
  - Congenital: 14%
  - Trauma: 3%
  - Disease: 77%
Some Statistics

- **2000**
  - the number of new upper limb amputees at or proximal to the wrist

- **3500**
  - the number of CP/O’s
  - each may see one every 18 months

- **7000**
  - the number of Psychiatrists:
  - each may see one every 3+ years

- **80,000**
  - The number of Occupational Therapists:
  - each may see one every 40 years

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CAUSES: CONGENITAL

- Genetic Disorders
- Substance Influence
- Intra-uterine Infection
- Amniotic Band Syndrome/Streeters Dysplasia
- Unknown

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Genetic Disorders

Substance Influence

Intra-uterine Infection

Amniotic Band Syndrome/Streeters Dysplasia

Unknown
CAUSES: CONGENITAL

- Disease

CAUSES: ACQUIRED

- Disease
CAUSES: ACQUIRED

- Trauma

Classifications

Radial Longitudinal

Ulnar Longitudinal
Classifications

Transverse:

Forequarter
Shoulder

TRANS-HUMERAL
ELBOW

TRANS-RADIAL

Figure 1: Case report 1 of male patient. Resulted from 15 months post-time after a traumatic amputation was performed before revision surgery and later repair in lateral flexor.
The Hand

- Challenging to replicate with singular technology
- Complicated
- Multi-functional
- 27 degrees of freedom
- **Active function** = generate high forces
- **Passive function** = resist high loads
  - (weight bearing)
- Combination of muscle & bone structures

PATIENT EDUCATION

- Understanding Condition
- Psycho-Social Support
- Prosthetic Options
- Understanding the Technology
- Choosing a Prosthetist
PATIENT EDUCATION

Understanding the Condition
- Accurate information
- Perception of Impact
- Function
- Social Implications
- Parent and Caregiver

PATIENT EDUCATION

Psycho-Social Support
- Professional Counseling
- Peer Support/ Modeling
- Family/ Caregiver Support
- Positive Vision
PATIENT EDUCATION

Prosthetic Options
- Understanding the components
- Understanding the function
- Understanding the relationship of technology to amputation level
- Discerning the benefits and disadvantages

Expectations of Technology
- UL vs LL
  - LL: Replacement
  - UL: Tool
- Defining success
- Importance of tolerance
- Importance of use
- Client-centered choices

PATIENT EDUCATION

Choosing a Prosthetist
- Certification
  - Specialty training
- UL Experience
  - Myoelectrode Position
  - Fit of Socket
- Collaborative Approach
  - Communicate with Client
  - Consult with OT
  - Access to peer support
TIP Sheet

- Certified by the American Board for Certification (ABC)
- Minimum of five years of current UL experience and has fit >10 patients in the last year
- Can specify what types of electrically-powered prostheses they have fit in the past two years
- Received certification/training from the following prosthetic component manufacturers:
  - Motion Control:
  - Otto Bock:
  - RSLSteeper:
  - Touch Bionics:
  - Liberating Technologies:
  - Hosmer:
- Works with an OT who has extensive UL prosthetic rehabilitation experience
- Will arrange for you to speak with some of their patients to discuss care experience

TEAM APPROACH

**Occupational Therapist**
- Functional Evaluation
- Preparation for Prosthesis
- Client Education
- Adaptive Strategies
- Consultation to develop prosthetic prescription
- Prosthetic Training

**Prosthetist**
- Evaluation
- Client Education
- Consultation to develop prosthetic prescription
- Molding
- Fabrication
- Modification
PHASES OF CARE

- Pre-prosthetic Readiness
- Prosthetic Training
- Refinement

RESOURCES

Amputee Coalition: www.amputee-coalition.org
Amplitude: www.oandp.com
Amputee Empowerment Partners: www.empoweringamputees.org
Association of Children’s Prosthetic and Orthotic Clinics: www.acpoc.org
American Occupational Therapy Association: www.aota.org
American Academy of Orthotics and Prosthetics: www.oandp.com
American Orthotic and Prosthetic Association: www.aopanet.org
REFERENCES

1. *Atlas of Amputations and Limb Deficiencies*, edited by Douglas G. Smith, MD, John W. Michael, MEd, CPO, and John H. Bowker, MD (Specific chapters by Thomas Passero, CP, Kim Doolan, John R. Fisk, MD, and Douglas G. Smith, MD, Joan E. Edelstein, MA, PT, and Donald R. Cummings, CP, LP.


QUESTIONS?

THANK YOU!
Contact Information

Debra Latour
latouranchor@googlemail.com