Rehabilitation Engineering in Clinical Practice
VA-PRC 21st Virtual Grand Rounds
Brian Burkhardt, MS ATP
Ben Salatin, MS
Carmen DiGiovine, PhD ATP/SMS RET

Contact Information
- Brian Burkhardt, MS ATP
  - Rehabilitation Engineer – Assistive Technology Lab
  - Richmond Veterans Hospital - Department of Veteran Affairs
  - brian.burkhardt@va.gov - 804-675-5000 ext 2176
- Ben Salatin, MS
  - Rehabilitation Engineer – Assistive Technology Lab
  - Richmond Veterans Hospital - Department of Veteran Affairs
  - benjamin.salatin@va.gov - 804-675-5000 ext 4897
- Carmen P. DiGiovine, PhD ATP/SMS RET
  - Program Director – Assistive Technology Center – The Ohio State University Wexner Medical Center
  - Associate Professor – Clinical – The Ohio State University
  - carmen.digiovine@osumc.edu - 614.293.7876
Outline

- Rehabilitation Engineering and Assistive Technology
- Rehabilitation Engineering History
- Rehabilitation Engineering at Richmond
  - Case Studies
- Rehabilitation Engineering at OSU
  - Research, Development, and Innovation
  - Academics

What is Assistive Technology?

- Services, devices, strategies and practices that are conceived and applied to increase, maintain or improve functional capabilities of individuals with disabilities.

Cook and Polgar (2008)

Assistive Technology
Human Activity Assistive Technology (HAAT) Model

Cook and Polgar (2008)

Context

Activity

Human

Assistive Technology

Assistive Technology: The Continuum

Design and Fabricate AT

Customized AT

Modified AT

Assistive Technology

Off-the-shelf consumer products

Rehabilitation Technology

Services, Devices, Strategies and Practices associated with the assessment, implementation, training, and follow-up process.
Rehabilitation Engineering

- Application of science and technology to improve the quality of life of individuals with disabilities

Hobson and Trefler (2000)
Reswick (1983)

What is Rehabilitation Engineering?

- Evaluation
- Treatment
- Re-evaluation
- Implementation
- Education
- Training / Trialing
- Research
- Outcome Measurements

- Engineering
- Research / Design
- Testing
- Fabrication
- Integration
- Customer Support
- Education
- Process Optimization

Rehabilitation Engineering and Assistive Technology Society of North America (RESNA)

- www.resna.org
- Mission: To improve the health and well-being of people with disabilities through technology.

Certification

- http://www.resna.org/certification/
- Assistive Technology Professional (ATP)
- Seating and Mobility Specialist (SMS)
- Rehabilitation Engineering Technologist (RET)
Professional Organizations

- IEEE - Engineering in Medicine and Biology
  - www.embs.org
  - www.embs.org/docs/careerguide.pdf
- Biomedical Engineering Society
  - www.bmes.org

History of Rehabilitation Engineering

- Pole as a walking aid – Egyptian stele circa 1500 BC
- Medieval armorers were the first rehabilitation engineers and prosthetists
- Modern era began in 1960s and 1970s
  - Creation of 3 research centers in Canada as a result of “Thalidomide tragedy” – 1960s
  - Program for “Rehabilitation Engineering Centers of Excellence” – 1970s
  - Rehabilitation act of 1973
  - Department of Veteran Affairs

Cooper, Ohnabe and Hobson (2007)

History of Rehabilitation Engineering

- 1980’s and 1990’s
  - RESNA formation
  - Increased role for Rehabilitation Engineering in service delivery
- 2000s
  - Transition of service delivery role from design and fabrication to integration, customization, performance analysis and outcome measures
  - Continue design and fabrication role in research and development sector which includes manufacturing and research

Cooper, Ohnabe and Hobson (2007)
The Role of the Rehabilitation Engineer
The Title of the Rehabilitation Engineer
The Education/Certification of the Rehabilitation Engineer
Resources for the Rehabilitation Engineer
Career Opportunities for the Rehabilitation Engineer
What makes the CRE Unique?

- Design and Fabrication
- Customization
- Technology Integration
- Performance Analysis **Key to success!**
- Outcome Measures

Key to Success – Consumer Centered
“The Ultimate Trans-disciplinary Team”

Educator  Recreational Therapist  Occupational Therapist  Case Manager

Physical Therapist  Rehabilitation Counselor  Consumer / Patient / Student / Family

Speech and Language Pathologist  Rehabilitation Engineer  Rehabilitation Technology Supplier

Physician  Kinesiotherapist  Manufacturer

Assistive Technology Centers of Excellence

[Image: Assistive Technology Centers of Excellence]
VA Assistive Technology Centers

- **Richmond, VA**
  - [http://www.richmond.va.gov/services/AT.asp](http://www.richmond.va.gov/services/AT.asp)
  - Melissa Oliver  804-675-5000  x2134

- **Palo Alto, CA**
  - [http://www.polytrauma.va.gov/facilities/Palo_Alto.asp](http://www.polytrauma.va.gov/facilities/Palo_Alto.asp)
  - Jonathan Sills  650-493-5000  x67236

- **Minneapolis, MN**
  - [http://www.minneapolis.va.gov/services/PMR/programs.asp](http://www.minneapolis.va.gov/services/PMR/programs.asp)
  - Brian Fay  612-725-2000  x5285

- **Tampa, FL**
  - [http://www.tampa.va.gov/services/Assistive_Technology_Program.asp](http://www.tampa.va.gov/services/Assistive_Technology_Program.asp)
  - Ursula Draper  813-972-2000  x5315

- **San Antonio, TX**
  - Edmund Rodriguez  210-617-5300  x15771

Richmond VA Medical Center
Rehabilitation Engineering in Action

AT Services Offered

- Adaptive Computer Access
- Adaptive Driving
- Adaptive Sports
- Augmentative & Alternative Communication (AAC)
AT Services Offered

- Electronic Aids to Daily Living (EADL)
- Electronic Cognitive Devices
- Powered Mobility/Seating

Inpatient Consult Flow at McGuire VAMC

Outpatient Consult Flow at McGuire VAMC
Telehealth

- Assist clinicians and patients with research and technical questions
- Problem solving technology application and integration
- Education through in services and one on one training
- Telehealth vs E-Consult

Role of Rehab Engineers at Richmond

- Assist the Clinician in….
  - Choosing Technology
  - Integrating Technology
  - Between Clinicians
  - Setup & Configuration
  - Training
  - Troubleshooting
  - Outcome Measures

- And also….
  - Find new technologies
  - Adapt/Modify off-the-shelf technologies
  - Provide in-services to staff on technology
  - Create clinical infrastructure for use by therapists
  - Create new technologies

Rehab Engineering Consults

- Program power wheelchairs
- Assemble manual wheelchair for evaluation and training
- Install and/or program AAC
- Install software on patient’s personal laptop
- Mount devices on wheelchair
- EADLS set-up for evaluation/trail
- Install and/or program software on electronic cognitive devices
- Follow-up device training
Power Wheelchair Programming

Install and/or program AAC devices
Mounting Solutions

Software or App Installation and Programming

Electronic Aids to Daily Living (EADL): Evaluation and Trial Set-up
Adaptive Sports Equipment: set-up, Adjustment and Customization

Computer Access

Rehab Engineering Case Studies
Case Study - Russ

- **History**
  - 37 year old male veteran
  - C4 AIS A C
  - Dysarthria, Decreased inspiratory and expiratory strength/volume
  - Uses chin control on Permobil C500 wheelchair

- **Consult**
  - Independent computer access, environmental control, AAC

Case Study – Russ

Case Study – Environment

- **Before:** Inpatient Vet with SCI using 3 sip & puffs to control:
  - Nurse call, TV, and telephone
- **After:** Use Primo ECU mounted on TV arm to control:
  - Nurse call, TV, and telephone
  - Light and fan
Case Study – Wheelchair Computer

- Vet with SCI using sip & puff on power wheelchair to control:
  - Wheelchair
    - Driving
    - Seat Functions
  - iPad
    - Dual switch scanning via Bluetooth
  - Desktop Computer
    - Left & Right clicking via Bluetooth (Head Mouse for cursor control)

- iPhone
  - With Siri & Bluetooth Speakerphone

Case Study – 3D Printing Mounting Accessory

- Non Flexible Cell Phone Mount
- Ball Attachment Not Compatible

Solution: 3D Printed Backshell

Reason for Printing: Item Did Not Exist

Case Study – 3D Printing Hygiene Mirror

- Purchased Device
- Larger Design Created by Occupational Therapist from Moldable Thermoplastic

Solution: 3D Printed Design Adding Hinge for Easy Insertion & Light

Reason for Printing: Item Did Not Exist
Improving the AT Service Delivery Process

- Organize and track wheelchair library
- Setup and track AT device library
- Setup and manage 3 AT computer labs
- Educate about AT services & devices
- Advocate for improved AT processes throughout VA

The Ohio State University

- Rehabilitation Engineering at OSU
  - Research, Development and Innovation
  - Academic

Assistive Technology Center
Universally Designed Lock

Research, Development and Innovation
- Use Need to Knowledge framework developed by the Center on Knowledge Translation for Technology Transfer (KT4TT)
  - Focus on Invention Phase
- Patient-reported outcome measures in assistive technology
- Industry Collaboration
  - Dynamic Controls
  - Invacare
- Local Seed Funding
  - School of Rehabilitation Science and Technology
- Best Practices in Assistive Technology Service Delivery
  - Department of Veterans Affairs

Need to Knowledge
Center on Knowledge Translation for Technology Transfer (KT4TT)
http://kt4tt.buffalo.edu
http://kt4tt.buffalo.edu/knowledgebase/gameboard.php
Thank You……

References