Patient Mobility in the ICU

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Normal Mobility

• “On average, a healthy individual will alter his or her posture during sleep every 11.6 minutes” (Hawkins, S., Stone, K., & Plummer, I., 1999)

History of Bed Rest

• Before 1940 normal duration of bed rest
  – 2 weeks strict bed rest for childbirth
  – 3 weeks bed rest for hernia repair surgery
  – ≥ 4 weeks for MI

• Post WWII
  – Shortage of hospital beds and personnel shortened length of bed rest
  – Early mobilization improved outcomes and reduced complications
  – Outcomes from VA Rehab programs found that bed rest was more disabling than the original injury

• 1980’s
  – Early discharges result from DRG payment system
    • No evidence of harm

Corcoran, P. (1991)
“Look at a patient lying in bed. What a pathetic picture he makes. The blood clotting in his veins, the lime draining from his bones, the scybala stacking up in his colon, the flesh rotting from his sweat, the urine leaking from his distended bladder, and the spirit evaporating from his soul”

Richard Asher, MD 1947
Immobility

- Every organ and body system progressively deteriorates when inactivated.
- There is a remarkable similarity between physiological effects of aging and the adverse systemic effects from prolonged immobility.

Bortz, W., (1982). Disuse and aging. JAMA, 248, 1203-1208
Physiological System Changes from Immobility

Cardiac
- Tachycardia
- Hypotension
  - Orthostatic hypotension occurs after 15-24 days of immobility
  - Avg. loss of 600ml plasma volume when on bed rest-contributes to hypotension.
  - After 12 hrs of bed-rest an upward fluid shift stimulates the baroreceptors in the aortic arch and carotid artery to have an opposite depressor effect. Must allow for hemodynamic equilibration when moving patient.
- Inc. risk DVT
- Decreased maximal oxygen uptake
- Dec. total blood volume
- Heart Muscle atrophy and decreased stroke volume

Physiological System Changes from Immobility cont’d

Pulmonary Complications

- Decreased vital capacity
- Decreased residual volume
- Less functional reserve
- Increased secretions
- Inability to clear secretions (increased aspiration risk)
- Increases risk for aspiration, pneumonia, pulmonary embolism and development of ARDS
- Increases risk for atelectasis even in the absence of preexisting respiratory disease
  - Mucous film lining of smaller airways tends to pool

Physiological System Changes from Immobility cont’d

Musculoskeletal
• Skeletal muscle atrophy has rapid onset
  - Begins 4 hours after start of hospitalization if pt is immobile
  - Decrease muscle mass, muscle cell diameter and # of fibers per muscle
• 1 week of bed rest = 20% decrease in muscle strength
• Loss of muscle strength is ongoing and progressive
  - Additional 20% muscle strength loss for each week of bed rest
• Use of weakened muscles generates an increased oxygen demand at the cellular level. Critically ill patients cannot meet this demand!
• Loss of Bone Mass Density
  • > 50% acceleration after 10 days bed-rest
  • Calcium clearance 4-6 x normal after 3 weeks of total immobilization
• Contractures
  • Can begin forming after 8 hours of bed rest
• Pressure Ulcers
  • Develops within hours of immobilization if progressive turning schedule is not implemented

Physiological System Changes from Immobility cont’d

Gastrointestinal/Genitourinary Systems

• Constipation
  – Decreased peristalsis
  – Risk of Ileus

• Urinary stasis
  – Inc. risk for UTI
  – Calculus formation
  – Increased calcium in urine is detected within a few days after bed rest

• Fluid retention

Physiological System Changes from Immobility cont’d

Metabolic

- Inc. excretion of calcium nitrogen, phosphorus
  - Renal Calculi
- Inc. risk of osteoporosis
  - Increased risk of bone fracture

Physiological System Changes from Immobility cont’d

Central Nervous System (CNS)
• Emotional & behavioral changes
• Anxiety, emotionally labile
• Decreased attention span
• Depression
• Altered Sleep Pattern (sleep deprivation)
• Perceptual /coordination deficits
• Diminished intellectual performance
• Learned helplessness syndrome

**Burden of Complications**

**Ventilator-associated Pneumonia**
- Increases need for vent support
- Increases ICU LOS by 4.3 days
- Increases Hospital LOS by 9 days
- I case VAP costs $27,900 to treat
- National Cost of VAP > $1.2 Billion
- Mortality from VAP 50-70%

Heyland et al. Am J Respir Crit Care Med 1999;159:1249
Craven, D. Chest 2000, 117, 186-187S
Rello, et al, Chest 2002; 122, 2115

**Pressure Ulcers**
- Pain and Suffering
- Venous thrombus
- Sepsis
- Pneumonia
- Potential for Health Care Expenditures
  - Mean cost of 1 pressure ulcer = $1,877
  - Increases LOS 4-7 days
  - Cost of healing 1 pressure ulcer = $5,000-$40,000

Current Patient Mobility Practices found in Literature

- Q 2 hour turning
- AROM/PROM
- OOB
- Cardiac Chair
- Progressive Pivot/Stand
- Ambulate
Q 2 Hour Turning

Widely accepted as a Standard of Nursing Care

Does it really happen?

Is it enough?

Corcoran, P., (1991). Use it or lose it –the hazards of bed rest and inactivity- adding life to years. Western Journal of Medicine, 154, 536-538
Literature Findings

Krishnagdopalan et al. (2002)

**Study:** Prospective longitudinal observation study conducted to determine compliance with Q 2 hr turning practices and how physicians and nurses perceived the practice was carried out in their critical care units

**Setting:** 3 separate ICU’s, 74 patients, with a total of 566 patient hour observations.

**Findings:**
- 49.3% of observation time – No body position changes were noted
- 2.7% of Patients observed had Q 2 Hr. body position changes
- 80%-90% of survey respondents believed that Q 2 hr turning was an accepted standard and that it prevented complications
- 57% of Physicians and Nurses surveyed believed that Q 2 hour turning was achieved in their ICU’s

**Study:** 6 month prospective cohort study in an 8 bed RICU conducted to determine safety and feasibility of early activity in mechanically ventilated patients.

**Goal:** Ambulate patients 100 ft before discharge from RICU
- **Pt movement to upright position in bed, cardiac chair and passive ROM were not considered activity**

**Definitions:**
- **Activity period:** From time of hemodynamic stability throughout ICU stay
- **Adverse Events:** Fall to knees, tube removal, SB/P < 90 mmHg >200 mmHg, Desat < 80% and extubation

**Criteria:** Pt.’s on MV >4 days, Fio₂ ≤ 60%, Peep < 10 cm H₂O, no orthostatic B/P, no vasopressor qtts.

**Interventions:**
- Progressive increase in activity level from sit in chair to ambulate BID
- Pre & Post 30min rest period with AC ventilation prn to support activity
- Increase FI0₂ by 20% prior to activity & administer O₂ during activity to prevent desaturation
- VS measurement pre & post activity
- Activity assisted with RN, RT, PT or CC Tech
Literature Findings
Bailey, et al. (2007)

• **Results:**
  - 103 patients participated
  - 89% patients on MV
  - 42% of pt’s with ETT tubes ambulated
  - 69% of patients ambulated
    > 100ft.
  - Median distance ambulated
    • 400 ft. for pt.’s d/c home after admission
    • 270 ft. for pt.’s d/c to SNF after admission
    • 230 ft. for pt.s d/c to rehab after admission
  - Nurse to patient ratio 1:2
  - No increase in nursing hours required

• **Adverse Events:**
  - 9 patients had 14 adverse events
    (14/1449 activity events =0.009%)
  - 5 Falls to knees without injury
  - 4 SBP< 90 mmHg
  - 3 O2 desats < 80%
  - 1 small bowel feeding tube removal
  - 1 SBP > 200 mmHg
    • No extubations, complications, extended LOS, additional costs or therapy required

• **Clinical Significance:**
  Early activity is safe, feasible and beneficial to ICU patients. It requires a multidisciplinary team approach and is a valuable therapy to reduce complications associated with prolonged immobility.
Mobility Expectations

Range of Activity
(Intensive Care Mobility Guidelines)

- Position Change Q 2 hrs
- AROM/PROM upper & lower extremities Q 8 hrs
  - Incorporated into routine daily care
- HOB elevation 30° while in bed
  - Progressive activity as tolerated following mobility algorithm
- Cardiac Chair
- Dangle legs
  - While sitting on side of the bed
- Stand
  - Any amount of time patient can stand will be beneficial for expanding lung capacity, enhance weight bearing and restores normal fluid balance
- Pivot -> Out of Bed to Chair
  - Patient should not be OOB to chair for ≥ 1-2 hours at a time
- Levels of ADL
  - Encourage participation in hygiene and feeding as appropriate
- Progress to steps->ambulation
Mobility Expectations

Documentation

• Appropriate documentation adhering to unit standards.
• Do not use:
  – Checkmarks
  – Q 2° Turn
  – Side to Side
  – Lines drawn through boxes
• Use specific position change Q2:
  – Right (R), Left (L), Supine, Prone
• Time Specific
  – Number of steps taken or distance if pt. is ambulatory
  – Amount of time if OOB to chair
Mobility Expectations

• Utilize OT/PT to reduce risks associated with health co-morbidities, provide early intervention for rehabilitation and contribute to the patients well being and quality of life (Madill, Cardwell, Robinson & Brintnell, 1986).

• Occupational Therapy:
  – Ask physician to order consult on admission
  – OT will follow up weekly to evaluate patient for OT intervention

• Physical Therapy:
  – Ask physician to order PT consult when patient is able to follow commands or is ready to begin Spontaneous Breathing Trials (SBT)

Mobility Expectations

**Mobility Assist Devices**
- Over Head Lifts
- Hover Mattress
- Wedges (foam)
- Slider Boards
- Mobility Cart

**Mobility Assistance**
- Lift Team
- Patient Care Techs
- Peers
**Intensive Care Progressive Mobility Guidelines**

**Goal of Early Mobilization:**
- Promote mechanical ventilator weaning process
- Reduce ICU and Hospital LOS
- Prevent physical deconditioning
- Prevent Ventilator-Associated Pneumonia (VAP)
- Prevent Pressure Ulcers
- Maintain/achieve preadmission activity level
- Enhance Patient physical and psychological well being

**Monitor for Physical Therapy / Occupational Therapy Consult:**
- OT consult on admission, then weekly follow-up evaluation
- PT consult when patient is able to cooperate with activity of begins SBT (Spontaneous Breathing Trials)
- Document all Mobility on Flow Sheet

**Level I Modified Mobility Process**
**Criteria: Admission to Intensive Care Unit or Progressive Care Unit**
- Reposition and Turn Q 2 Hrs
- AROM/PROM
- Splints and / or boots (alternate) for contracture prevention
- HOB @ 30 degrees

**Advance mobility using progressive Algorithm Level as Pt. tolerates. Reassess q 12 hours**

Exclusion criteria for advancing mobility level:
- Lobar collapse or atelectasis, excessive secretions and/or:
  - Fio2 > 50% with PEEP > 10
  - SaO2 < 90% at rest or < 88% with activity
- Decreased MS or severe neurological insult
- Severe orthopaedic problems
- Hemodynamic instability: SaO2, BP, HR

**Hemodynamic Tolerance**
- 5-10 minutes equilibration time is required with each position change to determine hemodynamic instability

**Level II (Include Level I Interventions)**
- HOB @ 45° to 65° if hemodynamically stable
- Place legs in dependent position
- Advance to Cardiac Chair
- OOB to Chair with assistive device (2X Daily for 1 hr)
- Time frame for OOB in Chair positioning is <1 hr

**Level III (Include Level I & II Interventions)**
- Sit on Side of Bed
- Advance to Standing Position
- Initiate Pivot / Stand to bedside chair @ least 2 X Daily

**Level IV (Include Level I, II & III Interventions)**
- Independent: OOB, Sit in Chair, Stand, Ambulate

“Teach us to live that we may dread unnecessary time in bed. Get people up and we may save Our patients from an early grave.”

Richard Asher, MD. 1947

Corcoran, P. (1991)
Mobility Level Achieved
Mobility Bundle Algorithm
n=137 mobility events
1st Measure 2/22/07-3/31/07  2nd Measure 4/5/07-5/22/07

BR Level 1 CC=Level 2 OOB to CHAIR (Slide)=Level 3 OOB to CHAIR (Stand/Pivot)= Level 4 AMBULATE=Level 5 DANGLE=Level 6 NOT SPECIFIED=Level 7

Percent

80.2
67.9
4.4
13.1
4.3
6.6
1.4
5.6
1.5
0.7
5.1

n
Level 1 = Modified Mobility Process (BR, Turning, AROM/PROM)
Level 2 = Progressive Mobility Process (CC, OOB, Dangle)
Level 3 = Active Mobility Process (Ambulate)
References

• Bortz, W., (1982). Disuse and aging. JAMA, 248, 1203-1208
• Corcoran, P., (1991). Use it or lose it –the hazards of bed rest and inactivity- adding life to years. Western Journal of Medicine, 154, 536-538
• Creditor, M., (1993). Hazards of hospitalization of the elderly. Annual of Internal Medicine, 118 (3), 219-223
• Canadian Journal of Occupational Therapy, 53, 38-44.