RST

Department of Rehabilitation Science and Technology

School of Health and Rehabilitation Sciences

Where Rehabilitation, Science and Technology changes lives!

Rehabilitation Engineering in Clinical Practice

VA-PRC 21st Virtual Grand Rounds

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Assistive Technology AT

Department of Veterans Affairs

RICHMOND

PITT

The Ohio State University

RESNA Rehabilitation Engineering and Assistive Technology Society of North America

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The Ohio State University

Outline

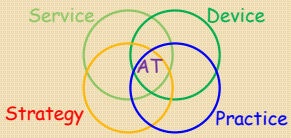
- Rehabilitation Engineering and Assistive Technology
- Rehabilitation Engineering History
- Rehabilitation Engineering at Richmond
  - Case Studies
- Rehabilitation Engineering at OSU
  - Research, Development, and Innovation
  - Academics



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.

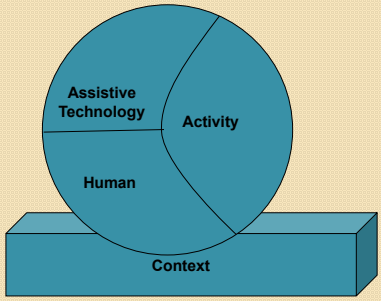
Cook and Polgar (2008)



Assistive Technology

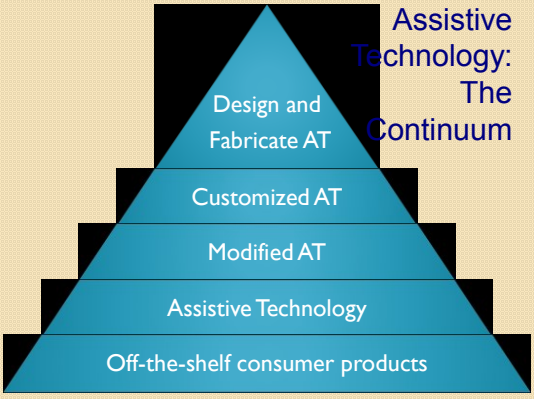


Human Activity Assistive Technology (HAAT) Model



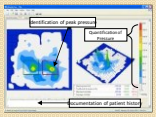
Cook and Polgar (2008)

Assistive Technology: The Continuum



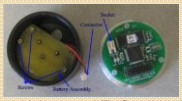
Rehabilitation Technology

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



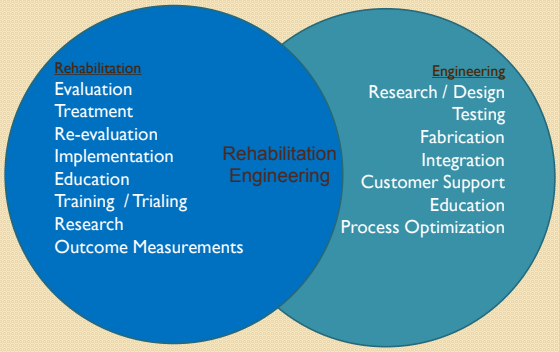
Rehabilitation Engineering

- 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?



RESNA Rehabilitation Engineering and Assistive Technology Society of North America

- 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)

ATP RESNA CERTIFIED ASSISTIVE TECHNOLOGY PROFESSIONAL

ATP SMS RESNA CERTIFIED

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 we 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

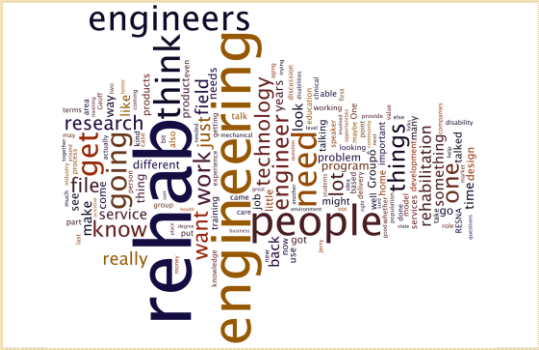
- 1980's and 1990's
  - RESNA formation
  - Increased role for Rehabilitation Engineering in service delivery
- 2000s
  - Transition of service delivery role from design and fabrication to integration, customization, performance analysis and outcome measures
  - Continue design and fabrication role in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

Cooper, Ohnabe and Hobson (2007)

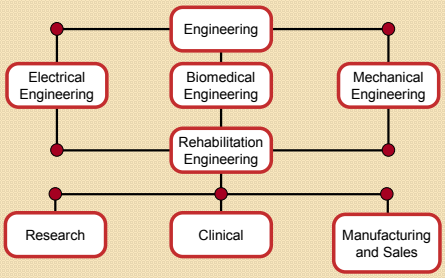
Rehabilitation Engineering Summit 2011

- 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

Rehabilitation Engineering Summit Wordle



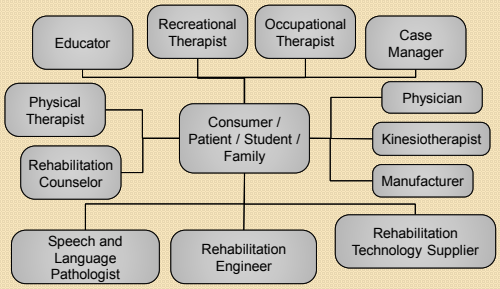
Clinical Rehabilitation Engineering - Today



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"



VA U.S. Department of Veterans Affairs

Assistive Technology Centers of Excellence

Assistive Technology AT

VA Assistive Technology Centers

- **Richmond, VA**
  - 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
  - Jonathan Sills 650-493-5000 x67236
- **Minneapolis, MN**
  - 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
  - Ursula Draper 813-972-2000 x5315
- **San Antonio, TX**
  - http://www.southtexas.va.gov/index.asp
  - Edmund Rodriguez 210-617-5300 x15771

Richmond VA Medical Center

Rehabilitation Engineering in Action

Ben Salatin, Melissa Oliver, Brian Burkhardt

AT Services Offered

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






AT Services Offered

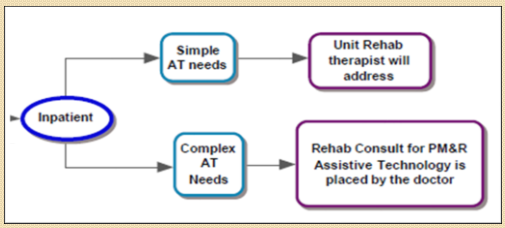
- Electronic Aids to Daily Living (EADL)
- Electronic Cognitive Devices
- Powered Mobility/Seating








Inpatient Consult Flow at McGuire VAMC



(Richmond AT Team, 2010)

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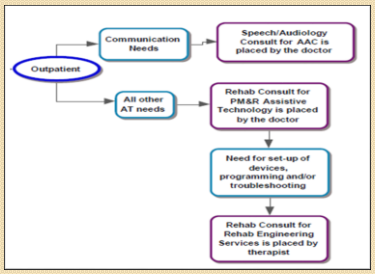
Outpatient Consult Flow at McGuire VAMC



(Richmond AT Team, 2010)

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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

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Power Wheelchair Mounting Solutions

Bad

Good

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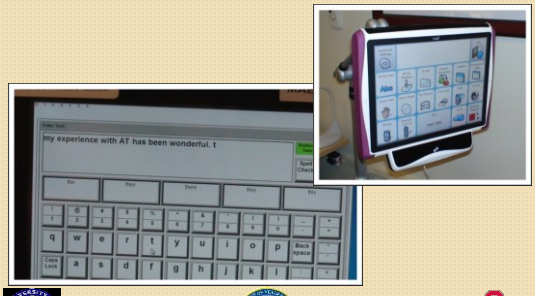
Install and/or program AAC devices



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Mounting Solutions

Software or App Installation and Programming

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Electronic Aids to Daily Living (EADL): Evaluation and Trial Set-up

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Adaptive Sports Equipment: set-up, Adjustment and Customization

Computer Access

Rehab Engineering Case Studies

Case Study - Russ

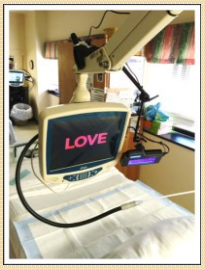
- History
  - 37 year old male veteran
  - C4 AISA C
  - Dysarthria, Decreased inspiratory and expiratory strength/volume
  - Uses chin control on Permobil C500 wheelchair

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

Case Study – Russ

Case Study – Environment

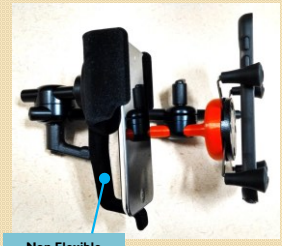
- **Before:** Inpatient Vet with SCI using 3 sip & puffs to control:
  - Nurse call, TV, and telephone
- **After:** Use Primo ECU mounted on TV arm to control:
  - Nurse call, TV, and telephone
  - Light and fan

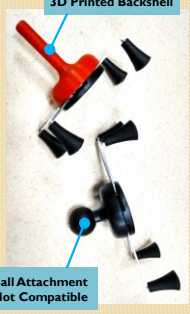


Case Study – Wheelchair Computer

- 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





Reason for Printing: Item Did Not Exist

Case Study – 3D Printing Hygiene Mirror

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

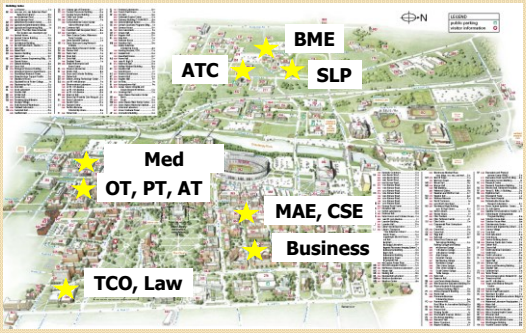
The Ohio State University

The Ohio State University

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

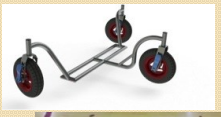
Assistive Technology Center

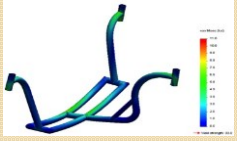
OSU & OSUWMC Collaboration



Education

Off-Road Wheelchair





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

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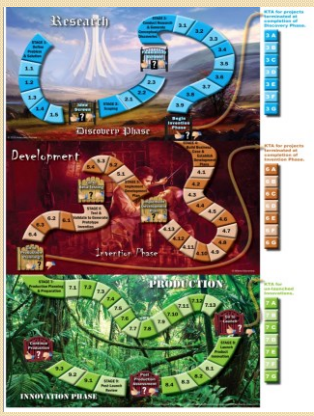
Need to Knowledge

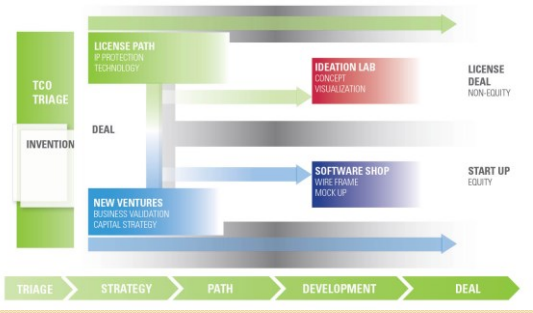
Center on Knowledge Translation for Technology Transfer (KT4TT)

http://kt4tt.buffalo.edu
http://kt4tt.buffalo.edu/knowledgebase/gameboard.php

Flagg, J. L., Lane, J. P., & Lockett, M. M. (2013). Need to Knowledge (NtK) Model: an evidence-based framework for generating technological innovations with socio-economic impacts. *Implementation Science: IS*, *8*, 21.

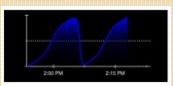


Technology Commercialization Process Overview



Healthy Chair System – Data Logger and Pressure Mat

Healthy Chair System – iPod Touch



Thank You……

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