Barrow Neurological Institute

SCI Rehab Fellowship 2019-2020

by

Matthias Linke DO

April 26th 2024

AZ Association of Rehabilitation Nurses

Objectives

- Describe current treatments for respiratory disorders in patients with a spinal cord injury.
- Describe social, hemodynamic and endocrine issues and how they affect the patient with a spinal cord injury.
- Describe an intervention to restore nerve function to a paralyzed arm or leg.

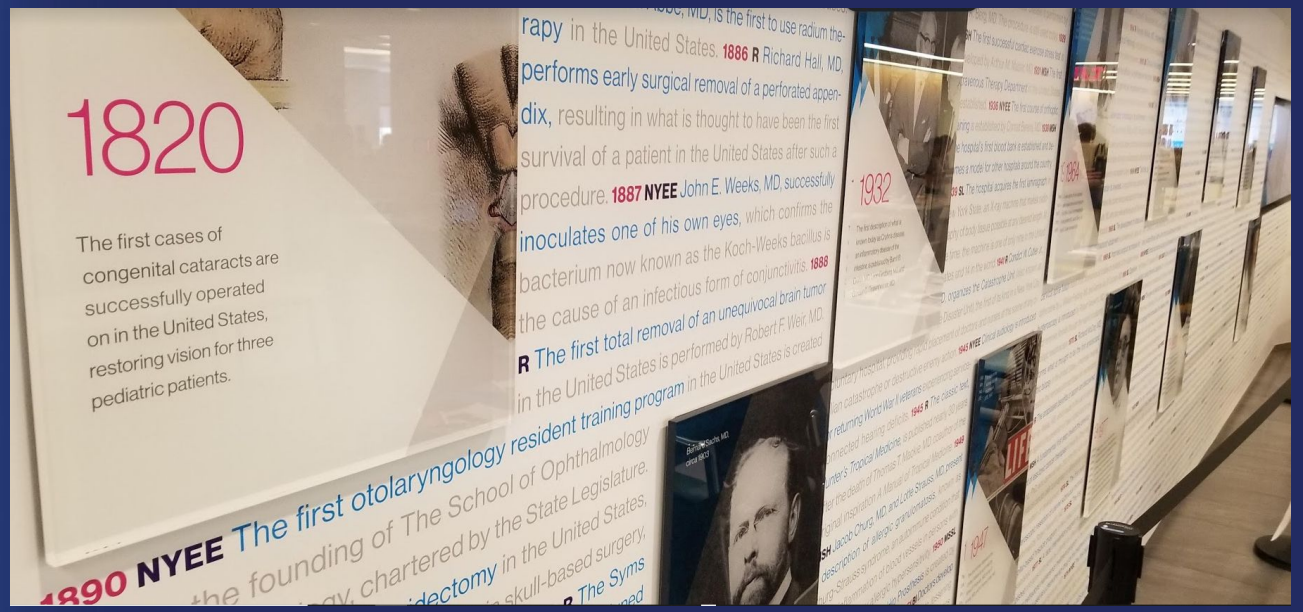
A little back story

- Director of SCI rehabilitation Barrow Neurological Institute department of Physical Medicine and Neuro-Rehabilitation at St. Joseph's Hospital
- Assistant Professor Creighton Medical School- Phoenix
- Medical Director Rehab Without Walls Arizona
- Passion for seeing spinal cord injured patients live a healthy, productive, happy, fulfilling life overcoming whatever physical challenges they may face
- 2018 started a journey to become fellowship trained after 11 years of being in medical practice
- Share with you the acute rehabilitation care of a patient with a SCI, the technology available to overcome barriers, the future of SCI care, with some funny and not so funny stories of living in NYC in 2019-202

Mount Sinai Hospital

New York City

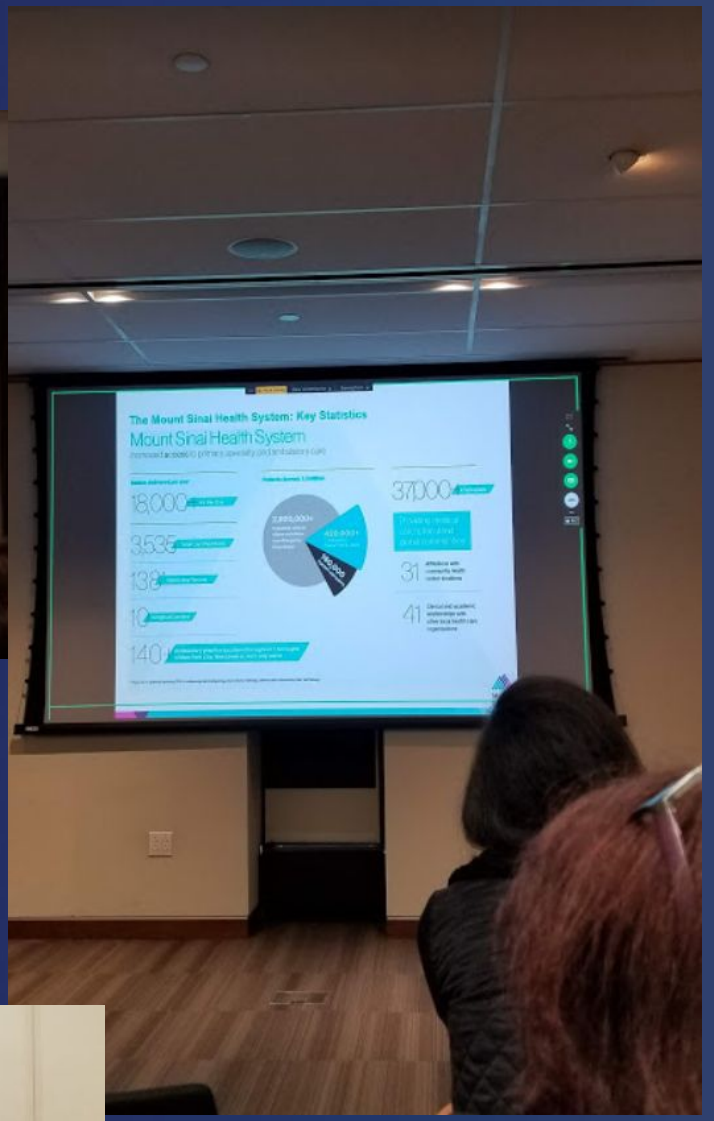
June 26th 2019, Orientation



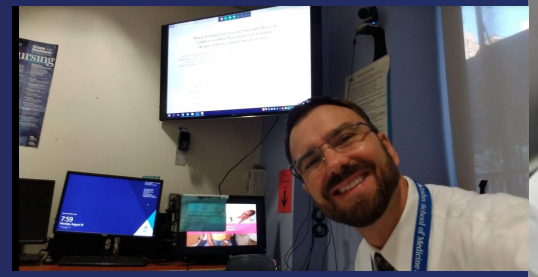
to apply the method clinically, allowing surgeons to open the chest without deflating the lungs for the first time. **1910 MSH** The first continuously running Department of Physical Medicine and Rehabilitation in the United States is founded. **1910 MSSL** Hans Zinsser, MD, coauthors Zinsser

Fellowship in SCI

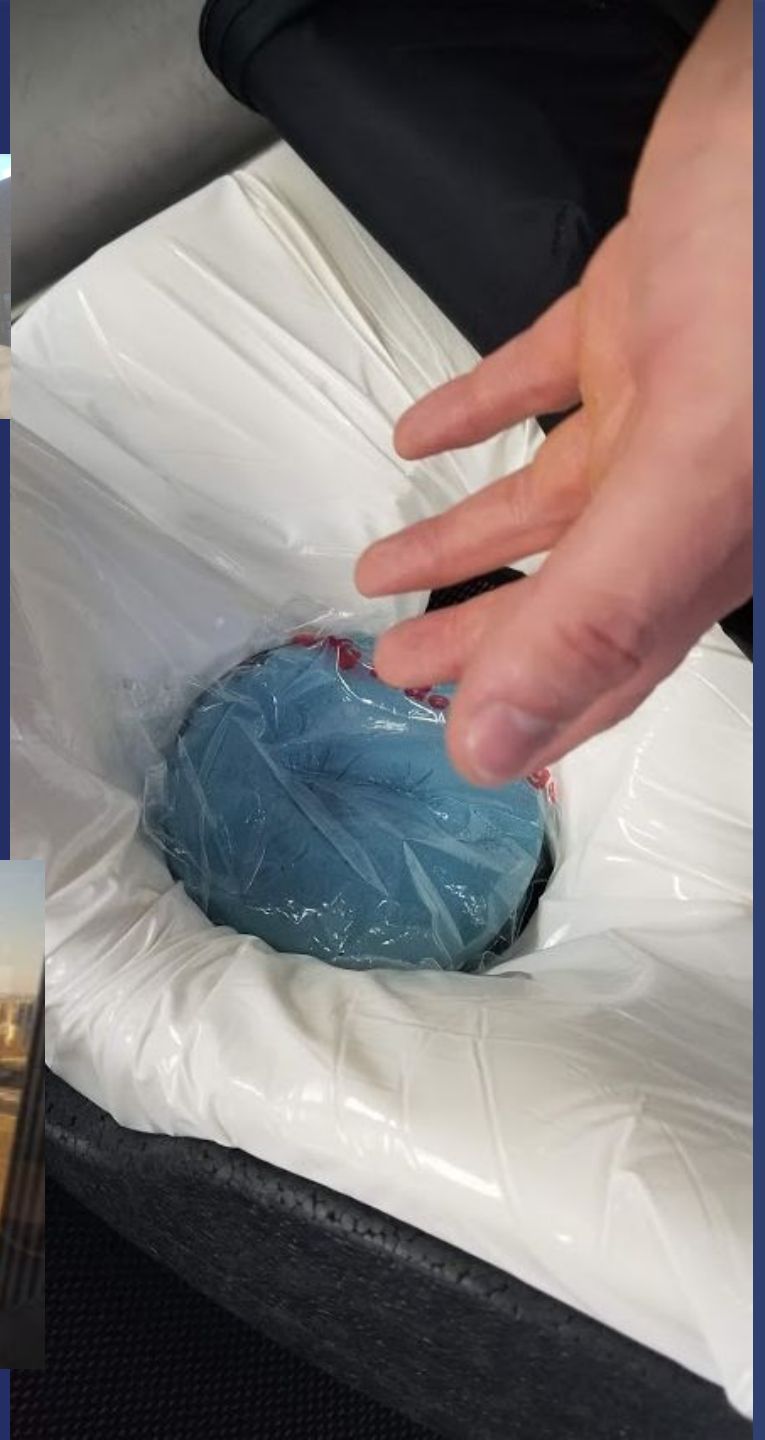
- Incredible education
- Exposure to cases
- Research Opportunities
- Density of institutions



Fellowship in SCI

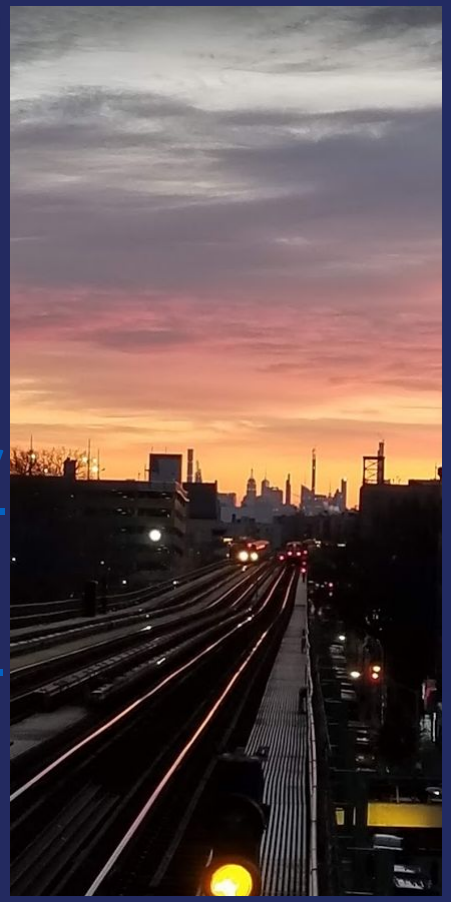


- Library resources
- Clinics on using research tools- Zotero, OneNote
- Weekly Journal club and lectures
- Equipment and Network of Vendors



VA Hospital in the Bronx

- 45-minute train ride
- Comprehensive care
- Adaptive programs
- https://photos.google.com/photo/AF1QipNVAjCTIiiSgjC_Q9[illegible]Ci-i



NYC Marathon

- https://photos.app.goo.gl/8HiKQvYFf6S9uhzn9
- Sir Ludwig Gutman, founder of the paraplegia society in 1061 felt very strongly that sports should be incorporated into rehabilitation

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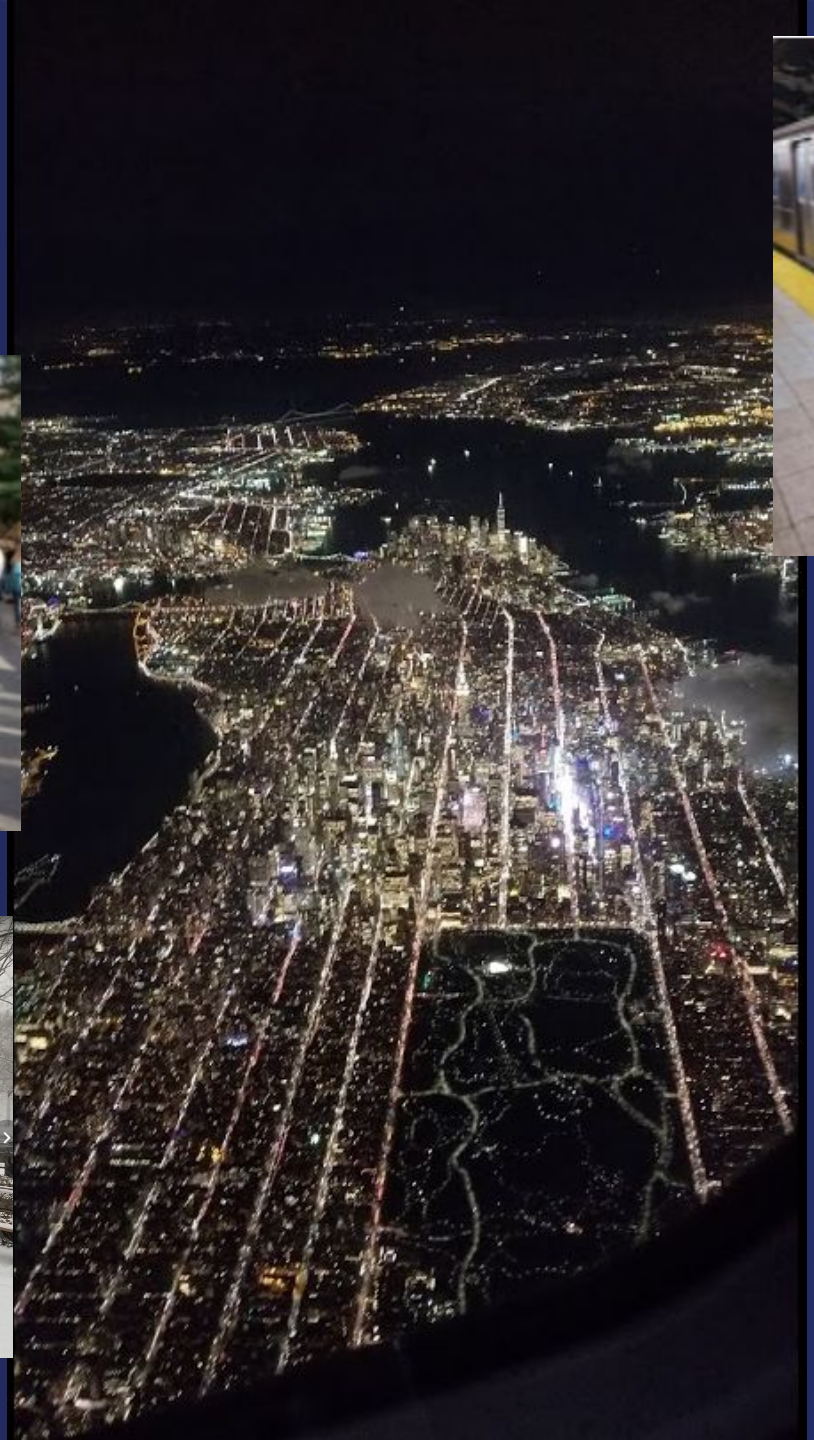
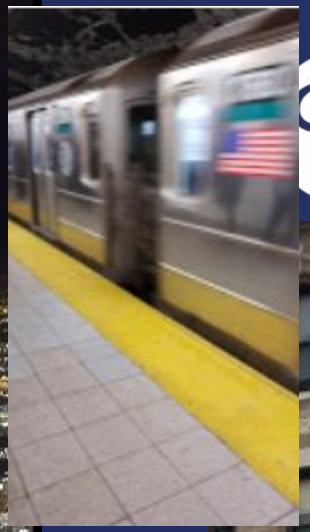
US Open

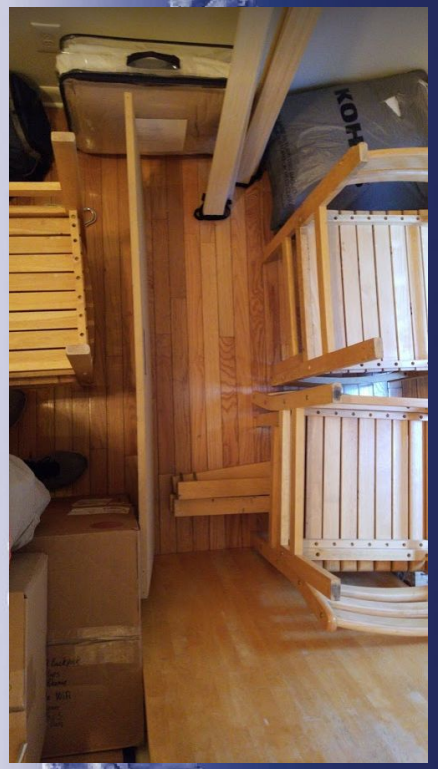
- https://photos.app.goo.gl/djY1MAVaBtGNiTjd9

The City





Barrow
Neurological Institute

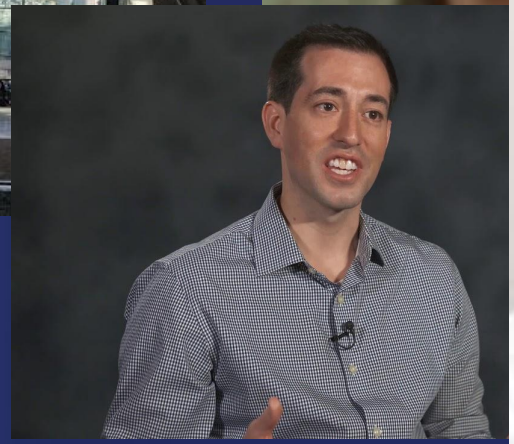


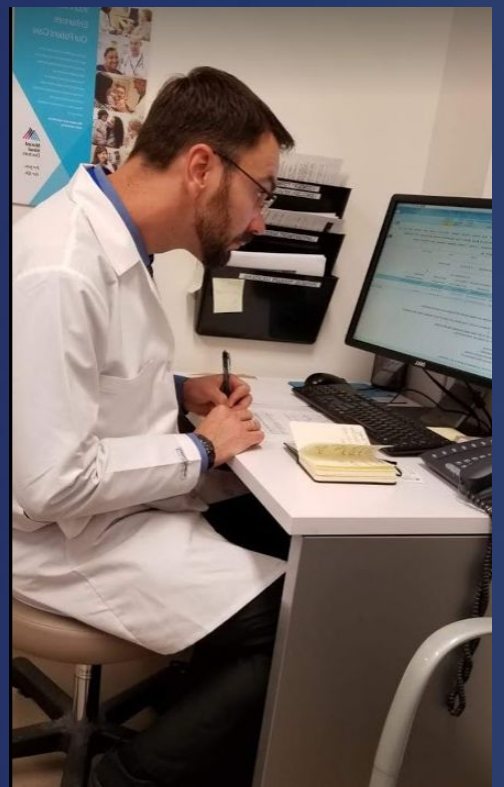
ASCIP in Nashville Tennessee

- SCI review course and excellent presenters
- Woolworth Sit-in location of the 1960s civil rights movement

Mount Sinai Hospital

Barrow Neurological Institute

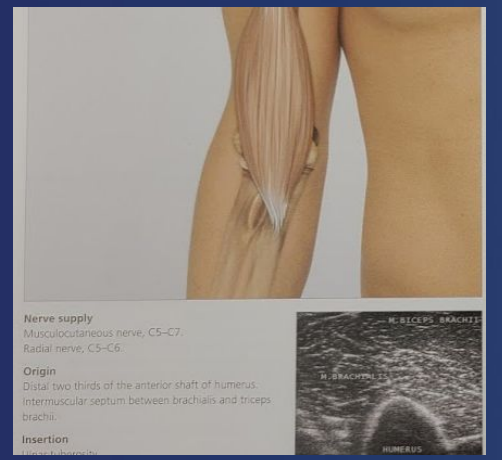


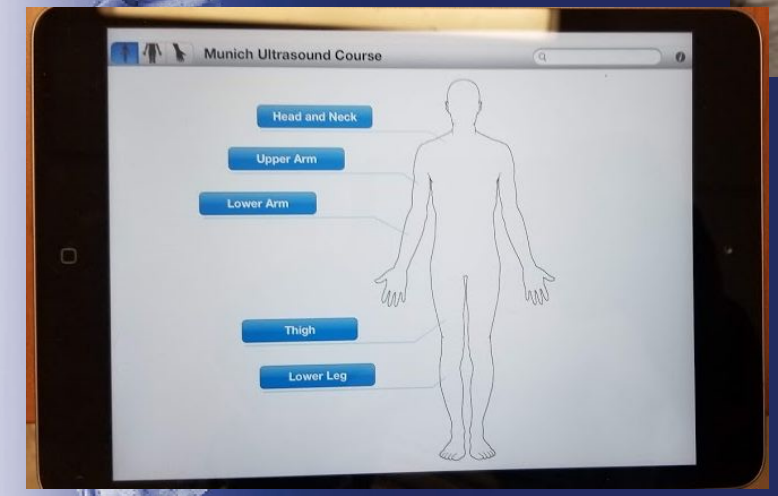


Breath Stacking

PCF spontaneous <60 L/min

Ultrasound guided Botox injections





Diaphragmatic Pacer

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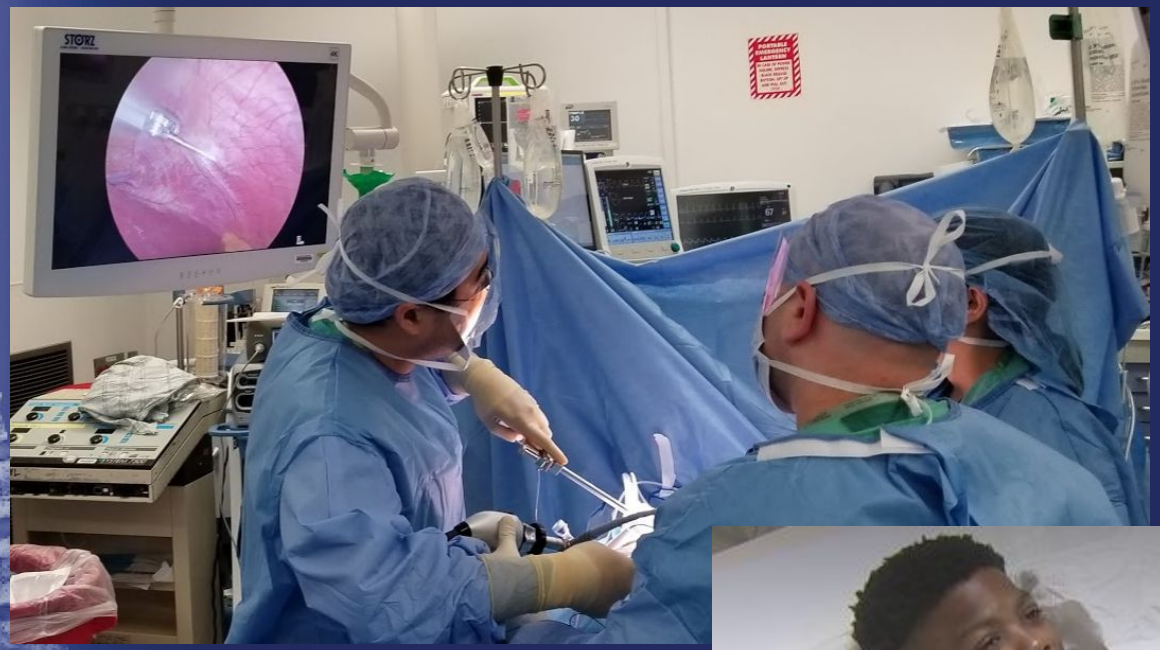
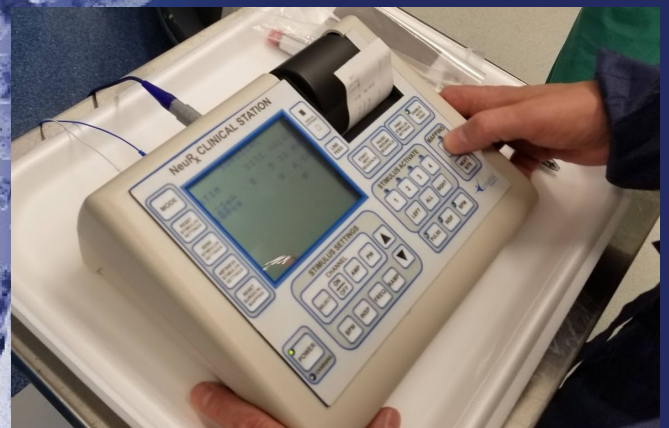
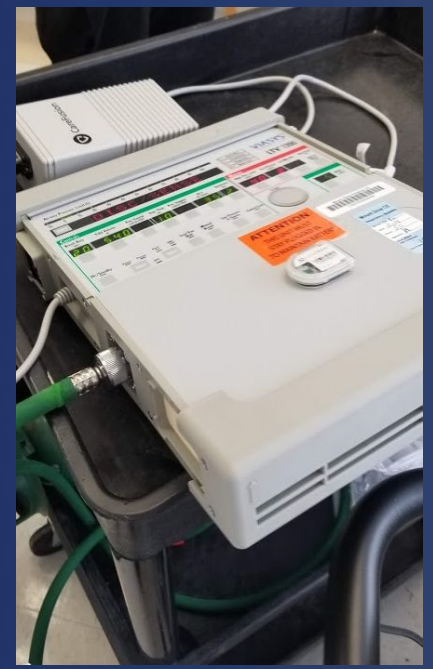
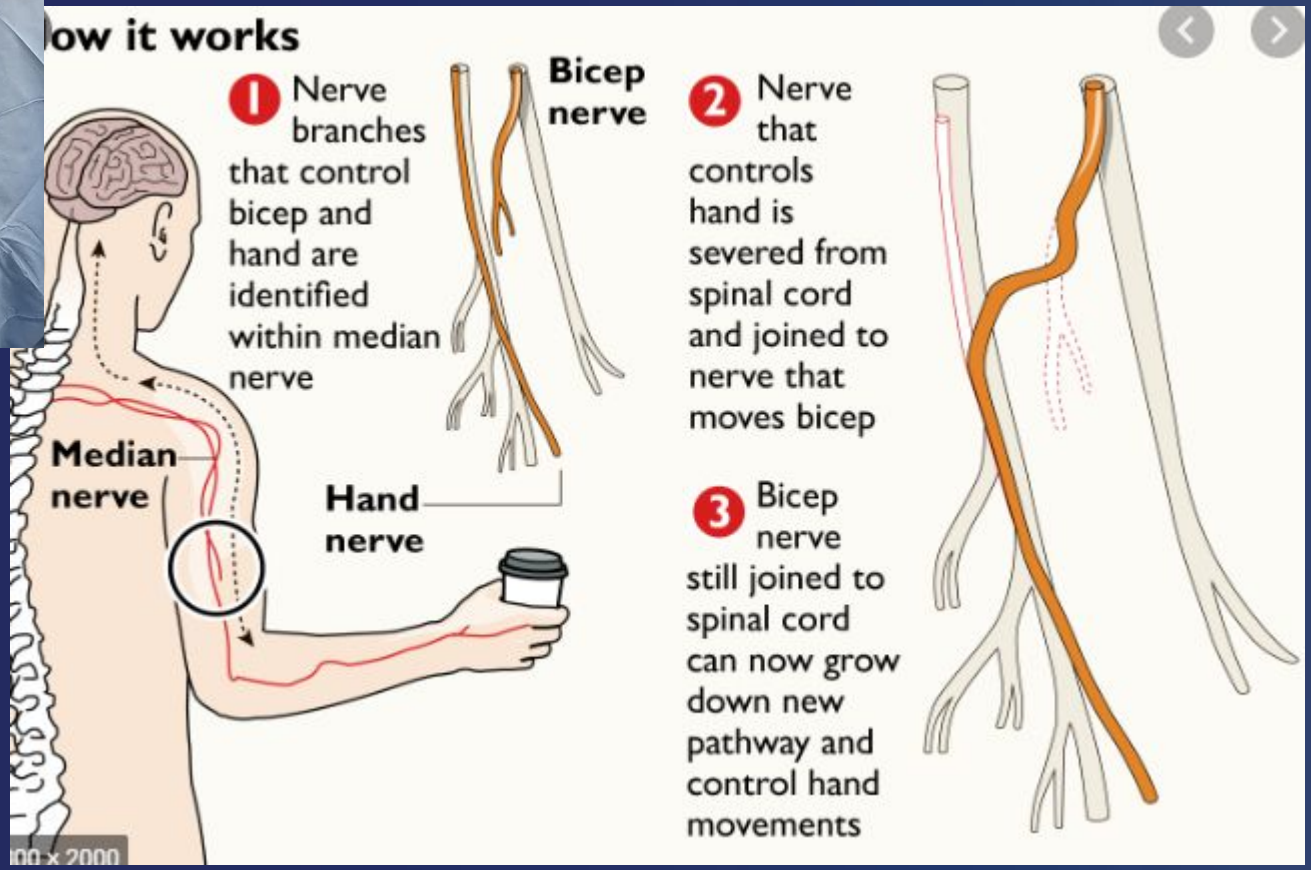


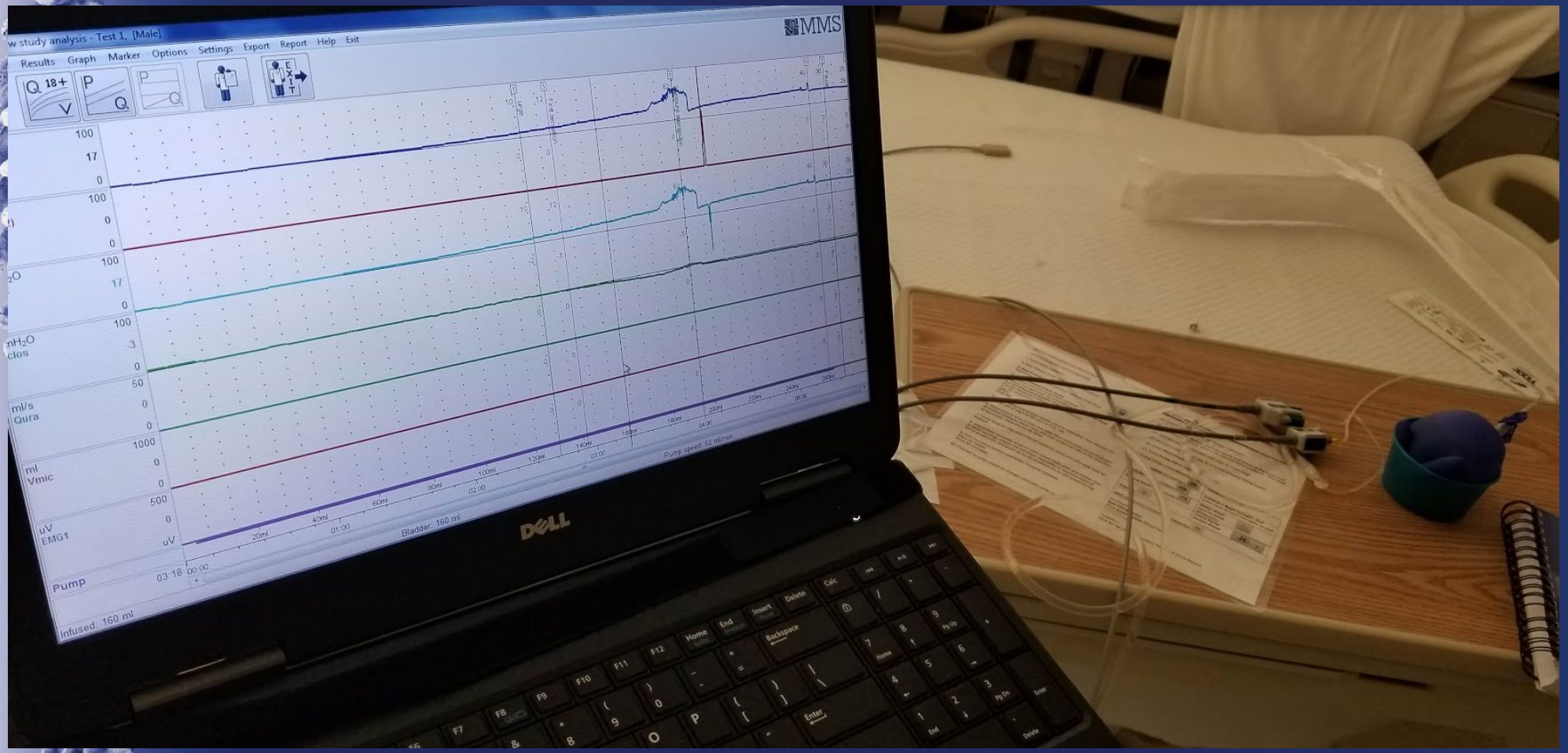




Nerve Transfer surgery

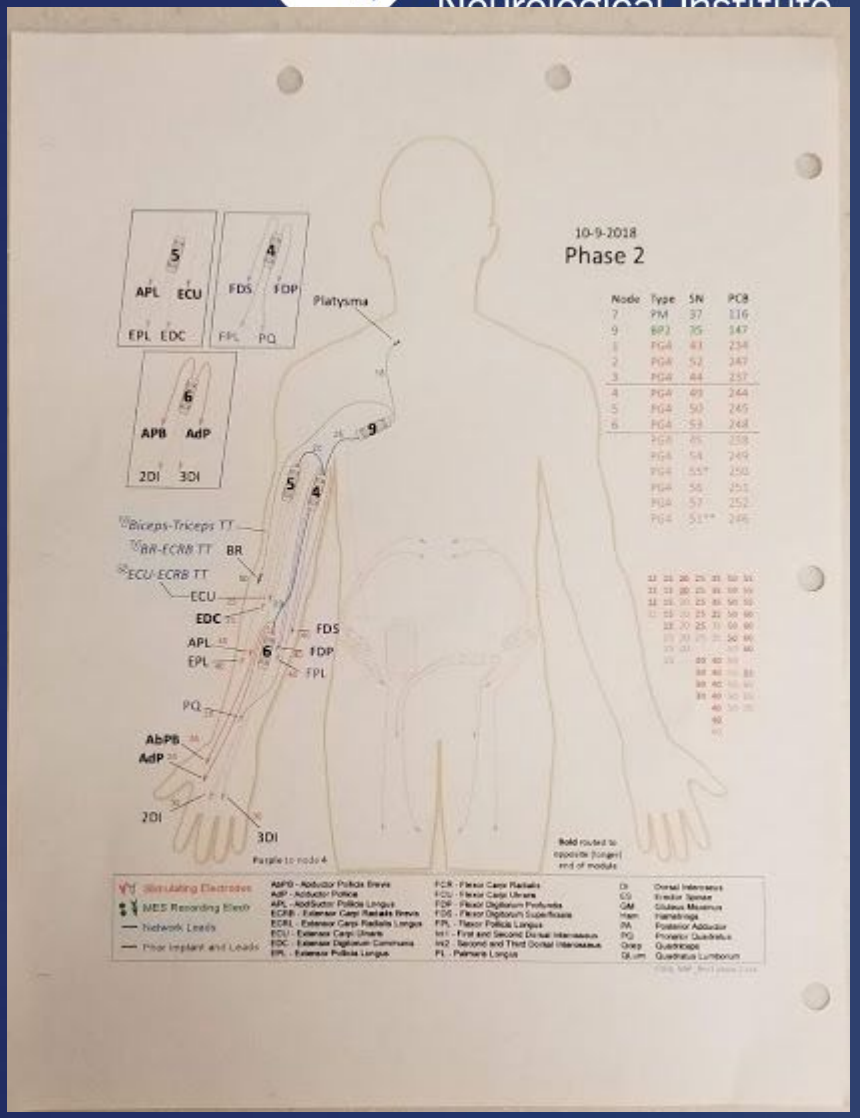


Urodynamic testing



Free Hand e-stim

- https://photos.app.goo.gl/XoppKWfJdWj89vkY9



Quality Improvement of Resident Assessment of Pressure Injuries in Patients with a Spinal Cord Injury

Linke M, Kent C, Nehrbass E, Ramin J, Bijlani T, Eldon E, Harris J, Harbus M , Huang V

Background

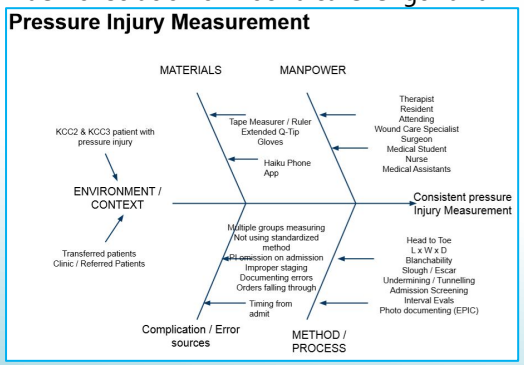
Patients with a spinal cord injury are at risk for developing a pressure injury[1-2]. Assessment of a pressure injury by healthcare professionals includes determining the size of the wound[3]. Several different methods can be employed for measuring the size of a wound including digital and manual techniques[4]. Manual measurement of the size of a pressure injury is the most common but may have variability in the approach used over time or by different individuals[5]. It is the purpose of this project to determine the variability of pressure injury size measurement, education of a single standard for measuring a pressure injury, and assessment of improved reliability among professionals assessing pressure injuries.

Methods

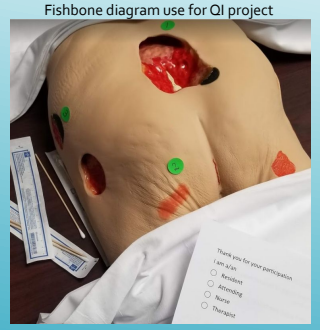
Physical medicine and rehabilitation residents, attendings, physical therapists, bedside nurses, wound care nursing, and the nurse manager were included in determining the current standards and practice of pressure injury assessment. A fishbone diaphragm was used to determine current barriers and challenges to assessing the size of a pressure injury of a patient with a spinal cord injury. Physical therapists who participate in pressure injury assessment, residents who rotate on the unit, attendings who admit patients to the unit, and registered nurses working on the rehabilitation unit were asked to measure three pressure injuries on a plastic model for length and width without any further instructions. The authors provided written instructions for the definition of the measured length and width of a wound and then required participants to watch a short video produced by the authors on measuring the length and width of a wound(https://photos.app.goo.gl/H59nd6o4H8STWS0y6) . Residents were asked to repeat the length and width measurements of the three pressure injuries after reviewing the definitions and watching the short video.

Results

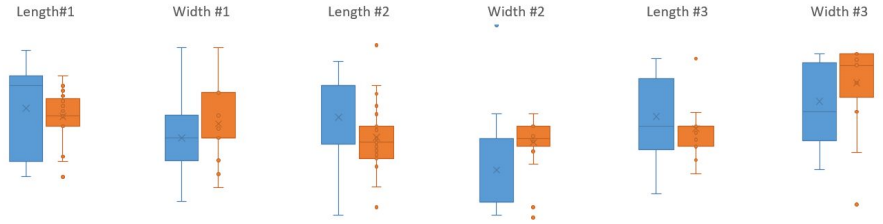
For each of the three wounds the length, width, and area where used to calculate the mean, variance, Interquartile Range, and standard deviation on initial wound measurement and again after education with written instructions and viewing the educational video. Interquartile range narrowed, variance decreased, and standard deviation decreased in all values calculated except for Wound #3 width and area. F-test was calculated on variance before and after wound care measurement education. The F critical value was used from a standard table with 24 degrees of freedom. F-test showed significant reduction in variance between wound #1 and #2 length measurement and wound #2 width measurement. Overall wound measurement became more consistent after education in writing and with video demonstration of wound care length and wi



Fishbone diagram use for QI project



Plastic Model used for pressure injury assessment



Conclusion

Education increases consistency in measuring a pressure injury and decreases variability in length and width of wound care assessment. Ongoing efforts should focus on continued education to make sure all members of the team have one consistent method for the assessment of pressure injury length and width.

References

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3. NPUAP Pressure Injury Stages- last accessed May 28, 2020
4. Li, D, Mathews, C, Zhang, F. The characteristics of pressure injury photographs from the electronic health record in clinical settings. *J Clin Nurs*. 2018; 27: 819– 828.
5. Measuring Wound Length, Width, and Area: Which Technique? : Advances in Skin & Wound Care. LWW. doi:10.1097/01.ASW.0000284967.69863.2f

Special Thank you to the James J. Peter Veterans Administration Hospital, Bronx, New York for use of the Pressure Injury Plastic

Delay in Spinal Cord Injury Care Among The US Immigrant Community

Matthias Linke DO, Thomas N. Bryce MD

Icahn School of Medicine at Mount Sinai

Introduction

Fear of deportation prevents immigrants from accessing medical care. [1] Undocumented day laborers in the United States usually do not have health insurance, more than half do not seek medical care after an injury, and are more likely to seek care in free or cash based clinics. [2]

For injuries to the spine, immobilization with early surgical intervention for spinal cord injury has been shown to improve neurological outcome.[3]

This case demonstrates a poor outcome for a laborer after a motor vehicle accident (MVA) due to lack of knowledge of spinal immobilization and delayed treatment in an immigrant employment setting where police and emergency medical services (EMS) were not called at the time of the accident.

Case Description

54-year-old male immigrant from South America working for cash at a slaughterhouse involved in a MVA late in the evening when the truck was too tall to go underneath and overpass. The patient struck the windshield with his shoulder and head.

The patient was immediately paralyzed unable to feel or move his arms or legs; however, EMS and police were not called even with repeated requests from the patient. The other passenger left the scene of the accident and the driver drove the truck back to the warehouse. The patient remained wedged against the dashboard and floorboard unable to move.

Upon return to the warehouse the patient was pulled out of the truck by his boss and driver, propped up against a crate and the driver left. EMS were finally called by the boss and the patient was admitted at a local trauma center.

Left-
sagittal CT scan with C6-7 fracture and dislocation

Below-
sagittal T2 MRI with T2 changes and narrowed cord at C5-

Left-
Sagital CT scan with diffuse Idiopathic Skeletal Hyperostosis

Hospital Course

The patient found to have a C6-C7 fracture requiring C4-6 laminectomy with posterior fusion. The patient required a tracheostomy and feeding tube and 4 months later was subsequently admitted to acute rehabilitation where he was diagnosed with C4 AIS – A tetraplegia.

In addition to spinal fractures the patient was found to have Diffuse Idiopathic Skeletal Hyperostosis (DISH) on imaging. The patient lives with his wife and 3 children in a second story walk-up apartment.

Discussion

MVAs account for the most spinal cord injuries in the United States.[3] Safety improvements in vehicles and acute treatment of spinal cord injury has improved the outcome of those injured. [3]

Despite the advances in care of the spinal cord injured patients the immigrant population has delayed access to spinal cord injury care due to fear of deportation or medical repatriation. [4,5] United States Immigration and Customs Enforcement has designated hospitals as sensitive locations limiting enforcement actions.

There is opportunity for basic education of neurological emergencies to the immigrant communities to avoid serious adverse events and reassurance from the medical community that hospitals are safe places to seek medical care.

References

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The Trait That Caused Quadriplegia: Rare Case of Sickle Cell Trait and Anterior Spinal Cord Infarction.

Mount Sinai *Rehabilitation and Human Performance*

Aaron Bolds MD, Matthias Linke DO, Miquel Escalon MD, MPH

Icahn School of Medicine Mount Sinai, New York, NY

Introduction

Is Sickle Cell Trait (SCT) benign? There is a debate in Neurology whether sickle cell trait is a risk factor in early stroke[1]; with increased sickling rates with dehydration, oxygen reduction, and exercise leading to strokes.[2] The detrimental effects of sickle cell trait has also caused the sudden deaths of some young athletes [3,4]. We report only the second case of a spinal cord infarction of an individual with SCT in order to bring more attention to this disease.[5]

Case Presentation

21 year old male with SCT and no other medical history developed a severe unrelenting headache at 6 am on June 2016. The patient was found down by his mother at 9 am with acute tetraplegia. The patient underwent neurological evaluation including MRI and MAR. Imaging was consistent with an anterior spinal artery stroke affecting the anteromedial medulla and cervical spine. Hypercoagulable work-up was negative. The patient required mechanical ventilation with placement of tracheostomy and percutaneous enteral feeding tube. The patient stabilized medically but did not regain any motor function of his upper or lower extremities. He was weaned off the ventilator at a subacute facility. The patient is being followed in a SCI clinic with examination showing intact touch Light touch only and position sense, but paralyzed muscles in both upper and lower

Family History/Social History

Family History/Social History: Father has sickle cell trait and the mother does not. The patient was living with his parents until the time of his stroke and has been in a Skilled/Subacute Care facility.

Labs/Imaging/Studies

T2 Sagital MRI 2 days after onset of symptoms demonstrating T2 changes in the medulla and cervical spinal cord. T2 Sagital Axial MRI showing anterior spinal cord T2 changes

Anatomy of the Spinal cord

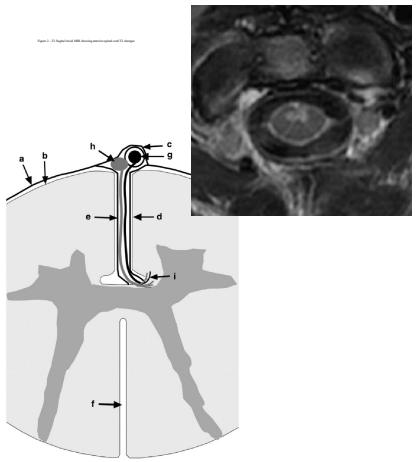
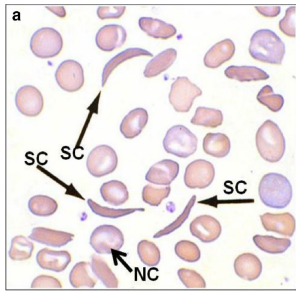


Figure 4 Anatomy of the anterior median fissure. a/b outer/inner layer of the pia mater, c, linea splendens; d, anterior median fissure; e, anterior median septum; f, posterior median sulcus; g, anterior spinal artery; h, anterior spinal vein; i, central artery. [7]

Imaging



Discussion

Sickle cell trait causes variable sickling with abnormal shaped hemoglobin S causing impaired blood flow.[6,7] In our patient impaired blood flow affected the anterior portion of the spinal cord, which is supplied by the anterior spinal artery. Clinically the patient presents with an Anterior Spinal Syndrome spinal cord injury secondary to infarction of his anterior spinal cord resulting from hypercoagulable state due to Sickle Cell Trait. Sickle Cell Trait is a risk factor for infarctions, including of the spine, and should be considered during work up and treatment of persons that suffer a spinal cord infarct

Acknowledgements

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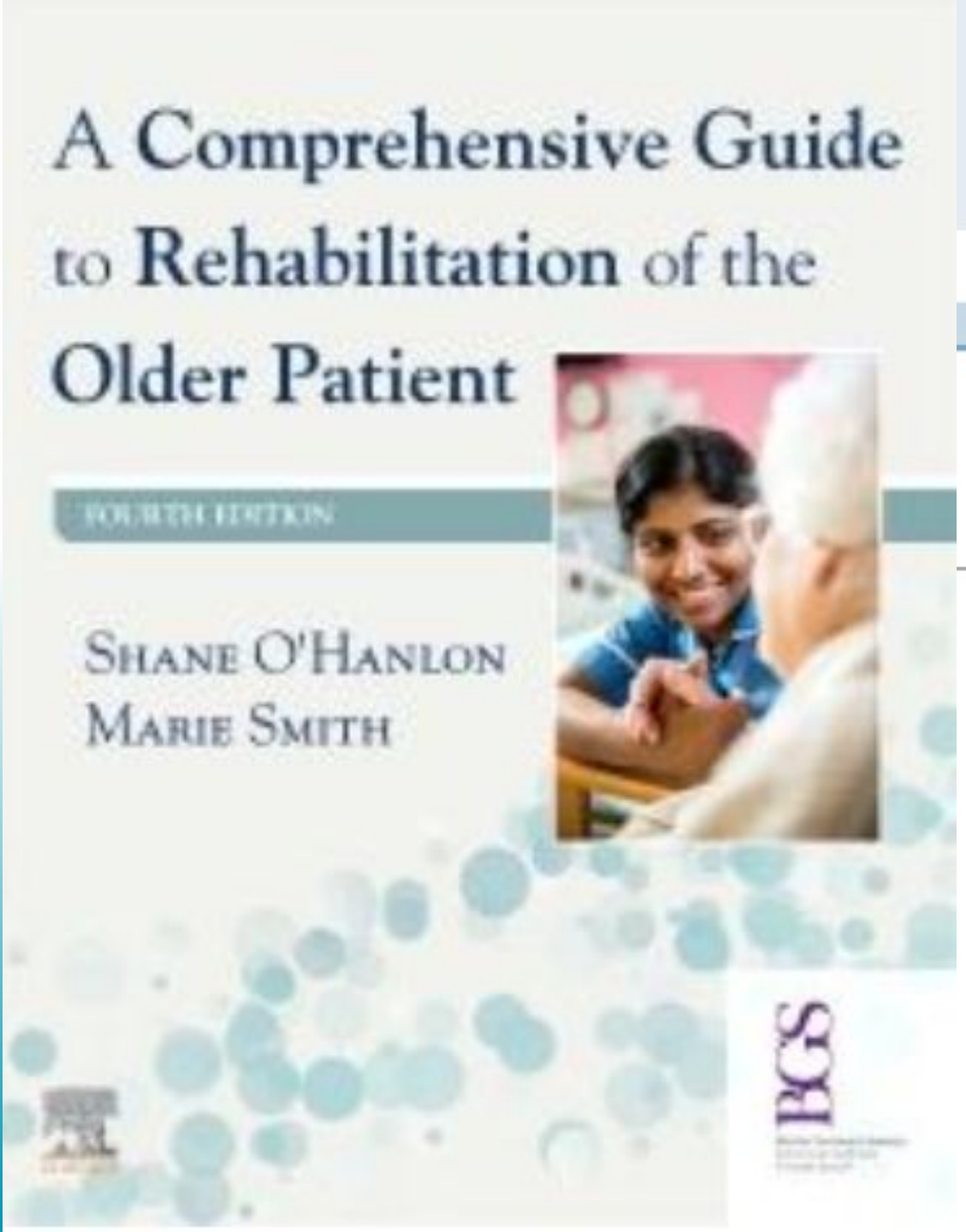


Spinal Injury

Thomas Bryce & Matthias Linke

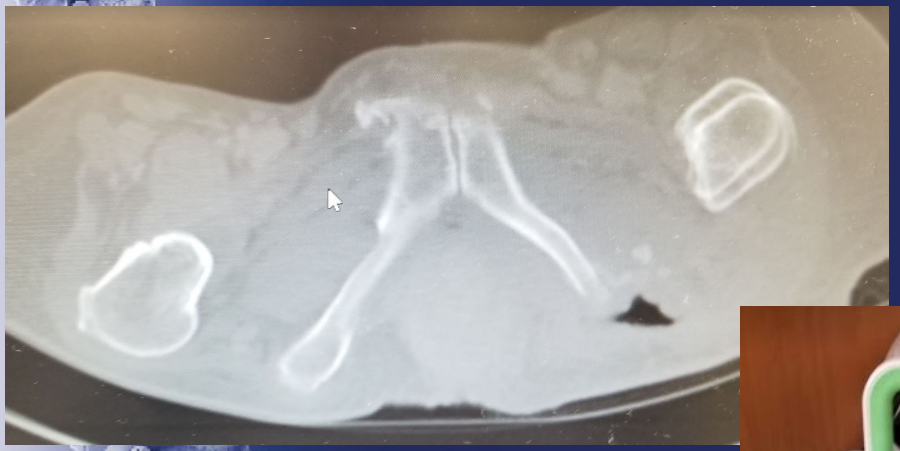
- Explain how secondary conditions related to spinal cord injury can affect the rehabilitation of an older individual with spinal cord injury
- Describe tenodesis action, how to promote it, and how it can improve function

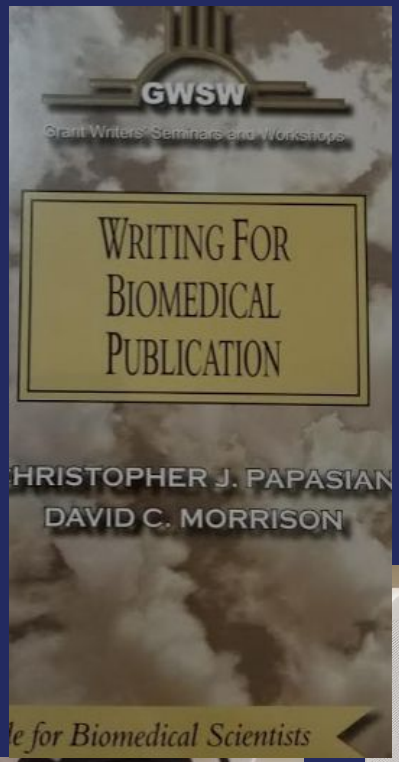
the strength in his shoulders, but by the time of discharge to home he still needed some assistance for dressing his upper body and bathing. With adaptive equipment including a sock donner, dressing stick, long-handled shoehorn and a long-handled sponge provided by the occupational therapist, he was able to dress his lower extremities and put on his shoes himself. He returned home needing only minimal assistance for bathing and dressing.

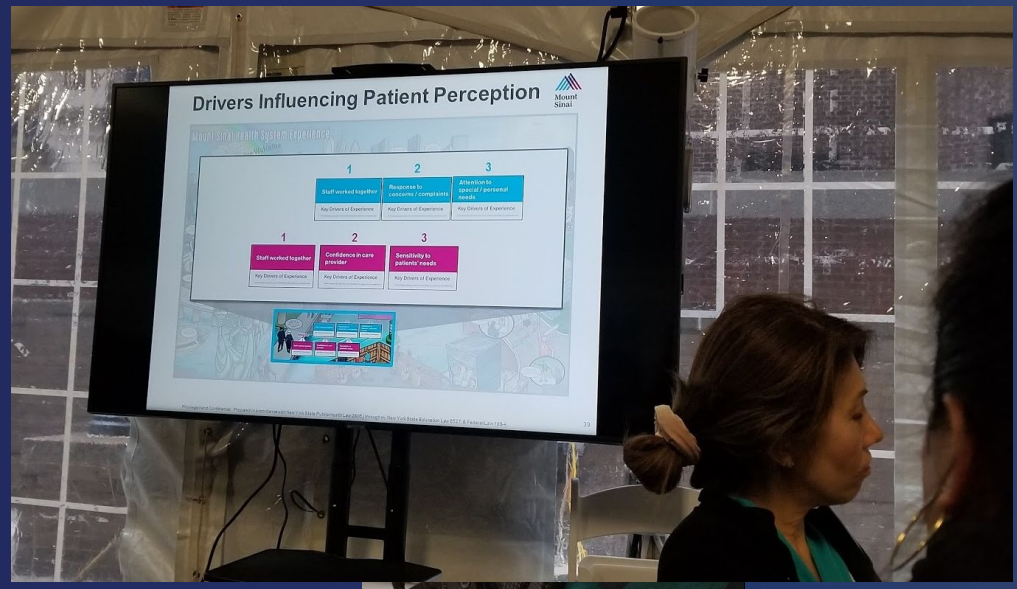
SPINAL CORD INJURY IN OLDER INDIVIDUALS

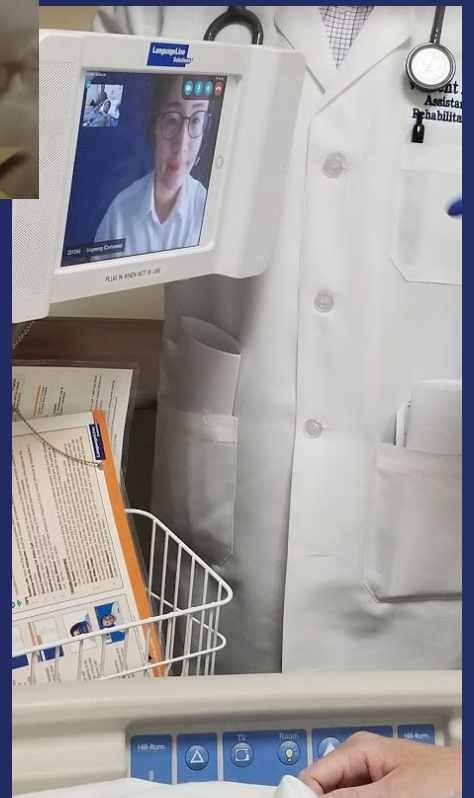
In the United States, the incidence of traumatic SCI in older individuals (> 65 years) approaches 90 cases per million as

Opportunities for learning



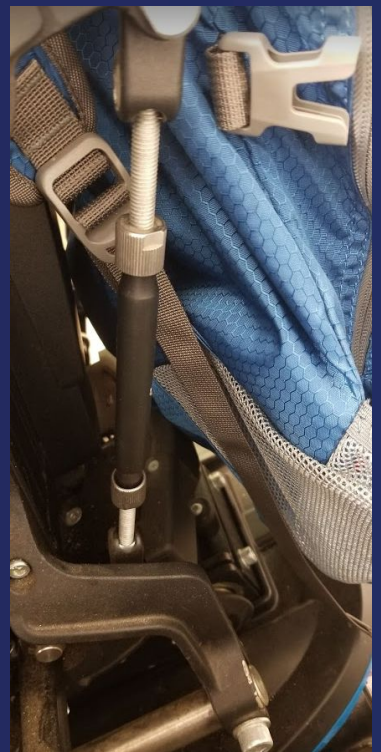


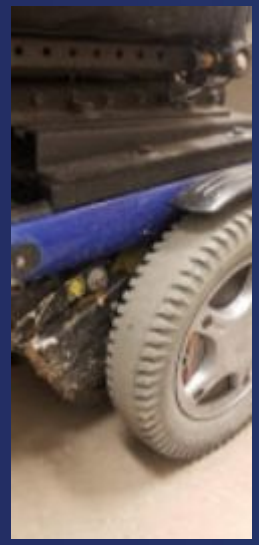


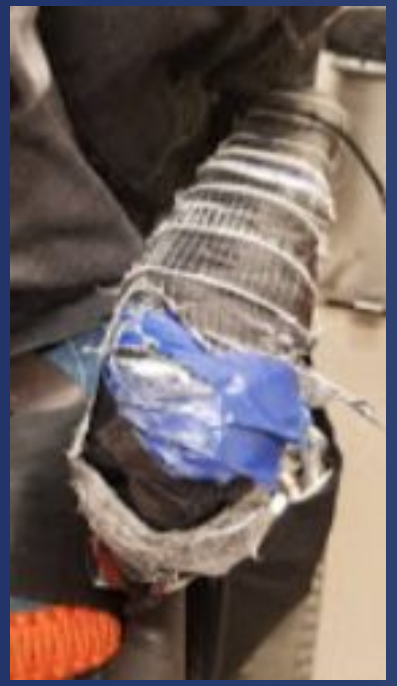


Wheelchair Repairs

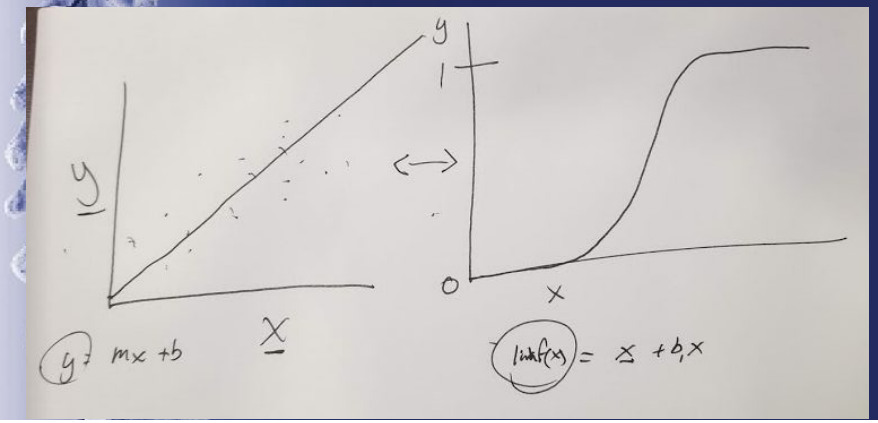
- Working with Mount Sinai and University of Pittsburgh Model system centers on wheelchair repair research article
- Significant difference among patients/family who can perform repairs

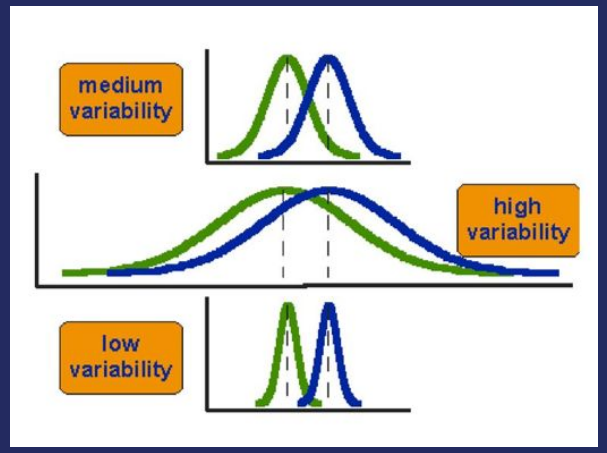






Research





RESEARCH AND REPORTING METHODS | Annals of Internal Med

A Systematic Examination of the Citation of Prior Research in Rep of Randomized, Controlled Trials

Karen A. Robinson, PhD, and Steven N. Goodman, MD, MHS, PhD

Background: A randomized, controlled trial (RCT) should not be started or interpreted without accounting for evidence from preceding RCTs addressing the same question. Research has suggested that evidence from prior trials is often not accounted for in reports of subsequent RCTs.

5 or more prior trials to cite, 254 (23%) cited no prior RCTs and 257 (23%) cited only 1. The median number of prior cited trials was 2, which did not change as the number of citable trials increased. The mean number of preceding trials cited by trials published after 2000 was 2.4, compared with 1.5 for those published before 2000 ($P < 0.001$)

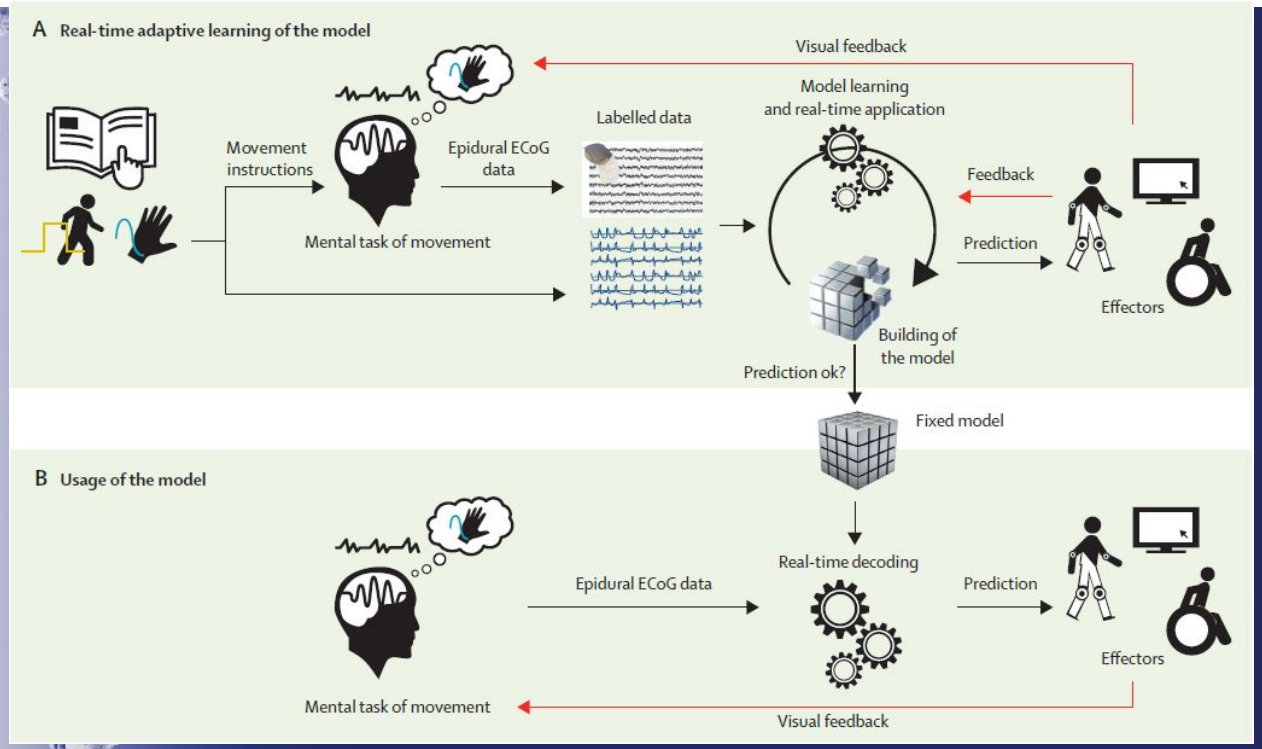
Epidural Stimulation

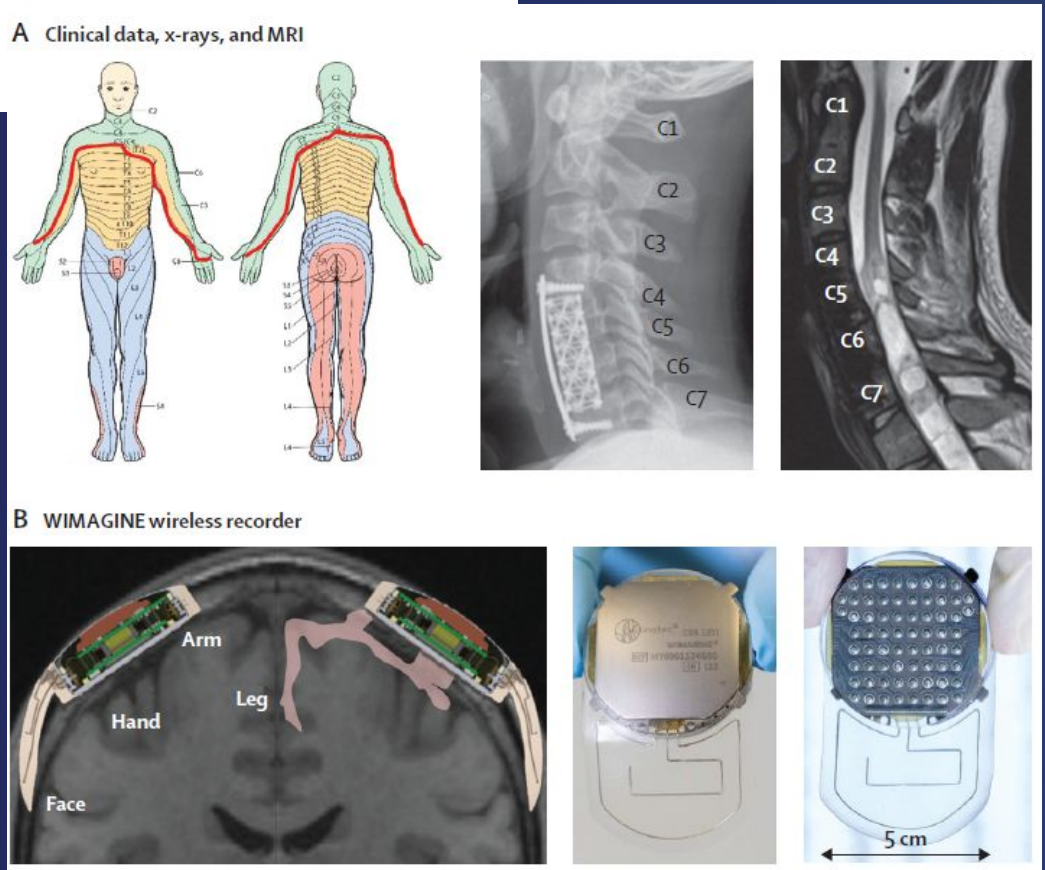
Barrow Neurological Institute

An exoskeleton controlled by an epidural wireless brain–machine interface in a tetraplegic patient: a proof-of-concept demonstration

Lancet Neurol 2019

Published Online
October 3, 2019





Epidural Stimulation

An exoskeleton controlled by an epidural wireless brain–machine interface in a tetraplegic patient: a proof-of-concept demonstration

Lancet Neurol 2019

Published Online
October 3, 2019

- C5 complete
- Suspended exoskeleton
- In the lab use only with backpack to house components/software
- Promising step for brain interface technology

Stem Cell Research

- Neuro Protection/Neuromodulation vs. stem cell
- NeuroModulations
  - Reduce inflammation
  - Reduce scar formation
  - Promote healing and growth
- HypoThermia
- Early Decompression
- Female steroids protective in rats administered prior to injury
- Glitazones- AstroGlial Scar formation prevents, prevent infiltration of connective tissue

Stem Cell Research

- Neural Stem cells
  - Derived from fetal tissue or other sources in the adult CNS- 30 % oligodendrocyte precursor cells
- Umbilical cord tissue provides a unique source of cells with potential for tissue repair
- Umbilical cord blood-derived mononuclear cell (UCBMNC)
- Mechanism of action
  - secretion of anti-inflammatory cytokines
  - release of growth factors
  - upregulation of matrix metalloproteinases
  - downregulation of tissue plasminogen activator
  - prevention of apoptosis
  - facilitation of myelination
  - reduced gliosis
  - increased angiogenesis
- Lithium stimulates stem cell proliferation, neurogenesis, and regeneration of long spinal tracts

Stem Cell Research

- Dangers
- Cell proliferation and growth- Cancer/Tumor

Autograft-derived spinal cord
mucosal cell transplantation in

Case report

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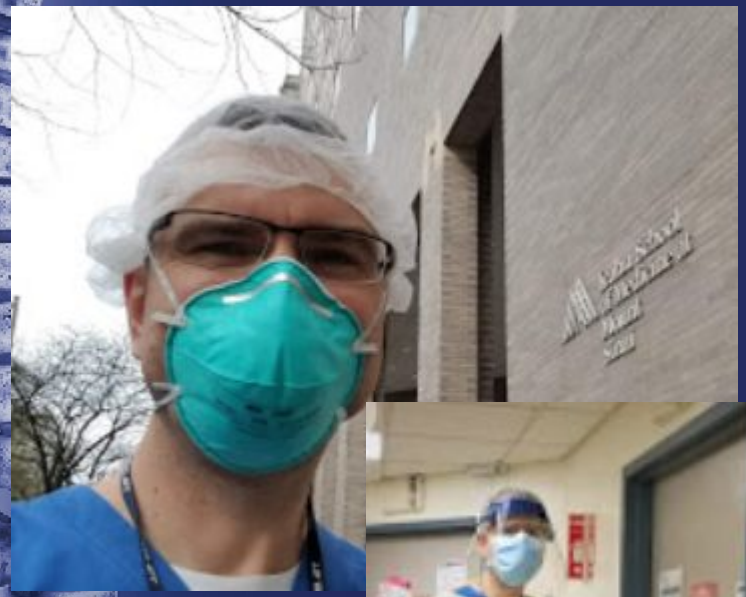
Departments of [1]Neurosurgery and [4]Pathology, Univer
and Departments of [2]Ophthalmology and Visual Scien
School, Ann Arbor, Michigan

SCI Resources & Trials

- https://scitrials.org/

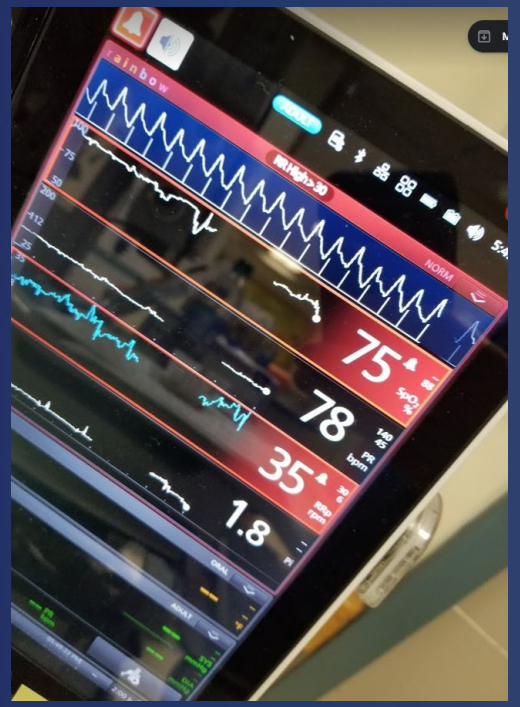
COVID-19

COVID-19 Re-deployment



All operations stopped and refocused on treating COVID patients

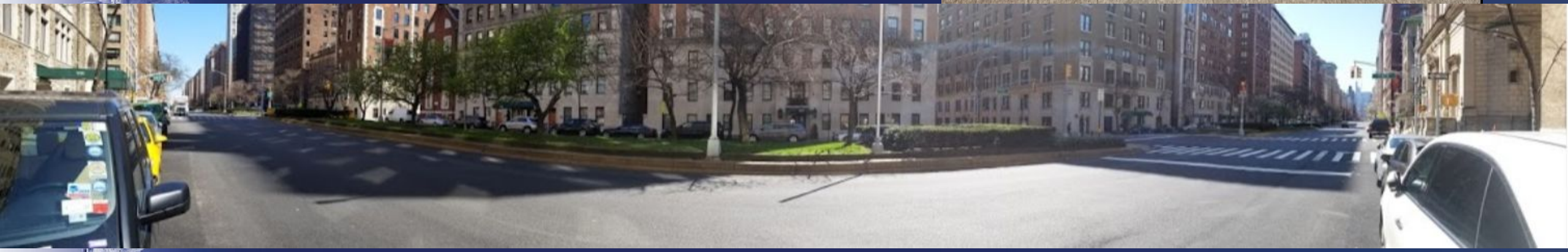
Monitoring installed on rehab units converted for COVID



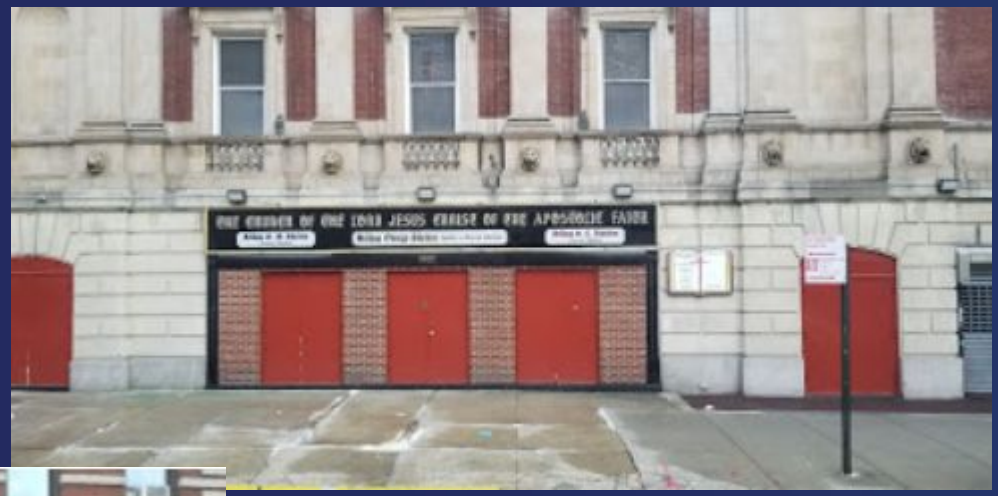
COVID-19 Re-deployment

Barrow Neurological Institute

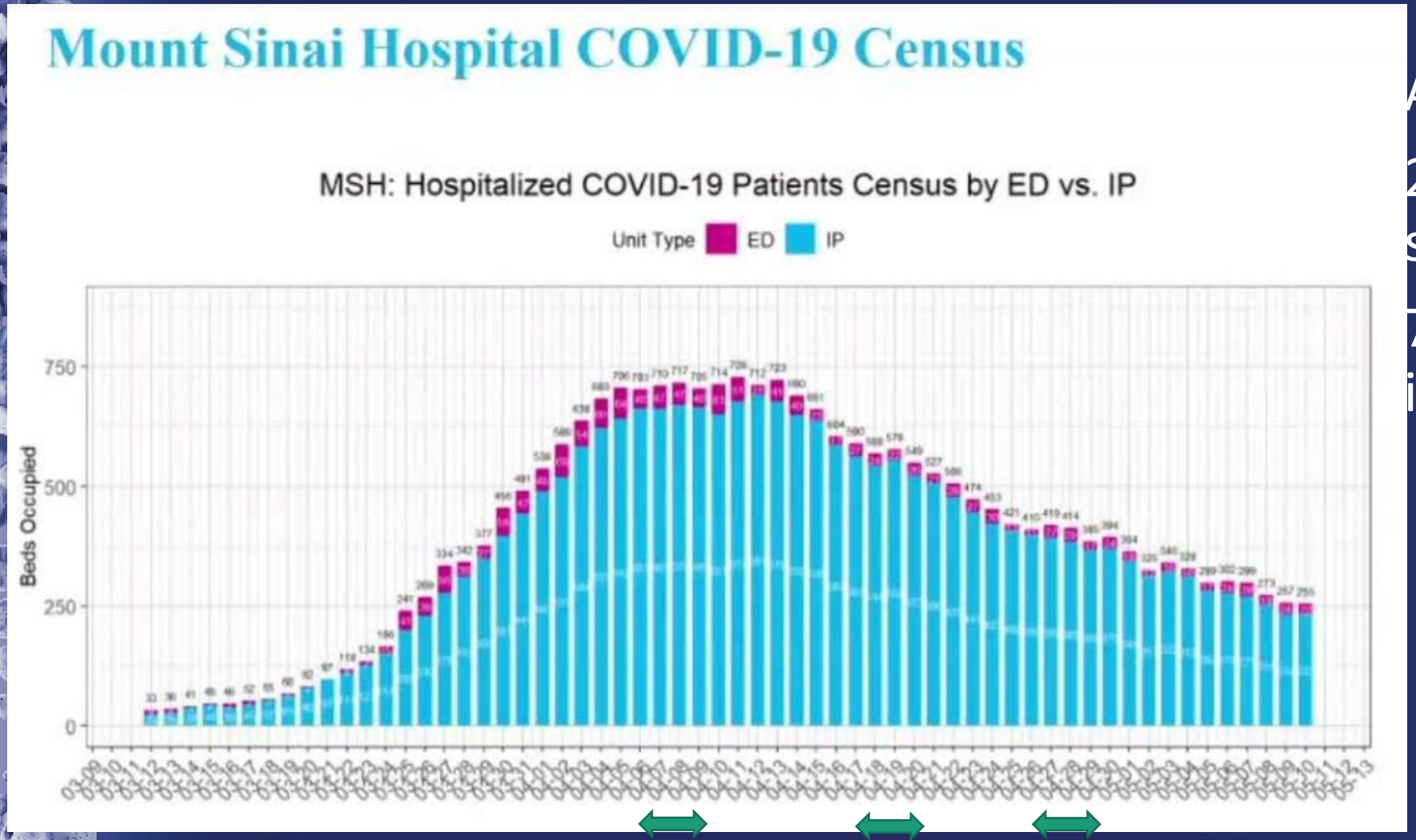
City shut down



City shut down



COVID-19 Re-deployment



At its peak

2,200 beds in system

731 NY state deaths in a single day

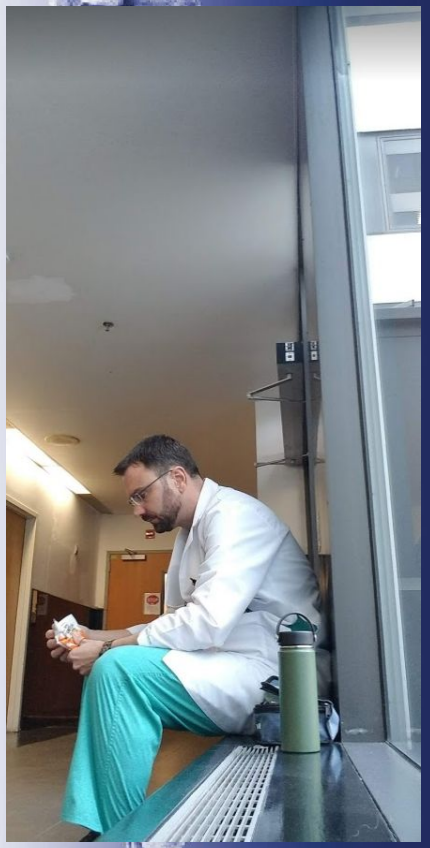
The numbers

Barrow
Neurological Institute

A U.S. Coast Guard helicopter flies above USNS Comfort as it enters New York Harbor during the outbreak of the coronavirus disease (COVID-19) in New York City, U.S., March 30, 2020.

Everyone and everything is affected

- https://photos.google.com/photo/AF1QipNHwa5sTXDNFDDt2Zb3OeTJyucWS2-diEYH9dY3



Social Distancing challenges in a city of 2 million people

Everyone and everything is affected

Barrow Neurological Institute

4 NEW YORK LOCAL WEATHER INVESTIGATIONS BAQUERO VIDEO TV LISTINGS TRAFFIC

CORONAVIRUS

NYC Emergency Room Doctor Dies by Suicide After Treating COVID-19 Patients

Dr. Lorna Breen died from suicide after treating patients at New York Presbyterian Allen Hospital.

Mount Sinai Hospital Employees Stand Solidarity

- https://photos.app.goo.gl/W231aZsbjG4VpDZ78

Show of support

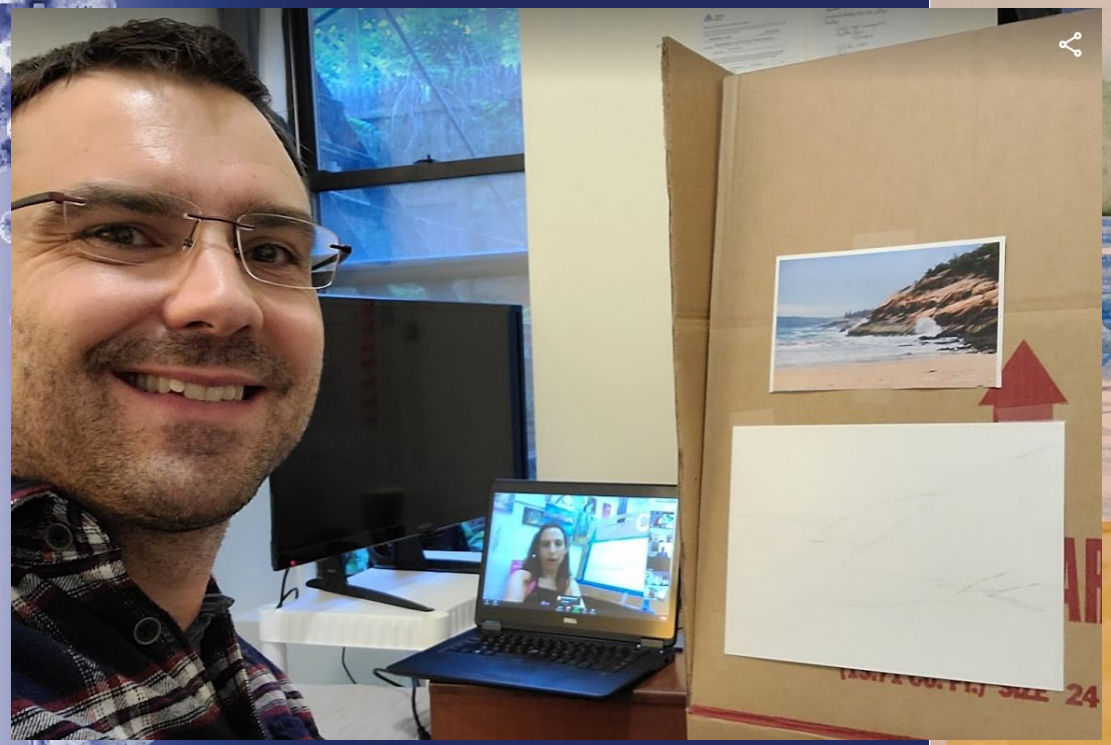
- https://photos.google.com/photo/AF1QipPU8EYqjwLLzi46w47d9zd2Ow5J99VG5693dCq5

Show of support

- https://photos.google.com/photo/AF1QipPno_K1m9bQiTepz9yriiXBXkBtQR4UQGg8uOxs
- **https://photos.google.com/photo/AF1QipNn9_jrV7peVIE5dQOR54MIUQfAXpgEds5l4Yju**

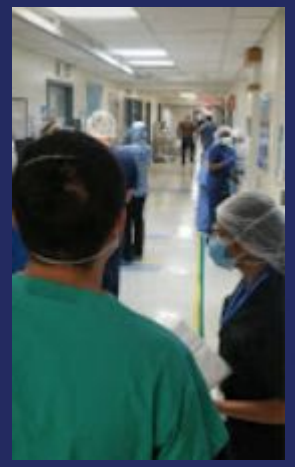
Online Water coloring class for relaxation

- Hospital sponsored mental health activities



Signs of Improvement

- https://photos.google.com/photo/AF1QipP7OjN6S320d7PHf9KztLsxX2uFQ8247V10lJqn



Recovery

Barrow Neurological Institute

Unite, stand together, support each other