NOTS
Northern Ohio Trauma System

Bridging the Evidence Gap Across Specialties

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11/2021

Cleveland Clinic MetroHealth University Hospitals Southwest General

Introduction/Outline

- Case Presentation
- How do we judge evidence that create guidelines?
- What are the SCI guidelines and where do they come from?
- What are the standards and evidence from other specialties?
- How can we build bridges across specialties?

- Other Examples: ventilator management and wean, primary care in SCI

Objectives

- Understand levels of scientific evidence
- Identify inherent difference in some medical specialties
- Appreciate variations in guidelines and begin to reconcile the differences

Disclosures

- None

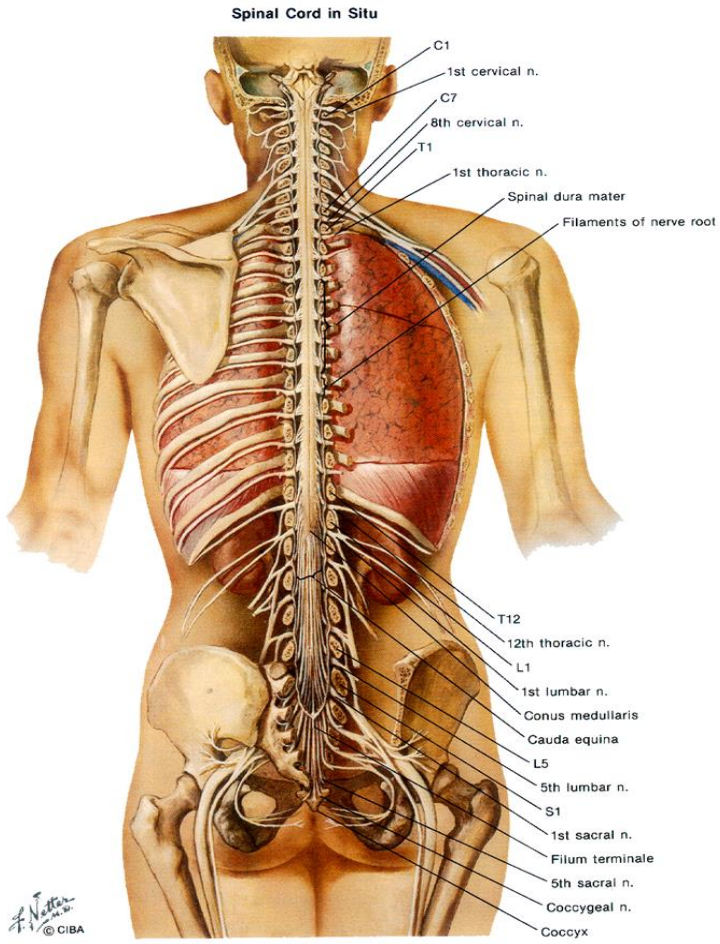
Acknowledgements

- Pulmonary, Urology, Trauma, Neurosurgical, Primary care departments at MetroHealth

- Dr. Michael Kelly and Dr. Nimitt Patel
- Dr. John Chae and Dr. Richard Wilson
- Dr. Kim Anderson

Spinal Cord Injury

- Damage to the nerves in the neck or spine
- Can effect *anything* at or below the neurologic level of injury
  - Motor
  - Sensory
  - Autonomic
  - Other



Tetraplegia:

- cervical segments

Paraplegia:

- thoracic, lumbar, or sacral segments

Dermatome:

- The area of skin innervated by one sensory nerve root.

Myotome:

- The collection of muscles innervated by one motor nerve root.

Incomplete Injury:

- If there is preservation of motor and or sensory function in the lowest sacral segment.

Complete Injury:

- The absence of motor and/or sensory function in the lowest sacral segment.

Zone of Partial Preservation:

- Dermatomes and myotomes caudal to the neurological level that remain partially innervated (this term is only used in complete injuries).

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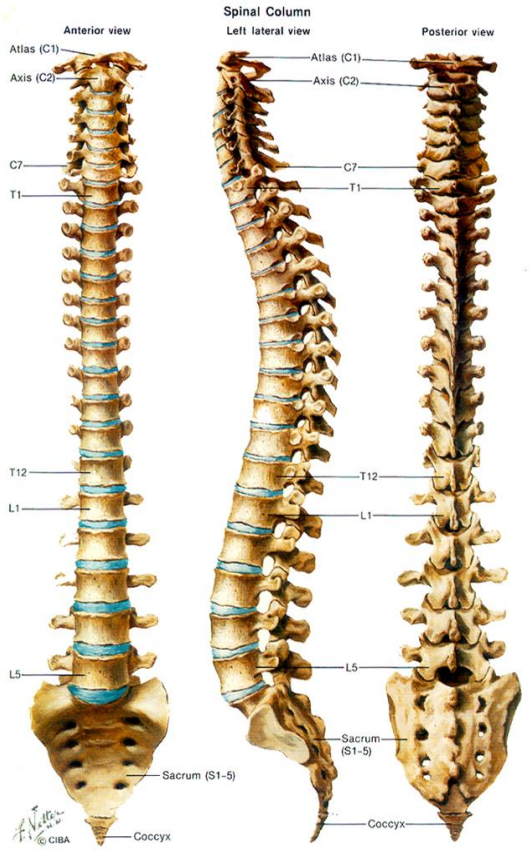
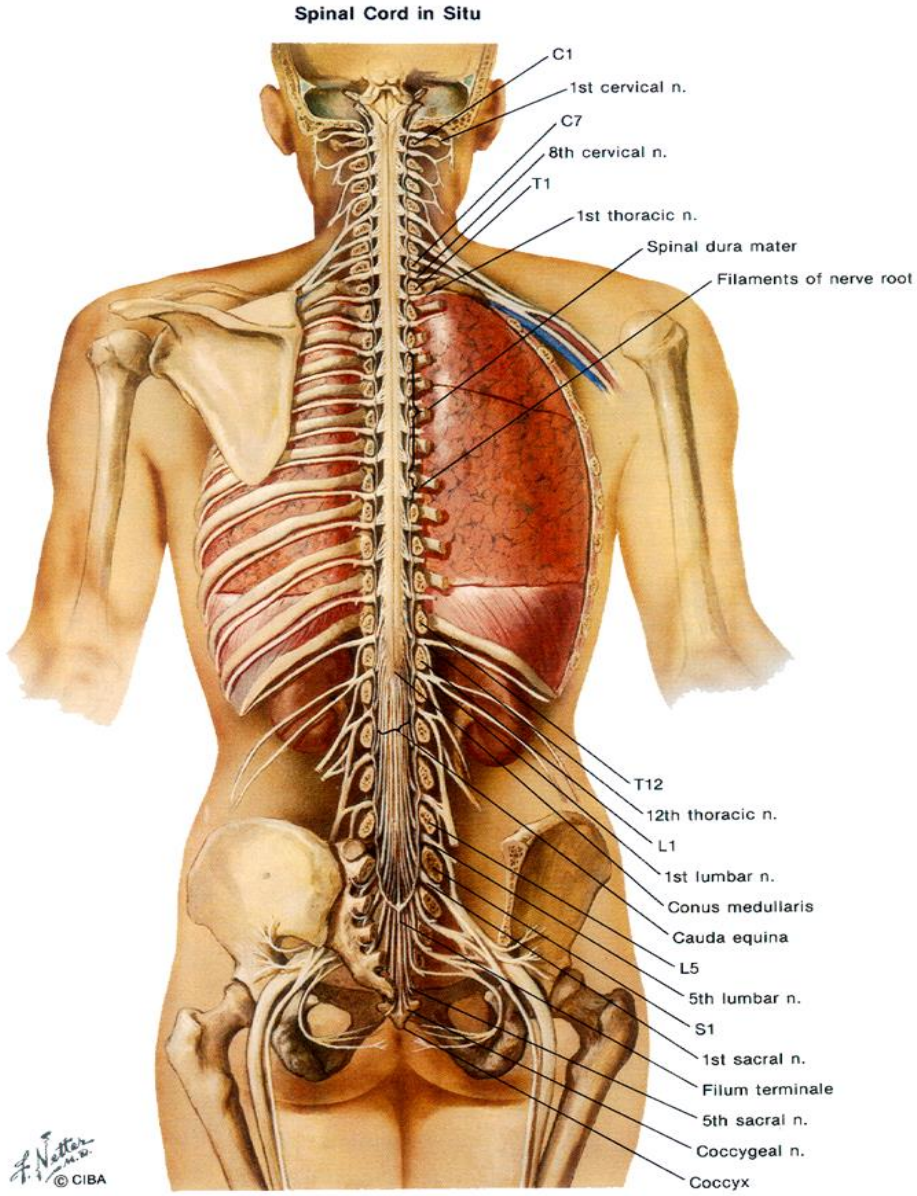


Neurological Level of Injury:

The most caudal segment of the spinal cord with normal motor and sensory function on both sides.

Skeletal Level:

The radiographic level of greatest vertebral damage.



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Epidemiology of Spinal Cord Injury

- Incidence: 54 cases per million
  - 17,810 new traumatic SCI per year
- Prevalence: 294,000 (250k-368k)
- Age: 43 year old
  - Up from 29 in 1970
- Gender: 78% males

Severity of Injury	Average Yearly Expenses (in 2019 dollars)		Estimated Lifetime Costs by Age at Injury (discounted at 2%)	
	First Year	Each Subsequent Year	25 years old	50 years old
High Tetraplegia (C1–C4) AIS ABC	$1,149,629	$199,637	$5,100,941	$2,803,391
Low Tetraplegia (C5–C8) AIS ABC	$830,708	$122,468	$3,727,066	$2,292,479
Paraplegia AIS ABC	$560,287	$74,221	$2,494,338	$1,636,959
Motor Functional at Any Level AIS D	$375,196	$45,572	$1,704,144	$1,202,832

Data Source: Economic Impact of SCI published in the journal *Topics in Spinal Cord Injury Rehabilitation,* Volume 16, Number 4, in 2011. ASIA Impairment Scale (AIS) is used to grade the severity of a person's neurological impairment following spinal cord injury.

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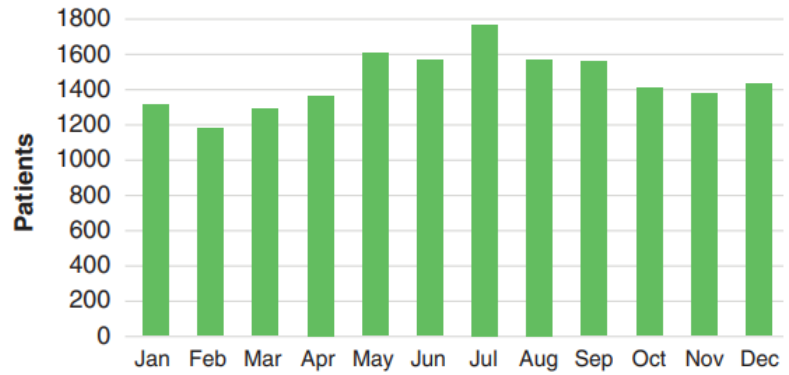
- 16931 Trauma in 5 NE Ohio hospitals

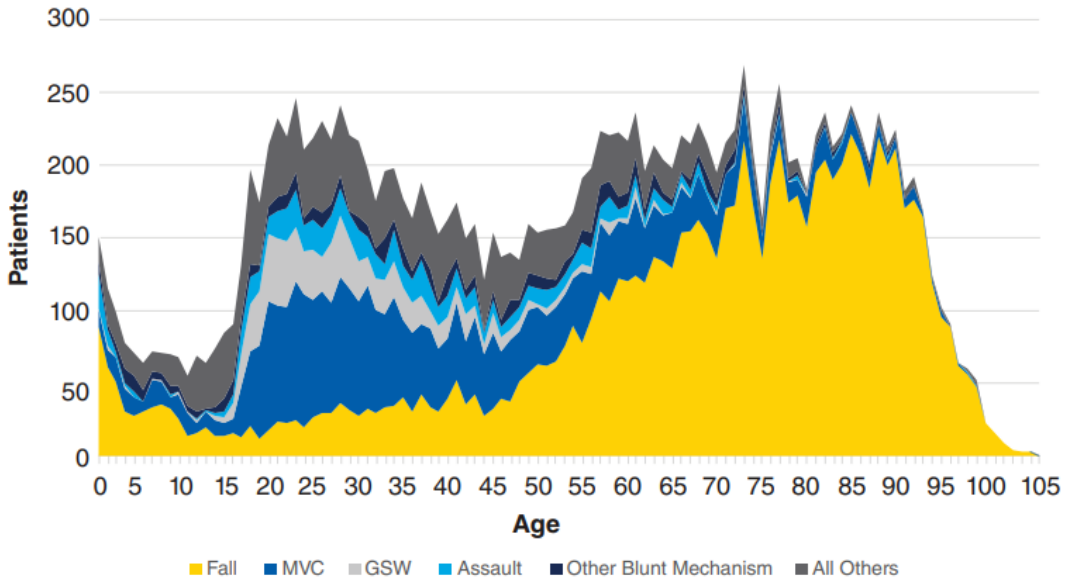
- 17810 Spinal Cord Injury in all of USA

MECHANISM OF INJURY

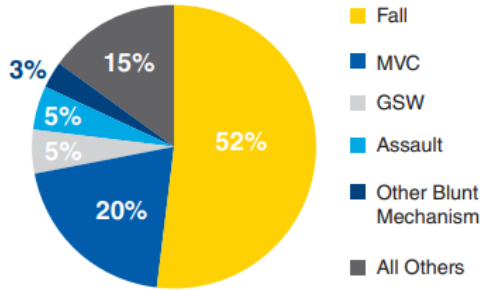
Frequency of Trauma: By Month



Top Mechanisms of Injury



All Patients



Mechanism of Injury by Age Group

Mechanism	<15	15-20	21-40	41-65	66-80	>80	Total
MVC	184	326	1389	996	323	135	3353
Fall - 10ft or More	82	36	203	315	106	47	789
Fall - Under 10ft	295	20	175	655	678	598	2421
Fall - Same Level	106	44	246	1008	1580	1822	4806
Fall - Not Further Specified	14	4	24	128	215	404	789
Assault	55	85	357	235	38		70
Asphyxiation or Hanging	10		34				44
Motorcycle	26		208	206	29	0	469
MVC vs. Pedestrian	59	49	167	139	48	18	480
Bicycle	88	30	62	125	29	0	334
Other/ Off-Road Vehicle	29	34	78	51	14		206
Horse and Rider	18		13	22	0		53
Other Blunt	89	47	170	191	73	23	593
Other Penetrating	18	21	77	77	16	0	209
Stabbing	23		163	86			272
Drowning			13			0	13
GSW	20	195	522	143	10	0	890
Biting	36	14		17	10	0	77
Sport Injury	51	69	14	17		0	162
Burn	45		27	32	17		121
Unknown	19			21	16	17	73
Totals	**1198**	**1031**	**3958**	**4461**	**3204**	**3079**	**16931**

Cleveland Clinic

MetroHealth

University

Impact on research

SCI

- Almost rare
- Expensive
- Unemployed
- Diverse
  - Mechanism
  - Outcome
- Disproportionate underrepresented

Heart Disease

- Common
- Inexpensive
- Employed
- More uniform
- More representative

Impact on research

- Less grant funding
- Less motivation in free market
- Less motivation in public
- Harder to recruit, retain
- Hard to design/blind
- Fewer, Smaller, Poorer quality studies

SCI Model System (NIDILRR)

- 1970 to 2026
- Pooled
  - Data
  - Efforts
  - Knowledge
- Clinical Excellence

MSKTC SCI · TBI · BURN | Model Systems Knowledge Translation Center

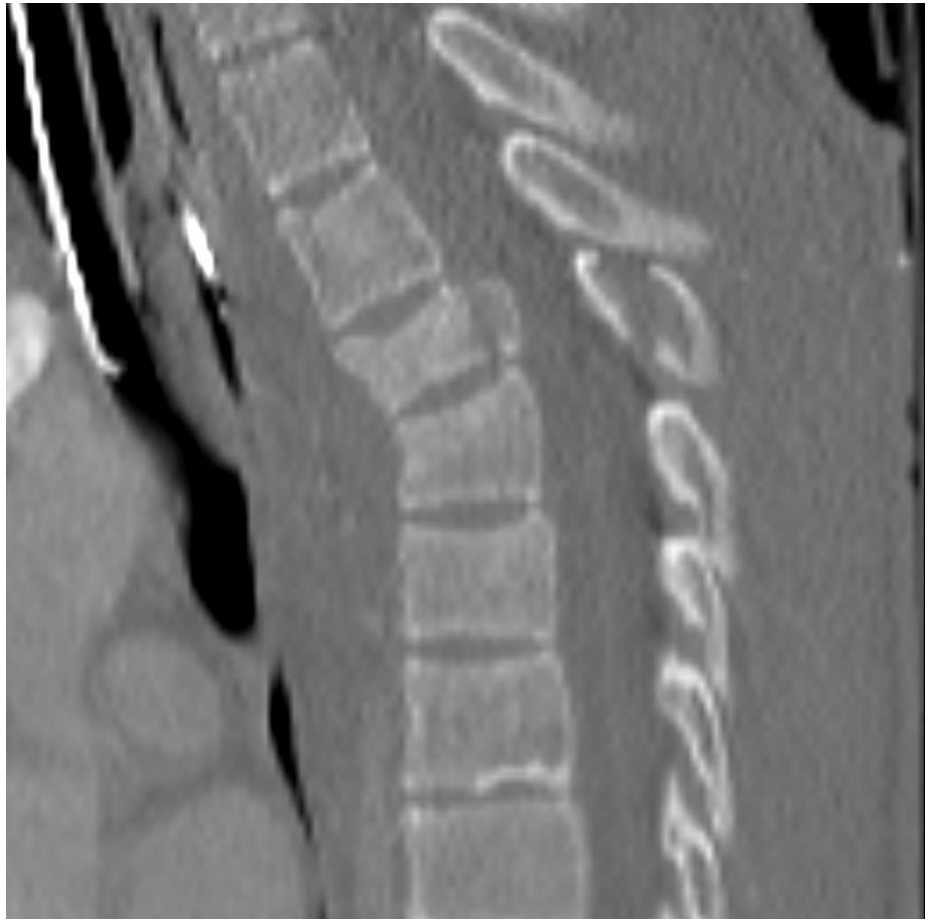
Cleveland Clinic · MetroHealth · University Hospitals · Southwest General

Case

- Greg is a 20-year-old previously healthy male s/p MVA. He endorses loss of consciousness and paraplegia.
- Initial imaging shows a T4 burst fracture and exam suggests a T4 AIS B paraplegia. His blood pressure ranges 85-110/55-65
- Initial surgery is aborted due to hypotension

Case: What do you think?

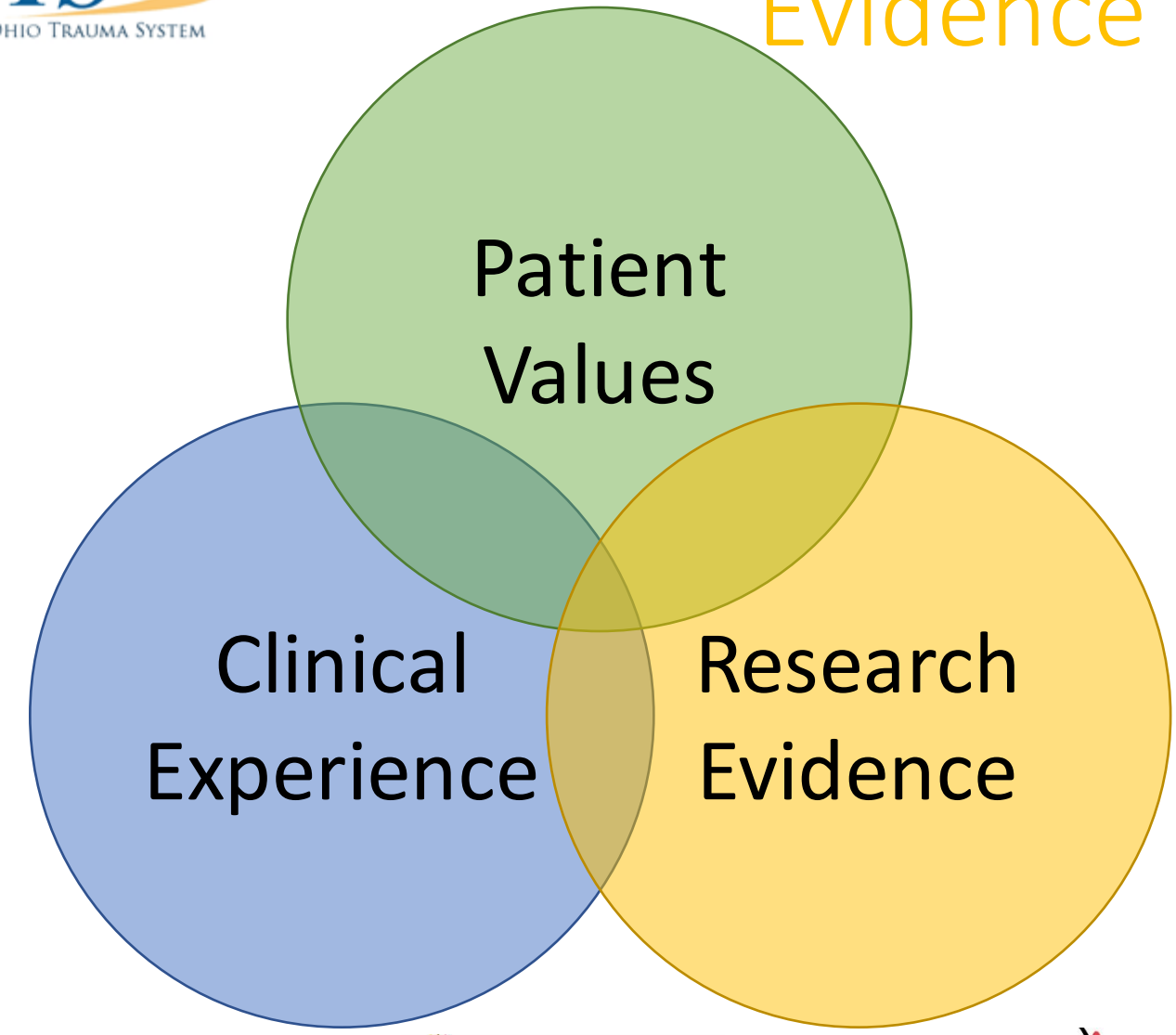
- Unmute to answer or type in the chat
- What are the possible causes of his hypotension?
- How do we manage SCI related hypotension?
- When should we treat or not treat SCI related hypotension?



Case

- Day 3, underwent surgical decompression and fusion
- SCI recommend maintain mean arterial blood pressure (MAP) > 85mmHg for 7 days after injury
- Spine surgeon recommends maintaining MAP > 80 mmHg for 48 hr post op
- Trauma surgeon treats symptomatically due to risk of vasopressors in asymptomatic 20yo

Evidence Based Medicine



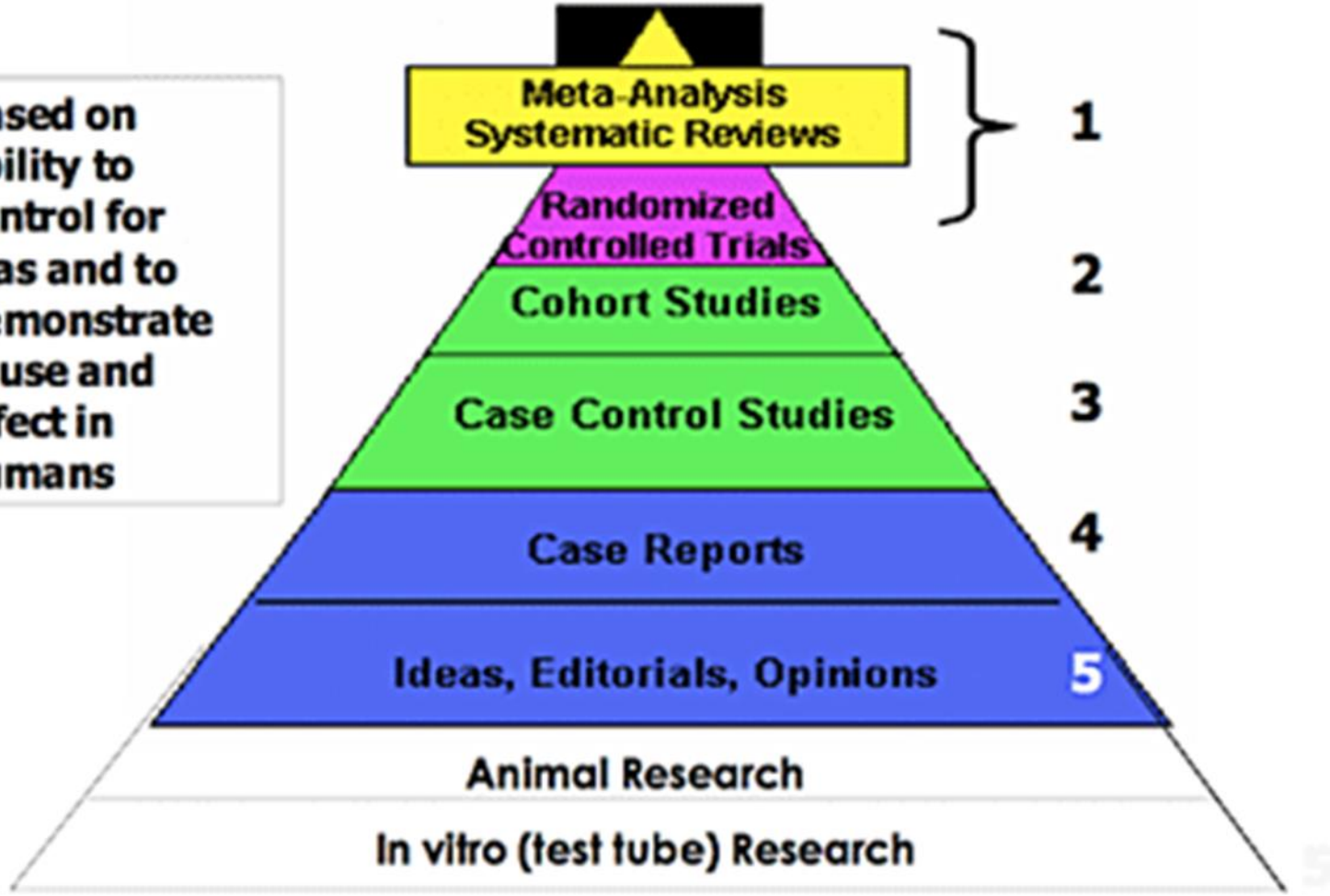
Study Types & Levels of Clinical Evidence

Internal Validity: Cause and Effect

High

Low

Based on ability to control for bias and to demonstrate cause and effect in humans



Low

High

External Validity: Broadly applicable

John Chae

Sackett 1959; US Task Force 1996

Level of Scientific Evidence	
Level	Description
I	Evidence based on **randomized controlled clinical trials (or meta-analysis of such trials)** of adequate size to ensure a low risk of incorporating false-positive or false-negative results.
II	Evidence based on randomized controlled trials that are **too small** to provide level I evidence. These may show either positive trends that are **not statistically significant** or no trends and are associated with a **high risk of false-negative** results.
III	Evidence based on **nonrandomized, controlled, or cohort studies**; **case series**; case-controlled studies; or cross-sectional studies.
IV	Evidence based on the opinion of respected authorities or expert **committees** as indicated in published consensus conferences or **guidelines**.
V	Evidence that expresses the opinion of those **individuals** who have written and reviewed this guideline, based on experience, knowledge of the relevant literature, and discussions with peers.

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Categories of the Strength of Evidence Associated with the Recommendations	
Category	Description
A	The guideline recommendation is supported by one or more Level I studies.
B	The guideline recommendation is supported by one or more Level II studies.
C	The guideline recommendation is supported by only Level III, IV or V studies.

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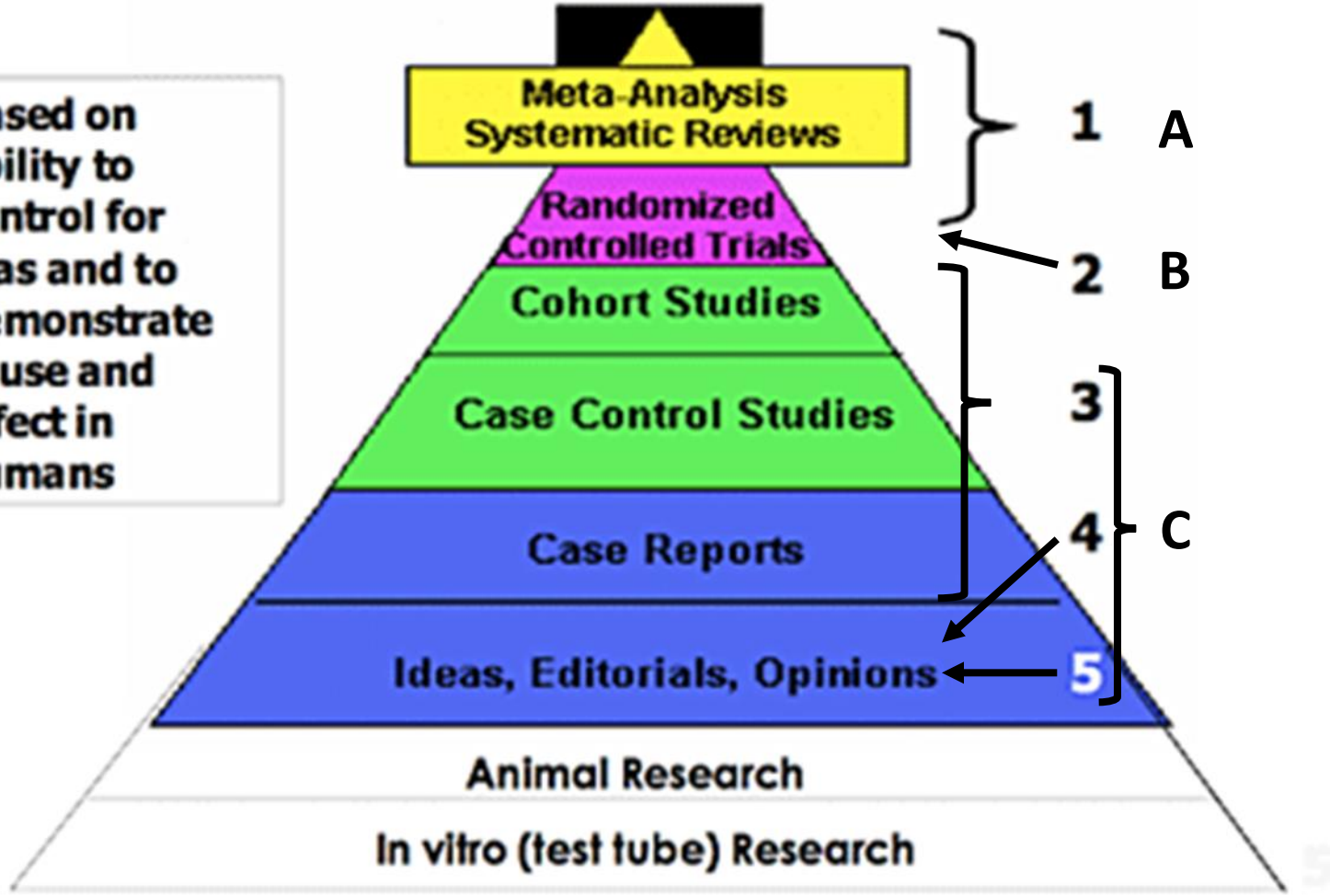


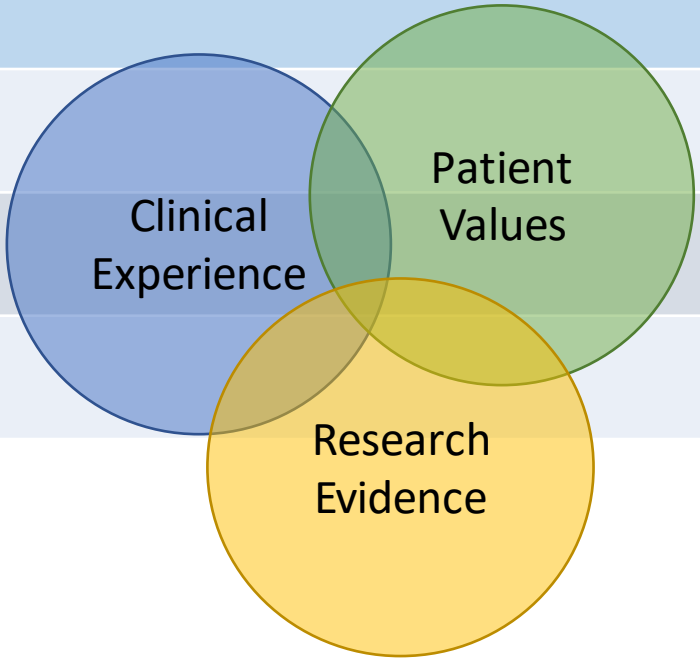
Low

High

External Validity: Broadly applicable

John Chae

Levels of Panel Agreement with the Recommendations	
Level	Description
Low	1.0 to 2.33
Moderate	2.33 to 3.67
Strong	3.67 to 5.0



Guidelines

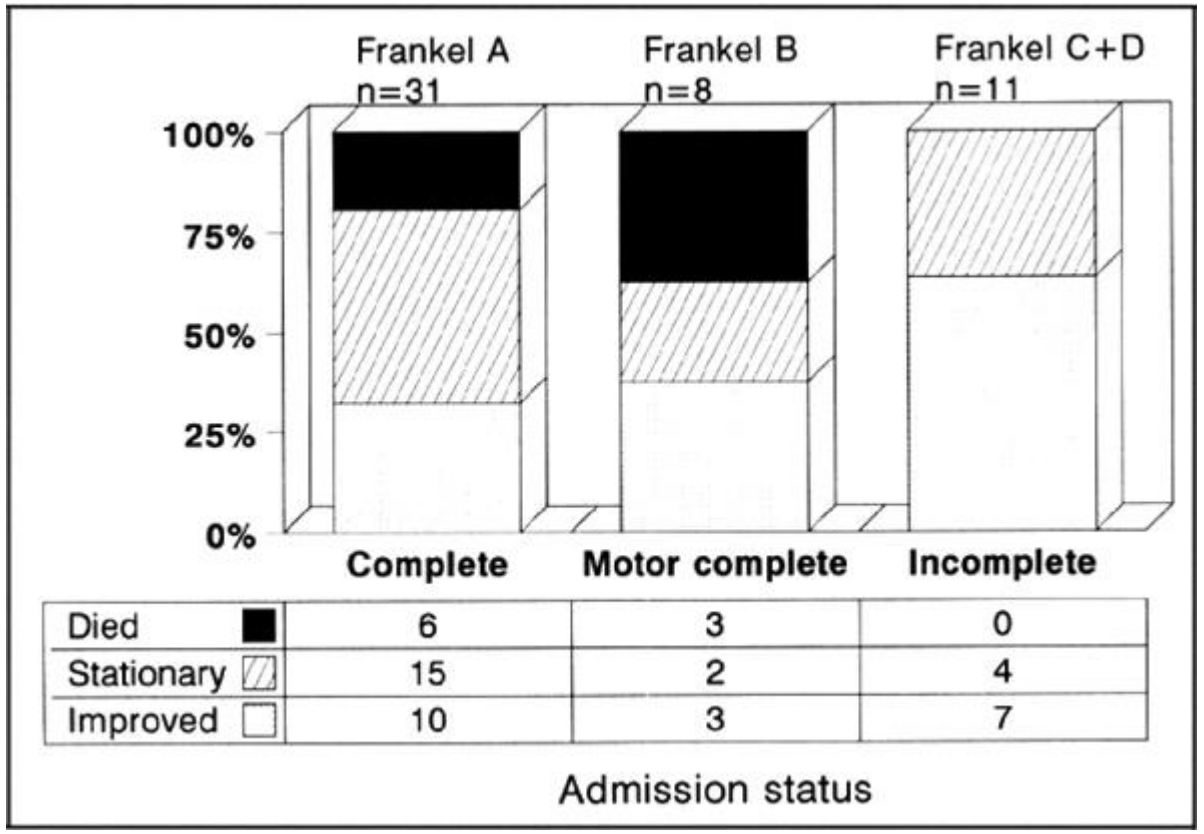
- Consortium for Spinal Cord Injury (PVA) - USA
- Spinal Cord Injury Research Evidence (SCIRE) – Canada
- American Association of Neurological Surgeons/Congress of Neurological Surgeons (AANS/CNS) - USA
- *National Institute of Health and Care Excellence (NICE) – UK*
- Others: Joint Trauma System (JTS CPG) – Military

Consortium for Spinal Cord Injury (PVA) -2008

- 16. **Prevent and treat hypotension**.
  - (Scientific evidence–II/IV; Grade of recommendation–B; Strength of panel opinion–4)
  - The appropriate resuscitation end point and optimal mean arterial blood pressure for maintenance of spinal cord perfusion are not known. Uncontrolled studies that used fluids and vasopressors to achieve a mean arterial pressure of 85 mmHg for a minimum of 7 days in patients with acute SCI have reported favorable outcomes (Levi et al., 1993; Vale et al., 1997).
  - Hypotension may exacerbate central nervous system injury. Avoiding hypotension in brain-injured patients is paramount in early treatment because diminished cerebral perfusion pressure may contribute to secondary neuronal injury (R. M. Chesnut, 1993). Although separate clinical data do not exist for patients with spinal cord injuries, hypotension should be recognized, the cause of the hypotension sought, and fluid resuscitation initiated with the goal of treating hypotension (systolic blood pressure < 90). Further study is needed to define ideal mean arterial pressure (MAP) and the potential role for elevation of MAP with fluids or pharmacologic treatment (Vale et al., 1997).

Levi et al., 1993: Hemodynamic parameters in patients with acute cervical cord trauma: description, intervention, and prediction of outcome

- Invasive monitoring: arterial line and Swan-Ganz catheter
- Fluid and Pressors: dopamine and/or dobutamine
- Goal MAP > 90 mm Hg for 7 days: results 94.4 +/- 9.4
- 50 SCI patients: 6 week follow up
- Conclusion: aggressive monitoring and hemodynamic intervention is feasible and safe



	Complete	Motor complete	Incomplete
Died	6	3	0
Stationary	15	2	4
Improved	10	3	7

Vale et al., 1997: Combined medical and surgical treatment after acute spinal cord injury: results of a prospective pilot study to assess the merits of aggressive medical resuscitation and blood pressure management

- Prospectively, uncontrolled
- Invasive monitoring, Fluid and Pressors: dopamine and/or dobutamine
  - All received NASCIS II Protocol
  - Complete tetraplegia admission MAP 66>mmHg, all others > 80mmHg
- Goal: MAP > 85mmHg for 7 days
- 77 patients with C/T-spine SCI

Initial Exam	Improved AIS Grade	Improved Ambulation	Improved Bladder function
Complete tetraplegia	60%	30%	20%
Complete paraplegia	33%	10%	10%
Incomplete Tetraplegia		92%	88%
Incomplete Paraplegia		88%	63%

Chesnut, 1993: Early and late systemic hypotension as a frequent and fundamental source of cerebral ischemia following severe brain injury in the Traumatic Coma Data Bank

- Severe head injury (GCS < = 8), prospective database, n=1210
- Hypotension (SBP < 90 mmHg), early (resuscitation), late (ICU)
  - Early hypotension associated with a doubling of mortality (55% vs. 27%)
    - ➢If shock was present on admission, the mortality was 65%
  - Late hypotension (without early hypotension): 66% died or were vegetative
  - No hypotension: 17% died or were vegetative
- Logistic regression modelling suggested that early and late shock were the most powerful independent predictors of mortality
  - Independent of age, admission GCS motor score, presence of hypoxia, or associated severe extracranial trauma

Congress of Neurosurgeons - 2013

- ICU monitoring allows the early detection of hemodynamic instability, cardiac disturbances, pulmonary dysfunction, and hypoxemia
  - Management in an ICU or other monitored setting appears to have an impact on neurological outcome after acute cervical SCI
- Correction of hypotension in spinal cord injury (systolic blood pressure < 90 mmHg) when possible and as soon as possible is recommended.
- Maintenance of mean arterial blood pressure between 85 - 90 mmHg for the first 7 days following an acute spinal cord injury is recommended.

SCIRE Project

- Hemodynamic support during the acute phase post SCI has been **associated** with improved neurological outcomes but **no cause-and-effect** relationship has been established.
- Management of hemodynamic changes during the acute phase of SCI has focused on the effectiveness of early aggressive support on neurological outcomes. In general, hemodynamic management involves a multi-pronged approach which includes administering fluids, vasopressors, decompressive surgery, and pulmonary catheters. Two studies have shown that this type of aggressive treatment may be effective for improving neurological outcomes post SCI (Vale et al., 1997; Levi et al., 1993).

- Level IV

Joint Trauma System (JTS CPG) 2020

- Avoid hypoxemia (SaO2 <92%) and hypotension (SBP<90) for all spinal cord injuries. (Level III)
- Maintain MAP >85 for all spinal cord injuries, with an *emphasis on avoiding hypotension*. (Level III)
  - Patients who sustain neurologic compromise should have an invasive arterial line for **continuous blood pressure monitoring with a goal MAP of 85-90 mmHg for up to seven days** following the injury. The evidence supporting this goal is **mixed, at best**, however it is the **opinion of the authors** that there is a **net benefit** to maintaining this goal. Regardless, hypotension (SBP < 90 mmHg) and hypoxemia (SaO2 <92%), must be avoided.
  - Vasopressor therapy (in the euvolemic patient) and/or supplemental oxygen are recommended, when necessary, to achieve these goals. Prior to the use of vasopressors, ensure that hypovolemia is addressed through adequate resuscitation and evaluation and control of any bleeding. **Vasopressor use in the hypovolemic patient may contribute to additional ischemic loss in other injured tissues**.

Orlando Regional Medical Center

- https://www.surgicalcriticalcare.net/guidelines.php
- Level 3 ➢ Mean arterial pressure (MAP) augmentation with norepinephrine (if needed) is recommended for at least the first 72 hours following injury to a maximum of 7 days.
  - Goal MAP ≥ 85 mmHg for blunt / incomplete penetrating injury
  - Goal MAP ≥ 65 mmHg for complete penetrating injury
  - Do NOT use for patients with **irreversible** SCI

  - 70/55 = MAP 65

ORMC Citations

- Readdy WJ, Saigal R, Whetsone WD, et.al. Failure of mean arterial pressure goals to improve outcomes following penetrating spinal cord injury. Neurosurgery. 2016; 79:708-14.
- Catapano JS, Hawryluk GWJ, Whetstone W, et.al. Higher mean arterial pressure values correlate with neurological improvement in patients with initially complete spine cord injuries. World Neurosurg. 2016; 96:72-9.
- Saadeh YS, Smith BW, Joseph JR, et.al. The impact of blood pressure management after spinal cord injury: a **systematic review** of the literature. Neurosurg Focus. 2017; 43:E20.
- Readdy WJ, Whestone WD, Ferguson AR, et.al. Complications and outcomes of vasopressor usage in acute traumatic central cord syndrome. J Neurosurg Spine. 2015; 23:574-80.

Readdy et.al. 2016 Failure of mean arterial pressure goals to improve outcomes following penetrating spinal cord injury.

- 14 patients with complete penetrating SCIs compared to nonpenetrating
  - 7.1% experienced improved AIS Grade
  - 71.43% experienced cardiogenic complications

Catapano, et al. 2016 Higher mean arterial pressure values correlate with neurological improvement in patients with initially complete spine cord injuries

- Retrospective MAP recording correlated with AIS recovery, n=62
- 33 complete SCI: 11 improved at least 1 AIS grade by discharge. Of those that improved:
  - Initial average MAP was significantly higher (96.6 ± 0.07 mmHg vs. 94.4 ± 0.06mm Hg, respectively; $P < 0.001$)
  - Proportion of MAP values <85 mm Hg was significantly lower (13.5% vs. 25.6%, respectively; $P < 0.001$).
- A positive correlation was observed between MAP values and neurologic recovery in AIS A, B, and C patients but not AIS D patients

Saadeh et.al. 2017 The impact of blood pressure management after spinal cord injury: a systematic review of the literature.

- 11 studies: 9 retrospective, 2 uncontrolled prospective
  - MAP goal > 85-90 mmHg
  - Duration goal 1-7 days
  - More complications with dopamine than phenylephrine or norepinephrine
- No high-quality data
  - Based on the 2 prospective studies, MAP goals of 85–90 mm Hg for a duration of 5–7 days should be considered.
  - Norepinephrine for cervical and upper thoracic injuries and phenylephrine or norepinephrine for mid- to lower thoracic injuries should be considered.

TABLE 1. Pertinent characteristics of the 11 articles included in this systematic review of BP management after spinal cord injury

Authors & Year	Data Collection	Study Type	Comparison Group	Neurological Outcome Measure	No. of Pts	MAP Goal (mm Hg)	MAP Goal Duration	Length of Follow-Up
Catapano et al., 2016	Retrospective	Case series	No	AIS grade	62	NS	NS	Until discharge
Cohn et al., 2010	Retrospective	Case series	No	AIS grade, ASIA motor score	17	NS	NS	Until discharge
Dakson et al., 2017	Retrospective	Comparative	Yes	AIS grade, ASIA motor score	94*	>85	5 days	After neurorehabilitation
Hawryluk et al., 2015	Retrospective	Case series	No	AIS grade	74	>85	5 days	Until discharge
Inoue et al., 2014	Retrospective	Case series	No	AIS grade	131	>85	7 days	Until discharge
Kepler et al., 2015	Retrospective	Case series	No	ASIA motor score	92	>85	≥5 days	Until hospital Day 5
Levi et al., 1993	Prospective	Case series	No	Frankel grade	50	>90	7 days	6 wks
Martin et al., 2015	Retrospective	Case series	No	ASIA motor score	105	NS	NS	Until discharge
Readdy et al., 2015	Retrospective	Case series	No	AIS grade	34	>85	>24 hrs	Until discharge
Vale et al., 1997	Prospective	Case series	No	AIS grade, ASIA motor score	77	>85	7 days	12 mos
Wolf et al., 1991	Retrospective	Case series	No	Modified Frankel score, Yale Scale score	52	>85	5 days	12 mos

NS = not specified; Pts = patients.

* Serial MAP data collected for 50 of these patients.

Cost of vasopressors and ICU

- Vasopressor complications (uptodate.com)
  - Hypoperfusion: extremities (acute limb ischemia/necrosis), kidneys (renal insufficiency and oliguria), mesenteric organs (gastritis, shock liver, intestinal ischemia, or translocation of gut flora with resultant bacteremia)
  - Dysrhythmias: powerful chronotropic effects (beta-1 adrenergic)
    - sinus tachycardia (most common), atrial fibrillation, re-entrant atrioventricular node tachycardia, or ventricular tachyarrhythmias
  - Myocardial ischemia including occult ischemia: chronotropic and inotropic effects
  - Local effects: extravasation results in skin necrosis necessitating central access
  - Hyperglycemia: inhibition of insulin secretion
  - Drug-drug interactions
- Price of ICU without mechanical ventilation:
  - Dasta et al. 2005 Daily cost of an intensive care unit day: the contribution of mechanical ventilation. Crit Care Med.
  - day 1 - $6,667; day 2 - $3,496; after day 3 - $3,184

How do you proceed?

- How do you come to agreement across disciplines?
- Is the data apples to oranges?
- Can you justify possible benefit given known risk (and costs)?
- Is no protocol the best solution?

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How do I get home?

- Traffic

- Weather

- Sports

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Mean Arterial Blood Pressure Treatment for Acute Spinal Cord Injury (MAPS)

- Pilot: randomized acute SCI to a spinal cord perfusion pressure (SCPP = MAP - intrathecal pressure (ITP)) target of ≥ 75 mmHg or to a control group (hypotension avoidance, MAP ≥ 65 mmHg).
  - motor score showed no difference at one-year post-SCI
- Noninferiority study
  - Hypotension avoidance (MAP >= 65 mmHg) for 7 days
  - Induced hypertension (MAP >= 85 mmHg) for 7 days
- Completed 9/2019

MAPS trial

Dr. Wilson:

Thanks for the inquiry.

Unfortunately, our trial of maintenance of normotension (MAP ~ 65 mmHg) vs. induced hypertension (MAP ~ 85 mmHg) for 5 days following acute SCI has ceased recruitment secondary to a lack of recruitment and funding support. As such, I am unfortunately not able to provide any further insight into what I believe is an important and clinically relevant question in the care of the acute SCI patient population.

Kind regards,

Saadeh Conclusion

- Although there has been significant interest in the topic of promoting hypertension in SCI patients in the acute post injury phase for the past several decades, there is **limited and low-quality evidence** regarding the risks and benefits of this practice. The basis of MAP goals and duration are most commonly attributed to 2 articles from the 1990s, which were both prospective studies reporting the goal of elevation of MAP for a specified duration of time postinjury. Based on a sound theoretical basis, other retrospective reviews and case series, and anecdotal reports, the practice of promoting elevated MAP goals is **widely practiced and is formally recommended** by the AANS/CNS Joint Committee guidelines.
- **There are risks**, however, associated with establishing elevated MAP in the period after SCI, which include complications due to vasopressor use, invasive monitoring, decreased patient mobilization, and prolonged hospitalization. Some of these risks, in particular vasopressor use, have been quantified and demonstrated to cause potentially major complications. Presently, the **risk-benefit profile** for vasopressor use is **unclear**, given the lack of definitive high-level evidence of BP augmentation in improving neurological recovery after SCI.

Saadeh Conclusion

- With regard to the optimal MAP, there have been **no comparison studies** to date, randomized or nonrandomized, comparing differences in outcome with different MAP goals. The formal recommendation of MAP of 85–90 mm Hg appears to be derived from studies of Levi and Vale and their colleagues, in which MAP goals of 90 and 85 mmHg were chosen, respectively, without a clear explanation. There is the possibility that lower MAP goals may achieve similar results with less risk.
- Given that BP augmentation is currently the standard of care after SCI based on current recommendations, future studies in this patient population involving control groups will have to carefully consider the potential **ethical questions** of providing nonstandard-of-care treatment to a control group. This question is currently under investigation via the MAPS trial: Mean Arterial Pressure in Spinal Cord Injury (MAPS): Determination of Noninferiority of a Mean Arterial Pressure Goal of 65 mm Hg Compared with a Mean Arterial Pressure Goal of 85 mm Hg in Acute Human Traumatic Spinal Cord Injury (clinicaltrials.gov no. NCT02232165).
- The duration of maintaining elevated MAP is currently recommended at 7 days, although **no studies have compared different durations**. A number of retrospective review papers have reported pursuing elevated MAP goals for a total of 5 days and did not indicate adverse outcomes related to this duration.

Consensus understanding of early blood pressure management in acute spinal cord injury

- Avoid hypotension (MAP < 70mmHg or SBP < 90mmHg) for 7 days post SCI
- Consider more aggressive MAP goals in delayed decompression
- Consider patient specific goals in central cord and penetrating trauma

Improving Relationships

- Neuromuscular Service Line Leadership
- Cross department interactions
  - Meetings: Trauma PI and Multidisciplinary Rounds
  - Education: Spine/Ortho Rounds, Resident and Fellow Didactics
  - Research: Clinical Research Meetings, Model System Team
- Personal Relationships
  - Find champions in other departments

SCI Mechanical Ventilator Protocol

- Goal: standardize our approach to
- Stakeholders: Pulm, Respiratory, Trauma, Nursing, SCI
- Barriers: lack of early vent wean data in SCI, competing theories for vents in different populations, practices based on tradition, experience, practicality
- Outcome: Unified, RT lead approach at SCI rehab, hope to unify all vent management, Removed inefficient protocols

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SCI Medical Home

- Goal: coordinate, competent, accessible preventative health care
- Stakeholders: FM/IM, Therapy, Research, SCI community, SCI providers, nursing/administration
- Barriers: reeducating providers and patients, coordination effort, space and cost, redundant effort
- Outcome: SCI Medical Home Clinic with PT, OT, SCI, PCP, Nursing and Research. Hope to continue to expand and streamline

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SCI Urodynamics Clinic

- Goal: available, accessible urodynamic studies for SCI
- Stakeholders: Urology, Research, Nursing, SCI, administration
- Barriers: inaccessible equipment, lack of urology bandwidth or buy-in, resistance to shared research/clinical space and equipment, need support staff
- Outcome: SCI Urodynamic Lab (clinical/research collaboration)

What's Next for Metro SCI Interdisciplinary Efforts?

- SCI Wound Prevention Protocols
- SCI Women's Health Clinic
- SCI Sexuality and Fertility Clinic
- Model System Gabapentin Study

2021-2026 SCIMS Project

Feasibility of Early Gabapentin as an Intervention for Neuroprotection

- Preclinical and retrospective data suggest early gabapentin has a persistent, positive effect on motor and autonomic neurologic recovery.
- Several feasibility questions
- Randomized, controlled gabapentin vs placebo within 120 hours
  - Screening / Consent / Randomize / Baseline data

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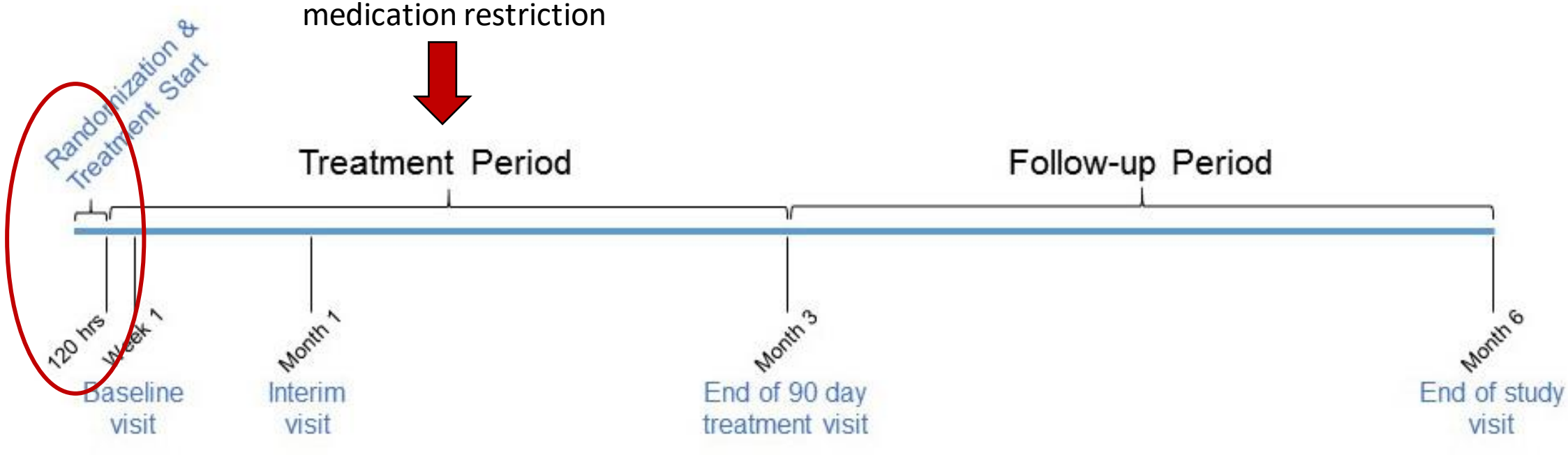
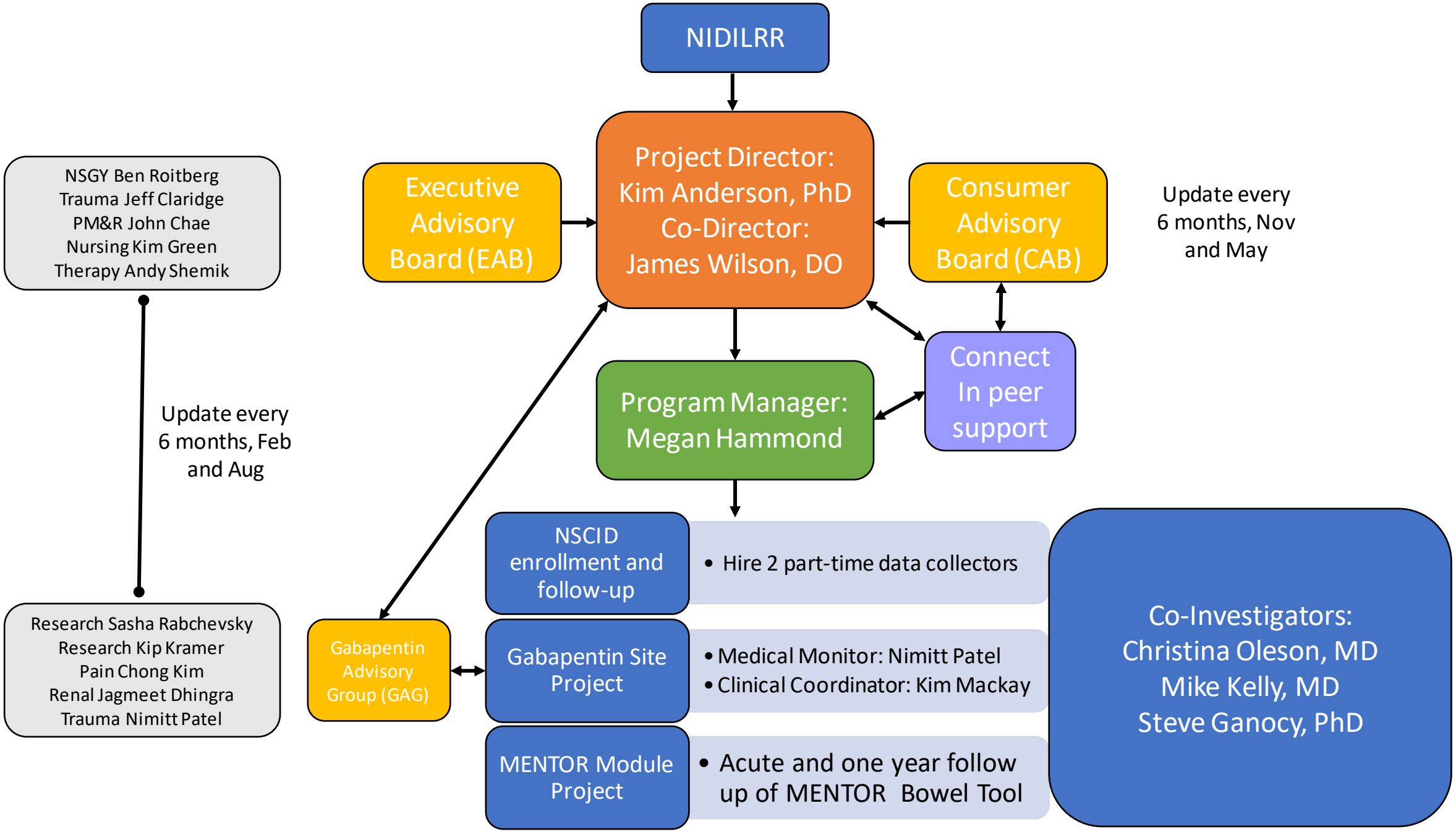
Only time there is medication restriction



Cleveland Clinic MetroHealth University Hospitals Southwest General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Research Kip Kramer
Pain Chong Kim
Renal Jagmeet Dhingra
Trauma Nimitt Patel
Gabapentin Advisory Group (GAG)
NSCID enrollment and follow-up
• Hire 2 part-time data collectors
Gabapentin Site Project
• Medical Monitor: Nimitt Patel
• Clinical Coordinator: Kim Mackay
MENTOR Module Project
• Acute and one year follow up of MENTOR Bowel Tool
Co-Investigators:
Christina Oleson, MD
Mike Kelly, MD
Steve Ganocy, PhD

Questions?

- Thank you!!