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Chronic Critical Illness Syndrome:

The LTACH Specialty

Purpose

- Define **Chronic Critical Illness** (CCI) and CCIS (Chronic Critical Illness Syndrome)
- Explain the pathophysiology and cohort of characteristics based on the concept of **allostasis** and **allostatic burden**
- Identify the **cohort of symptoms** related to CCIS so that treatment can be unified
- Identify appropriate **model and venue of care**

Introduction

- In some form, this syndrome has been recognized for at least 20 yrs
- **CCI-CCIS** is the product of medical technology supporting patients in the limbo of prolonged critical illness. CCIS exists because of the great care provided in the acute care ICU
- The **physiology** and **care needs** are distinctly different than those of the acute critically ill patient
- Acute compensatory mechanisms persist and result in the cohort of symptoms in these patients
- Historical Pre-cursors: SIRS, MODS (Systemic Inflammatory Response Syndrome ; Multiple Organ Dysfunction Syndrome)

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2002
Landmark Publication in Critical Care Clinics of North America

For the first time CCI-CCIS were used by multiple authors describing the syndrome as a cohort caused by common pathophysiology

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2005
Chest — NAMDRC Position Paper — PMV

- This paper dealt with the most well known sub-set of the CCIS group — prolonged mechanical ventilation patients
- Defined as patients **needing mechanical ventilation for at least 21 consecutive days**
- Recommended early transfer to a specialty environment with a strong interdisciplinary team approach (transfer consideration should begin when the trach is considered)
- When most think about CCI — we do think about PMV patients, this group of patients is much broader

Perspective: The scope of CCIS

- > 5 million patients admitted to ICU every year
- 1/3 require mechanical ventilation

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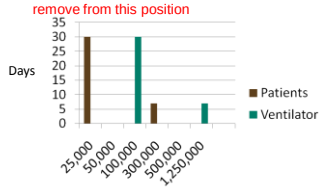

Census Bureau Forecast

- > ½ of all ICU days are for patients 65 years or greater
- This greater than 65 year age group will double in 20 years

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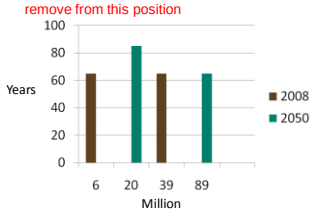

Perspective

- 5-10% of acutely critically ill patients become chronically critically ill
- Median hospital stay for CCI – 50 days at enormous cost

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Perspective

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- Trauma
- Burns
- Sepsis
- Surgery

Critical Illness

- Recovery
- Chronic Critical Illness
- Death

Case Study | Mr. Jones

- Mr. Jones is a 68 year old patient admitted to an LTACH from the tertiary care ICU. He underwent an emergency AAA repair and has been on the ventilator since. A tracheotomy was done day 14 and he moved to the LTACH on day 21, after failing weaning trials. He is on 2 IV antibiotics, ativan drip for sedation, dilaudid, oxycodone for pain, heparin drip, and an insulin drip.
- His condition has been complicated by bouts of sepsis, VAP, hyperglycemia.
- His WBC are 11,000; his H/H: 8/24 Albumin: 2; Prealbumin:12.

Case Study | Mr. Jones

- He has a TF of Jevity at 40 hr through a PEG.
- He has 2 central lines: IJ and PICC left arm.
- He has a foley catheter.
- He has an FMS in place with a small amount of stool.
- He has a large unstageable sacral wound and a non-healing abdominal wound.
- He is incoherent and restless.
- His family is highly anxious.

Where to Begin?

First, let's understand how Mr. Jones got this way…

Transition to Chronic Critical Illness (CCI)

- Pathophysiology
  - **Allostasis**: a relatively new concept in both acute and chronic illness. We will apply to:
    - Acute Critical Illness
    - Chronic Critical Illness

Allostasis

- Builds on **Canon's work** on stress and homeostasis
- Builds on **Selye's work** on stress
  - General Adaptation System (GAS)

Allostasis

- Allostasis is the body's ability to regain and maintain stability - "set points" in times of stress by **mobilizing interconnected physiological responses**
  - Physiological mediators are released
  - Mediators help the person survive and regain stability
  - Genetic variability in person's response

(McEwen, 1998, 2000, 2003, 2005; Semen et al., 2005; Shlomo, 2001; Koorte et al., 2005)

Allostasis

- **Primary Regulators of Allostasis** — Complex cascade of mediators from:
  - Hypothalamus and Anterior Pituitary Gland
  - Adrenal Glands
  - Immune system
  - Sympathetic Nervous System
    - The products of the above help the person regain and maintain stability in stress

(McEwen, 1998, 2000, 2003, 2005)

Allostasis

- Hallmarks of an **Effective Allostatic Response**
  - Restoration of stability
  - Termination of the response
  - For acute illness and injury, this response is adaptive initially.

(McEwen, 1998, 2000)

Allostatic Responses to Critical Illness

- Effective Allostatic response to Critical illness: designed for acute event to about 72 hrs post event
  - **Regulators** *respond* and *release* potent chemicals
    - Fluid volume is preserved
    - Cardiac output is preserved
    - Energy is preserved by breaking down protein in the tissues (organs, and muscles)
    - Inflammatory response is activated

(Van den Berghe, 2002; Vanorebeek & Van den Berghe, 2006)

Allostatic Responses to Critical Illness

- Effective response to critical illness
  - **Chemicals** *restore* stability — "set points"
    - With the help of modern medicine and nursing care
  - Patient survives
  - Response terminated
  - Patient can RECOVER

(Van den Berghe, 2002; Vanorebeek & Van den Berghe, 2006)

Allostasis

- Hallmarks of an **Ineffective Allostatic Response**
  - Response *does not* restore stability
  - Response *is not* terminated:
    - Initial insult continues
    - Multiple stressors in sequence do not allow the response to be terminated
- Persistent high level of response is Maladaptive.
- Evidence exists that acute critical illness transitions to Chronic Critical Illness at about 10-14 days

(McEwen, 1998, 2000)

Allostasis

- What happens when the allostatic response is **sustained**?
  - Tissue damage
    - Called **allostatic load**
    - The price tissues pay for sustained response

(McEwen, 1998, 2000)

Allostatic Responses to Critical Illness

- **Ineffective response**
  - Chemicals persist in the body without restoration of stability
    - Even with modern care
  - Persistent protein tissue breakdown
  - Organ and tissue deterioration
  - Persistent inflammatory response

(Shlomo, 2001; Mechanick & Brett, 2002; Van den Berghe, 2002; Vanhorebeek & Van den Berghe, 2006)

Allostatic Responses to Critical Illness

- What happens when the **response is ineffective**?
  - Death
  - CCIS: Survival with the burden of Allostatic Load; Survival without Recovery
    - Tissue damage
    - Syndrome of Chronic Critical Illness

(Hollander & Mechanick, 2006; Squires, Lazzarin &Gatel, 2004)

Chronic Critical Illness Syndrome (CCIS)

- What are the **manifestations** of allostatic load and CCIS?
  - Endocrine dysfunction
  - Severe malnutrition, muscle wasting
  - Critical illness neuromyopathy
  - Infection and sepsis
  - Bone loss
  - Wounds and poor healing
  - Delirium
  - Depression
  - Suffering

Return to Mr. Jones

- Case study revisited
- Lets look at the data in the case that identifies the **nine elements of CCIS**

Return to Mr. Jones

Elements of CCIS	Data from Mr. Jones
Endocrine problems	
Muscle wasting/malnutrition	
Critical illness neuromyopathy	
Infection/sepsis	
Bone loss	
Wounds/poor healing	
Delirium	
Depression	
Suffering	

Two Principles to Guide Clinical Care

- Treat all the 9 elements as **continuing sources of stress**
- Treat the elements as a **cohort**, not as separate problems
  - Recognize that any and all interventions have the potential for "unintended consequences" thus sustaining or increasing the allostatic burden

Neuroendocrine: Hyperglycemia

CCIS Problem	Plan
Glycemic Control **INFLUENCES:** • Ongoing stress and organ dysfunction/failure • Infection • Feeding **KEY TO SUCCESS:** • MD • Therapists • NP • Nursing Staff • RD • Patient • Pharmacist • Family	1. A clear plan to manage glucose needs to be established upon admission. "Permissive hyperglycemia no longer indicated, but there is no evidence for "tight glycemic control" in CCIS. 2. Meticulous follow-through with management strategy. 3. Interruptions in feeding must be considered before insulin administration. 4. Daily assessment of changing needs: a. As CCIS resolves, insulin supplementation needs should decrease. b. Renal failure reduces the need for insulin and negates the use of many oral drugs. c. Progressive difficulty with glycemic control may be a sign of sepsis. d. Consider screening for adrenal insufficiency if persistent hypoglycemia is an issue, and is not related to an interruption of calorie source.

Neuroendocrine: Protein Loss

CCIS Problem	Plan
Malnutrition Protein catabolism, Calorie deficiency **INFLUENCES:** • Ongoing stress and organ dysfunction/failure • Infection/Antibiotic use • Mobility plan • Bowel program **KEY TO SUCCESS:** • MD • Therapists • NP • Nursing Staff • RD • Patient • Pharmacist • Family	1. Establish a clear nutrition plan that is known and supported by the entire interdisciplinary team. 2. Reduce, eliminate, tube feeding interruptions. 3. Consider combination enteral-parenteral therapy until protein-calorie goals can be reliably met enterally. 4. Restore some oral feeding as soon as possible in an attempt to reduce suffering and restore normalcy. Consult ST early. 5. Manage diarrhea and investigate. a. Examine the medications and eliminate as needed (stool softeners, laxatives, metoclopramide, liquid medications containing sorbital, proton pump inhibitors). b. Send stool for clostridium difficile toxins and treat empirically if very suspicious (leukocytosis). c. Perform a digital rectal exam for fecal impaction. d. Re-consult dietician to re-evaluate tube feeding. e. When all is addressed, may use Pepto 10-30 ml per 500 ml o tube feeding. 6. Manage constipation as naturally as possible.

Wounds

CCIS Problem	Plan
Wounds **INFLUENCES:** • Ongoing stress and organ dysfunction/failure • Nutrition • Infection • Bowel program and Management of Continence • Mobility Plan **KEY TO SUCCESS:** • MD • Therapists • NP • Nursing Staff • RD • Patient • Pharmacist • Family	1. Prevention: Implementation of a Standard Skin Care Protocol. 2. Use wound care protocols for existing wounds. 3. Consider a "turn team" approach. a. Ensure dialysis patients receive pressure relieving maneuvers minimally every 2 hrs during treatment. 3. Follow the "Rule of 30." 4. Float the heels consistently. 5. Mobilize patients, but do not allow them to sit on their wounds endlessly. 6. Follow the nutrition plan. a. Ensure dialysis patients are given diet on dialysis days.

Infection and Risk of Infection

CCIS Problem	Plan
Management and Protection from Infection **INFLUENCES:** • Ongoing stress and organ dysfunction/failure • Nutrition • Invasive devices (lines) • Mobility plan **KEY TO SUCCESS:** • MD • NP • RD • Pharmacist • Therapists • Nursing Staff • Patient • Family • Infectious Disease Consultant	1. Review the infection history and place in the appropriate transmission precautions. 2. Antibiotic stewardship: Review the use of current antibiotics. Ensure that an actual infection is being treated decisively, using the appropriate antibiotic(s) for the appropriate time period. This often requires an ID consult. 3. Meet the nutritional goals enterally if possible (PO preferred), as soon as possible. 4. Remove all lines and devices when not clearly needed. 5. Perform a daily sepsis screen. 6. Ensure glycemic control. 7. Ensure patient/visitor teaching. 8. Ensure staff compliance with precautions ("imbedded watchdogs"). 9. Implement VAP-CVC bundles. 10. Avoid pancultures. Allow an infection to "declare itself."

Bone Loss

CCIS Problem	Plan
Bone Loss **INFLUENCES:** • Ongoing stress and organ dysfunction/failure • Nutrition • Invasive devices (lines) • Mobility plan **KEY TO SUCCESS:** • MD • NP • RD • Pharmacist • Therapists • Nursing Staff • Patient • Family	1. Mobilize and focus on early weight bearing. Only true hemodynamic instability should interfere with the mobility plan. Post the plan in the patient room. 2. Perform passive/active ROM. 3. Evening and weekend resistance exercises as ordered by therapists. 4. Treat osteoporosis and consult dietician to ensure adequate calcium and vitamin D supplementation. Consider checking vitamin D levels in all patients (sunshine). 5. Treat renal osteodystrophy and check parathyroid hormone level (and Vitamin D level) with chronic kidney disease ≥ Stage III.

Critical Illness Neuromyopathy: Profound Weakness

- **Incidence**: Difficult to pinpoint due to various definitions and measures, but truly an underestimated problem
- **Risk factors**:
  - Length of stay in the ICU
  - SIRS and sepsis
  - Hyperglycemia
  - Pharmacologic agents
    - Corticosteroids (myopathy)
    - Neuromuscular blockers (myopathy)
    - Aminoglycosides ?
    - Vasopressors ?
  - Renal replacement therapy?
  - Hypoalbuminemia?

(De Jonghe et. al., 2008; Goodman & Boone, 2008; Khan et. al., 2008)

Critical Illness Neuromyopathy: Profound Weakness

- Features
  - Limb weakness
    - Most often symmetric
    - Muscle atrophy
    - DTRs intact, reduced or spared
    - Facial muscles (cranial nerves) often spared
  - Sensory loss in some patients
  - Failure to wean from mechanical ventilation

(De Jonghe et. al, 2002; De Jonghe et. al, 2008)

Critical Illness Neuromyopathy: Bedside Assessment — MRC Score

- **Assessment**: Medical Research Council Neuromuscular Score (Kleyweg et. al., 1988)
  - Each limb is assigned a score from 0 to 15
  - Range 0 (quadraplegia) to 60 (normal)
  - < 48 reflects significant weakness

Movements Tested	Score for Each Movement
• Arm Abduction • Elbow Flexion • Wrist Extension • Hip • Knee Extension • Ankle Dorsiflexion	0 = No visible contraction 1 = Visible contraction, no limb movement 2 = Active movement, insufficient to overcome gravity 3 = Active movement against gravity 4 = Active movement against gravity and resistance 5 = Normal power

(De Jonghe et. al, 2002; De Jonghe et. al, 2008)

Critical Illness Neuromyopathy: Profound Weakness

CCIS Problem	Plan
Profound Weakness **INFLUENCES:** • Ongoing stress and organ dysfunction/failure • Nutrition • Invasive devices (lines) • Mobility plan **KEY TO SUCCESS:** • MD • NP • RD • Therapists • Nursing Staff • Patient • Family	1. Establish the mobility plan with the entire interdisciplinary team. a. Maintain ROM. b. Day and night are planned to allow activity and rest periods and sleep. PMV patients initially sleep in AC mode. c. Use of submaximal strengthening is required: i. OT/PT plan in place and posted for evenings and weekends. ii. Physical medicine and rehabilitation consult. 2. Control hyperglycemia. 3. Ensure proper nutrition. 4. Avoid medications that may contribute, as possible.

(De Jonghe et. al, 2002; De Jonghe et. al, 2008)

Delirium

- **Delirium** old terms: ICU psychosis, acute confusional state, metabolic encephalopathy, sundowners…
  - There are three subtypes of delirium:
    - Hyperactive
    - Hypoactive (may look normal unless assessed)
    - Mixed

Diagnostic and Statistical Manual of Mental Disorders (DSM IV) officially defines delirium as a disturbance of consciousness with inattention accompanied by a change in cognition or perceptual disturbance that develops over a short period of time (hours to days) and fluctuates over time.

(Herridge et. al., 2008; Peterson et. al., 2006; www.icudelirium.org)

Delirium

- Assessment with the **CAM-ICU**
  - Assesses 4 features quickly and consistently
  - Allows for bedside assessment and trending of patient status

(Ely et. al., 2001; Pun et. al., 2005)

Delirium and Depression

CCIS Problem	Plan
Neurocognitive dysfunction **INFLUENCES:** • Ongoing stress and organ dysfunction/failure • Nutrition • Mobility plan • Sleep **KEY TO SUCCESS:** • MD • NP • RD • Therapists • Nursing Staff • Patient • Family	1. Screen for delirium each shift. Positive screens require a clear plan. a. Examine the medications and eliminate as indicated (sedatives, opiates being used as sedatives, anticholinergics, metoclopramide). b. Treat as a change in condition with a complete patient re-assessment and notifications. Check TSH and B12. c. Treat psychosis with antipsychotics. 2. Screen for depression and treat appropriately (considering the symptoms using SIGECAPS). 3. Mobilize and change of scenery. 4. Ensure sleep at night and re-establish normal circadian rhythms. 5. Consult Psychiatry if needed.

(De Jonghe et. al, 2002; De Jonghe et. al, 2008)

The "Burden of Suffering"

CCIS Problem	Plan
Suffering **INFLUENCES:** • Pain • Delirium • Depression • Anxiety • Anorexia/Nausea • Hunger and Thirst • Loneliness • Inability to speak • Fatigue • Insomnia	1. Sources of pain are clearly identified and treated appropriately and holistically. 2. The entire interdisciplinary team understands the plan for delirium/depression/anxiety. 3. Treat anorexia and nausea (can use certain antidepressants/mood stabilizers) and allow early oral feedings. 4. Nursing and staff : a. Visit with patient and see them as they were prior to the illness. b. Encourage positive visitation, including pets. c. Celebrate small successes. 5. Encourage the early use of speaking valves. 6. Establish the 24 plan of care that allows rest, activity and sleep and a change in scenery.

(De Jonghe et. al, 2002; De Jonghe et. al, 2008)

Management of the CCIS Patient

- Goal
  - Technology saved this person at great expense to the integrity or wholeness of the person, the care team now needs to artfully guide the removal of technology
    and the re-establishment of wholeness to the greatest extent possible

(Ely et. al., 2001; Pun et. al., 2005)

The Ultimate Goal

- Restoration of "**Normalcy**"
- *Defined* as the person and all of their body systems functioning as designed

(Ely et. al., 2001; Pun et. al., 2005)

Principles for Evaluation of Plan of Care

- A Patient who is *not progressing* is a continued victim of **sustained allostatic burden**
- All progress reduces Allostatic Burden
- Progress in the CCIS Patient is measured in very **small increments**

(Ely et. al., 2001; Pun et. al., 2005)

Venue of Care

What type of **venue** is appropriate for patients with CCIS?

(Ely et. al., 2001; Pun et. al., 2005)

Environment

They *no longer need* nor will they improve in the High Tech ICU environment — they need and will improve in a specialty environment where syndrome can be managed as a cohort of symptoms.

(Ely et. al., 2001; Pun et. al., 2005)

Environment

- Why *not continue* in the **ICU**?
  - Mobility, medication reduction, re-connecting to "normalcy" are not part of the modern ICU
  - Critical Care staff are "wired" for fast paced – these patients require slow and deliberate care

(Ely et. al., 2001; Pun et. al., 2005)

Summary Statement of NAMDRC Recommendations

"Consider the environment of care from the patients' perspective, when continuing weaning efforts in those difficult to wean from mechanical ventilation in the ICU. Venue selection should also be guided by the services each patient requires.The co-morbidities that often accompany the need for PMV may preclude transfer to facilities without some level of ICU or acute care capabilities. All facilities that are available to patients should be screened by the critical care team for effectiveness and safety when effecting discharge for post-ICU weaning."

(CHEST, 2005)

Venue	Patient Type	Advantages	Disadvantages
STACH ICU	all	Full ICU capabilities	Costs, life support rather than patient focused
STACH Stepdown	all except very acute	Most ICU capabilities at lower costs, full acute care capabilities	Not full ICU
LTACH	all except very acute	Most ICU capabilities at lower costs, most acute care capabilities, more patient focused	Not full ICU
Rehab hospital	stable	Lower cost, patient focused, OT/PT focus	No ICU care, limited acute care
Subacute hospital	stable	Lower cost, patient focused	Limited or no weaning, no ICU care, limited acute care
SNF	stable	Lower cost, patient focused	Limited or no weaning, no ICU care, limited acute care
Home	stable	Very patient focused	No weaning, no ICU care, no acute care

(CHEST, 2005)

Venue of Care

A setting with a clinical team expert in the care and management of the CCIS patient. The focus of care needs to be persistent reduction in allostatic burden by **treatment of all nine elements as a cohort**.

(CHEST, 2005)

Admission Priorities | Mr. Jones

- **Place Back on Assist-Control** and allow him to rest and sleep.
- **Basic Labs**: CBC with diff, Nutrition Labs, BMP, TSH, B12.
- **Review Medications**: thoroughly investigate antibiotic use and D/C ASAP; wean and D/C ativan drip, perhaps transitioning to antipsychotic with or without mood stabilizer; use opiates only for the treatment of moderate to severe pain not responsive to other treatments; place patient on sliding scale insulin, D/C heparin drip and transition to subcutaneous heparin.

Admission Priorities | Mr. Jones

- Change **tube feeding** to Glucerna at 75 hr over a 24 hr period. Consult ST.
- **Wound**: debridement plan for sacral wound, then plan based upon guidelines; incisional wound managed according to guidelines; specialty Bed according to protocol; skin care bundles implemented.
- **Mobility Plan**: Dangle with Feet on Floor–then weight bear with transfer to chair for short intervals (because of wound); off-load pressure points while up.

Admission Priorities | Mr. Jones

- He is **positive for delirium**: Evaluate all medications; allow activity, rest periods and sleep; order to the day and manage stimulation. Can he be taken from room for short intervals?
- Remove IJ CVC line, remove FMS and check for fecal impaction. Can the foley and the PICC be removed as well?
- **Explain** the plan of care to patient and family.

Day 14 | Mr. Jones

Mr. Jones is now on trach collar at 28%. He weaned rapidly (CPAP/PSV) when rested for first 24 hrs and delirium cleared with sleep and discontinuation of many of his meds. His discomfort is being managed with Tylenol. He has reconnected with his family and uses the speaking valve when they visit. He is now weight bearing with moderate assistance, and is taken out of room with family once a day.

Day 14 | Mr. Jones

- He is now on **nocturnal tube feeding** at 40 ml/hr and attempting monitored oral feeding during the day. His albumin is 2.8 and his prealbumin is 21.
- His **sacral wound** was debrided and staged (stage 3). He was initially managed with NPWT and after 7 days he was transitioned to a hydrogel dressing and EMPT. The wound is granulating and beginning to close. His **surgical wound** is also beginning to close.
- He is placed on thyroid supplement 50 mcg/day.
- MRC is now 44, up from 36 and he is up in the chair twice daily, and performs active ROM with reminders

Day 14 | Mr. Jones

- His central lines are out. His foley is out and he is managed with a condom catheter at night. His FMS is out and he is mostly continent of soft stool.
- The next steps:
  - **Downsize trach** and **decannulation** if tolerated.
  - DC planning: SNF due to **ongoing wound care**

Day 28 | Mr. Jones

Discharge to SNF planned in next 3 days. He has been decannulated and is on oxygen at 2 L/min per NC. His sacral wound has decreased in size by 50% but remains a significant barrier to full recovery. His surgical wound is 80% healed. He is continent of both urine and stool and is tolerating oral feeding very well. His PEG is capped. He continues to require set up for mobility and ADL's, MRC is now 52. He is alert and interacts positively with his family.

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Conclusion

- Presentation:
  - Overview of CCIS
  - Complex physiology and needs of patients with CCIS
  - Clinical management
  - Model of care to guide nursing management
  - Proper venue of care

References

- Bellar, A., Kunkler, K., & Burkett, M. (2009). Understanding, recognizing, and managing chronic critical illness syndrome. *Journal of the American Academy of Nurse Practitioners, 21*(11), 571-578. doi:10.1111/j.1745-7599.2009.00451.x
- Carson SS, & Bach PB. (2002). The epidemiology and costs of chronic critical illness. *Critical Care Clinics, 18*(3), 461-76.
- Nelson J.E., Hope A.A., Cox C.E., & Carson S.S. (2010a). Chronic critical illness. *Am.J.Respir.Crit.Care Med.American Journal of Respiratory and Critical Care Medicine, 182*(4), 446-454.
- Nelson JE, Kinjo K, Meier DE, Ahmad K, & Morrison RS. (2005). When critical illness becomes chronic: Informational needs of patients and families. *Journal of Critical Care, 20*(1), 79-89.
- Nelson JE, Meier DE, Litke A, Natale DA, Siegel RE, & Morrison RS. (2004). The symptom burden of chronic critical illness. *Critical Care Medicine, 32*(7), 1527-34.
- Via, M. A., Gallagher, E. J., & Mechanick, J. I. (2010). Bone physiology and therapeutics in chronic critical illness. *Annals of the New York Academy of Sciences, 1211*(1), 85-94.
- Weincek, C., Winkleman, C. (21). Chronic critical illness. *Advanced Critical Care Nurse, 1*, 44-61.