Rehab Robotics Can help Bridge Gaps in Stroke Care

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For Empowering people using robot technology

Agenda

• Myths about rehab robots
• Review 2 case studies

Rehabilitation Robots will take therapists and clinical rehab jobs
• Major factors causing disabilities worldwide
  • High Blood Pressure >> Strokes
  • HIV >> Dementia, Strokes
  • Neonatal Nutrition >> Premature Births >>
    Cerebral Palsy, Autism, Down Syndrome etc.

Technology Can Help Bridge This Gap
Therapist >> Robot

• Ideally the robot should take on three roles as demonstrator, observer and helper and co-act with the patient
• Helper role is often seen in hands-on effector THERAPY ROBOTS (e.g., ADLER, Theradrive)
• Demonstrator and Observer Roles are often found in ASSISTIVE ROBOTS or SERVICE ROBOTS (e.g., Nao)
• Fluid transitioning from contact to non-contact with a patient is not often done due to huge safety concerns about soft and hard impacts.

Helper roles >>

Demonstrator/Observer role >>
Demonstrator/Observer roles >>
Baxter: Elder Exercise

Rehabilitation Robots are expensive and not worth the cost
Problem with current systems

Design issues:
- Mechanical complexity
- Huge sizes and masses
- High costs

Therapy Robots
- Automate traditional therapy treatments
- Enable semi-autonomous training
- Provide consistent, repeatable, intensive training
- Provide objective measures of recovery
- Reduce Impairment
- Increase Activity

Rehab Landscape
- 75% discharge with residual impairments
- 40% go home without post-acute care

Rehab taking place in community
- At home with nursing care or a home health agency
- Nursing home
- Day-care or all-inclusive care facility (PACE)
- Assisted Living Facility

In LMICs these issues are compounded.
1) low resources
2) limited # of skilled clinicians
3) limited access to technology
Case #1
Robot/Technology-Assisted Stroke in Mexico and Botswana

- Rehabilitation Robotics Lab (MCW/MU/UPENN)
- ITESM Campus Chihuahua, Chihuahua, Mexico
- CREE: Centro de Rehabilitacion y Educacion Especial DIF NL, Chihuahua, Mexico

Mexican Theradrive

Technology-assisted stroke rehabilitation: a pilot randomized trial comparing traditional therapy to circuit training in a Robot/technology-assisted therapy gym.
Rehab C.A.R.E.S. Gym


Haptic Theradrive (TD-3)
HIV, stroke, and rehabilitation in Botswana

4th highest HIV prevalence in the world

2 Occupational therapists in the main referral hospital

1/3* Stroke survivors have HIV

*unpublished data
1. Patents filed on PANDA gym, TheraDrive, Rehab CARES robot system
2. Equity in a spin-off company of UPENN called Recupero Robotics, LLC.