Hypermobility 102:

Postural Orthostatic Tachycardia Syndrome (POTS) and Mast Cell Activation Syndrome (MCAS) Associated with Hypermobility Spectrum Disorder

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Slides are available on my web site:

https://webspace.clarkson.edu/~lrussek/hsd.html

Who Am I?

- Professor Emeritus, Physical Therapy Department, Clarkson University
- Staff PT, St. Lawrence Health System, Potsdam NY
  - Clinical specialties: hypermobility, fibromyalgia, headaches, temporomandibular disorders
- Frequent presenter to professional and patient groups at national conferences
- Author of multiple review and research articles on hypermobility
- Author of ”Chronic Pain” chapter in *Physical Rehabilitation* textbook for PT students
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I do not have any conflicts of interest to report

DISCLAIMER

- I cannot provide individual medical advice in this presentation: I cannot diagnose or provide personal treatment recommendations.
- The information provided here is generally applicable to HSD/hEDS, but your personal situation may be different.
- You should discuss options with your healthcare provider before starting a new management approach.

“HSD 101” Lecture Series

I will refer to these if you want more info

- HSD 101: Basics of HSD/hEDS and self-care
- HSD 102: POTS and POTS self-care, basics of MCAS
- HSD 103: Pain management in HSD/hEDS
- HSD 104: Safe exercise selection and progression with HSD/hEDS
- HSD 105: Posture and joint protection
- HSD 106: Gut issues in HSD/hEDS, POTS, MCAS
- HSD 107: Fatigue in HSD/hEDS and POTS
- HSD 108: Headaches, migraines, and TMJ pain in HSD, POTS and MCAS
- HSD 109: Breathing dysfunctions in HSD
- HSD 110: Lumbar instability
- HSD 111: Cervical instability
- HSD 112: The vagus nerve
- HSD 113: The importance of fascia
- HSD 114: Surgery and hospitalization precautions

Relevant Handouts Available

I will refer to these if you want more info

- https://webspace.clarkson.edu/~lrussek/research.html
- **POTS**
  - Overview of POTS symptoms and causes.
  - Checklist for POTS self-care management.
  - Flow charts for POTS management, including fatigue and sleep.
- **MCAS self-care**
  - Suggestions for managing MCAS.
  - How to check your medications for (MCAS) sensitivities.
- **General Self-Care Strategies**
  - Breathing. Breathing incorrectly can increase pain sensitivity, headaches, jaw pain, and more.
- **Links to other resources**
  - www.potsuk.org POTS-UK
  - http://www.dysautonomiainternational.org Dysautonomia International.
  - https://www.dysautonomiasupport.org/handbooks/ Disautonomia Support has excellent suggestions about school and work accommodations for POTS
  - https://tmsforacure.org The Mast Cell Disease Society.
  - https://www.mastzellaktivierung.info/en/introduction.html. (has English language pages)

Learning Objectives

At the end of this session, participants will be able to:

1. Describe the possible relationships among HSD, POTS and MCAS
2. Recognize signs and symptoms of Postural Orthostatic Tachycardia Syndrome (POTS) as the most common form of dysautonomia; contrast with Orthostatic Intolerance (OI)
3. Describe self-management strategies for POTS
4. Identify medical approaches to POTS management
5. Recognize signs and symptoms of Mast Cell Activation Syndrome (MCAS)
6. Describe self-management approaches for MCAS.

Approach to Management of HSD

Assist patient in identifying and managing systemic comorbidities: education, treatment and/or referral

Decrease central, peripheral, and autonomic pain sensitization

Educate for correct posture and joint alignment, body mechanics, joint protection, appropriate use of splints and braces

Proprioceptive and motor control training, with training to relax muscles that are guarding

↓

Stabilization, strengthening, muscle flexibility, aerobic conditioning

↓

Integration of proper alignment & movement into function

↓

Education about flare management

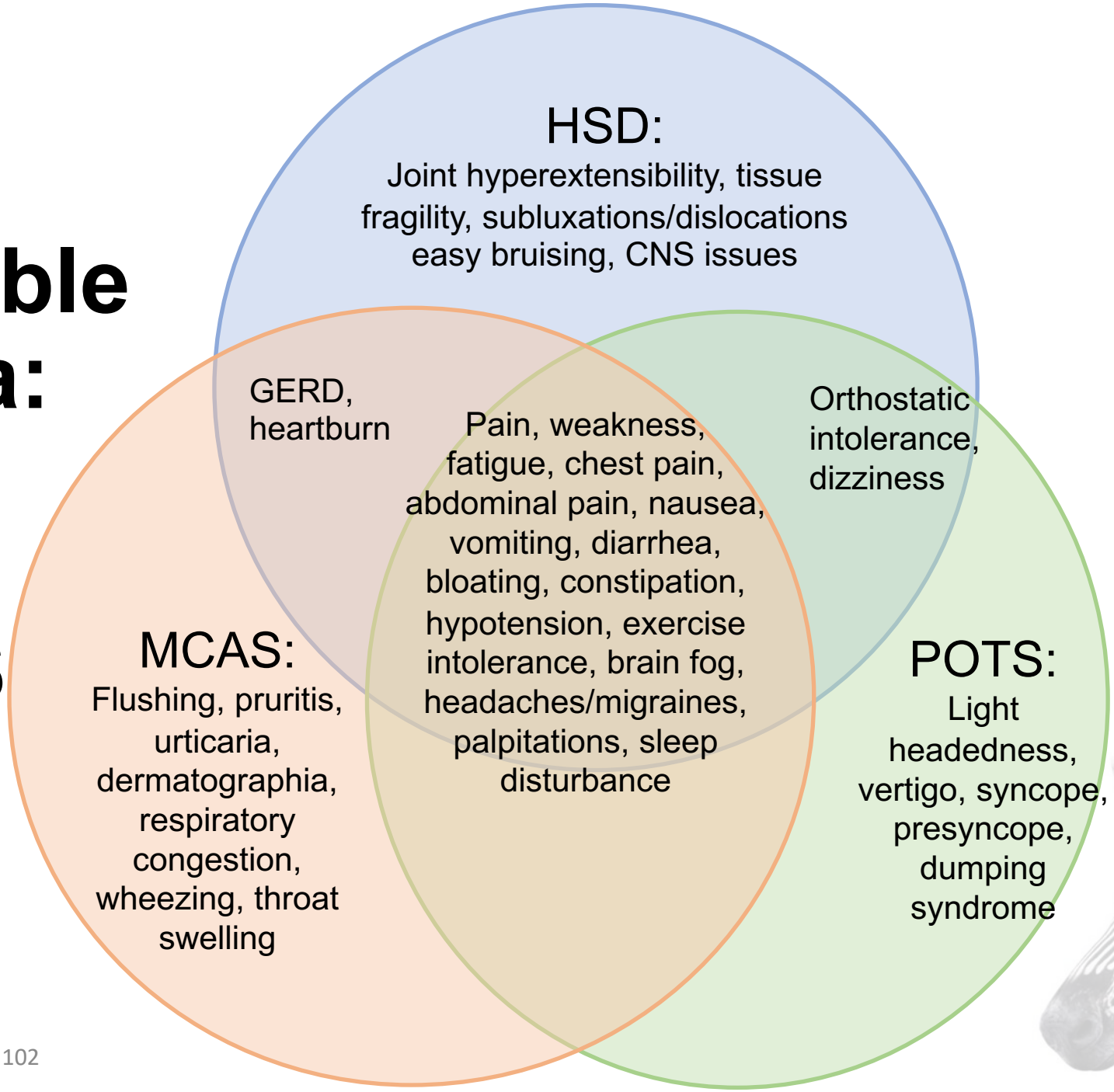
Why Discuss POTS, MCAS?

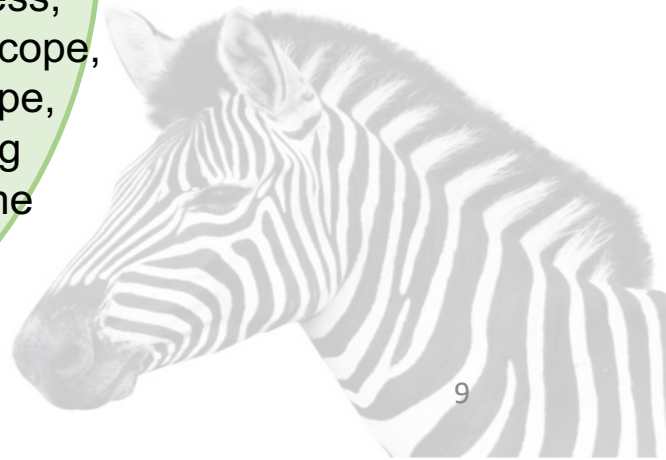
Why are we talking about POTS and MCAS in "HSD102"?

- POTS, MCAS and Hypermobility frequently co-exist as **"The Terrible Trifecta"**
- Together, HSD, POTS, and MCAS look like fibromyalgia
- Interestingly… POTS, MCAS & Chronic Fatigue Syndrome/Myalgic Encephalitis look like Long-COVID

- Russek LN. Is it really fibromyalgia? Recognizing mast cell activation, orthostatic tachycardia, and hypermobility. *Orthopaedic Practice.* 2018;30(3):187-193. Available on-line at: https://www.researchgate.net/publication/326426655_Is_It_Really_Fibromyalgia_Recognizing_Mast_Cell_Activation_Orthostatic_Tachycardia_and_Hypermobility ..

The Terrible Trifecta: HSD POTS MCAS

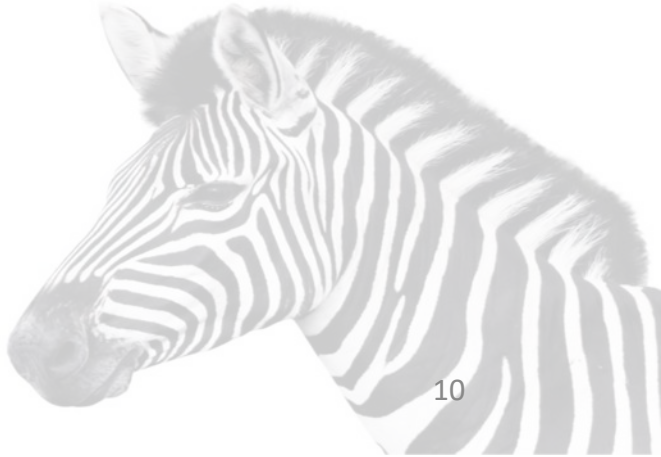




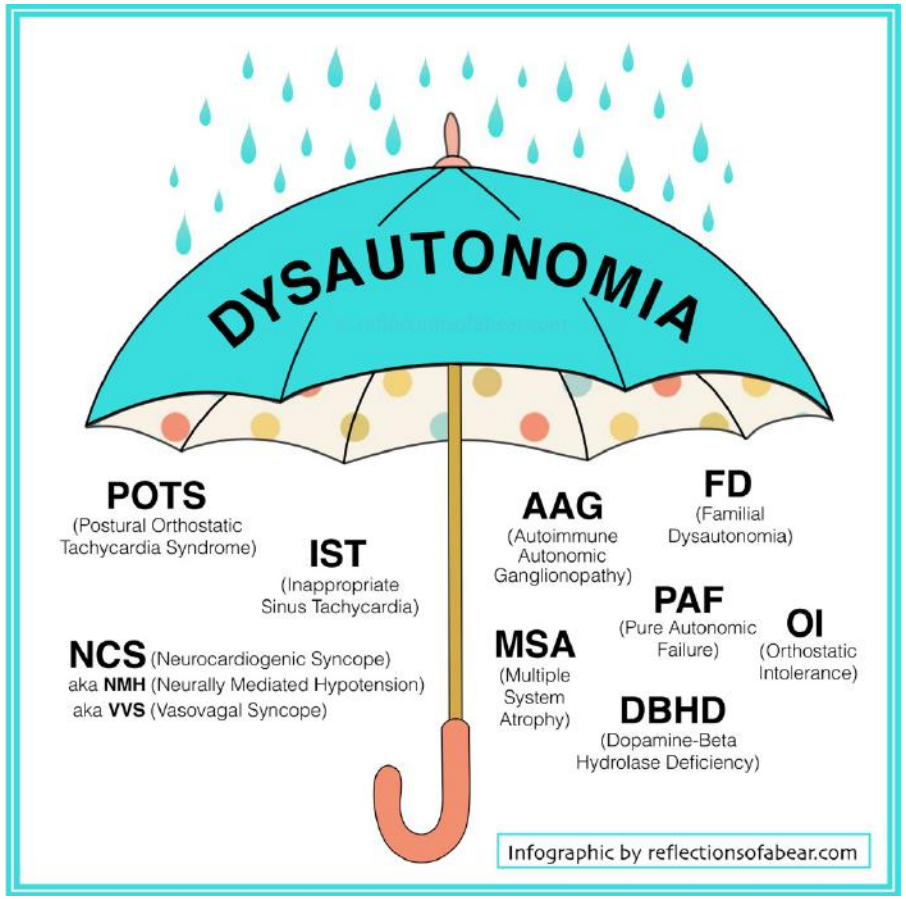
Dysautonomia & POTS

Why is it so common in HSD?

- Mechanical reasons
- Neurological reasons



Types of Dysautonomia



If your body is able to compensate with increased heart rate:

- Postural Orthostatic Tachycardia Syndrome (POTS) – most common

If your body is NOT able to compensate with increased heart rate (e.g. 'just because' or due to meds such as anxiety meds):

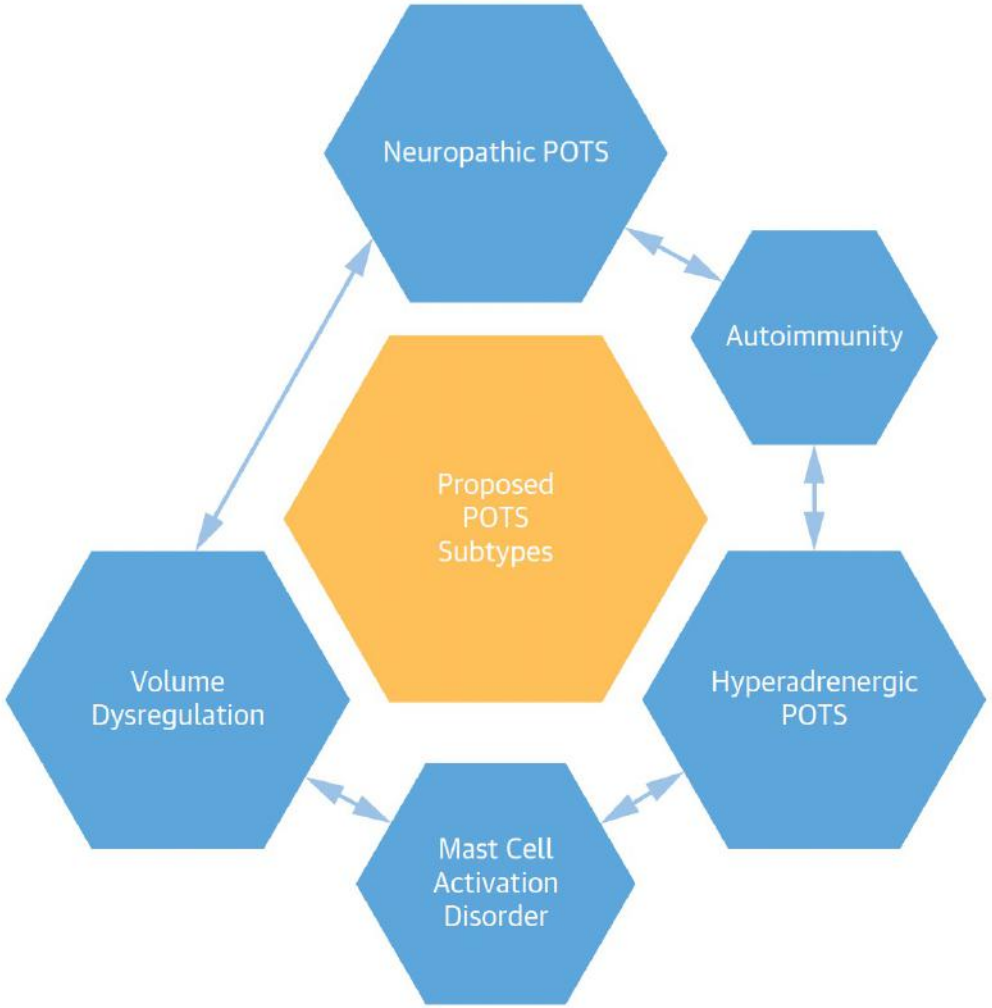
- Orthostatic hypotension/ intolerance (OI) is also common.
  - Tinkle et al, 2017

Types of POTS

- Volume dysregulation (30%)
  - Due to stretchy veins, pooling
  - Maybe common in HSD?
- Neuropathic POTS (>50%)
  - Decreased autonomic nerve function
  - Less anxiety & depression, ↓ sweating
  - Maybe associated with neck problems?
- Mast Cell Activation (controversial)
  - Flushing, short of breath, headache, lightheaded, ↑ sweating, GI symptoms
  - Maybe contributes to POTS & HSD?
- Hyperadrenergic (30-60%)
  - Palpitations, tremulous, sweating, nausea
  - Increased by exercise & stress
- People may have multiple types or switch among different types
- Non-pharmacological management probably the same

(Bryarly, 2019)

FIGURE 3 POTS and Proposed Subtypes



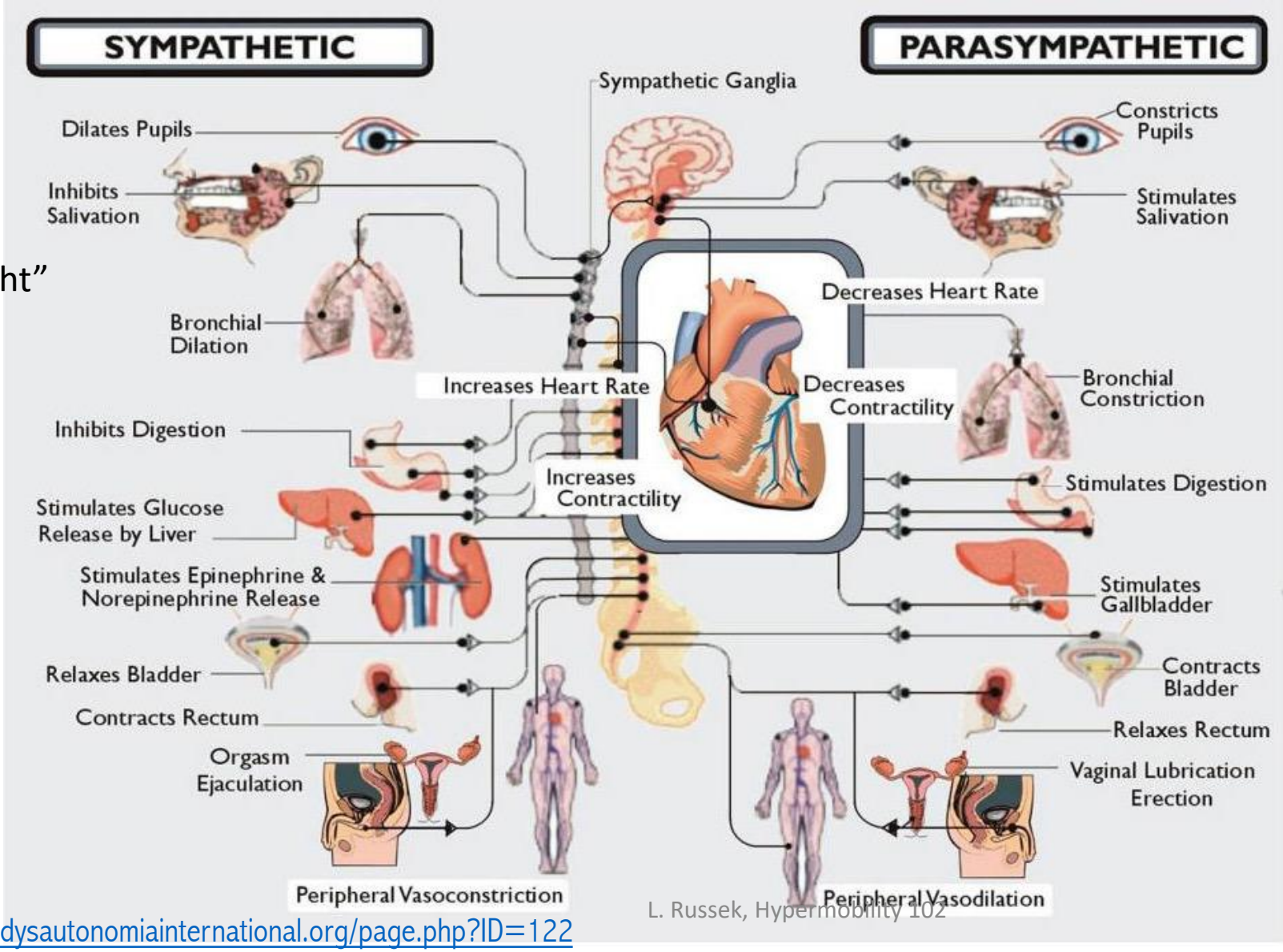
Several subtypes of POTS have been proposed and include neuropathic POTS, autoimmunity, hyperadrenergic POTS, mast cell activation disorder, and volume dysregulation. These subtypes are not mutually exclusive or clearly independent. POTS = postural orthostatic tachycardia syndrome.

Prevalence of POTS

- Prevalence not known, as it is often undiagnosed
- Diagnosis often requires ≥4 years, 7 MDs
- Maybe 0.5-3M in US
  - This is more than all MS and Parkinson's together
- Maybe 1% of all teenagers
  - 52% have onset ≤ 18 years old..
- (Stiles, 2017)

The Autonomic Nervous System

”Fight or Flight”

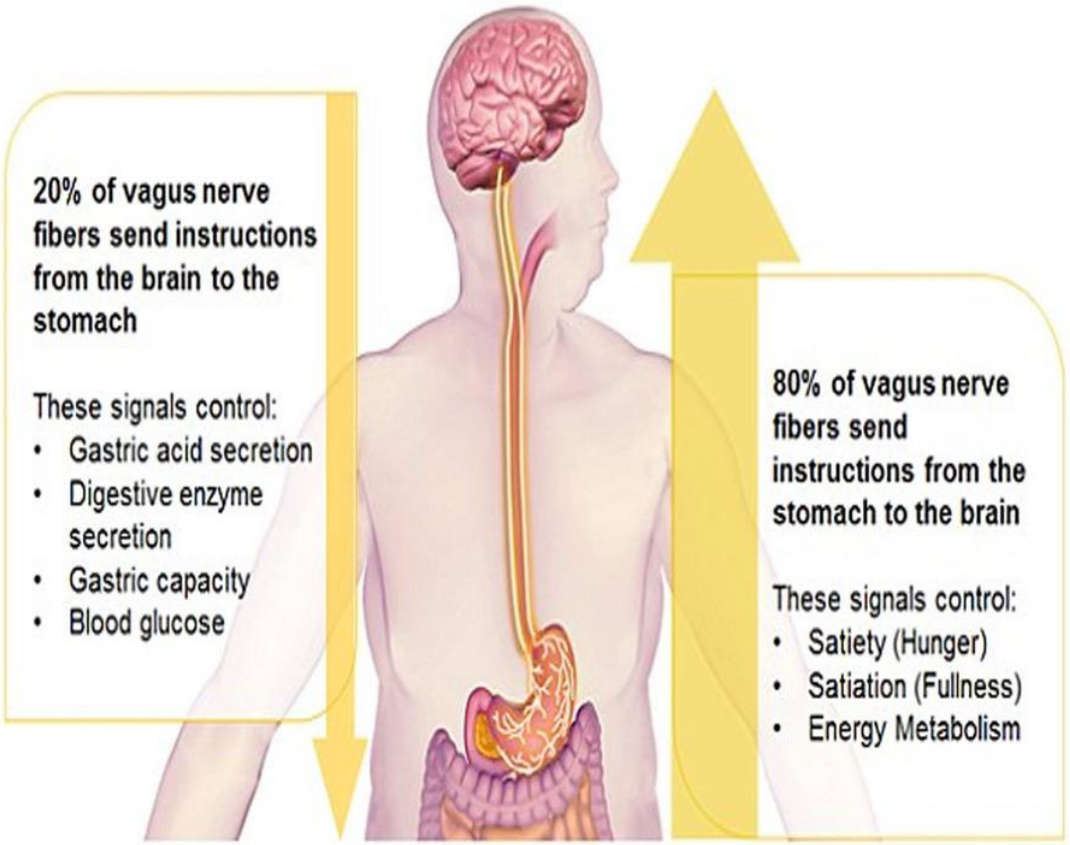


”Rest and Digest” or
“Breed and Feed”

http://www.dysautonomiainternational.org/page.php?ID=122

Vagus Nerve and Dysautonomia

HSD 112: The vagus nerve

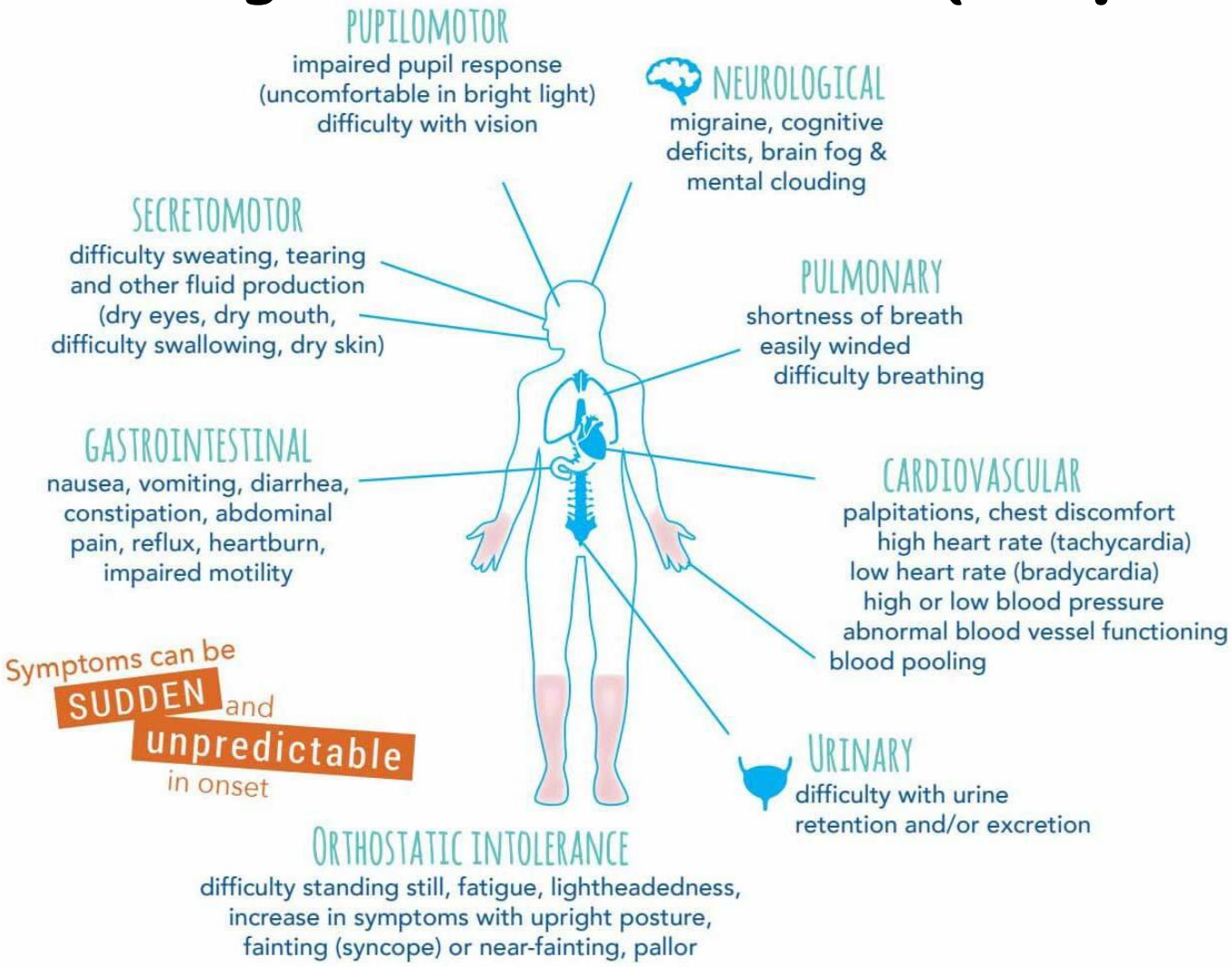


- Vagus nerve:
  - Controls autonomic function (sympathetic/ parasympathetic activity)
  - Communicates from the body to the brain
- Vagus nerve function is disrupted in POTS

- Anjum, 2018

https://www.facebook.com/IBSHelpisHere/photos/pcb.326199840910720/326199620910742/

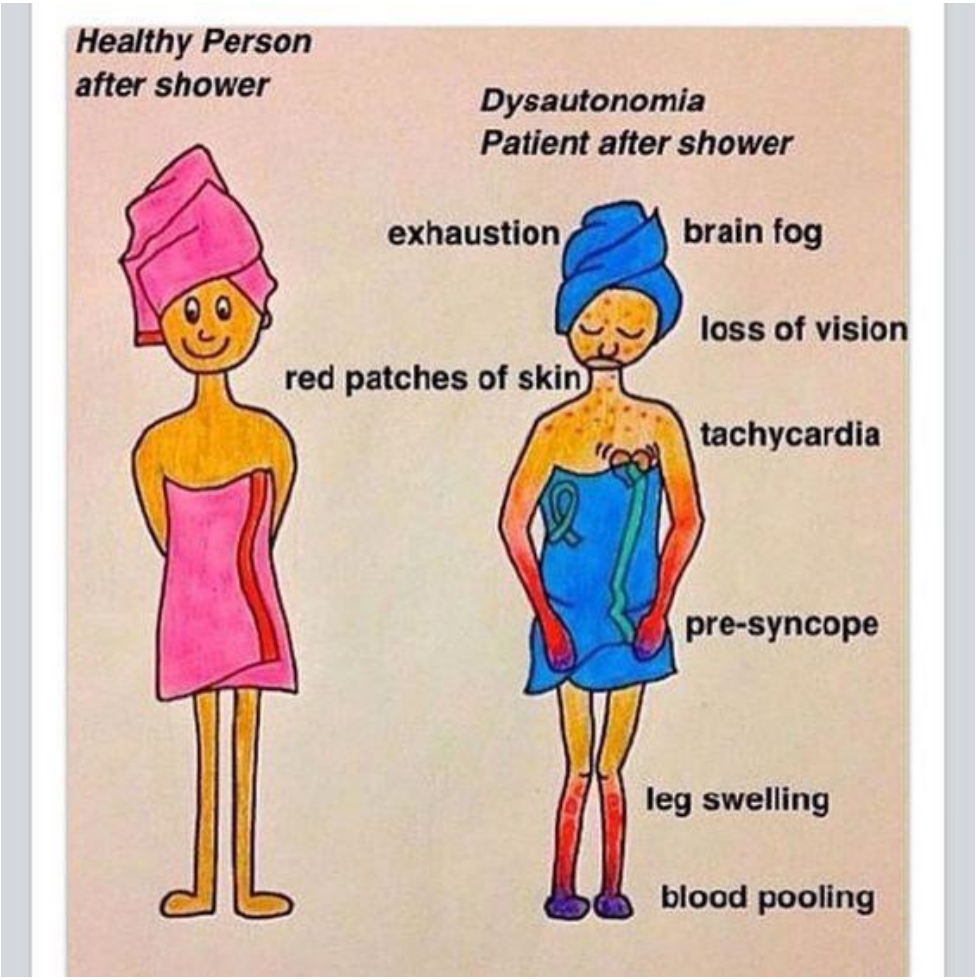
Dysautonomia (especially POTS)



- Hypovolumic POTS
  - Extreme fatigue, exercise intolerance
- Neuropathic POTS
  - Hx of surgery, infection, trauma; acrocyanosis (purple) feet standing
- Hyperadrenergic POTS
  - Dizziness, headache, tremulousness

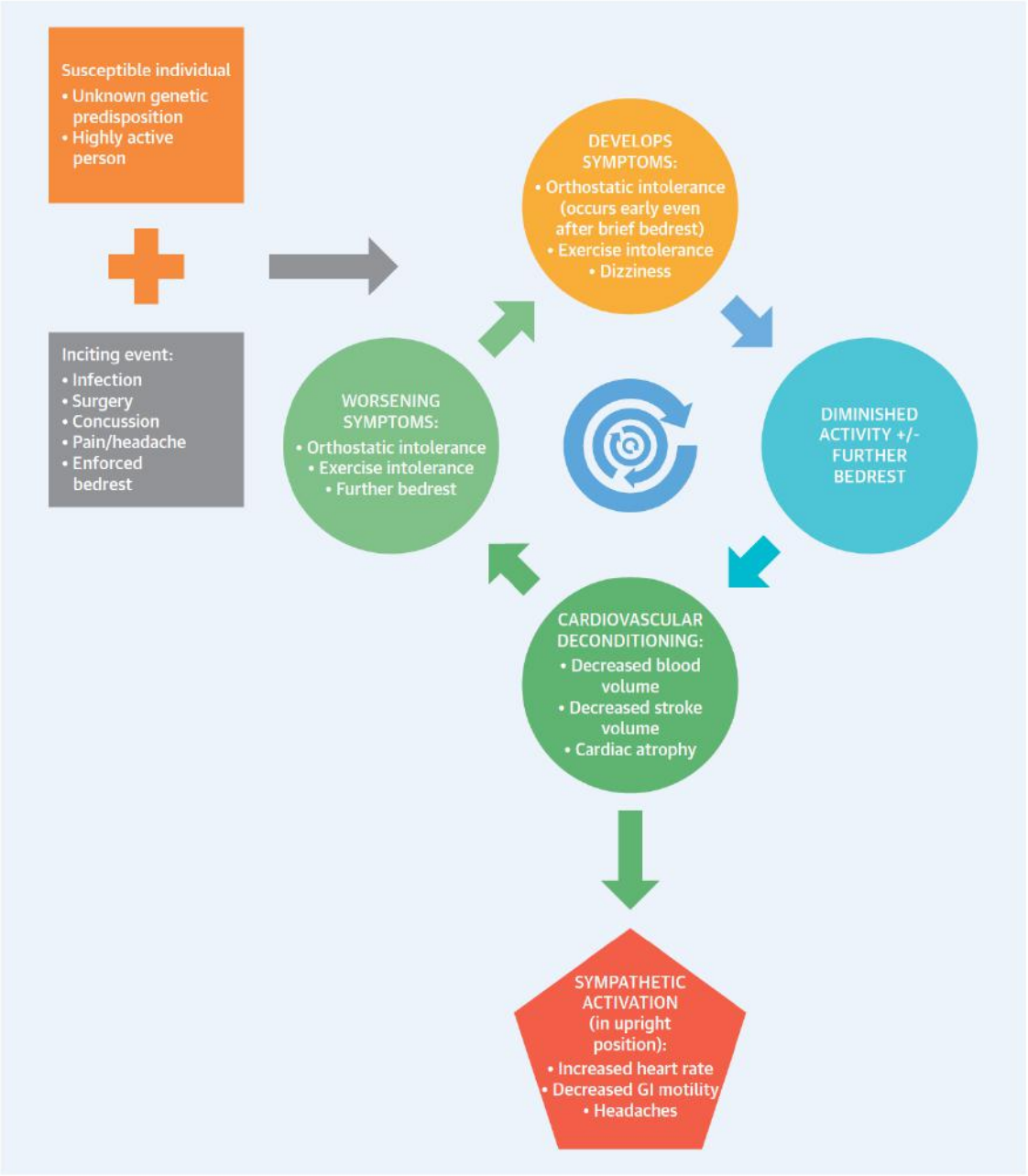
Zhang, 2020

POTS Looks Like…



Acrocyanosis
Stiles, 2017

CENTRAL ILLUSTRATION Postural Orthostatic Tachycardia Syndrome: Downward Spiral



Bryarly, M. et al. J Am Coll Cardiol. 2019;73(10):1207-28.

- HSD is a risk factor
- Common triggers:
  - Puberty
  - Concussion or trauma
  - COVID or other viral illness
  - Deconditioning
  - Sleep disorders
  - Upper cervical instability?
- Prevalence 6.8% in children/teens
- 1/3 of patients develop POTS symptoms before age 18
  - Median age 13.1 yrs
  - Female:male ratio is 5:1

Chen, 2020; Zhang, 2020
Wells, 2018; Fedorowski, 2019

Characteristics of POTS

- In a sample of 779 people with POTS in the UK
  - 92% were female
  - 81% were 18-49 years old
  - Most common symptoms:
    - Fatigue: 91%
    - Dizziness & near-fainting: 90%
    - Palpitations: 86% (may present as anxiety)
    - Fainting or blackouts 58%
    - Brain fog, trouble concentrating 40%
  - 37% stopped working due to POTS
  - Of school age respondents, 50% missed 3 months or more of school..

- Kavi, 2016

POTS-Related Headaches

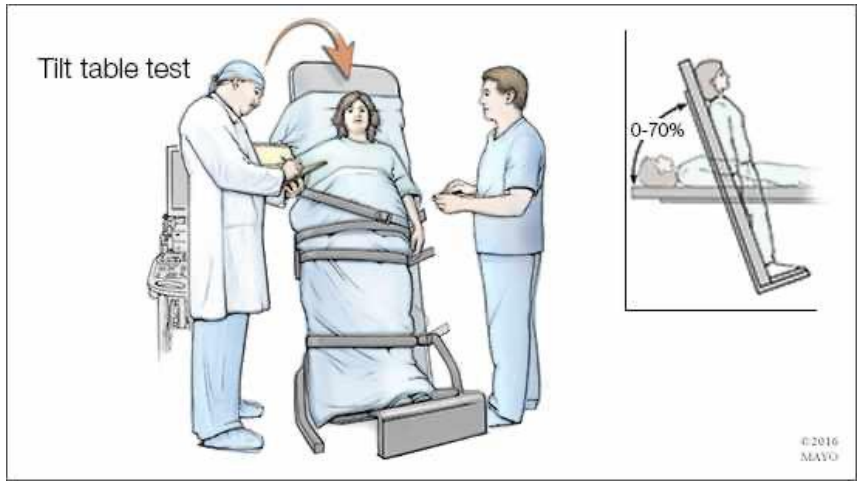
HSD 108: Headaches

- Headaches and migraines are common in POTS: 41-96%
- Migraines most common in POTS
- Sleep-disturbance HA
- Coat-hanger HA

- POTS is commonly overlooked in patients with migraine

- (Cook, 2018; Wig, 2019; Fedorowski, 2019)

POTS Diagnostic Criteria



- Stand Test, Lean Test, Tilt Table Test:
- Adults: Heart rate increases (and remains high for several minutes) ≥30 bpm from lying down to upright (10 min). BP drop < 20/10
- Children: HR increases ≥ 40 bpm
  - OR maximum HR >130 BPM, (6-12 y/o), 125 BPM (13-18 y/o)
- Symptoms worsen with standing and improve lying down
- Symptoms last ≥ 6 months
- Absence of other obvious cause of orthostatic symptoms or tachycardia (e.g., active bleeding, acute dehydration, medications)..

Instructions for POTS Stand Test available at:
https://batemanhornecenter.org/assess-orthostatic-intolerance/

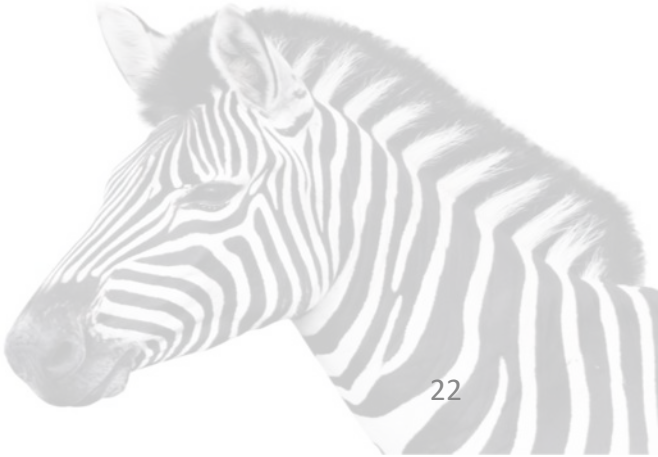
Raj et al, 2013

Common Triggers of POTS Episodes

POTS Checklist

- Excess heat (hot weather, showers, etc.)
- Eating – especially refined carbohydrates & sugar
- Rapid position changes, sitting/standing up quickly
- Dehydration
- Time of day (especially mornings)
- Menstrual period (for women)
- Alcohol (which dilates blood vessels)
- Inappropriate or unaccustomed exercise

https://www.potsuk.org/symptoms ..



Questions?

POTS Checklist

POTS/OI Self-Care

Orthostatic Intolerance and Postural Orthostatic Tachycardia Self-Care Checklist

1. **Identify and avoid your triggers**
   a. Physical triggers:
      - ☐ Extreme heat, hot showers/baths.
      - ☐ Standing up quickly or for long periods.
      - ☐ Holding arms up for an extended time.
      - ☐ Lifting objects over 10–15 pounds.
      - ☐ Climbing long flights of stairs.
      - ☐ Donating blood.

   b. Food/beverage triggers:
      - ☐ Getting dehydrated.
      - ☐ Caffeine (especially energy drinks).
      - ☐ Extra-large meals, especially high carbohydrate or sugar meals.
      - ☐ Alcohol.
      - ☐ Foods high in gluten or other allergens.

   c. Psychological triggers:
      - ☐ Stress at home or work; (note that POTS is not just anxiety and is not caused by anxiety).
2. **Learn short-term 'countermeasures' to control acute onset of symptoms**
   a. Standing:
      - ☐ Cross and squeeze legs and buttocks; Squat; Do calf raises, Stand with one leg on a chair.
      - ☐ Shift weight side-to-side, bounce on your toes, fidget, walk in place.
      - ☐ Bend slightly forward from the waist (such as leaning over a shopping cart).

   b. Sitting:
      - ☐ With knees tucked to your chest.
      - ☐ With feet propped/elevated.
      - ☐ Leaning forward with hands on the knees.

   c. Lying down:
      - ☐ With feet propped up on a chair or against a wall; pumping your feet helps even more. Try not to lie still for a long time, as this can make POTS symptoms worse.

   d. Other:
      - ☐ Before sitting or standing up, pump the ankles, then tense and release your thighs, then your buttocks; Squeeze a ball to pump your arms.
      - ☐ Take deep belly breaths to help return fluids to your heart. Inhale against resistance (like sucking in air through a straw). Cough.
      - ☐ Cool your skin with a water mister or cold wet cloth on your face. Finish showers with cool water.

3. **Implement long term prevention/self-care**
   a. Food/beverage strategies
      - ☐ Drink lots of fluid and electrolytes (100 ounces, or 3L, per day). Avoid sugary drinks.
      - ☐ Eat lots of salt (8-10 grams per day) and/or use an electrolyte supplement.
      - ☐ Eat small, frequent meals (with salt); avoid high sugar/carbohydrate foods.

   b. Physical strategies
      - ☐ Get up and move around frequently throughout your day. This decreases blood pooling.
      - ☐ Practice deep, diaphragmatic breathing at least once a day, preferably more often.
      - ☐ Use compression socks/stockings (20-40 mmHg, waist high works best) or an abdominal binder.
      - ☐ Participate in an appropriate exercise program. Some people need to start in a reclined position and focus on leg and core strength. (i.e.: recumbent bike, swimming, row machine, leg machines). Progress gradually.

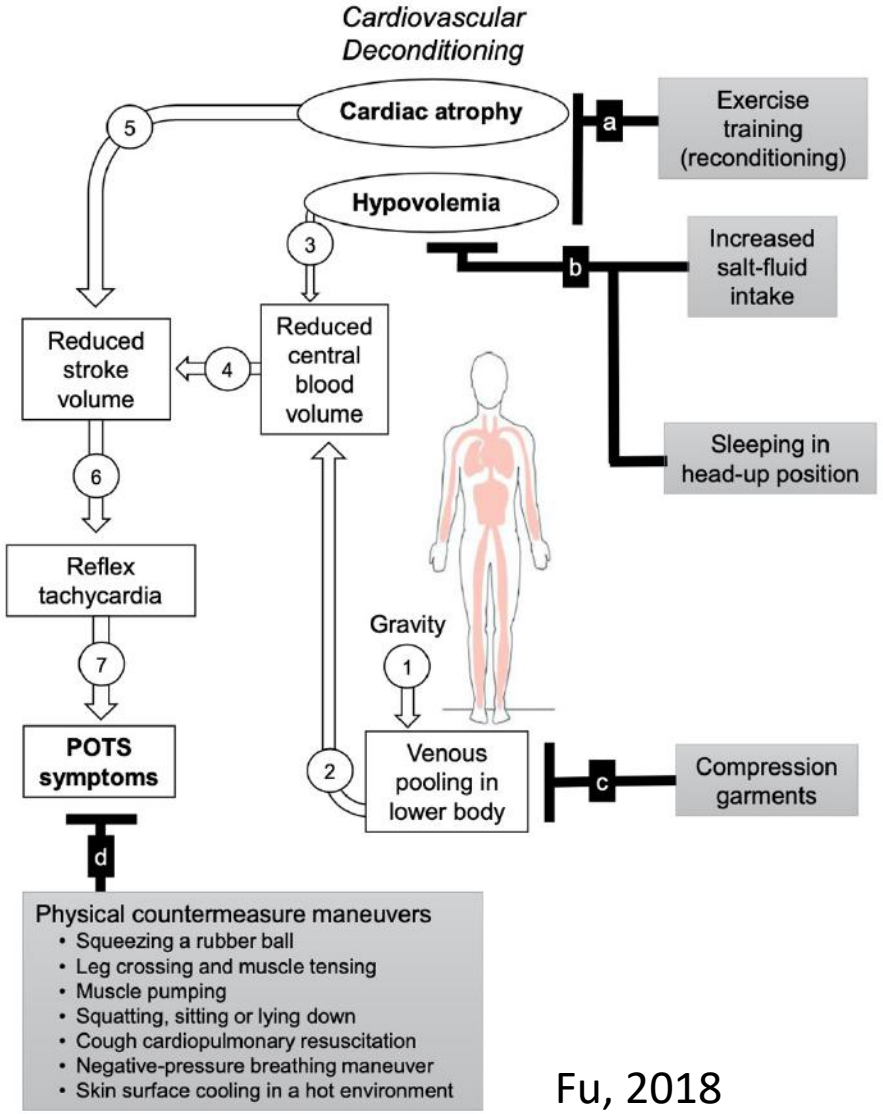
   c. Psychological strategies
      - ☐ Relaxation practice through diaphragmatic breathing, meditation, biofeedback, etc.

Leslie Russek, PT, DPT, PhD, Clarkson University

1. Avoid POTS/OI Triggers

- **Physical triggers:**
  - Extreme heat, hot showers/baths.
  - Standing up quickly or for long periods.
  - Holding arms up for an extended time.
  - Lifting objects over 10–15 pounds.
  - Climbing long flights of stairs.
- **Food/beverage triggers:**
  - Getting dehydrated.
  - Caffeine (especially energy drinks).
  - Extra-large meals, especially high carbohydrate or sugar meals.
  - Alcohol.
  - Foods high in gluten or other allergens.
- **Psychological triggers:**
  - Stress at home or work; (note that POTS is not just anxiety and is not caused by anxiety).

Overview of POTS Management



Fu, 2018

- Countermeasures for acute symptoms
- Long term management to prevent/control symptoms

2. Physical Countermeasures For Immediate Relief

Physical countermeasure maneuvers

Maneuvers	Brief description	Action mechanisms
Squeezing a rubber ball	Static or rhythmic muscle contraction to increase mean arterial pressure and prevent orthostatic intolerance or syncope	Sympathetic activation, vagal withdraw, or both via the exercise pressor reflex
Leg crossing and muscle tensing	Crossing one foot in front of the other and squeezing the thighs and gluteal muscles together	Restoration of venous return and prevention of further blood pooling in the lower body
Muscle pumping	Swaying, shifting, tiptoeing, or walking	Activation of the muscle pump in the legs to increase venous return
Squatting, sitting, lying down	Squatting is a combination of sitting, bending and muscle tensing; sitting and lying down to reduce/eliminate gravitational stress	Facilitating venous return from the legs to the heart and increasing central blood volume
Cough cardiopulmonary resuscitation	Forceful coughing	Increasing intrathoracic pressure to force blood out of the chest into the aorta and its braches
Negative-pressure breathing maneuver	Breathe through an inspiratory impedance threshold device	Using endogenous respiratory pump to increase venous return and central blood volume
Skin surface cooling	Spray cold water, use fan and cooling towel to cool the skin in a hot environment	Decreasing blood supply to the skin and reducing clinical symptoms

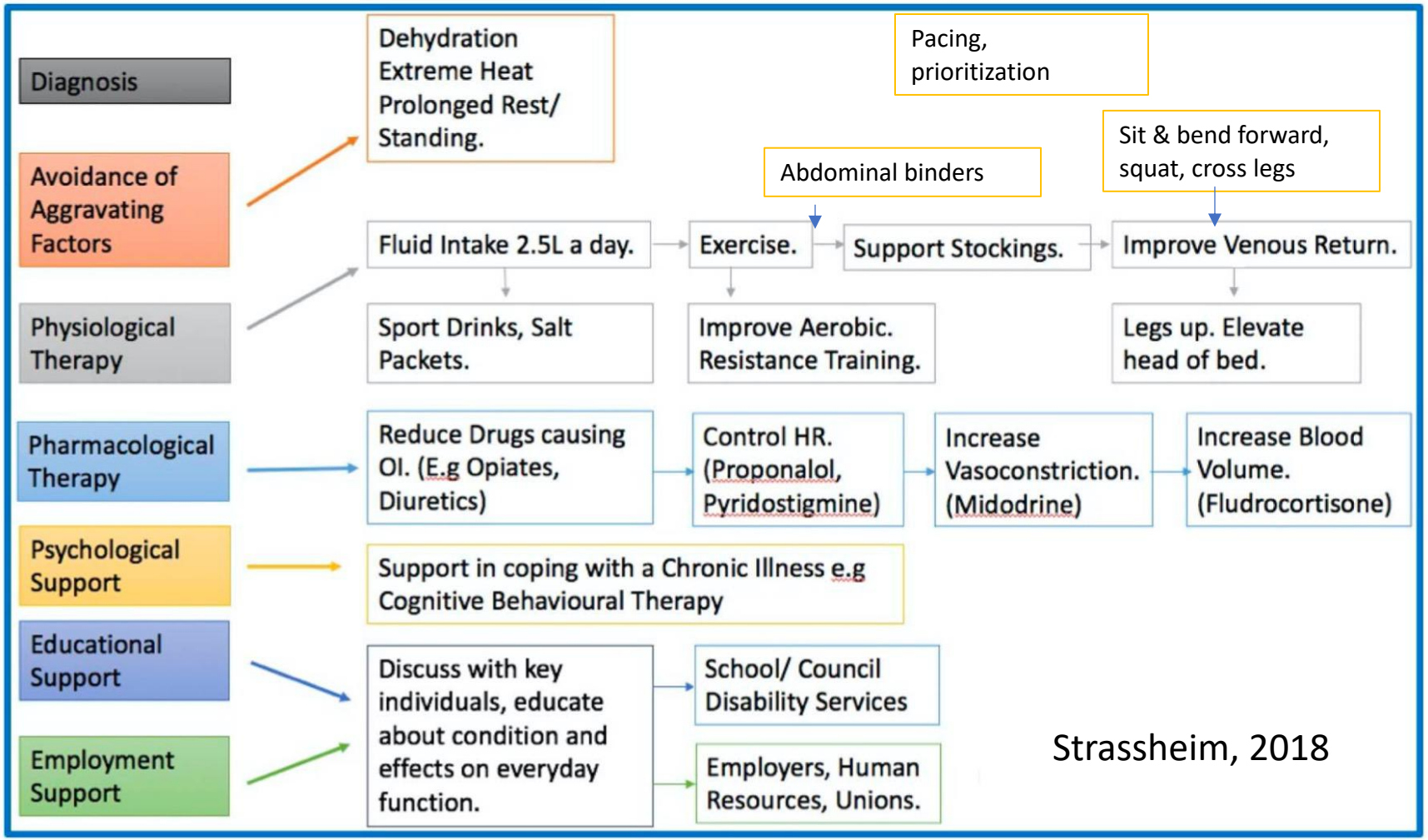
Fu, 2018

3. Long-Term Control of POTS/OI

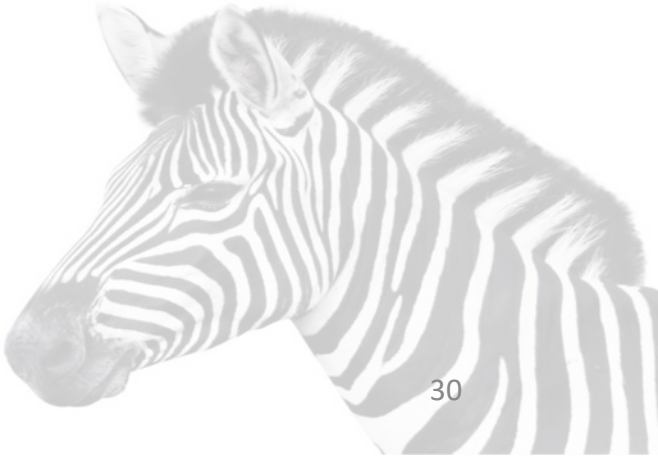
- **Food/beverage strategies**
  - Drink lots of fluid and electrolytes (100 ounces, or 3L, per day). Avoid sugary drinks.
  - Eat lots of salt (8-10 grams per day) and/or use an electrolyte supplement.
  - Eat small, frequent meals (with salt); avoid high sugar/carbohydrate foods.
- **Physical strategies**
  - Get up and move around frequently throughout your day. This decreases blood pooling.
  - Practice deep, diaphragmatic breathing at least once a day, preferably more often.
  - Use compression socks/stockings (20-40 mmHg, waist high works best) or an abdominal binder.
  - Appropriate exercise. Some people need to start in a reclined position and focus on leg and core strength. (i.e.: recumbent bike, swimming, row machine, leg machines). Progress gradually.
  - Place 6” blocks under the head of your bed; this helps you retain fluid overnight.
- **Psychological strategies**
  - Relaxation practice through diaphragmatic breathing, meditation, biofeedback, etc.

Managing Fatigue

HSD 107: Fatigue in HSD & POTS



Strassheim, 2018



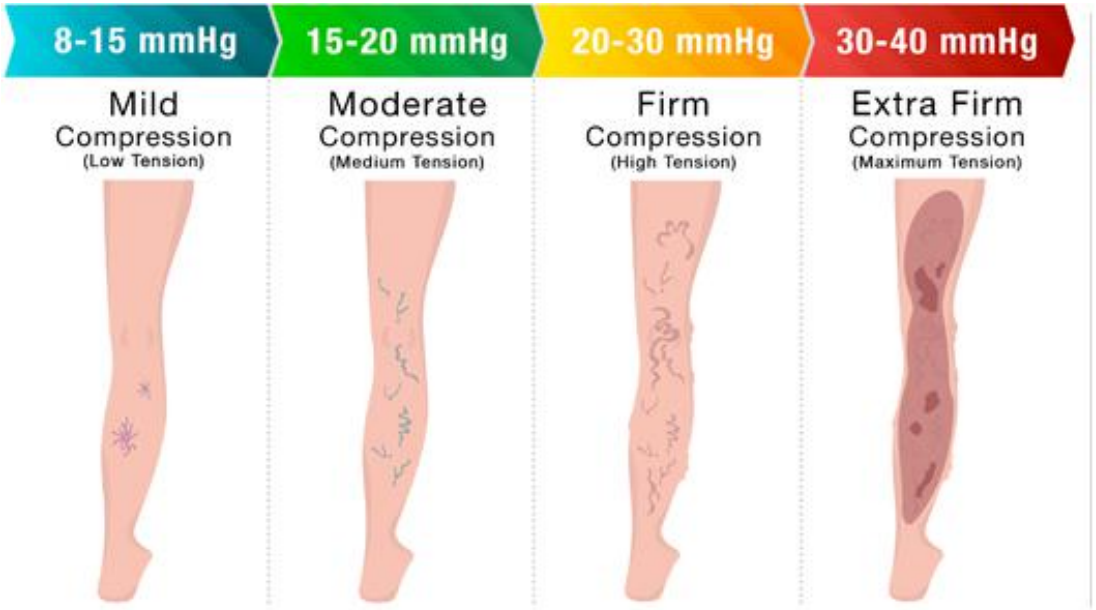
Managing Poor Quality Sleep

Sleep Hygiene & Positioning

HSD 107: Fatigue in HSD & POTS

- Address pain interfering with sleep
  - Positioning for decreased pain
  - General pain management
  - Mindfulness meditation/relaxation
- Sleep hygiene
  - Cool, dark room; winding down routine; avoid screens 1-2 hrs before bed
- Physiological quieting, relaxation training
- Regular exercise
- Good information at https://sleep.org .

Compression Garments for POTS



MILD COMPRESSION (8-15 mmHg)

Best for healthy legs with few or no visible symptoms.For proactive and preventative wear.

MODERATE COMPRESSION (15-20 mmHg)

Best for legs with minor to moderate symptoms. The common starting point for first time wear.

FIRM COMPRESSION (20-30 mmHg)

Best for legs with major symptoms and/or severe conditions. Wear when specifically directed by a doctor or health care provider.

EXTRA-FIRM COMPRESSION (30-40 mmHg)

Best for legs with severe conditions. Wear when specifically directed by a doctor or health care provider.

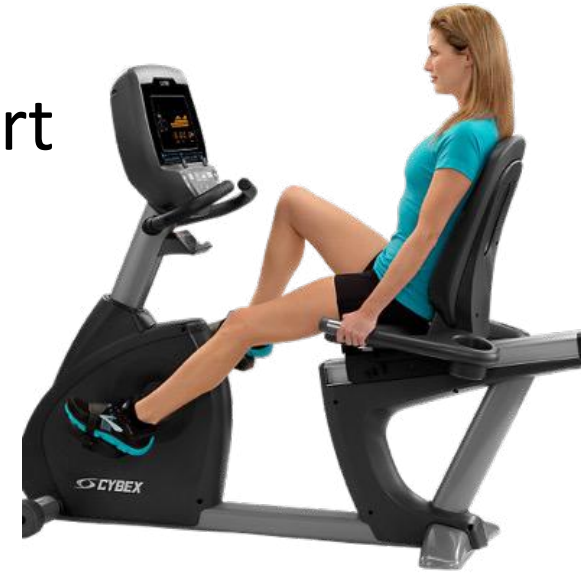
- Compression stockings 20-40 mmHg
  - Consider compressive sports clothing or slimwear
  - Abdominal binder/compression or compression shorts
  - Compression tights for PoTS should be waist high for maximum benefit. Knee high socks seldom ideal.
  - CWX brand, Old Navy, FourYourLegs, BrightLifeDirect, etc.
- https://www.potsuk.org/compression_clothing

POTS Exercises: Starting Out

Starting to Exercise

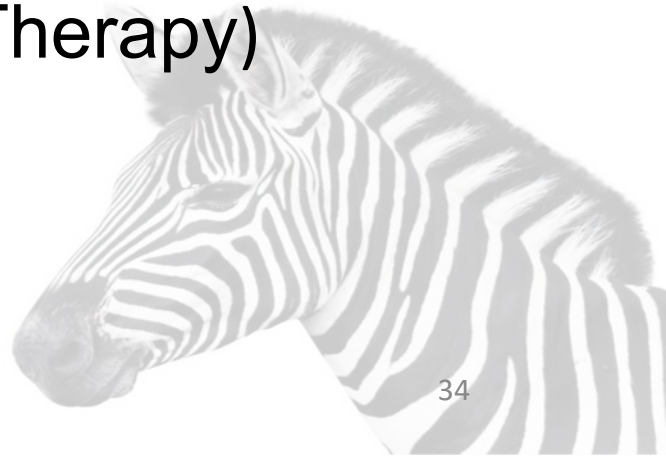
If you are very deconditioned, start easy:

- Lying down exercises encourage blood return to heart
  - Squeeze pillow between legs; Pillow between palms
  - Ankle alphabets; Leg lifts
  - Core exercises (lying down)
  - Muscle stretching (careful to protect hypermobile joints)
- Progress exercises gradually
  - Start horizontal, progress to vertical
  - Start with lower extremity exercise, add upper
  - May need to start with compression garments
- Recumbent (horizontal) cardio exercises:
  - Pool exercise, recumbent bike, rowing
- The Levine Protocol: http://standinguptopots.org/treatment/exercisehttps://heartofthevalley.us/docs/levin-protocol-example/ ..



POTS Exercise Protocols

- Old exercise protocols
  - CHOP (Children's Hospital of Philadelphia)
  - Lavine protocol
- NEW exercise protocols
  - CHOP AADP (Children's Hospital of Philadelphia Acquired Autonomic Dysfunction Protocol)
  - ADaPT (Autonomic Disorder *adaptive* Physical Therapy)

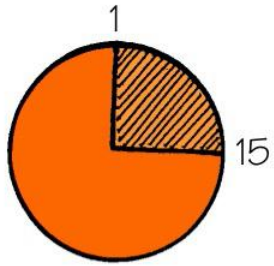


Gastrointestinal Issues in POTS

HSD 106: Gut Issues in HSD, MCAS & POTS

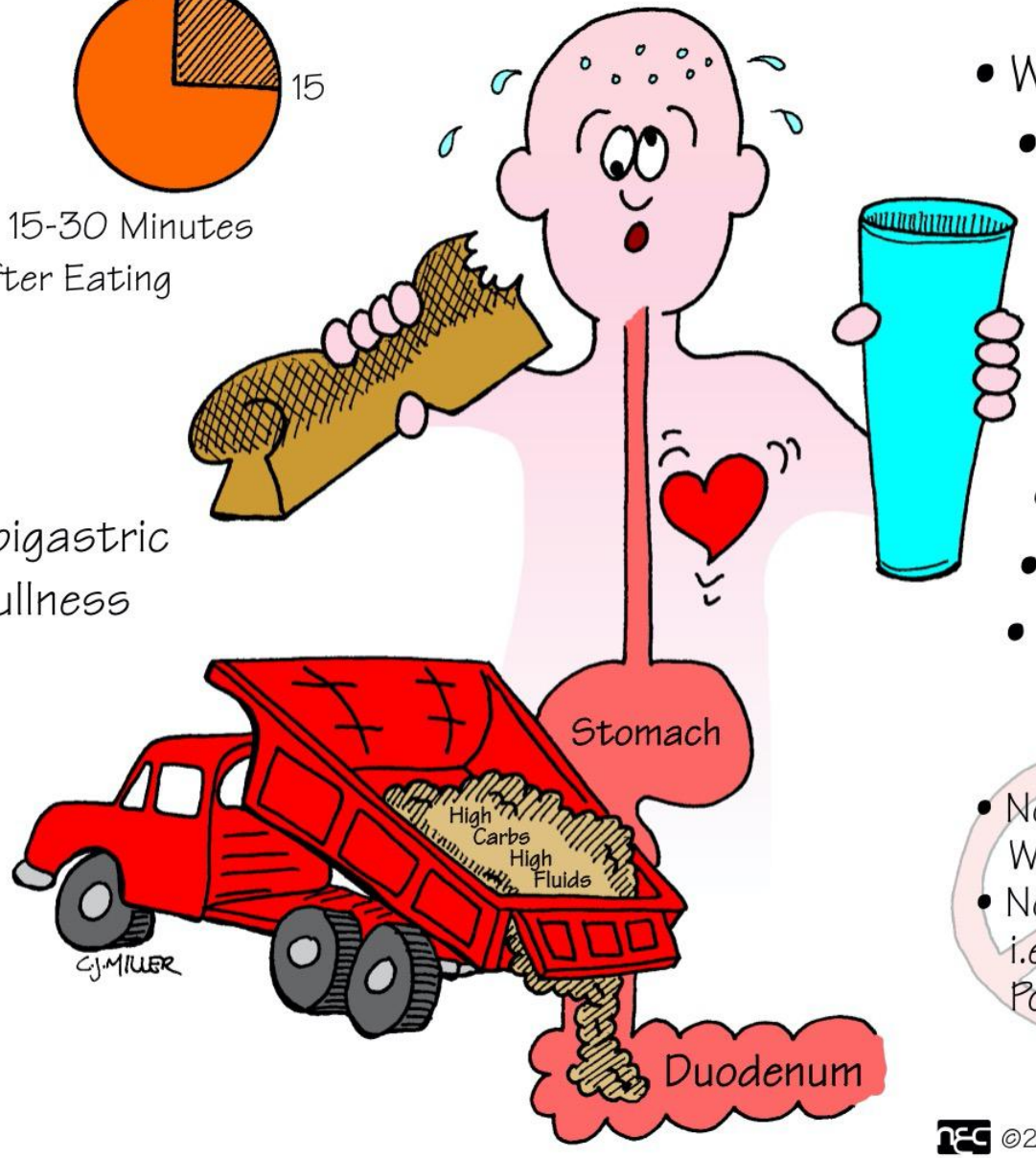
- Nausea and/or vomiting
- GERD/indigestion
- Abdominal pain & bloating
- Early satiety (feeling full)
- Rapid or delayed gastric emptying
- Constipation or diarrhea
- Increased POTS symptoms after eating..
- POTS and GI: Primer for Gastroenterologist (DiBaise, 2018)
  - https://www.proquest.com/docview/2124758833/fulltextPDF/9AE27033078D48C5PQ/1?accountid=37646

DUMPING SYNDROME



Occurs 15-30 Minutes After Eating

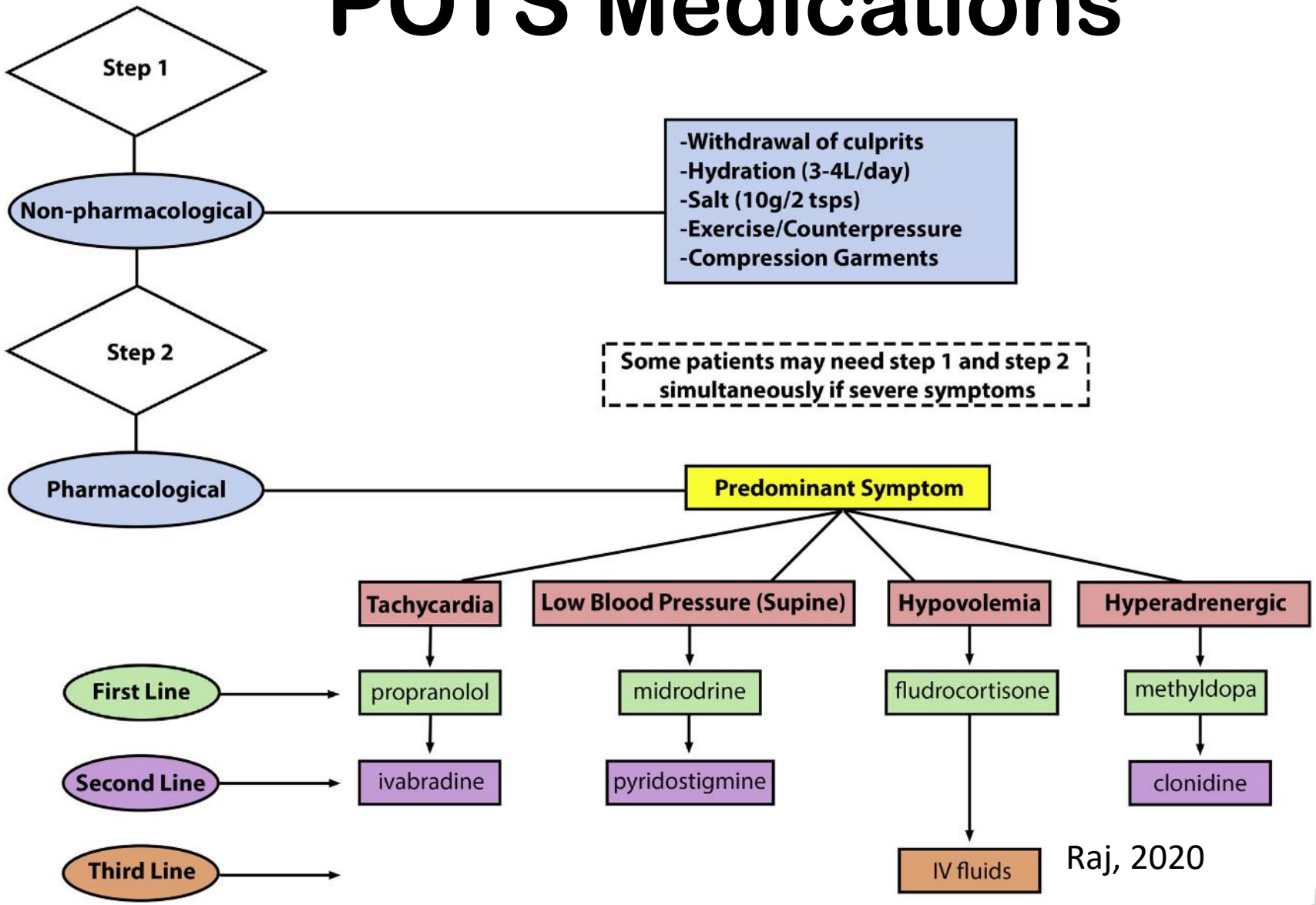
- Epigastric Fullness



- Weakness
  - Dizziness, vertigo
    - Diaphoresis
- Tachycardia
- Abdominal Cramping
- Self-Limiting

- No Fluids With Meals
- No High Carbs i.e., Bread, Potatoes

POTS Medications

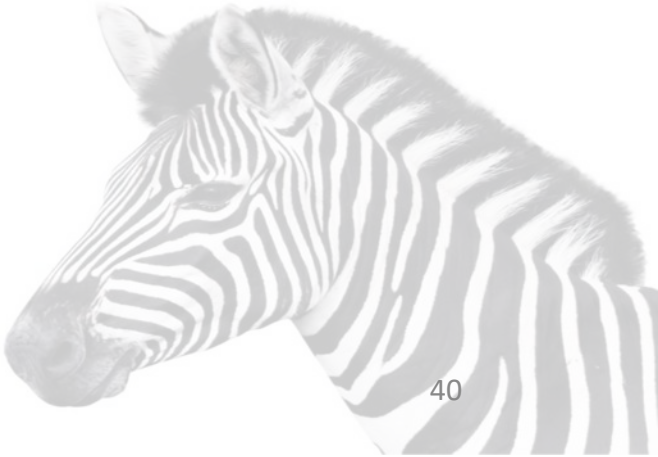


Raj, 2020

Accommodations for POTS

Once you have done as much as possible to manage POTS…

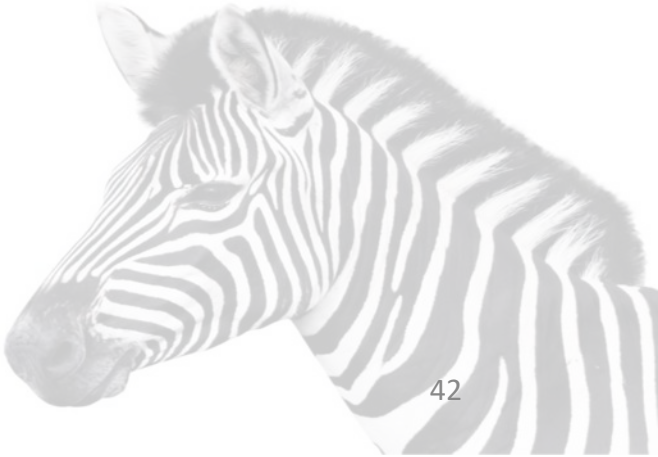
- Primary school accommodations:
  - http://www.dysautonomiainternational.org/page.php?ID=107
  - https://www.dysautonomiasupport.org/handbooks/
- College students:
  - https://www.standinguptopots.org/sites/default/files/images/College_Accommodations_for_Students_with_POTS_-_2018.pdf
  - https://www.dysautonomiasupport.org/handbooks/
- Workplace accommodations
  - https://www.dysautonomiasupport.org/handbooks/

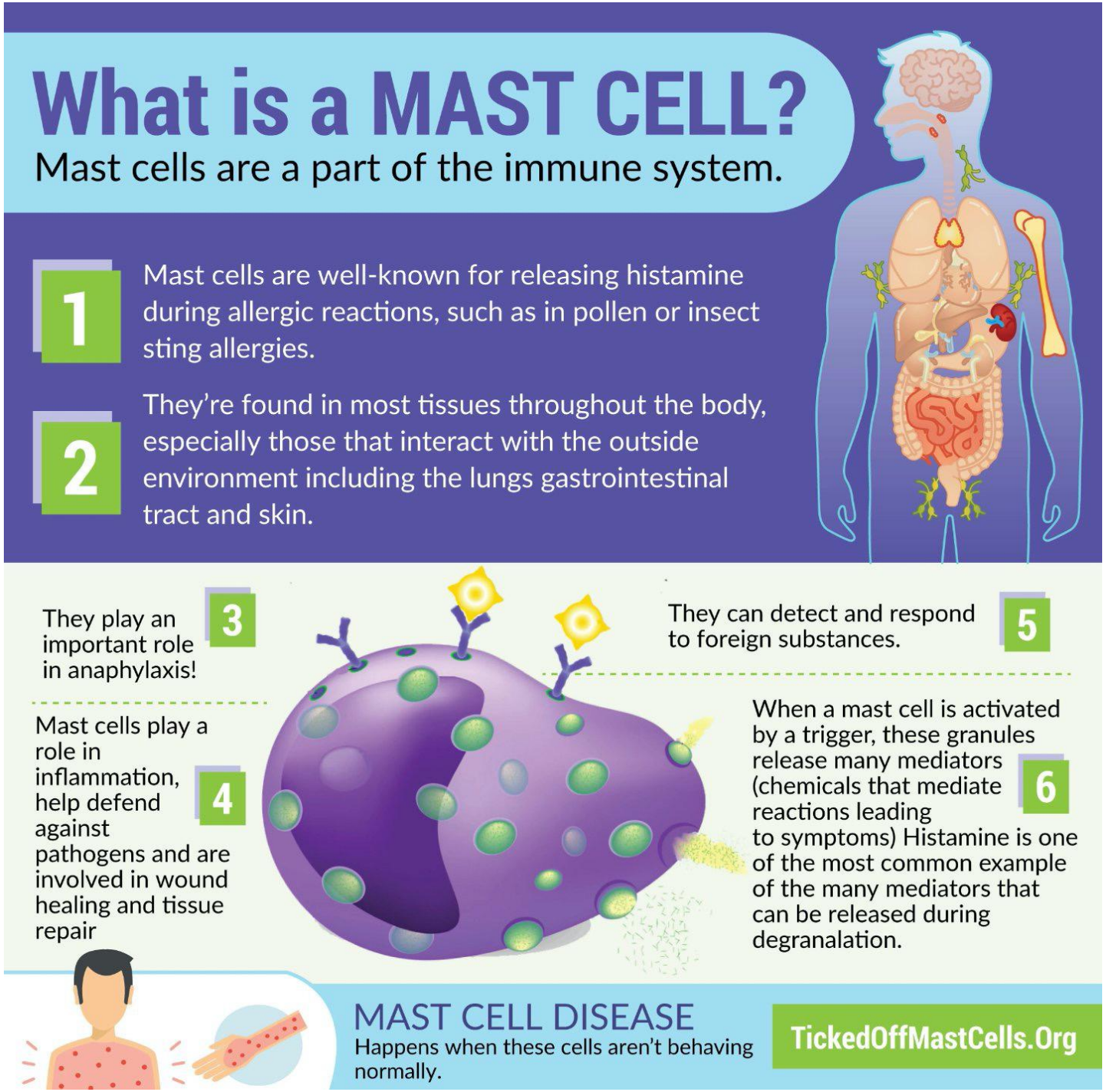


Questions?

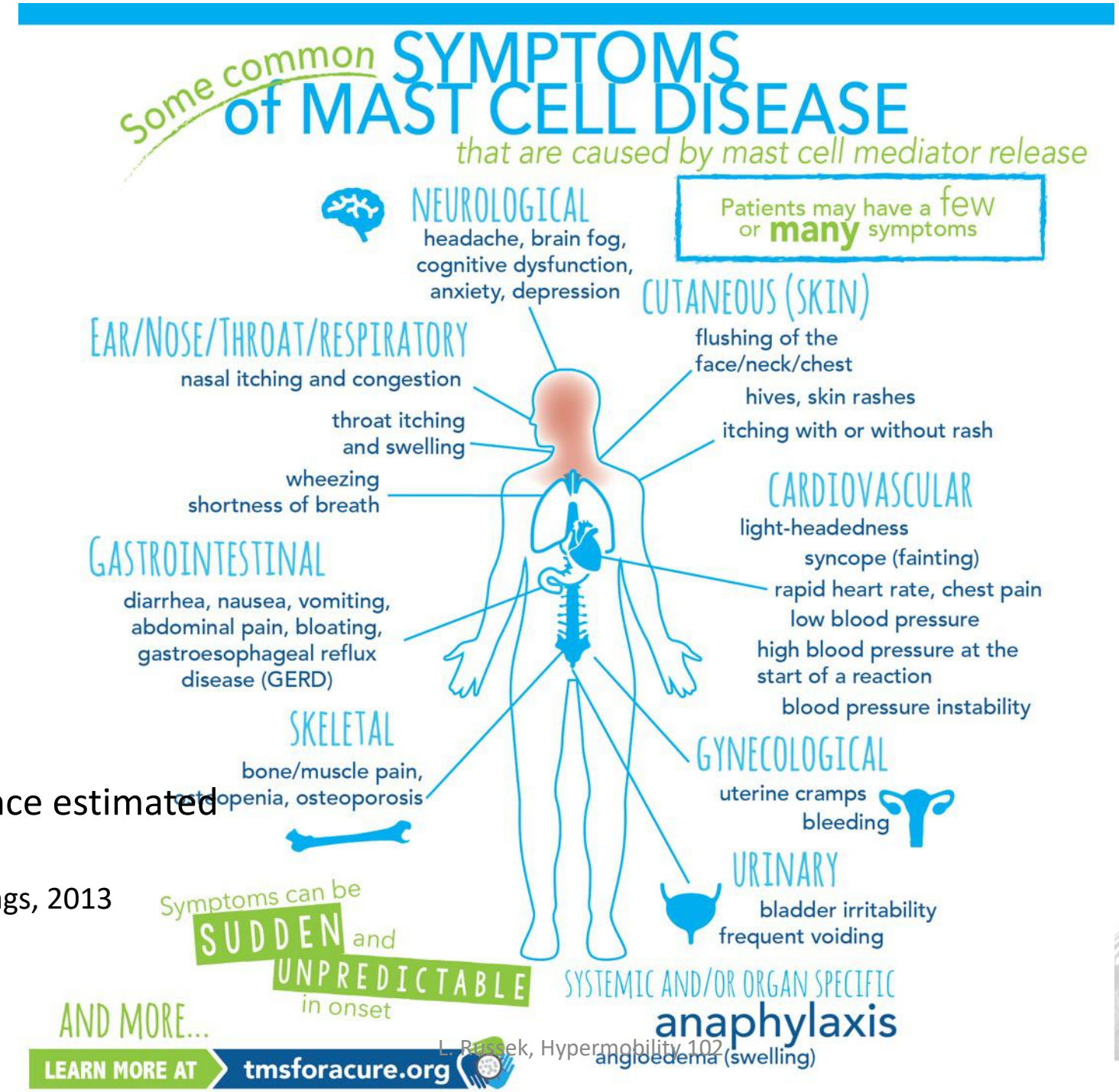
Mast Cell Activation Syndrome/Disorder MCAS/MCAD

Why is it so common in HSD?





- Mast cells mediate an allergic response
- Mast cells do not cause autoimmune disorders, but can aggravate them



Prevalence estimated at 17%

- Molderings, 2013

MCAS: Skin Problems

https://tmsforacure.org/visual-guide-skin-lesions/

MCAS: Diagnostic Criteria

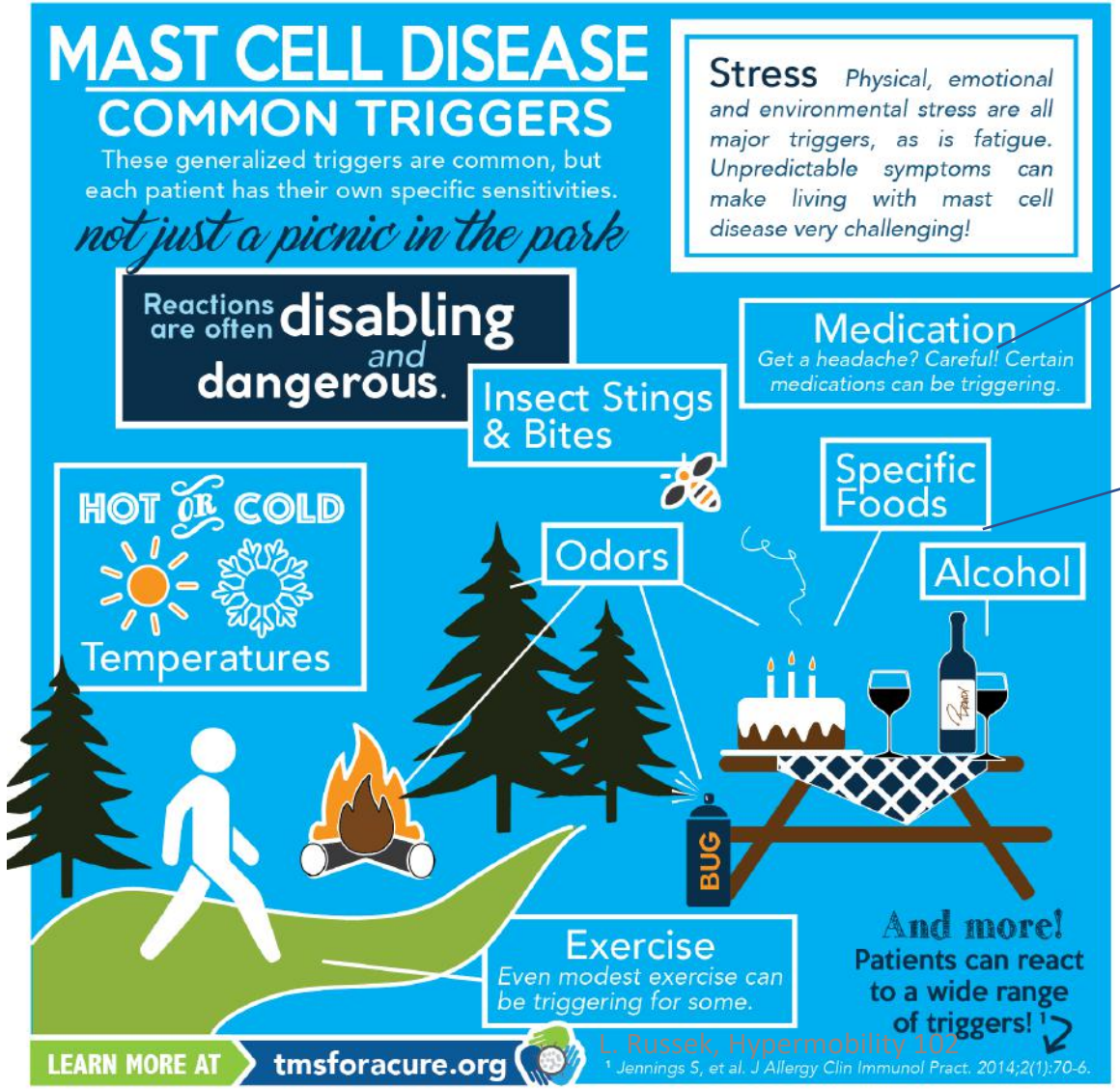
- It is really difficult to formally diagnose
  - Blood tests are technically difficult and often have false negative results
- Official diagnostic criteria are still argued. One version:
  A. Typical symptoms of severe, recurrent (episodic) systemic MCA, involving ≥ 2 organ systems
  B. Involvement of MC documented by biochemical studies (increased serum tryptase is preferred marker)
  C. Response of symptoms to therapy with MC-stabilizing agents or drugs blocking mediator release (Valent, 2019)
- **Use the Mast Cell Activation Disease Questionnaire**
  - https://www.humangenetics.uni-bonn.de/de/forschung/forschungsprojekte-export/forschungsprojekte/mastzellerkrankungen/validatedquestionnaire
  - Don't worry about the questions you can't answer
  - Score ≥ 14 indicates systemic mast cell mediator release syndrome.
  - Score 8 - 14 indicates a pathological activation of mast cells.

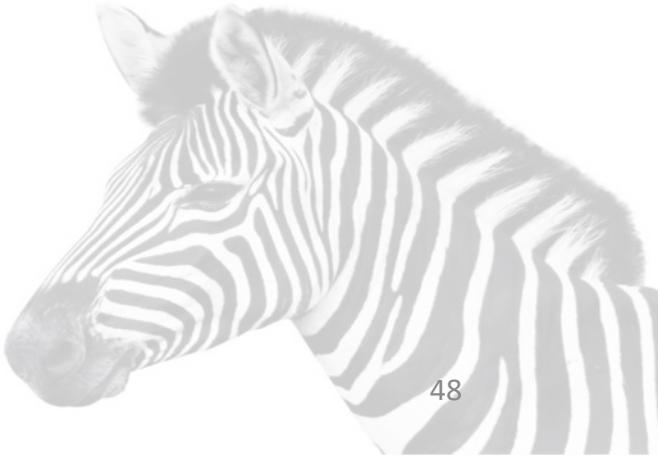
MCAS Common Triggers

Check your meds for MCAS sensitivity

Opiates & NSAIDs, medication 'excipients' (inactive ingredients)

Especially histamine containing or releasing foods





HSD 108: Headaches

Migraine & MCAS Triggers

- Migraines & headaches reported in 63% of people with MCAS (Afrin, 2017)
- Mast cells contribute to migraines through a neuroinflammatory process
- Histamine in the CNS causes migraines

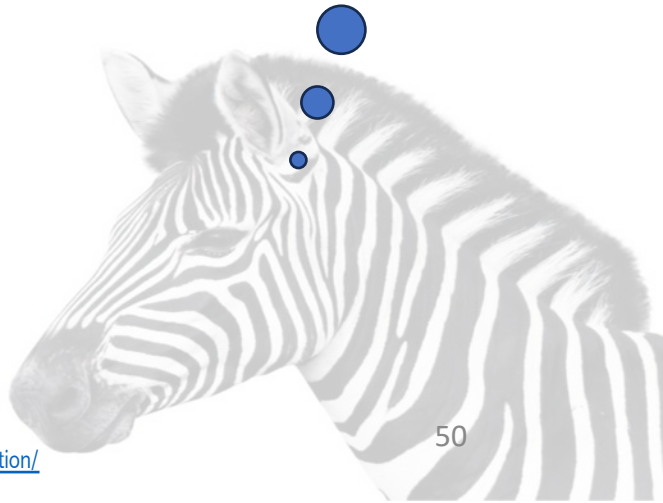
Migraines:

- **Stress**
- **Changes in sleep schedule**
- **Alcohol (especially red wine)**
- **Diet: histamine, MSG, chocolate, cheese, dairy, artificial sweeteners, cured meats**
- **Strong smells**
- **Sunlight**
- Dehydration
- Hormones
- Caffeine
- Weather changes
- (https://americanmigrainefoundation.org/resource-library/top-10-migraine-triggers/)

Mast Cell Activation:

- **Stress**
- **Fatigue, changes in sleep schedule**
- **Alcohol (especially red wine)**
- **Diet: ripe cheese, dried meat or sausage, tomato, nuts, pickled foods, cured meats fish, food additives**
- **Strong smells**
- **Sunlight**
- Exercise
- Medications (NSAIDs, antibiotics, opioids)
- Insect and other venoms
- Infections (viral, bacterial, fungal)
- Mechanical irritation, friction
- https://tmsforacure.org/symptoms/symptoms-and-triggers-of-mast-cell-activation/

Are migraines really a mast cell reaction?



MCAS Management

Managing MCAS

See "Suggestions for Managing MCAS" Handout

- Avoid triggers, especially foods
  - Probably histamine containing or releasing foods
- Substitute 'safe' meds for mast cell activators (Molderings, 2016)
- Physiological quieting
  - Relaxation, meditation, yoga, Tai chi, etc.
- Medication (Molderings, 2016)
  - https://tmsforacure.org/treatments-2/medications-treat-mast-cell-disorders/ ..
- What every gastroenterologist should know about MCAS
  - Weinstock, 2021 (https://link.springer.com/article/10.1007/s10620-020-06264-9)

HSD 106: Gut Issues in HSD, MCAS, POTS

Dietary Histamine Intolerance

Managing MCAS

- Histamine that crosses from the gut to blood stream causes systemic effects
- Some foods contain a lot of histamine, or cause mast cells to release histamine
- Histamine is normally metabolized in the gut by DAO (diamine oxidase)
  - Some people lack DAO
  - Some foods and medications inhibit DAO
  - There is a blood test for DAO, but it is tricky, expensive, and not often available
  - You can take DAO supplements

Comas-Basté, 2020

HSD 106: Gut Issues in HSD, MCAS, POTS

Low Histamine Diet

Low Histamine Foods to Eat

- Fresh meat and freshly caught fish.
- Non-citrus fruits.
- Eggs, mozzarella, ricotta.
- Gluten-free grains, such as quinoa corn and rice.
- Dairy substitutes, such as coconut milk and almond milk.
- Fresh vegetables except as noted
- Cooking oils, such as olive oil.

High Histamine Foods to Avoid

- Fermented dairy products, such as cheese (especially aged), yogurt, sour cream, buttermilk, and kefir.
- Fermented or pickled vegetables
- Vinegar, kombucha, miso, soy sauce
- Cured or fermented meats, such as sausages, salami, and fermented ham.
- Wine, beer, alcohol, and champagne
- Fermented grains: sourdough bread
- Tomatoes, eggplant, banana, spinach
- Soy milk
- Most nuts..

https://www.healthline.com/health/low-histamine-diet
Good resource at: https://www.histaminintoleranz.ch/downloads/SIGHI-Leaflet_HistamineEliminationDiet.pdf

Low FODMAP Diet

A low FODMAP diet may help people with gastrointestinal problems like bloating, gas, or irritable bowel syndrome (IBS).

GASTROENTEROLOGY CONSULTANTS of San Antonio™

Avoid

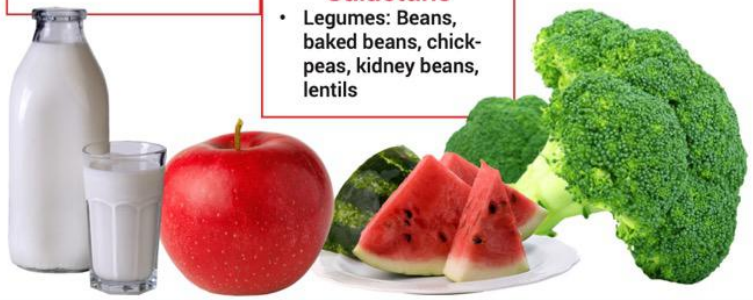
Excess Fructose
- Fruit: apple, mango, nashi, pear, canned fruit in natural juice, watermelon.
- Sweeteners: fructose, high fructose corn syrup, corn syrup, honey.
- Concentrated fructose: concentrated fruit, large servings of fruit, dried fruit, fruit juice.

Lactose
- Milk: milk from cows, goats, or sheep.
- Custard, ice cream
- Yogurt
- Cheese: soft, unripened cheeses like cottage, cream, mascarpone, ricotta

Fructans
- Asparagus
- Beetroot
- Broccoli
- Brussels sprouts
- Cabbage
- Eggplant
- Fennel
- Garlic
- Leek
- Okra
- Onion (all)
- Shallots
- Cereals: wheat and rye in large amounts (e.g. bread, crackers, cookies, couscous, pasta)
- Fruit: custard apple, persimmon, watermelon
- Misc: chicory, dandelion, inulin

Galactans
- Legumes: Beans, baked beans, chickpeas, kidney beans, lentils

Polyols
- Apple
- Apricot
- Avocado
- Blackberry
- Cherry
- Lychee
- Nashi
- Nectarine
- Peach
- Pear
- Plum
- Prune
- Watermelon
- Vegetables: Green bell pepper, mushroom, sweet corn
- Sweeteners: sorbitol (420), mannitol (421), isomalt (953), maltitol (965), xylitol (967)



Enjoy

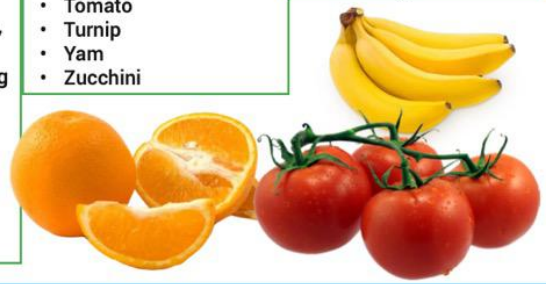
Fruit
- Banana
- Blueberry
- Boysenberry
- Canteloupe
- Cranberry
- Durian
- Grape
- Grapefruit
- Honeydew melon
- Kiwi
- Lemon
- Lime
- Mandarin
- Orange
- Passionfruit
- Pawpaw
- Raspberry
- Rhubarb
- Rockmelon
- Star anise
- Strawberry
- Tangelo

Misc
- Sweeteners - sucrose, glucose, artificial sweeteners not ending in "-ol", and sugar in small quantities
- Honey substitutes - small quantities of golden syrup, maple syrup, molasses, and treacle

Vegetables
- Alfalfa
- Artichoke
- Bamboo shoots
- Beat shoots
- Bok choy
- Carrot
- Celery
- Choko
- Choy sum
- Endive
- Ginger
- Green beans
- Lettuces
- Olives
- Parsnip
- Potato
- Pumpkin
- Red bell pepper
- Silver beet
- Spinach
- Summer squash (yellow)
- Swede
- Sweet potato
- Taro
- Tomato
- Turnip
- Yam
- Zucchini

Starch
- Gluten free bread or cereal products
- 100% spelt bread
- Rice
- Oats
- Polenta
- Other: arrowroot, millet, psyllium, quinoa, sorgum, tapioca

Dairy
- Milk - lactose-free milk, oat milk, rice milk, soy milk (check for additives)
- Cheeses - hard cheeses, brie, and camembert
- Yogurt (lactose free)
- Ice cream substitutes - gelati, sorbet
- Butter substitutes (e.g. olive oil)



www.gastroconsa.com

Download the FODMAP App

Monash University: https://www.monashfodmap.com/about-fodmap-and-ibs/high-and-low-fodmap-foods/

MCAS Medications

Talk to your doctor

- **H1 antihistamines:** help with itching, abdominal pain, flushing, headaches, brain fog
- **H2 antihistamines:** help with gastrointestinal symptoms and overall mast cell stability
- **Mast cell stabilizers:** help with stomach and intestinal symptoms and brain fog
- **Leukotriene inhibitors:** help with respiratory symptoms and overall mast cell stability (all mast cell activation symptoms)
- **Aspirin therapy** *(only under direct supervision of a physician)*: if tolerated and if prostaglandins are elevated, helps with flushing, brain fog and bone pain

https://tmsforacure.org/treatments-2/medications-treat-mast-cell-diseases/ ..

(more on medications in the 'appendix' slides)

Medications To Treat Mast Cell Diseases

ALL PATIENTS:

Self-Injectable Epinephrine (two doses; e.g., EpiPen®/EpiPen Jr®) should be carried by all patients with a mast cell disease at all times, even if previous anaphylaxis has not occurred. Both the patient and family members/caregivers should be trained on administering the epinephrine!

Please visit the American Academy of Allergy, Asthma and Immunology (AAAAI) website for more information on anaphylaxis.

http://www.aaaai.org/conditions-and-treatments/allergies/anaphylaxis

Basic Medications for Symptomatic Patients with Mast Cell Diseases[1-4]

- **H1 antihistamines:** help with itching, abdominal pain, flushing, headaches, brain fog
- **H2 antihistamines:** help with gastrointestinal symptoms and overall mast cell stability (all mast cell activation symptoms)
- **Mast cell stabilizers:** help with stomach and intestinal symptoms and brain fog
- **Leukotriene inhibitors:** help with respiratory symptoms and overall mast cell stability (all mast cell activation symptoms)
- **Aspirin therapy** *(under direct supervision of a physician)*: if tolerated and if prostaglandins are elevated, helps with flushing, brain fog and bone pain
- **Other medications may include:** omalizumab (Xolair®, anti-IgE therapy), steroids, and proton pump therapy *[for additional control of gastroesophageal reflux (GERD), but proton pump therapy may not replace the H2 antihistamine necessary to stabilize mast cells]*

Please see **Table 1- Table 6** for lists of some specific drugs in these different categories.

Please see **Table 7** for a list of some specific drugs for *advanced systemic mastocytosis.*

Table 1. Some First Generation H1 Antihistamines

Brand Name	Generic Name
Atarax®	Hydroxyzine hydrochloride
Benadryl®	Diphenhydramine
Chlor-trimeton®	Chlorpheniramine
Doxepin®, Sinequan®	Doxepin hydrochloride
Tavist®	Clemastine

Table 2. Some Second Generation H1 Antihistamines (may tend to cause less drowsiness)

Brand Name	Generic Name
Allegra®	Fexofenadine
Claritin®	Loratidine
Clarinex®	Desloratidine
Zaditor®/Zaditen® (in Europe)*	Ketotifen
Xyzal®	Levocetirizine
Zyrtec®	Cetirizine

*Zaditor® is only available in the US as eye drops; Zaditen® is available by prescription, but it must be obtained from a compounding pharmacy or from abroad.

Table 3. Some H2 Antihistamines

Brand Name	Generic Name
Axid®	Nizatidine
Pepcid®	Famotidine
Tagamet®	Cimetidine
Zantac®	Ranitidine

Continued on page 28

Medication Options

- Over the counter:
  - H1 inhibitor
  - H2 inhibitor
- Prescription
  - Cromolyn

MCAS Supplements

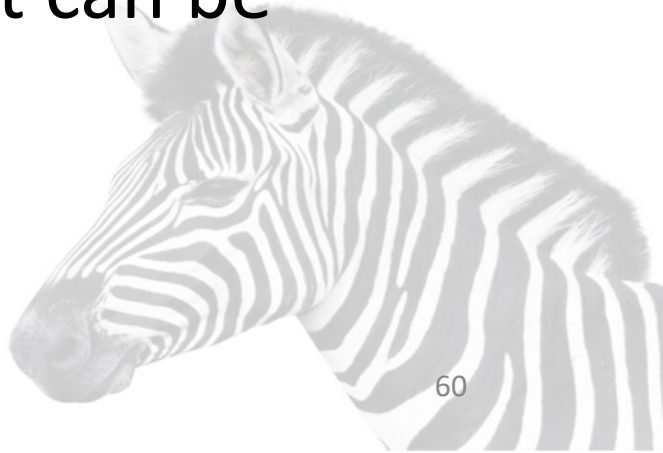
- Research is weak or absent, but MCAS experts recommend:
  - Diamine oxidase (DAO) enzyme: breaks down histamine in the gut
    - Good research that migraine is associated with DAO deficiency and DAO supplements can help treat migraines (Comas-Baste, 2020)
  - Vitamin C
    - If you don't tolerate ascorbic acid, e.g., citrus, try vitamin C made from broccoli
  - Quercetin: an antioxidant found in some plants

So, What Do I Do Now?

- HSD, POTS and MCAS are all quite variable, day to day. This makes it difficult to identify triggers or know whether a change has helped.
- Change one thing at a time
- Keep a wellness journal, tracking what you are changing and how you feel.
- Give it 2 weeks to see if it helps.
  - If it does help, keep it and change something else
  - If it doesn't help, eliminate it and wait 1 week to make sure it wasn't actually helping.
- Be patient. Each change might only help 5-15%.

Summary

- POTS/Dysautonomia and MCAS are common in people with hypermobility/hEDS
- POTS and MCAS are often overlooked by MDs
- Understanding these conditions can help you avoid aggravating factors and do more to care for yourself
- Improvements are often slow (~6-12 months) but can be dramatic!



Web Resources

- POTS:
  - www.potsuk.org
  - http://www.dysautonomiainternational.org
    - POTS video: http://www.dysautonomiainternational.org/page.php?ID=30
    - School accommodations: http://www.dysautonomiainternational.org/page.php?ID=107
    - Extensive patient guide POTS: http://www.dysautonomiainternational.org/pdf/RoweOIsummary.pdf
  - Guidelines for providers: https://www.onlinecjc.ca/article/S0828-282X(19)31550-8/fulltext
  - List of POTS providers: http://www.dysautonomiainternational.org/page.php?ID=14
- MCAS:
  - https://www.tmsforacure.org
  - https://www.mastzellaktivierung.info/en/introduction.html
  - Booklet for health care providers: https://tmsforacure.org/physicianresources/
  - List of MCAD clinics: https://tmsforacure.org/resources/finding-a-physician/
- My handouts: https://webspace.clarkson.edu/~lrussek/research.html

Web Resources

- EDS-specific
  - www.ehlers-danlos.com
  - www.hypermobility.org
  - https://webspace.clarkson.edu/~lrussek/hsd.html
  - Potsdam Fibro/EDS Support Group: https://webspace.clarkson.edu/~lrussek/pfsg.html
  - List of EDS providers: https://www.ehlers-danlos.com/healthcare-professionals-directory/
- Books
  - Holding It All Together When You're Hypermobile: Christie Cox
  - Disjointed | Navigating the Diagnosis and Management of hEDS and HSD. Diana Jovin, ed.
  - The Trifecta Passport: Amber Walker
  - Mast Cells United: Amber Walker
- Excellent fatigue self-management resources at: https://www.newcastle-hospitals.nhs.uk/services/chronic-fatigue/
- Symptom tracking app: https://www.flourish.care/

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Questions?

MCAS OTC Medications

Some First Generation H1 Antihistamines

Brand Name	Generic Name
Atarax®	Hydroxyzine hydrochloride
Benadryl®	Diphenhydramine
Chlortrimeton®	Chlorpheniramine
Doxepin®, Sinequan®	Doxepin hydrochloride
Tavist®	Clemastine

Some people need to use dye-free version

Some Second Generation H1 Antihistamines (may cause less drowsiness)

Brand Name	Generic Name
Allegra®	Fexofenadine
Claritin®	Loratidine
Clarinex®	Desloratidine
Xyzal®	Levocetirizine
Zyrtec®	Cetirizine

https://tmsforacure.org/treatments-2/medications-treat-mast-cell-diseases/

Table 3. Some H2 Antihistamines

More MCAS Medications

Some H2 Antihistamines

Brand Name	Generic Name
Axid®	Nizatidine
Pepcid®	Famotidine
Tagament®	Cimetidine
Zantac®	Ranitidine

Some Leukotriene Inhibitors

Brand Name	Generic Name
Singulair®	Montelukast
Accolate®	Zafirlukast
Zyflo®/Zyflo CR®	Zileuton

https://tmsforacure.org/treatments-2/medications-treat-mast-cell-diseases/

And More MCAS Medications

Mast Cell Stabilizers

Brand Name	Generic Name
Gastrocrom®	Oral cromolyn sodium
Zaditor®/Zaditen® (in Europe)*	Ketotifen
Algonot, Neuroprotect, etc.	Food supplements containing bioflavonoids such as quercetin and luteolin
Bayer aspirin; Aspirin; ASA	Aspirin, under the direct supervision of a physician!

Proton Pump Inhibitors to Help with GERD

Brand Name	**Generic Name**
Aciphex®	Rabeprazole
Dexilant®	Dexlansoprazole
Nexium®	Esomeprazole
Prevacid®	Lansoprazole
Prilosec®	Omeprazole
Protonix®	Pantoprazole

Medications That Inhibit DAO

Table 2. Active ingredients with an experimentally demonstrated inhibitory effect on the DAO enzyme [23,28,80,81].

Active Ingredient	Indication
Chloroquine	Antimalarial
Clavulanic acid	Antibiotic
Colistimethate	Antibiotic
Cefuroxime	Antibiotic
Verapamil	Antihypertensive
Clonidine	Antihypertensive
Dihydralazine	Antihypertensive
Pentamidine	Antiprotozoal
Isoniazid	Antituberculous
Metamizole	Analgesic
Diclofenac	Analgesic and anti-inflammatory
Acetylcysteine	Mucoactive
Amitriptyline	Antidepressant
Metoclopramide	Antiemetic
Suxamethonium	Muscle relaxant
Cimetidine	Antihistamine (H2 antagonist)
Prometazina	Antihistamine (H1 antagonist)
Ascorbic acid	Vitamin C
Thiamine	Vitamin B1

Comas-Basté, 2020