

# Assistive Technology for Persons with Spinal Cord Injury

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**VA Palo Alto Health Care System**

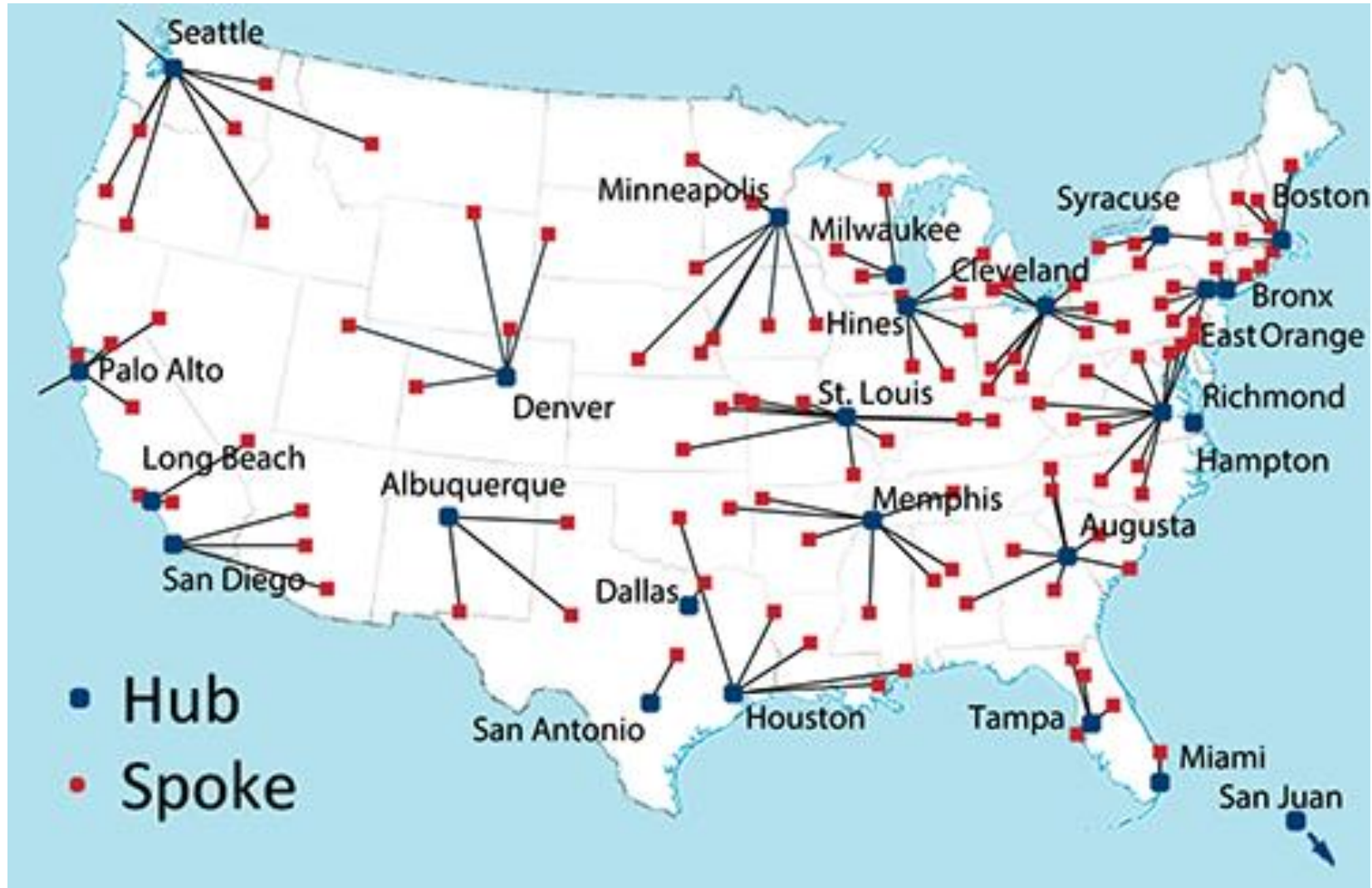


# Veterans Affairs Health Care System

- VA – US Cabinet Department for Veterans Affairs
- VHA – The Veterans Health Administration is America’s largest integrated health care system, providing care at [1,293 health care facilities](#), including 171 medical centers and 1,112 outpatient sites of care of varying complexity (VHA outpatient clinics), serving 9 million enrolled Veterans each year.
- VA’s Spinal Cord Injuries and Disorders (SCI/D) System of Care provides a coordinated life-long continuum of services for Veterans with a spinal cord injury or disorder. VA serves Veterans in a convenient and connected network that delivers care for each phase of life.
- SCI/D does not have to be related to military service or combat.



# VA SCI/D System of Care – 25 Hubs

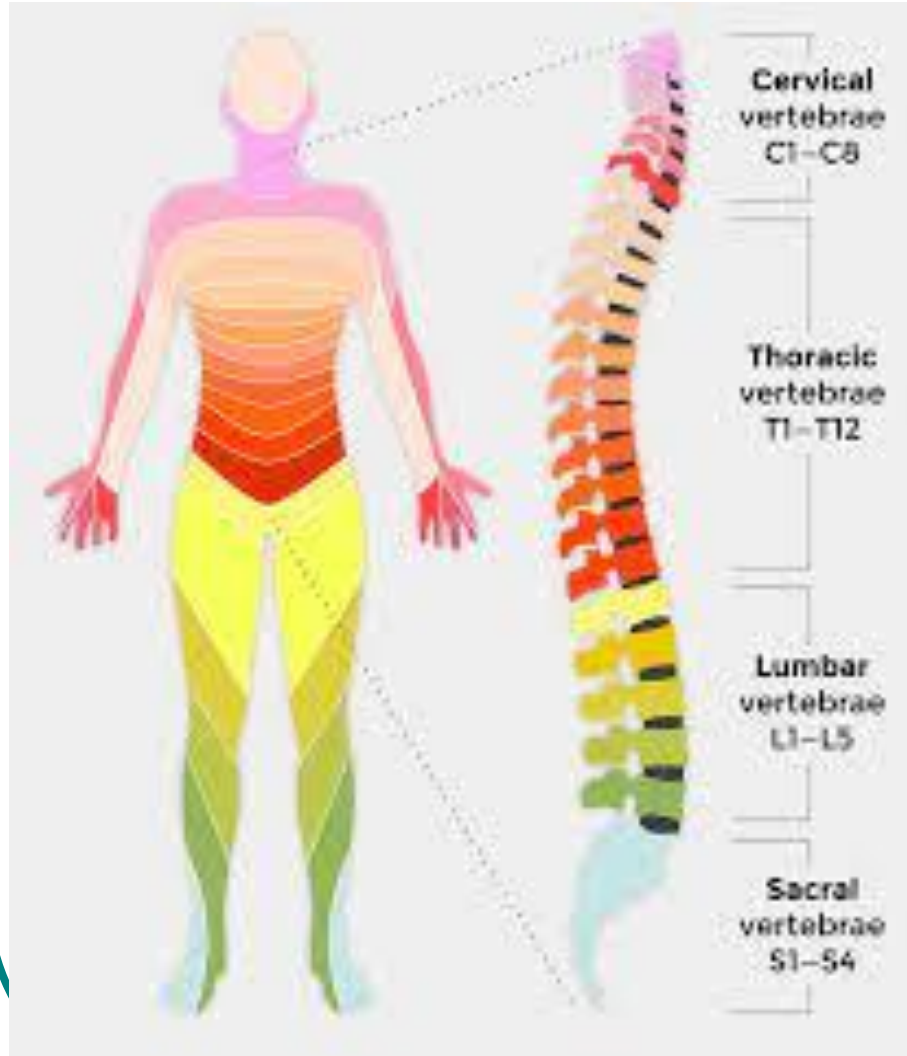


# VA Palo Alto Health Care System

- Provides to >1000 Veterans with SCI/D
- 5 Spokes – San Francisco, Fresno, Sacramento, Reno, Hawaiian Islands & Pacific Rim
- Lifelong Comprehensive Care – Physicians, nursing, Therapy (Physical, Occupational, Recreation), Psychology, Social Work, Dietary, Pharmacy
- Care Settings - Inpatient, Outpatient, Homecare, Telehealth  
*\*\*COVID-19 resulted in expanded care by Telehealth*



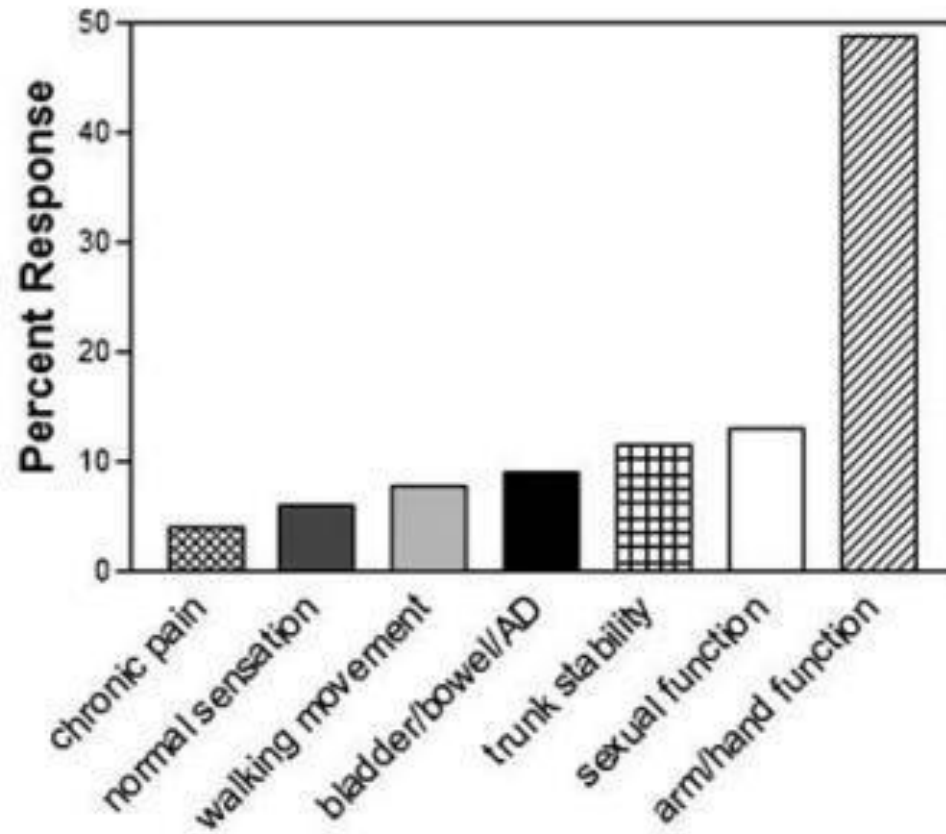
# Spinal Cord Injury & Disorders (SCI/D)



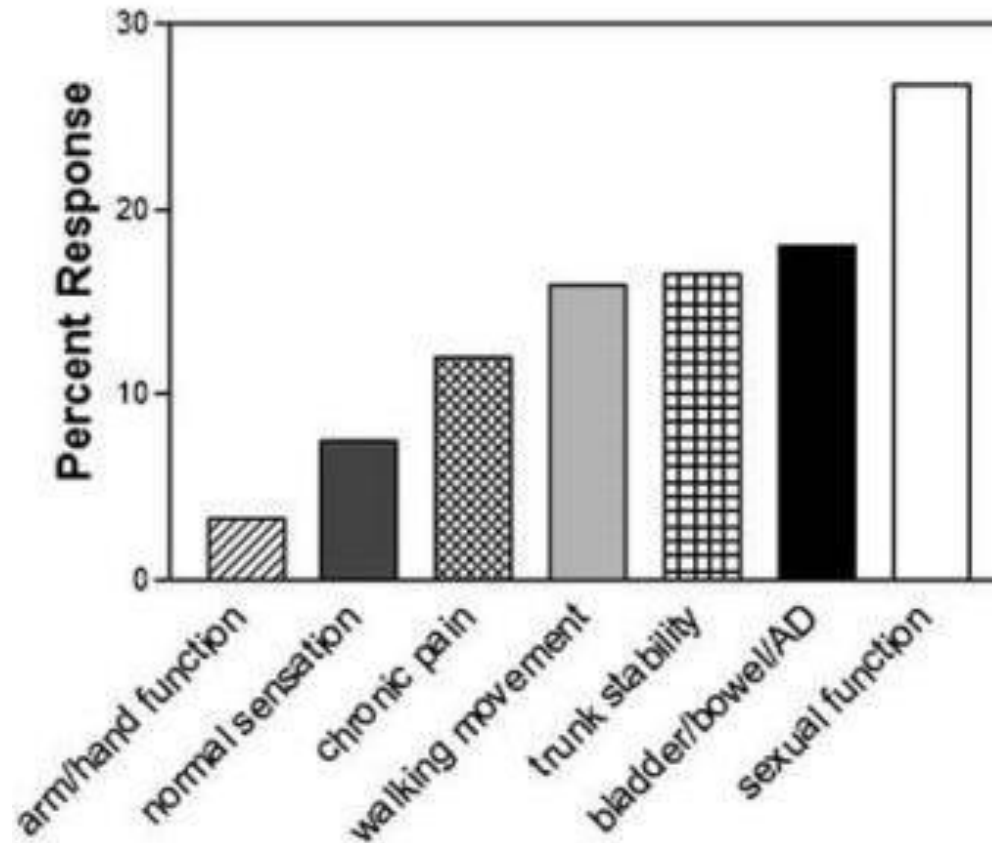
- SCI/D – Damage to the spinal cord, may be traumatic or non-traumatic; can be caused by disease or medical disorder
- Designated by neurological level of function
- Tetraplegia/Quadriplegia – Upper & Lower extremities
- Paraplegia – Lower extremities
- Motor and Sensory Effects
- Complete or Incomplete
- 80% male

# Recovery Priorities

## Highest Priority to Quadriplegics

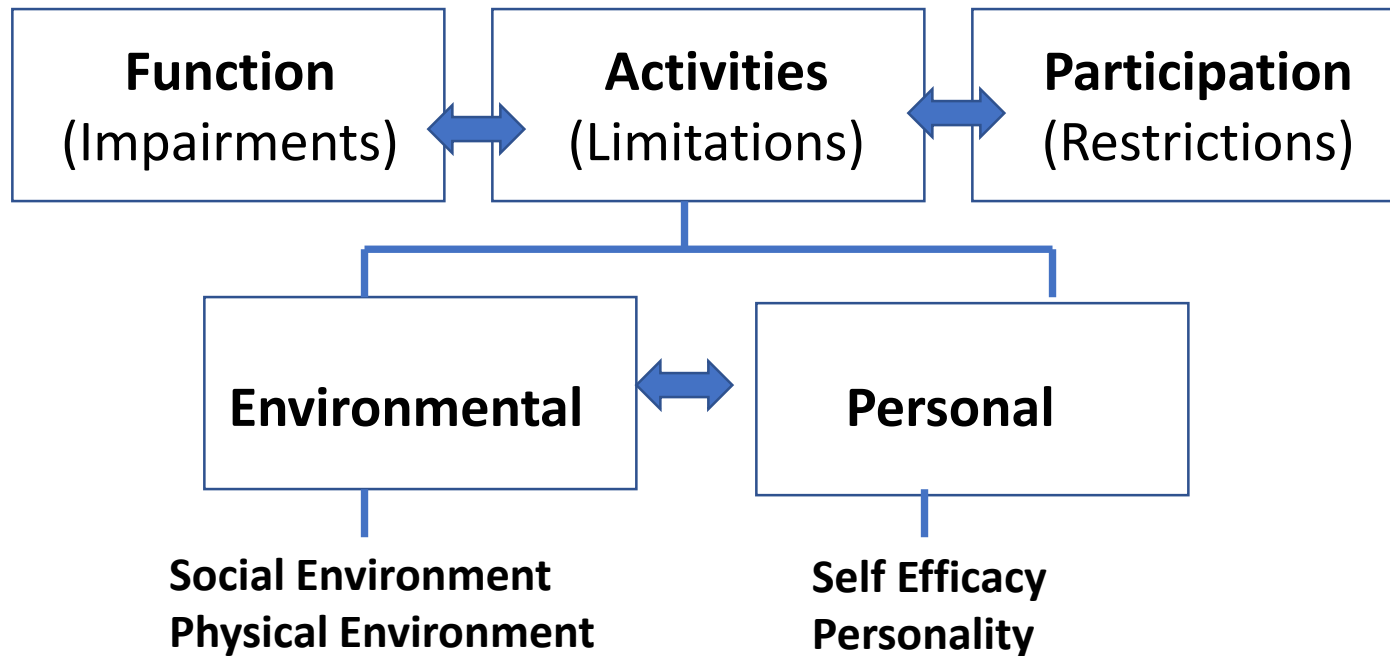


## Highest Priority to Paraplegics



Anderson KD. Targeting recovery: priorities of the spinal cord-injured population. J Neurotrauma. 2004;21(10):1371-83.

# World Health Organization International Classification of Functioning, Disability & Health (ICF)

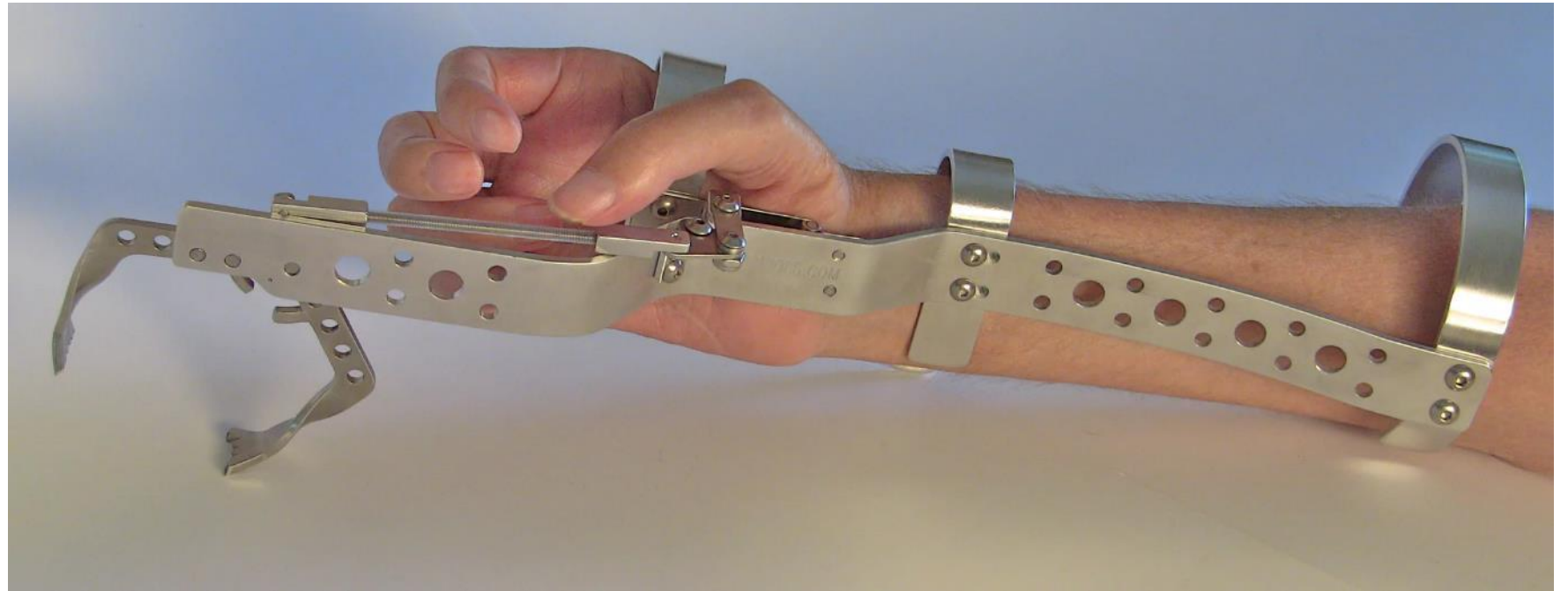


# Leveraging Technology for Active Lifestyles





# Creative Designs to Overcome Loss of Hand Function



<https://quadtools.com/collections/all>

<https://youtu.be/Z-9HCYQtAQk>

# VA Palo Alto SCI Assistive Technology Lab





# AutonoME - Environmental Control Unit



**autonoME ECU/SGD tablet**



**Floorstand**



**All in One microphone/  
sip and puff system**



**autonoME  
command center**

# AutonoME - Environmental Control Unit



## Voice

The autonoME features a microphone so it can be controlled with vocal commands.



## Touch

Individuals with use of their hands can operate the autonoME using its capacitive touch screen.



## Sip and Puff

The sip and puff switch operates using a straw which allows users to activate the ECU / SGD switch by sipping and puffing to move across and down the screen.



## Eye Tracking

Equipped with Eye Gaze, the autonoME's commands can be activated by the user's eyes. A camera tracks the pupils to move the cursor up, down, left and right.



## Head Tracking

This feature works much like Eye Gaze, tracking the movements of the user's head to control the cursor.

*Bed - lights - phone - internet*

# Power Assist Wheelchair - Technology



Quickie  
Xtender



NEXT  
Tailwind



Frank Mobility  
Emotion



# Wheelchair - Technology



# Mobius Mobility – iBOT Wheelchair





# LEVO - Mobile Manual Standing Wheelchair



# Multi-Purpose Arm Cycle Ergometer (M-PACE)





# Exoskeletons

Then...



Now...



Future...

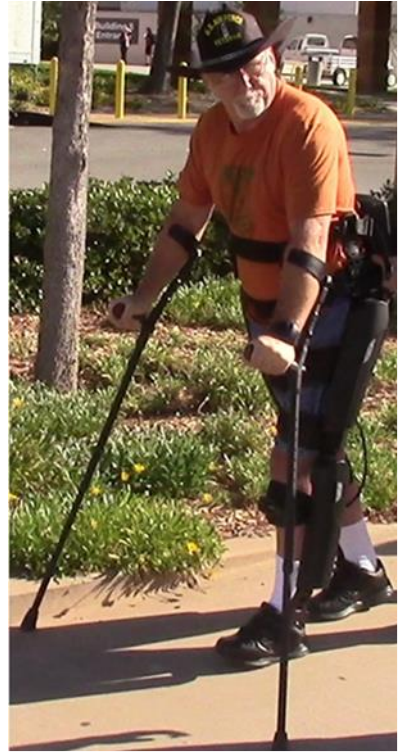


Futuristic...









# Available and Emerging Technologies



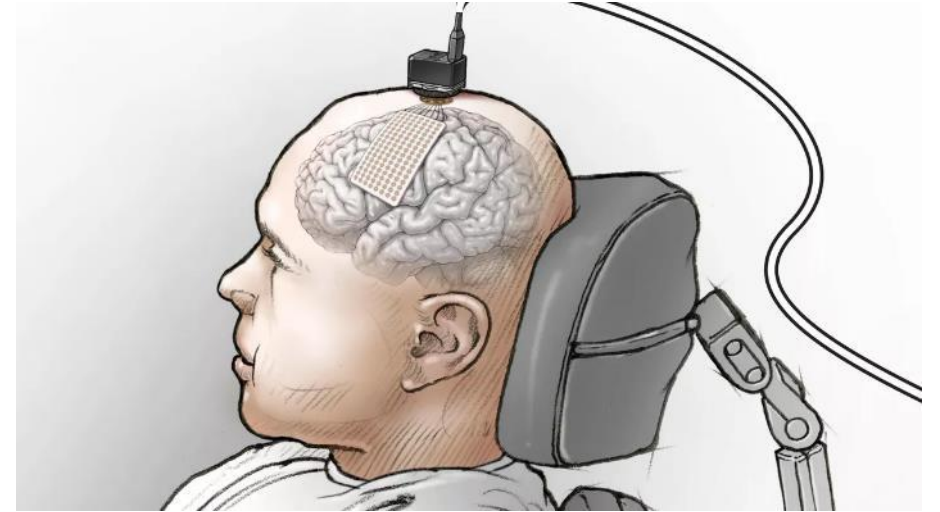
# JACO – robotic arm with three-fingered hand



# Brain Computer Interface



[https://news.uci.edu/files/2015/09/walk\\_cropped-768x1134.jpg](https://news.uci.edu/files/2015/09/walk_cropped-768x1134.jpg)



<https://www.cnet.com/a/img/LI6PgqYf417kfOPNkcLbBlie1-Q=/1200x675/2021/07/14/1329d5a4-ed85-425a-8237-fd10d2521f55/ucsf-chang-patient-setup-illustration.jpg>

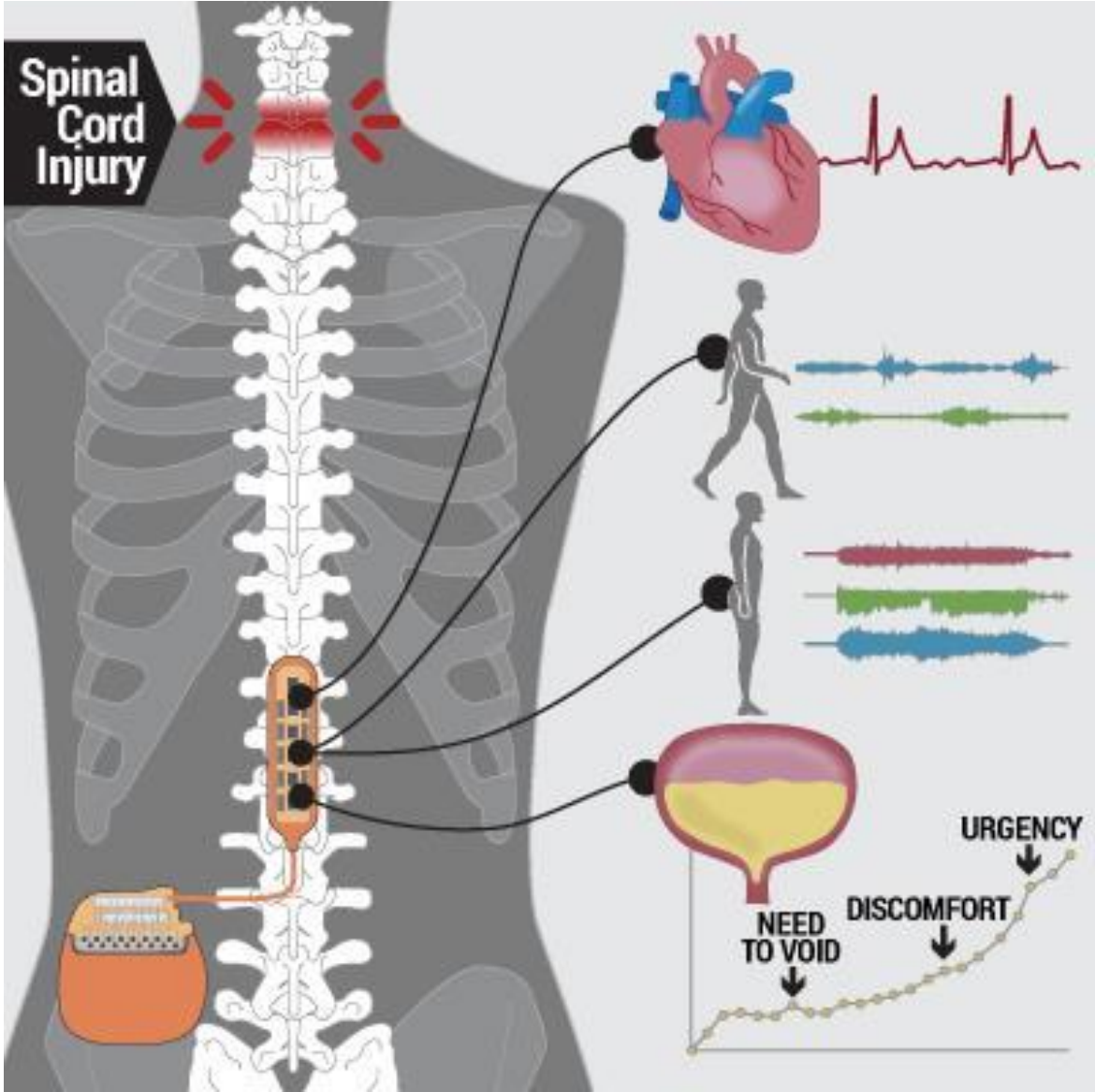


<https://i.ytimg.com/vi/L1bO-29FhMU/maxresdefault.jpg>

# Spinal Cord Epidural Stimulation



<http://depts.washington.edu/moritlab/wordpress/wp-content/uploads/2018/07/Researchmatters-600x400.jpg>



<https://www.frontiersin.org/image/researchtopic/11075>