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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
- Adults
- Congenital
- Acquired
- Unilateral
- Bilateral
- Multi-membral

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 (Transtibial) 47%
Through Ankle (Symes or Ankle Disarticulation) 3%

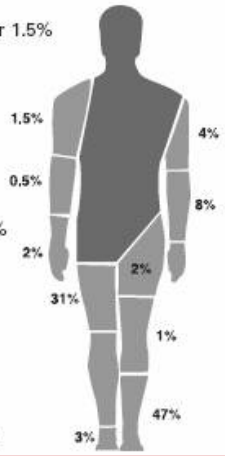


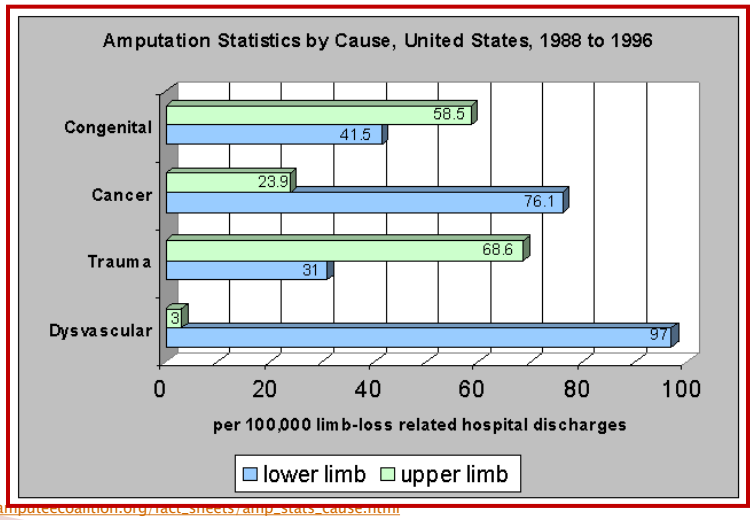
Fig. 1.1

http://rompglobal.org/prosthetics101.php

Statistics: Frequency

- 1988: Clinical Pediatrics 2-8/10,000 births
- 1991: Journal of Prosthetics & Orthotics International 1/2000 live 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

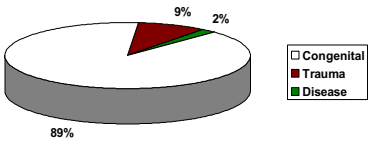
Statistics: Cause

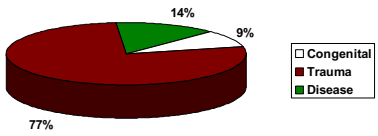


http://www.amputeecoalition.org/fact_sheets/amp_stats_cause.html

Etiology of UL Loss

- Pediatric
- Adult





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 Physiatrists:
  - each may see one every 3+ years
- **80,000**
  - The number of Occupational Therapists:
  - each may see one every 40 years

- Ziegler-Graham K, E.J. MacKenzie, P.L. Ephraim, T.G. Travison & R Brookmeyer. Estimating the prevalence of limb loss in the United States: 2005 to 2005. Archives of Physical Medicine and Rehabilitation. March 2008;89:422-429.
- The Orthotic and Prosthetic Profession: A Workforce Demand Study. Prepared for the National Commission on Orthotic and Prosthetic Education and the American Orthotic and Prosthetic Association. December 2006.

CAUSES: CONGENITAL

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

CAUSES: CONGENITAL

CAUSES: ACQUIRED

- Disease

CAUSES: ACQUIRED

- Trauma

Classifications

Radial Longitudinal

Ulnar Longitudinal

Classifications

Transverse:

Forequarter

Shoulder

TRANS-HUMERAL

ELBOW

TRANS-RADIAL

Figure 5.
Case report 1 of male patient. Residual limb 13 months postinjury after a transradial amputation was performed before revisional surgery to improve socket fit.

WRIST

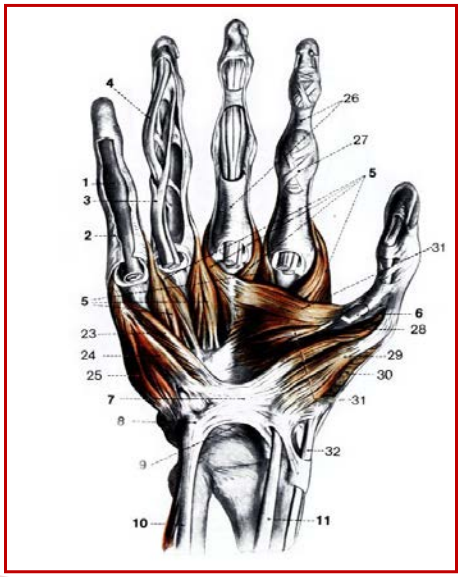



PARTIAL HAND




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.**aopa**net.org

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QUESTIONS?

THANK YOU!

Contact Information

Debra Latour
latouranchor@googlemail.com