Medical Optimization Prior to Elective Total Joint Arthroplasty

Richard Crank DO
Lakeland Regional Orthopedic Associates
2135 Harden Blvd
Lakeland, FL 33803
rcrank@atsu.edu
Why is this necessary

• Value

• Median Household income 2000- $56,000
• Median Household income 2013- $51,000
• By 2020, national health spending is expected to reach $4.6 trillion and comprise 19.8 percent of GDP
Why is this Important for Total Joints?

• 21% of the U.S. population aged 18 or older have arthritis

• The percentage grows higher with age

• 67 million, or 25 percent of the adult population, will have arthritis in 2030.
Why is this Important for Total Joints?

• The most recent National Healthcare Safety Network (NHSN) report includes data from 2006 to 2008.

• Knee replacement postoperative infection rates ranging from 0.68% to 1.60%

• Hip replacement infection rates from 0.67% to 2.4%.

• Estimated between 6,000 and 20,000 SSIs occur annually in hip and knee replacements

• The mean cost to treat hip PJIs was $5965 greater than the mean cost for knee PJIs. The annual cost of infected revisions to US hospitals increased from $320 million to $566 million during the study period and was projected to exceed $1.62 billion by 2020.

Why is this Important for Total Joints?
Diagnosis

Healthy Knee

Arthritic knee
Diagnosis

Normal hip

Arthritic hip
What Labs are necessary

- CBC
- CMP
- Erythrocyte Sedimentation Rate
- C-reactive Protein
- Urinalysis with Micro and Culture
- HgbA1C
- BMI
- Chest X-ray

- EKG
- MRSA Nasal Culture
- 25-Hydroxy vitamin D
- CD4+
- Viral Load
- Nicotine level
- Type and Screen?
- PT?
- PTT?
So let's break it all down

- Hgb > 12g/dl
- HgbA1C < 7
- Albumin >3.5mg/dl
- Transferrin >200mg/dl
- Pre-albumin >22.5mg/dl
- Total Lymphocyte count between 1200-1500 cells/mm$^3$
- 25-Hydroxy vitamin D >30 ng/ml
- BMI <40

- NO SMOKING
- CD4+ >350
- Viral load < 0.75 copies per 1000ml
- HIV must be on at least 2 anti-retroviral meds
So let's break it all down

• Grady Memorial in Atlanta 900 bed teaching hospital

• Nine patients in the pre-protocol group developed an infection for a rate of 12.9%. Two patients in the post-protocol group developed an infection for a rate of 1.9%. $P$-value of 0.007

• Decreased infection rates following total joint arthroplasty in a large county run teaching hospital: A single surgeon's experience and possible solution. Gottschalk, Michael B. et al. The Journal of Arthroplasty, Volume 29, Issue 8, 1610 – 1616
• The Charlson Comorbidity Index consists of seventeen items as follows:
  • myocardial infarction, congestive heart failure, peripheral vascular disease, dementia, cerebrovascular accident, pulmonary disease, connective tissue disorder, peptic ulcer, mild to moderate liver disease, and diabetes (each item has a score of 1 point);
  • hemiplegia, diabetes with complications, renal disease, and cancer (each item has a score of 2 points);
  • severe liver disease and metastatic cancer (each item has a score of 3 points);
  • acquired immunodeficiency syndrome (AIDS), which scores 6 points

Studies have shown that patients who have increased levels of hemoglobin A1c and glucose levels greater than 200 mg/dl in the immediate postoperative period are associated with an increased risk for surgical site infections.

Surgical site infection

- 43 patients with a Charlson Comorbidity Index of 0
- 15 patients with a Charlson Comorbidity Index of 1
- 12 patients with a Charlson Comorbidity Index of 2
- 10 patients with a Charlson Comorbidity Index of ≥3

- The highest rate of surgical site infection at 4.23% was in patients with a preoperative hemoglobin level of ≤10 g/dL.
- Patients with a preoperative hemoglobin level of 12 to 13 g/dL had the lowest rate of surgical site infection at 0.84%
### Complications and Nutrition.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Malnourished (Low Albumin or Transferrin (n = 184))</th>
<th>Normal Transferrin and Albumin (n = 1977)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular complications</td>
<td>1/184 (0.5%)</td>
<td>0/1977 (0%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Neurovascular complication</td>
<td>5/184 (2.7%)</td>
<td>0/1977 (0%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pulmonary complication</td>
<td>2/184 (1.1%)</td>
<td>6/1977 (0.3%)</td>
<td>0.094</td>
</tr>
<tr>
<td>Renal complication</td>
<td>10/184 (5.4%)</td>
<td>16/1977 (0.8%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Required I&amp;D</td>
<td>5/184 (2.7%)</td>
<td>12/1977 (0.6%)</td>
<td>0.002</td>
</tr>
<tr>
<td>Hematoma</td>
<td>7/184 (3.8%)</td>
<td>13/1977 (0.7%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DVT</td>
<td>3/184 (1.6%)</td>
<td>21/1977 (1.1%)</td>
<td>0.482</td>
</tr>
<tr>
<td>PE</td>
<td>2/184 (1.1%)</td>
<td>15/1977 (0.8%)</td>
<td>0.63</td>
</tr>
<tr>
<td>Acute Infection within 3 months</td>
<td>5/184 (2.7%)</td>
<td>8/1977 (0.4%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Any complication</td>
<td>22/184 (12.0%)</td>
<td>58/1977 (2.9%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

The Effect of Malnutrition on Patients Undergoing Elective Joint Arthroplasty
Huang, Ronald et al.
The Journal of Arthroplasty, Volume 28, Issue 8, 21 - 24
April 2010-May 2011 Rothman Institute
BMI

- **fourfold to nearly tenfold**, in the prevalence of infection in obese and morbidly obese patients (BMI > 40 kg/m²)

- Super obesity (BMI > 50 kg/m²) is associated with a **twenty-onefold** increase in the risk of infection
Why UA

Classic urinary tract infection symptoms of dysuria and urgency and increased frequency of urination are often absent in elderly patients.

4% of total joint arthroplasty patients have asymptomatic urinary tract infections prior to surgery.


Consider urinalysis and urine culture if:

- Symptoms suggestive of urinary tract infection
- No symptoms, but risk factors for infection or patient is elderly

Proceed with surgery if:

- Urinary tract infection, but no irritative or obstructive symptoms
- Urinary tract infection with irritative symptoms, but bacterial count <1000 CFU/mL
- Urinalysis not suggestive of urinary tract infection

Address prior to surgery if:

- Obstructive symptoms
- Dysuria and bacterial count >1000 CFU/mL
Staph Treatment We all are exposed

- **Basic principles of therapy:**
  - *Staph aureus* is a very common organism. Colonization of the nose, and subsequently on the skin, is frequent
  - 60% of people are intermittently colonized
  - 20% always colonized
  - 20% never.
  - Colonization with a certain strain of bacteria can persist for years.
  - Spread between people is by skin contact (shaking hands, etc.) and sometimes on equipment (e.g., Hospital bedrail, gym workout equipment, home utensils, cups, TV remote, computer keyboards, stethoscopes).

Decolonization procedure MRSA:

1. **All active skin infection sites must be resolved before decolonization becomes feasible.** Boils must be drained. Antibiotics may be needed. Soaks or warm compresses are appropriate.

2. **Ideally, no chronic intravenous device is present** (e.g. Hickman, PICC line, etc.), and urinary catheters should be avoided.

3. **Colonization eradication should be attempted at home,** not in the hospital.

4. **Chlorhexidine or hexachlorophene antiseptic soap:**
   - Wash whole body (from scalp to toes) once daily. A big lather is not necessary! Skin moisturizer may be applied for dry skin after bathing.
   - Remove all artificial nails and all fingernail polish.
   - Scrub fingernails for one minute with nail brush twice daily.
   - **Duration:** 7 days

5. **Mupirocin 2% ointment**
   - Apply inside each nostril twice daily for 7 days, using a cotton tipped swab. No need to put deep into the nose. One Rx enough for all.
   - **Duration:** 7 days

6. **Oral antibiotics:**
   - Are not required for decolonization
   - May be used to decrease gastrointestinal colonization, and may include clindamycin, doxycycline, or TMP-SMZ, occasionally with rifampin

7. **Encourage treatment of all household members** (and regular sexual contacts) with chlorhexidine/hexachlorophene and mupirocin during the same time period.

8. Post-treatment nasal culture for surveillance is optional and not encouraged.
Vitamin D

- Multicenter German and Australian study: between Jan 2011 and Dec 2012 looked at 109 primary TKA, THA, TSA, 50 PJI, 31 aseptic loosening

- **NORMAL** >30ng/ml

- 64% (n=70) primary arthroplasty had inadequately low levels of vitamin D, with a mean of 19.46 ng/ml (± 9.49; range 2.8–48.7 ng/ml).

- Loosening and infection had 25OHD values <20 ng/ml

- aseptic loosening (n=16; 52%) mean level of 20.52 ng/ml (± 9.13; range 3.3–33.8 ng/ml)

- periprosthetic joint infection (n =43; 86%) with a mean level 13.29 ng/ml (± 6.54; range 4.9–31.5 ng/ml)

Smoking Cessation

• Smoking causes vascular constriction
• Since a history of smoking is associated with a statistically significant increased risk of periprosthetic joint infection, many centers use formal smoking cessation programs to assist patients in giving up, preferably Mandatory before surgery.
• 6 WEEKS BEFORE AND AFTER
• Nicotine test
Dentition

• Approximately 2% of total joint arthroplasty infections involve organisms found in the oropharynx, and most affected patients have preexisting cavities or oral abscesses

• Antibiotic prophylaxis before substantial dental procedures in patients who have undergone total joint arthroplasty is controversial; authors of 74% of the prior literature on the topic take no clear position

• The American Academy of Orthopaedic Surgeons (AAOS) suggests prophylaxis in patients at high risk of hematogenous or prosthetic infection

• Bacteremia from dental procedures can cause seeding and sepsis of the prosthetic joint

• Treatable dental issues should be screened for and treated before total joint arthroplasty

• Preoperative Risk Stratification and Risk Reduction for Total Joint Reconstruction Vincent Y. Ng, David Lustenberger, Kimberly Hoang, Ryan Urchek, Matthew Beal, Jason H. Calhoun, Andrew H. Glassman The Journal of Bone & Joint SurgeryFeb 2013,95(4)
Who Needs Cardiac Evaluation

Unstable coronary syndromes
- Unstable or severe angina
- Recent myocardial infarction (within 4-6 weeks)

Decompensated heart failure
- Inability to carry out any physical activity without discomfort
- Symptoms of cardiac insufficiency at rest, such as fatigue, palpitation, or dyspnea
- Discomfort that is increased with physical activity
- Worsening or new-onset heart failure

Substantial arrhythmias
High-grade, Mobitz type-II or tertiary atrioventricular block
- Symptomatic ventricular arrhythmias
- Supraventricular arrhythmias (including atrial fibrillation) with heart rate of >100 beats/min at rest
- Symptomatic bradycardia
- Newly recognized ventricular tachycardia

Severe valvular disease
- Severe or symptomatic aortic stenosis
- Symptomatic mitral stenosis (progressive dyspnea on exertion, exertional presyncope, heart failure)

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Who Needs Cardiac Evaluation

It is reasonable to require electrocardiogram evaluation in all patients >50 years old and within 30 days of elective total joint arthroplasty surgery. In patients with important abnormalities such as left bundle branch block and left ventricular hypertrophy with a “strain pattern,” stress cardiac imaging should be strongly considered.

Functional capacity should be assessed with use of a metabolic equivalent (MET) scale. Patients with adequate functional capacity to perform activities involving >4 METs without experiencing symptoms can typically be cleared for surgery from a cardiovascular standpoint.

Unless contraindicated, beta-blockers are indicated for patients with at least one of the clinical risk factors or poor cardiovascular functional capacity.

If poor functional capacity is present, patients with at least one of the clinical risk factors should be evaluated by a specialist for clearance or potential additional noninvasive testing. Patients with no risk factors are likely to receive cardiovascular clearance.

Coronary revascularization prior to noncardiac surgery has limited value and is not recommended for patients with stable coronary artery disease. It is likely beneficial only in those patients in whom it would be indicated independent of the planned surgery for reasons such as ST segment-elevation myocardial infarction, high-risk unstable angina, angina with substantial left main coronary artery stenosis, or three-vessel disease.
Pulmonary

- Obstructive sleep apnea is present in 5% to 11% of total joint arthroplasty patients
- The current gold standard for diagnosing obstructive sleep apnea is an overnight sleep study involving polysomnography, but the STOP-BANG questionnaire can screen for high-risk
- The maximum possible score is 8. A score of ≥3 is considered to indicate a high risk of obstructive sleep apnea

S: Do you *snore* loudly, loud enough to be heard through a closed door?
T: Do you feel *tired* or fatigued during the daytime almost every day?
O: Has anyone observed that you *stop* breathing during sleep?
P: Do you have a history of high blood *pressure* with or without treatment?
B: *BMI* >35
A: *Age* >50 yr
N: *Neck* circumference >40 cm
G: Male *gender*
Renal impairment is associated with a longer hospital stay, cardiac complications, early and late infections, and greater in-hospital and one-year mortality.

Patients with renal insufficiency (serum creatinine > 1.5 mg/dL or creatinine clearance < 100 mL/min) should be evaluated for potential treatment and preventative preoperative measures.

Dialysis:
- 66% rate of medical complications, a 21% rate of orthopaedic complications, and a 40% mortality at three years.
- Prevalence of periprosthetic infection ranges from 0% to 19%.

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Meds To Consider

Stress-dose **steroids** (SDS) for patients on steroids

- If <7.5 mg/day or any dose for <3 wks, only use typical daily dose perioperatively
- If 7.5 to 20 mg/day, individualize SDS on basis of infection risk and chronicity of steroid use
- If >20 mg/day for >3 wks, secondary adrenal insufficiency is likely; treat with SDS

**Methotrexate**

- Considered safe to continue in the perioperative period

  Reasonable to hold for 2-4 weeks preoperatively if patient does not have debilitating disease and can tolerate withdrawal of methotrexate therapy

**Other disease-modifying antirheumatic drugs**

- Hydroxychloroquine considered safe to continue in perioperative period

- Leflunomide, sulfasalazine, and azathioprine generally held until normal bowel/renal function postoperatively

**Tumor necrosis factor inhibitors (Enbrel, Remicade, Humira)**

- Caution advised. Hold agents for at least one dosage cycle prior to surgery and until staple/suture removal postoperatively

**Rituximab**

- Prolonged B-cell depletion can occur; may consider postponing surgery until B-cell counts normalize
Low risk (<4% annual risk of thromboembolism without anticoagulation)

- Nonvalvular atrial fibrillation
- Cardiomyopathy without atrial fibrillation
- Deep venous thrombosis >3 mo ago without high-risk features

Recommendations:

- Stop warfarin 4 days preoperatively
- Use prophylactic doses of LMWH or UFH
- Resume warfarin on day of surgery

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Intermediate risk (4%-7%)

- Mechanical aortic valves in sinus rhythm
- Atrial fibrillation and (1) age >65 yr without high-risk features, (2) age <65 yr with diabetes mellitus, coronary artery disease, or hypertension, or (3) peripheral vascular disease²
- Deep venous thrombosis <3 mo ago without high-risk features
- Mitral stenosis, coronary artery disease, left ventricle aneurysm, or congestive heart failure with left ventricle dilation

Recommendations:

- Stop warfarin 4 days preoperatively
- Optionally, use a therapeutic dose of LMWH or UFH preoperatively and postoperatively (discontinue 12-24 hr before surgery and resume 12-24 hr postoperatively)
- If therapeutic LMWH not used preoperatively, use LMWH postoperatively
- Resume warfarin on day of surgery
High risk (>7%)

- Mechanical mitral valves
- Aortic mechanical heart valve with prior thromboembolism, atrial fibrillation, or congestive heart failure
- Deep venous thrombosis >3 mo ago with high-risk features (recurrent venous thromboembolism, malignancy, hypercoagulable state, extremity paresis)
- Atrial fibrillation with history of stroke or transient ischemic attack, congestive heart failure, left ventricle dysfunction, mitral stenosis, prosthetic heart valves, thyroid disease, or age >75 yr with diabetes mellitus or hypertension

- Hypercoagulable state (Factor V Leiden, prothrombin gene mutation, antiphospholipid antibody, anticardiolipin antibody, protein-C and S deficiency, antithrombin-III deficiency)

Recommendations:

- Stop warfarin 4 days preoperatively
- Therapeutic dose of LMWH or UFH preoperatively and postoperatively (discontinue 12-24 hr before surgery and resume 12-24 hr postoperatively)
- Resume warfarin on day of surgery
Very high risk

- Multiple heart valves
- Bileaflet mitral heart valve with atrial fibrillation, congestive heart failure, or prior embolus
- Deep venous thrombosis <1 mo ago or 1-3 mo ago with high-risk features

Recommendations:

- Stop warfarin 4 days preoperatively
  - Therapeutic LMWH or UFH preoperatively and postoperatively (discontinue 12 hr before surgery and resume 12 hr postoperatively)
- Resume warfarin on day of surgery
How Do We Succeed?

• We must show our value.
• We must empower our patients.
  • We must unite.
  • We must be transparent.
Questions?