Comorbidities in Orthopaedic Care

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Outcomes from this Presentation

1. Identify major comorbidities influencing outcomes for orthopaedic surgery patients
2. Identify the incidence of these comorbidities in persons age 65 and older
3. Define “failure to rescue”
4. Review selected comorbidities, their presentation, nurse assessment, and interventions to prevent complications
What are Comorbidities?

• **Definition:** diseases or medical conditions that coexist with the disease of interest. (*The disease of interest is the reason for orthopaedic surgery, for example: osteoarthritis.*)

  • Examples:
    • Patient receiving total hip arthroplasty, has CHF and COPD
    • Patient receiving total knee arthroplasty, has diabetes

• **Comorbidity is a major factor in determining the outcomes of various conditions** (Bjorgul, Novicoff, & Saleh, 2010)
Outcomes for Patients with Comorbidities

• Increase in complications
• Increased mortality
• Worse functional outcomes
• Greater expense to treat the patient
Age, Comorbidities, Complications - TKA Patients, Japan

<table>
<thead>
<tr>
<th>Age</th>
<th>At least one complication</th>
<th>Odds Ratio</th>
<th>Inhospital death</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>64 years or &lt;</td>
<td>3%</td>
<td>Reference Rate</td>
<td>0.077%</td>
<td>Reference Rate</td>
</tr>
<tr>
<td>65 – 79</td>
<td>4.1%</td>
<td>1.22</td>
<td>0.22%</td>
<td>2.58</td>
</tr>
<tr>
<td>80 or older</td>
<td>4.9%</td>
<td>1.51</td>
<td>0.55%</td>
<td>5.88</td>
</tr>
</tbody>
</table>

**ODDS RATIOS FOR INHOSPITAL DEATHS BY NUMBER OF COMORBIDITIES**

<table>
<thead>
<tr>
<th>Comorbidities</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 comorbidities</td>
<td>Reference Rate</td>
</tr>
<tr>
<td>1 comorbidity</td>
<td>1.60</td>
</tr>
<tr>
<td>2 comorbidities</td>
<td>6.58</td>
</tr>
<tr>
<td>3 comorbidities</td>
<td>16.50</td>
</tr>
</tbody>
</table>
Davis, Chung, and Juarez, 2011.
Prevalence of comorbid conditions with aging among patients with diabetes and cardiovascular disease.
IDENTIFYING AND MEASURING COMORBIDITIES
### American Society of Anesthesiology Physical Status Classification System

<table>
<thead>
<tr>
<th>ASA PS Classification</th>
<th>Definition</th>
<th>Examples, including, but not limited to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA I</td>
<td>A normal healthy patient</td>
<td>Healthy, non-smoking, no or minimal alcohol use</td>
</tr>
<tr>
<td>ASA II</td>
<td>A patient with mild systemic disease</td>
<td>Mild diseases only without substantive functional limitations. Examples include (but not limited to): current smoker, social alcohol drinker, pregnancy, obesity (30 &lt; BMI &lt; 40), well-controlled DM/HTN, mild lung disease</td>
</tr>
</tbody>
</table>

### ASA III

A patient with severe systemic disease

Examples, including, but not limited to:

- Substantive functional limitations; One or more moderate to severe diseases. Examples include (but not limited to): poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (≥3 months) of MI, CVA, TIA, or CAD/stents.
American Society of Anesthesiology Physical Status Classification System

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<tr>
<th>ASA PS Classification</th>
<th>Definition</th>
<th>Examples, including, but not limited to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA IV</td>
<td>A patient with severe systemic disease that is a constant threat to life</td>
<td>Examples include (but not limited to): recent (&lt; 3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis</td>
</tr>
<tr>
<td>ASA V</td>
<td>A moribund patient who is not expected to survive without the operation</td>
<td>Examples include (but not limited to): ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction</td>
</tr>
</tbody>
</table>
The study included 10,868 total joint arthroplasty patients in Toronto, Canada.

ASA II patients have mild or well-controlled comorbidities.

ASA III patients have one or more moderate to severe comorbidities.
OBESITY AND UNDERWEIGHT AS COMORBIDITIES
Definitions of Obesity and Underweight

Body Mass Index (BMI) calculator

Weight in pounds $\times$ 703
Height (sq) in inches

Obesity is increasingly common: over 78,000,000 people in the US are obese (CDC, 2016)
CHARACTERISTICS OF THE OBESE PATIENT
(Thornqvist, Gilason et al, 2014)

Obese is defined as BMI > 30

- Common comorbidities include
  - Heart Disease
  - HTN (1.5 to 3 times more likely than normal weight persons)
  - Diabetes (2 to 6 times more likely than normal weight persons)
- Sleep Apnea
- Weight loss may be needed prior to surgery
Obesity and Outcomes - Orthopaedic Patients
(AAOS, 2014)

- Obesity is an independent risk factor for pain. Patients with obesity have double the risk of chronic pain.
- Obesity increases the risk for osteoarthritis. Patients with a BMI of 30 or greater have at least 8 times more likelihood for need of a TKA.
- Patients with obesity odds of musculoskeletal injury are 1.48 that of non-obese persons.

- Obese patients have slower recoveries than non-obese.
- Obese patients experience more pain than the non-obese.
- Obese patients have 1.2 risk of mortality compared with patients with BMI > 18.4 and < 26.
UNDERWEIGHT (BMI < 18.5) AND COMORBITIES

- Pressure ulcer risk
- Risk for dislocation of THA (probably due to reduced muscle mass)
- Nutritional deficits for healing
- 7.7 hazard ratio of all cause 30-day mortality compared with normal weight patients
- 5.7 hazard ratio of all cause 1-year mortality
CHARACTERISTICS OF THE UNDERWEIGHT PATIENT (Thorqvist, Gislason et al., 2014)

A study of 34,744 Danish patient having hip or knee replacement

Underweight patients were more likely to

• Be a current smoker
• Have cerebrovascular disease
• Have COPD
• Be anemic
• Be on average 75 years old

The underweight advantages, including being less likely to

• Receive statin treatment or calcium channel blockers
• Be diabetic
Protein-Calorie Malnutrition in the Elderly

Estimated Malnutrition in the Elderly
(Molnar, Underdown & Clark, 2014)

ASA III

ASA II

ASA I

Total Joint Arthroplasty Patients
Malnutrition

• Protein needs increase with recovery from surgery, from 1.0 to 2.0 GM additional needed per Kg of body weight

• Protein-calorie malnutrition can result in loss of lean body mass

• Protein-calorie malnutrition is associated with poor healing and wound complications (Molnar, Underdown & Clark)
COMORBIDITIES AND HIP FRACTURE SURGERY
Hip Fracture Surgery is Urgent

Issues with Hip Fracture Surgery

1. Many comorbidities in this population
2. 25% of patients have three or more comorbidities
3. Little time to mitigate comorbidities. Obese patients have no time to lost weight to reduce risk.
4. Many patients are underweight, frail, and anemic, and more likely to need transfusion
5. Ideal timeframe for surgery is within 48 hours of fracture. Preparing the patient involves stabilizing comorbidities preoperatively.
Patient Profile – Hip Fracture

- 80% of hip fracture patients are women
- Average age – 80 years, nearly all are > 65 years old
- 12% to 17% of patients with a hip fracture die within the first year (LeBlanc, Muncie & LeBlanc, 2014)
- This population has a large number of comorbidities. Only 4.9% of patients in a 2012 study presented with NO comorbidities (Nikkel et al., 2012)
Figure 2  Common Comorbidities in Patients With Hip Fracture

- Hypertension
- Deficiency anemias
- Fluid and electrolyte disorders
- Chronic pulmonary disease
- Diabetes, uncomplicated
- Other neurologic disorders
- Hypothyroidism
- Congestive heart failure
- Depression
- Renal failure
- Valvular disease
- Peripheral vascular disorders
- None

Comorbidities may delay surgery

• Patients presenting with a hip fracture must be evaluated by the physician for comorbidities (LeBlanc, Muncie, LeBlanc)
• The family physician, hospitalist, or internist manage comorbid conditions
• Comorbidities may require extensive evaluation for patient safety. This may delay hip surgery.
Delay to Surgery and Comorbidities (Ricci, Brandt, McAndrew & Gardner, 2015)

- Delay to surgery for a patient with a cardiac condition (Example: patient needs cardiac testing, such as echocardiogram, stress dobutamine or thallium imaging)

- Delay to surgery may be due to consultations needed for complex cardiac conditions

CONSEQUENCES OF DELAY TO SURGERY

Operative delay > 48 hours after admission increased odds of 30-day all-cause mortality by 41%

Operative delay > 48 hours after admission increased odds of one-year all-cause mortality by 32%
Consequences of Delayed Surgery (Lee & Elfar, 2014)

- “Patients with a poorer baseline health status underwent more delayed surgery and that this association alone accounted for the poorer outcomes in patients who had delays” (Lee & Elfar, 2014).

- “Early surgery has been shown to reduce risk of pressure ulcer development, a serious complication that occurs with prolonged immobilization” (Lee & Elfar, 2014).

- “Surgery performed within 36 hours increased the likelihood of returning to independent living within 4 months” (Lee & Elfar, 2014).
## Delay to Surgery and Length of Stay

(Ricci, Brandt et al, 2015)

<table>
<thead>
<tr>
<th>ASA Score</th>
<th>Delay to Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA II</td>
<td>1.4 days</td>
</tr>
<tr>
<td>ASA III</td>
<td>2.0 days</td>
</tr>
<tr>
<td>ASA IV</td>
<td>3.0 days</td>
</tr>
</tbody>
</table>

Factors associated with increased length of stay:
- Male gender
- Pre-op cardiac testing
- ASA score
- Admission on Thursday and Friday
- Admission on a holiday
Best Practices for Care – Postop Fractured Hip
( Colon-Emeric, 2012)

- Regional anesthesia
- Treat pain adequately
- Antibiotic prophylaxis
- Mobilize early and often
- Maintain oxygenation
- Prevent DVT (Anticoagulation longer than 7-10 days associated with fewer DVTs, more major bleeding)
- Prevent pressure ulcers
- Monitor and protect surgical wound

- Prevent delirium
  - Fluid and electrolyte balance
  - Adequate elimination
  - Careful with antipsychotics
  - Support sleep-wake cycle
  - Orient with clocks and reminders
- Remove foley catheter
- Monitor for and treat anemia
- Rehabilitation (PT) – significant impact with IP, OP, or home PT
- Fall prevention (home OT)
- Prevent secondary fractures
COMORBIDITIES AND JOINT REPLACEMENT SURGERY
<table>
<thead>
<tr>
<th>Comorbidity</th>
<th>Hazard Ratio</th>
<th>Confidence/Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>1.64</td>
<td>95%, CI 1.39 to 1.93</td>
</tr>
<tr>
<td>Psychosis</td>
<td>1.34</td>
<td>95%, CI 1.08 to 1.68</td>
</tr>
<tr>
<td>Rheumatological disease</td>
<td>1.32</td>
<td>95%, CI 1.11 to 1.57</td>
</tr>
<tr>
<td>Renal disease</td>
<td>1.29</td>
<td>95%, CI 1.06 to 1.58</td>
</tr>
<tr>
<td>CHF</td>
<td>1.20</td>
<td>95%, CI 1.01 to 1.43</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>1.15</td>
<td>95%, CI 1.01 to 1.32</td>
</tr>
</tbody>
</table>
ADDRESSING COMORBIDITIES IN HIP OR KNEE SURGERY PATIENTS
PREOP MANAGEMENT OF COMORBIDITIES

**CARDIAC COMORBIDITIES**
- Arrhythmias must be evaluated preoperatively
- Fluids and electrolyte balance should be restored pre-op
- Assess response to cardiac meds

**PAIN CONTROL**
- Administer pain medication – consider sleep apnea

**DVT PREVENTION**
- Thromboembolism prophylaxis begun pre-op per protocol
- Patients with a history of DVT or PE evaluated, to determine if adjustments to therapy needed
- Check INR for patients taking anticoagulants
PREOP MANAGEMENT OF COMORBIDITIES

ENDOCRINE – METABOLIC
• Evaluate admission blood glucose levels
• Adjust oral hypoglycemic, insulin and other therapy to goal blood glucose
• Continue thyroid supplements, evaluate for dose adjustment

PULMONARY DISEASE
• Evaluate lung disease, including medications
• Teach therapy needed post-op (incentive spirometry, nebulizer treatments)
• Obstructive Sleep Apnea: use CPAP if patient has one; use ETCO2 monitor if available, or SaO2 to monitor
PREOP MANAGEMENT OF COMORBIDITIES

**URINARY TRACT**
- Evaluate for UTI pre-op
- Treat UTI pre-op

**HEMATOLOGIC (ANEMIA)**
- Correct hemoglobin pre-op
- Check INR

**COGNITIVE/NEUROLOGICAL**
- ABCDE bundle for delirium

**PROTEIN-CALORIE MALNUTRITION**
- Nutritional supplements while patient can have oral intake
- Consider pressure-relieving mattress while awaiting surgery
OBESITY
• Keep in mind the patient may experience higher levels of pain
• Be cautious about medication for pain, especially if the patient has obstructive sleep apnea

UNDERWEIGHT
• Monitor for anemia in pre-op period
• Use a mattress overlay to prevent pressure ulcers
• Offer protein supplements to improve protein intake
POST OPERATIVE MANAGEMENT OF COMORBIDITIES
Post-op Nursing Interventions

**CARDIAC**
- Assess rhythm, rate
- Monitor electrolyte levels
- Assess response to any new cardiac meds or dose changes

**PAIN CONTROL**
- Monitor pain levels, medicate using p.o. medications appropriately
- Monitor PaO2 or EtCO2 to maintain safe oxygenation

**DVT PREVENTION**
- Begin post-op anticoagulant on time!
- Use sequential compression stockings. Check the patient’s skin under the sleeves, and check the sleeves for fit and inflation.
- Assess peripheral pulses and assess leg swelling.
- Administer anticoagulants as ordered.
Post-op Nursing Interventions

ENDOCRINE-METABOLIC
• Be aware of goal blood glucose
• Monitor blood glucose and response to medications
• Establish adequate food intake
• Resume thyroid supplement post-op

PULMONARY DISEASE
• Assess chest sounds and breathing pattern
• Avoid over-sedation!
• Remind patient to perform I.S.
• Get patient out of bed, ambulate
# Post-op Nursing Interventions

## URINARY TRACT
- Remove foley catheter timely, to prevent CAUTI
- Assess response to treatment if UTI was treated pre-op
- Monitor for signs and symptoms of sepsis

## HEMATOLOGIC
- Monitor Hgb, administer blood as needed

## COGNITIVE/NEUROLOGICAL
- Ambulate
- Support sleep cycle
- Monitor for delirium

## PROTEIN/CALORIE MALNUTRITION
- Use dietary supplements to increase protein intake
Post-op Nursing Interventions – Wound Healing

• Address malnutrition with supplements
• Keep patient well-hydrated
• Monitor Hgb levels for post-op anemia
• Keep patient (and wound) warm
ABDCE Bundle to Address Delirium

AWAKENING and BREATHING trial
COORDINATION
DELIRIUM assessment and management
EARLY EXERCISE and progressive mobility
FAILURE TO RESCUE
WHAT IS “FAILURE TO RESCUE”?  
(American Hospital Association, 2016)

“Failure to rescue (FTR) is the failure to recognize and appropriately respond to early signs of patient deterioration. It is considered an indicator of the quality of care within a health care organization...”
FAILURE TO RESCUE

TO AVOID FAILURE TO RESCUE:

- recognize clinical deterioration
- communicate and escalate concerns
- physically assess the patient
- diagnose and treat appropriately
### Failure to Rescue

<table>
<thead>
<tr>
<th>Category of Complication/Comorbidity</th>
<th>Complication involved with Failure to Rescue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac</td>
<td>Arrhythmias, cardiac arrest, infarction, CHF</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Pneumonia, bronchospasm, aspiration pneumonia, respiratory compromise</td>
</tr>
<tr>
<td>Neurologic</td>
<td>Stroke, seizure, psychosis, coma</td>
</tr>
<tr>
<td>DVT</td>
<td>PE, arterial clot, phlebitis</td>
</tr>
<tr>
<td>Infection (including UTI)</td>
<td>Sepsis, wound non-healing, CAUTI</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>Decubitus ulcer</td>
</tr>
<tr>
<td>Sleep Apnea</td>
<td>Central sleep apnea, respiratory arrest</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Stroke</td>
</tr>
</tbody>
</table>
Rescuing a Patient (Hravanek, 2015)

Initiate evaluation of patient condition - RESCUE

Detect a change in patient condition

Role of the Nurse in Recognizing a Critical Patient Change in Condition

Recognize that the change is abnormal

Determine that help is needed

Know how to summon help

Articulate the problem to the RRT / provider
References


