Harvard Quality Colloquium

Collaboration, Technologies to Achieve Transformational Change and Physician Buy-In for Quality Improvement and P4P

Boston: August 22, 2006

Track IA
Speakers/Disclosure

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  HealthGate Data Corp.  
  Medical Director, Center for Healthcare Informatics  
  University of Kansas

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  Dept. of Medical Informatics and Clinical Epidemiology  
  Oregon Health & Science University

- Brian Levy, MD  
  Chief Medical Officer & Senior Vice President  
  Health Language, Inc.
Collaboration, Technologies to Achieve Transformational Change

- **Frame the problem**
  - Trends and motivation for collaboration technologies (across industries)
  - Requirements for collaboration tools in healthcare

- **Case Study**

- **Success Factors**
  - An evidentiary basis for collaboration
  - “Encoding the evidence”: integration with controlled medical terminology

- **Discussion**
The Problem

- Quality programs and CPOE require standardization of practices
  - order sets, nurse documentation forms, discharge planning materials, safety checklists

- Effective standardization requires:
  - Interdisciplinary collaboration and consensus building…and that usually means committee meetings
    - Expensive to manage
    - Time consuming
    - Slow
    - Inefficient
  - Creation of an evidentiary foundation
    - Accounting for updates
  - Operationalization of committee decision making
Challenges in Healthcare

- Loose affiliation of participants
  - Non-uniform IT platform and training
- Burgeoning amount of committee work
  - CPOE adds dozens and dozens of new committees
- Inadequate staffing
- Geographic distribution of participants
  - Expense and effort in coordinating committee meetings
- Multiple heterogeneous local versions of care documents and processes
- Etc…
Challenges in Healthcare  
(for the CMO/CMIO/VP Quality)

- No easy/obvious way to track committee performance
- No easy/obvious way to have unambiguous interpretation of committee decisions
- No easy/obvious way to find and compare documents
  - Most are archived in paper format around the enterprise
- No systematic process of identifying existing documents that need re-evaluation or re-review in light of changing evidence
- No easy way to have the results of committee work “flow” into IT systems (for CPOE, documentation, etc…)
Collaboration Tools
Collaboration Technologies

- Remote conferencing
- Telephony
- Whiteboarding
- Enterprise wikis
- Enterprise blogging
- AJAX niche applications
- Content management systems
Why should the healthcare industry be interested in collaboration technologies…?


From the Los Angeles Times

A TIMES INVESTIGATION

20% of U.S. Transplant Centers Are Found to Be Substandard

Medicare allows 20% of the 236 programs in the U.S. to stay in business despite performing too few operations or having low survival rates.

By Tracy Weber and Charles Ornstein
Times Staff Writers

June 29, 2006

About a fifth of federally funded transplant programs fail to meet the government's minimum standards for patient survival or perform too few operations to ensure competency, a Los Angeles Times investigation has found.

The U.S. Centers for Medicare and Medicaid Services has allowed 48 heart, liver and lung transplant centers to continue operating despite sometimes glaring and repeated lapses, the newspaper's review found. There are 236 approved centers nationwide.

Although many of the substandard programs treat small numbers of patients, their collective failings carry a significant toll.

Consider the latest available statistics, for transplants performed between 2002 and 2004. Nine lung programs failed to meet the minimum Medicare standards for survival, number of surgeries or both.

These hospitals accounted for 21 more deaths than would be expected, based on a government-funded analysis of how all patients fare nationwide within a year. 
Why should the healthcare industry be interested in collaboration technologies...?

- We are already spending huge amounts of time, resources and money on inefficient/ineffective collaboration (meetings, staff, research, etc…)

- There is a large ROI for increased efficiency
Requirements for Healthcare User

- **Collaboration Management**
  - Simple (i.e. in-box) notification of work/tasks
  - Threaded discussion/annotation
  - One-step review and completion of work
  - Synchronous and asynchronous communication

- **Workflow Management**
  - Task assignment
  - Task Tracking
  - Dashboard of progress

- **Evidence and Updates**
  - Access to locally created documents
  - Access to evidence-based clinical resources
  - Access to a library of quality measures (JCAHO, CMS, societies)
  - Ongoing literature surveillance--linked to local documents
Requirements for the Healthcare Technologist

- **ASP Model**
  - Non-disruptive implementation
  - Low cost of management/ownership

- **Indexing to Control Medical Terminology Standards**
  - Export into contemporary EHR systems

- **Robust content management**
  - Automatic versioning and statusing of all documents
  - Roll-back, automated document comparisons

- **Representation of the Governance, Committee, and Geographic Structure of a System**
  - Users assigned to teams, teams assigned to facilities, facilities assigned to regions, regions and facilities assigned a health system
  - Health system determines the allowed variation between regions, facilities, and teams…and can see and track that variation

- **Minimal Training**
  - “Casual users” vs Super-users
Patient Case

Mr. Smith is a 65 year old man admitted to the hospital for left total hip replacement. He has a history of osteoarthritis of this hip and has considerable pain with mobility. Mr. Smith has a history of diabetes mellitus controlled by oral medications and coronary artery disease with a MI and angioplasty 10 years ago. He takes glipizide, metformin, aspirin, and lisinopril.
Patient Case Issues

- Identify this patient as requiring post-operative DVT prophylaxis
- Consider pre-operative measures as well
- Start appropriate DVT prophylaxis based on this patient’s profile
- Realize the benefits to the hospital in preventing post-operative DVTs in improving patient safety and pay for performance policies
Patient Case

- Pay for performance issues
  - Administration of proper anticoagulation for post-op orthopedic procedures

- Evidence
  - (DVT) occurs after approximately 25 percent of all major surgical procedures performed without prophylaxis, and pulmonary embolism (PE) occurs in 7 percent of operations conducted without prophylaxis. More than 50 percent of major orthopaedic procedures are complicated by DVT, and up to 30 percent by PE, if prophylactic treatment is not instituted. Despite the well-established efficacy and safety of preventive measures, studies show that prophylaxis is often underused or used inappropriately.
  - Without prophylaxis, the rates for symptomatic and asymptomatic VTE in total hip replacement include total DVT, 45%-57%; proximal DVT, 23%-36%; total PE, 0.7%-30%; and fatal PE, 0.1%-0.4%. In total knee replacement rates are total DVT, 40%-84%; proximal DVT, 9%-20%; total PE, 1.8%-7%; and fatal PE, 0.2%-0.7%. In hip fracture patients without prophylaxis, rates are total DVT, 36%-60%; proximal DVT, 17%-36%; total PE, 4.3%-24%; and fatal PE, 3.6%-12.9% (ACP Pier 1)
  - A computer alert reduced the risk of deep-vein thrombosis or pulmonary embolism at 90 days by 41 percent
Developing the Evidence:

Evidence-based Resources for Creation of Clinical Tools
Critical success factors for clinical decision support systems

- They don't require an intentional request
- They give recommendations not just assessments
- They give support at the time and location of decision-making
- They are computer-based

Decision support for creation of CDS tools

- Evidence is a few clicks away.
- The evidence provided must be current.
- Resources provide recommendations not just assessments
- Uncertainty must be known
- They give support at the time and location of decision-making
- They are computer-based
Evidence-based Medicine

The process of systematically finding, appraising, and using contemporaneous research findings as the basis for clinical decisions.

Evidence-based medicine asks questions, finds and appraises the relevant data, and harnesses that information for everyday clinical practice.

* Scope notes for "Evidence-based Medicine", Medline, National Library of Medicine
- formulate a clear clinical question from a patient problem
- search the literature for relevant clinical articles
- evaluate (critically appraise) the evidence for its validity and usefulness
- implement useful findings in clinical practice
Clinical Practice Guidelines

Work consisting of a set of directions or principles to assist the health care practitioner with patient care decisions about appropriate diagnostic, therapeutic, or other clinical procedures for specific clinical circumstances.....

*Scope notes for "Practice Guidelines [Publication Type]", Medline, National Library of Medicine
University Health Center

**Instructions:** All applicable orders must have a checkmark in the box. All orders must be signed by the ordering physician and initialed by the person fulfilling the orders. RNs that initial orders must print their name in the space provided at the bottom of the page.

**Hip Replacement: Postoperative Order Set**

<table>
<thead>
<tr>
<th>Admission Diagnosis</th>
<th>Physician(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoarthritis of hip</td>
<td>Admitting:</td>
</tr>
<tr>
<td>Rheumatoid arthritis of hip</td>
<td>Attending:</td>
</tr>
<tr>
<td>Post-traumatic arthritis of hip</td>
<td><strong>Admit To</strong></td>
</tr>
<tr>
<td>Osteonecrosis of hip</td>
<td></td>
</tr>
<tr>
<td>Ankylosing spondylitis</td>
<td></td>
</tr>
<tr>
<td>Procedure</td>
<td></td>
</tr>
</tbody>
</table>

- **Critical care bed** (Type: ____________)
  - Criteria: ____________
- **Telemetry bed** (Criteria: ____________)
- **Med surg bed**
- **Other** ____________
<table>
<thead>
<tr>
<th>Antiemetic for nausea or vomiting:</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
<tr>
<td>Zoferan</td>
</tr>
<tr>
<td>Phenergan 6.25 mg IV every 6 hours as needed; do not give if patient is drowsy or lethargic</td>
</tr>
<tr>
<td>Notify physician if nausea persists &gt; 3 hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DVT prophylaxis:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Note: medications listed not applicable to patients receiving IV heparin)</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>TED hose</td>
</tr>
<tr>
<td>Sequential compression boots</td>
</tr>
<tr>
<td>- Unaffected side only</td>
</tr>
<tr>
<td>- Bilateral</td>
</tr>
<tr>
<td>Lovenox</td>
</tr>
<tr>
<td>- 30 mg bid</td>
</tr>
<tr>
<td>- 40 mg subcutaneous daily at ________</td>
</tr>
<tr>
<td>Coumadin protocol</td>
</tr>
<tr>
<td>- Place anticoagulation flow sheet in chart</td>
</tr>
<tr>
<td>- Place warfarin drug interaction sheet in chart</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient education:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking cessation</td>
</tr>
<tr>
<td>Sodium restriction</td>
</tr>
<tr>
<td>Low-fat diet</td>
</tr>
<tr>
<td>Disease-specific education: ________________________</td>
</tr>
<tr>
<td>Start anticoagulation patient teaching post-op day 10M</td>
</tr>
</tbody>
</table>
Categories List

CANCER
- Breast Cancer
- Cervical Cancer
- Colorectal Cancer
- Leukemia - Acute Lymphoblastic (Adult)
- Leukemia - Acute Lymphoblastic (Ped)
- Leukemia - Acute Myeloid (Adult)
- Leukemia - Chronic Lymphocytic (Adult)
- Leukemia - Acute Myelogenous (Ped)
- Leukemia: Chronic Myelogenous (Adult)
- Leukemia: Myleodysplastic Syndrome
- Lung Cancer: Non-Small Cell
- Ovarian Cancer
- Prostate Cancer
- Prostate: Benign Hypertrophy (BPH)
- Thyroid Nodules and Cancers

CARDIOLOGY
- Atherosclerotic Peripheral Vascular Disease
- Atrial Fibrillation
- Cardiac Transplant
- Congestive Heart Failure (CHF)
- Coronary Artery Disease (CAD: Chronic)
- Dystiopidemia
- Hypertension
- Myocardial Infarction: Acute
- Tachyarrhythmia

EAR, NOSE, AND THROAT
- Allergic Rhinitis
- Pharyngitis
- Sinusitis

ENDOCRINE/METABOLIC
- Diabetes Mellitus
- Hyperthyroidism
- Hypothyroidism
- Obesity
Hip Replacement - Key Points

- Hip replacement surgery is usually performed either for severe hip arthritis with resulting pain or for displaced femoral neck fractures. For patients with arthritis, surgery is indicated when the symptoms are no longer controlled with conservative therapies and the quality of life for these patients is no longer adequate. This is a patient-driven decision.

- Most hip replacement surgery is performed for severe hip arthritis; however, there is little that can be done to prevent this cause. Most femoral neck fractures result from low-energy falls in the elderly coupled with any number of other abnormalities. Fall prevention and treatment of osteoporosis are two important preventive measures.

- Preoperative administration of erythropoietin to patients with hemoglobin levels below 10-11 mg/dL can result in lower transfusion rates.[A1]

- Prevention of deep venous thrombosis and pulmonary embolism in the immediate postoperative period is a major concern. There are a number of different regimens, both medical and mechanical, that have been shown to decrease the incidence of deep venous thrombosis. The recent trend in the orthopedic community is to use sequential compression devices and aspirin. This is supported only by observational studies, however.[C1]

- The use of single dose prophylactic antibiotics reduces the risk of postoperative infections in surgery on fractures of the hip or other long bones.[A1]

- Postoperative infections are treated operatively with irrigation and debridement and possibly with removal of the prosthesis. Acute infections (within one month of surgery) are treated with irrigation and debridement of the hip with retention of the components.[A1] Chronic infections (present for more than one month) are treated with irrigation and debridement of the wound, removal of the components, placement of an antibiotic spacer, intravenous antibiotics, and reinsertion of the components after at least six weeks of antibiotics.[A1]

- Detection of early failure of the prostheses with routine radiographs every 2-3 years following surgery is recommended on the basis that early detection makes revision of the prostheses easier.

QID: 7508

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PREVENTION & TREATMENT

Prevention in the context of hip replacement surgery includes prevention of the risk factors that lead to hip fractures. Lack of estrogen supplementation after menopause or hysterectomy, smoking, and use of psychotropic medications have been implicated as risk factors. (See guidelines on Menopause, Smoking Cessation, and Major Psychoses for more information on these topics.) There are no established preventive measures for arthritis.

While age, sex, race and hip geometry are associated with hip fractures, they are not modifiable. Comorbid medical conditions, including osteoporosis, may be treated to reduce the risk of falls and associated fractures, while medications may increase the risk. Diet and malnutrition may affect the incidence of hip fracture, while the role of smoking and alcohol consumption is controversial. Prevention of falls is a major concern both at home and in hospitals. The use of hip protectors in elderly patients living in supported care environments may prevent hip fractures, but long-term compliance with the specialized garments is often poor.

Conservative Treatment of Hip Arthritis

Decision to Perform Hip Replacement Surgery

Contraindications

Total Hip Replacement Procedures

Intraoperative Complications

Postoperative Complications

Postoperative Course

Conservative Treatment of Hip Arthritis

Treatment options available for arthritis at this time are aimed at treating symptoms, not the disease itself. Nonsteroidal anti-inflammatory medications (i.e. ibuprofen), acetaminophen, low-dose narcotics, and glucosamine/chondroitin sulfate preparations are used in the
Postoperative Complications

Overall mortality rate after unilateral primary total hip replacement reported by Sharrock and coworkers was 0.11% between 1987-1991. The same study reported a 0.35% mortality between 1981-1985. Whether or not this decrease in mortality has occurred in general is not known. A metanalysis published in 1996 of 130,000 people undergoing hip replacement (without thromboprophylaxis in some cases) revealed overall mortality of 0.3% to 0.4%. A recent meta-analysis found that revision hip replacement procedures have a slightly higher morbidity and mortality rate than primary procedures.

Deep Venous Thrombosis and Pulmonary Embolism. Pulmonary embolism is a major concern with total hip replacement, resulting primarily from development of deep venous thrombosis in the lower extremities. Fatal pulmonary embolism occurs in 0%-0.18% of patients who have undergone hip replacement surgery, even with warfarin or aspirin prophylaxis. Prophylaxis may consist of low-molecular-weight heparin (LMWH), warfarin, aspirin, or sequential compression devices. Prophylaxis for 7-10 days with LMWH or warfarin is recommended in the guidelines established by the American College of Chest Physicians. However, LMWHs are associated with an increase in minor and major bleeding complications, and warfarin requires close monitoring in the outpatient setting. Recently, the trend in the orthopedic community has been to use sequential compression devices and aspirin. This is supported by data showing no difference in the incidence of symptomatic pulmonary emboli or deep venous thrombosis as compared to reported rates with LMWH or warfarin. The reader is referred to the guideline on Anticoagulation for more information. Selection of various LMWHs, dosing schedules including extended treatment postoperatively, and early work on a synthetic pentasaccharide inhibitor of activated factor X have been the subject of recent studies.

Infection. Infection occurs in 0% to 5% of cases and may be classified as early or acute (occurring within four weeks of surgery), late or chronic (occurring more than four weeks after surgery), or late hematogenous infections (resulting from the hematogenous spread from other sources of infection). A recent Cochrane review supports the use of single dose prophylactic antibiotics to reduce the risk of postoperative infections in surgery on fractures of the hip or other long bones. Insulin drips should be considered in diabetics undergoing total hip replacement based on a study of diabetic open-heart surgery patients. In this study, a continuous postoperative insulin drip decreased the incidence of sternal wound infections from 2% to 0.8% (P=.01) when compared to intermittent subcutaneous insulin injections. This study has not been duplicated with patients undergoing hip replacement surgery. Acute infections (within one month of surgery) are treated with irrigation and debridement of the hip with retention of the components. Recommendation for this treatment can be made based on the results of systematic reviews of the topic. Tsukayama reported a 71% success rate in treating 35 infections in this manner.

Chronic infections (present for more than one month) are treated with irrigation and debridement of the wound, removal of the components, placement of an antibiotic spacer, intravenous antibiotics, and reinsertion of the components after at least six weeks of antibiotics. The timing of reinsertion of the components is controversial, however. In the United Kingdom, for instance, it is common to replace the prosthesis immediately, necessitating only one procedure. There are no good studies comparing these single-stage versus two-stage procedures. Expected cure rate is approximately 80% with the single-stage procedure and 90% with the two-stage procedure.

Late hematogenous infections are generally treated with the same algorithms used for acute infections. An option to this approach is to remove the components. The incidence of this condition is low, making study of the best management difficult. Approximately 50%
Orthopedic Surgery of the Lower Limb or Fractured Hip

Without prophylaxis, DVT occurs in 50%-70% of patients undergoing total knee replacement, total hip replacement, and surgery for a fractured hip. Anticoagulant prophylaxis has been shown to reduce the risk of VTE and is cost-effective. The choice of therapies should be tailored to the individual patient based on the clinical assessment of relative risk of thrombosis and bleeding. Investigators have shown the effectiveness of LMWH in orthopedic surgery prophylaxis of DVT and the reduced risk of heparin-induced thrombocytopenia (HIT)

Anticoagulation Options for Patients Undergoing Hip or Knee Surgery With Evidence Grade

<table>
<thead>
<tr>
<th>Options</th>
<th>Knee replacement</th>
<th>Hip replacement</th>
<th>Hip fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMWH: starting 12 hours before surgery, followed by usual dose the day after surgery</td>
<td>A1</td>
<td>A1</td>
<td>B1</td>
</tr>
<tr>
<td>Warfarin: adjusted dose (INR 2.0-3.) started preoperatively or immediately postoperatively</td>
<td>A1</td>
<td>A1</td>
<td>B1</td>
</tr>
<tr>
<td>UFH: adjusted dose started preoperatively and recommencing &gt;12 hours post op</td>
<td>C2</td>
<td>A2</td>
<td>C2</td>
</tr>
<tr>
<td>UFH: Low dose</td>
<td>NR*</td>
<td>NR*</td>
<td>B2</td>
</tr>
<tr>
<td>Fondaparinux: 2.5 mg daily, initiated 6-8 hrs postoperatively</td>
<td>A1</td>
<td>A1</td>
<td>A1</td>
</tr>
<tr>
<td>IPC: Intermittent pneumatic compression</td>
<td>B1</td>
<td>NR*</td>
<td>C2</td>
</tr>
</tbody>
</table>

*NR indicates not recommended (see text, below) for specifics

- In patients undergoing elective total hip replacement, treatment with LMWH (starting 12-24 hours postoperatively) and warfarin (to target INR of 2.0-3.0) is recommended. Adjusted-dose UFH started preoperatively or immediately postoperatively is an alternative option. For hip replacement, when LMWH was compared with low-intensity warfarin with a target INR of 2.0-3.0, LMWH was found to be marginally better with no difference in bleeding complications. However, no monitoring of LMWH was required compared with dose-adjusted UFH and warfarin. The risk of clinically important bleeding with warfarin is small. Adjusted-dose UFH started preoperatively is also an option, recommencing >12 hours postoperatively.

- In patients undergoing elective total knee replacement, a regimen of LMWH, warfarin, or IPC is recommended. Low-dose UFH is not recommended. In patients undergoing total knee replacement, LMWH has been compared with warfarin and found to be superior in preventing VTE. LMWH caused excess bleeding when given early postoperatively. LMWH should not be given until 12 hours postoperatively when hemostasis has been assured. IPC when used effectively is a reasonable alternative.

- In patients undergoing open reduction and internal fixation for a fractured hip, LMWH (starting 12-24 hours after surgery) or warfarin (to target INR of 2.0-3.0 starting preoperatively or immediately postoperatively) is advised.

- Fondaparinux versus enoxaparin has been evaluated in four large, phase III trials in orthopedic surgery (hip fracture, elective hip arthroplasty, and elective knee arthroplasty). Fondaparinux was found to reduce the risk of VTE by approximately 55% compared with enoxaparin. However, major bleeding occurred more frequently with fondaparinux.

- Optimal duration of treatment for orthopedic patients is not known, but a minimum of 7-10 days is recommended or until full ambulation. Longer duration to 30 days may offer additional protection.
Elastic stockings (ES) reduce the incidence of lower leg DVT, but there is limited data on their ability to protect from proximal DVT and pulmonary embolism.

In patients undergoing elective total hip replacement, treatment with LMWH (starting 12-24 hours postoperatively) or warfarin (to target INR of 2.0-3.0) is recommended. (A1)
How certain are those recommendations?

In patients undergoing elective total hip replacement, treatment with LMWH (starting 12-24 hours postoperatively) or warfarin (to target INR of 2.0-3.0) is recommended. (A1)
Clinical care requires us to make complex decisions. Patients rarely meet strict inclusion criteria for studies.

All clinical decisions cannot be put into simple algorithms.

Estimation, expert opinion are therefore required.
How do you manage change over time?

- Incorporation of some research is best done through performance of systematic reviews or metaanalyses.
- New evidence may strengthen or weaken recommendations that have been made.
- Other new evidence needs to be incorporated quickly into clinical care.
Nov, 2001

CONCLUSIONS: In patients undergoing surgery for hip fracture, fondaparinux was more effective than enoxaparin in preventing venous thromboembolism and equally safe.
Operationalizing the Evidence:
Controlled Medical Terminology
Mr. Smith is a 65 year old man admitted to the hospital for left total hip replacement. He has a history of osteoarthritis of this hip and has considerable pain with mobility. Mr. Smith has a history of diabetes mellitus controlled by oral medications and coronary artery disease with a MI and angioplasty 10 years ago.

52734007 (THR)
73211009 (DM)
53741008 (CAD)

Anti-coagulation
Peri-op blood sugar management
CAD history – consider EKG, ASA, B-Blocker

Standards!
Data Re-use

- Decision Support
- Clinical Care Communication
- Surveillance
- Outcomes/Research
- Consumer
- Documentation
- Billing and Claims

52734007 (THR)
73211009 (DM)
53741008 (CAD)
What kinds of standards?

- Framework for order sets and guidelines
  - HL7
  - SAGE

- Terminologies
  - SNOMED CT
  - LOINC
  - RxNorm
  - ICD, CPT, DRG…
How to ‘Charge’ EBM and Order Sets

- **Tools**
  - Indexing terms and order sentences
  - Tools for the end-user
  - Tools for the developer

- **Services**
  - Mapping proprietary order catalogues
  - Manual review of indexing and mappings
Indexed EBM and Orders

Deep Venous Thrombosis and Pulmonary Embolism. Pulmonary embolism is a major concern with total hip replacement, resulting primarily from development of deep venous thrombosis in the lower extremities. Fatal pulmonary embolism occurs in 0%-0.18% of patients who have undergone hip replacement surgery, even with warfarin or aspirin prophylaxis. Prophylaxis may consist of low-molecular-weight heparin (LMWH), warfarin, aspirin, or sequential compression devices. Prophylaxis for 7-10 days with LMWH or warfarin is recommended in the guidelines established by the American College of Chest Physicians (A1). However, LMWHs are associated with an increase in minor and major bleeding complications, and warfarin requires close monitoring in the outpatient setting. Recently, the trend in the orthopedic community has been to use sequential compression devices and aspirin. This is supported by data showing no difference in the incidence of symptomatic pulmonary emboli or deep venous thrombosis as compared to reported rates with LMWH or warfarin (C1). The reader is referred to the guideline on Anticoagulation for more information. Selection of various LMWHs, dosing schedules including extended treatment postoperatively, and early work on a synthetic pentasaccharide inhibitor of activated factor X have been the subject of recent studies.

Lovenox (C0706734) 30 mg SQ Daily
Benefits

- Deliver the right content at the right time to the right person
- Achieve integration of expert systems into clinical systems
- Improve patient safety
  - Reduce adverse drug events
  - Improve information access and sharing
- Achieve interoperability
  - Reuse of data for reporting and analysis
Automation

The “Thursday-night Community-Acquired Pneumonia QI Committee”
What Does This Look Like?
**University Health Center**

**Instructions:** All applicable orders must have a ✔ in the □. All orders must be signed by the ordering physician and initiated by the person fulfilling the orders. RNs that initial orders must print their name in the space provided at the bottom of the page.

**Hip Replacement: Postoperative Order Set**

<table>
<thead>
<tr>
<th>Admission Diagnosis</th>
<th>Physician(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Osteoarthrosis of hip</td>
<td>Admitting:</td>
</tr>
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</tr>
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<td>□ Post-traumatic arthritis of hip</td>
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</tr>
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</tr>
<tr>
<td>□ Ankylosing spondylitis</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure</th>
<th></th>
</tr>
</thead>
</table>

| Critical care bed (Type: ________________)   |
| Criteria: ___________________________        |
| Telemetry bed (Criteria: ________________)   |
| Med surg bed                                 |
| Other ___________________________            |

Patient Label

---

- CEC with differential, platelet count post-op day: □ 1 □ 2 □ 3
- Protime, INR, PTT post-op day 2, then every day IF on Coumadin
- Other: _______________________

Preoperative antibiotics (24-hour coverage): □ QM QM QM
- None
- Patients not allergic to beta-lactams:
  □ Cefazolin 1 gm IV every 8 hours □ times 3 doses □ times ___ doses
- If documented beta-lactam allergy:
  □ Levaquin protocol
    □ Discontinue in 24 hours
  □ Vancomycin protocol
    □ Discontinue in 24 hours
- Patients with history of MRSA or VRE within 2 years not cleared by consecutive negative cultures:
  □ Contact isolation precautions
  □ Vancomycin protocol (MRSA)
    □ Discontinue in 24 hours
  □ Zyvox protocol (VRE or MRSA)
    □ Discontinue in 24 hours
  □ Other: _______________________

Postoperative pain control:
(if pain is unrelieved, notify MD)
- Peripheral nerve and indwelling epidural catheter management per anaesthesia
- Standard unit PCA protocol
- Intermittent analgesia bolus (scale of 1-10, with 10 being the maximum):
  □ Morphine sulfate 1 mg IV every hour as needed (PAIN 0-3)
  □ Morphine sulfate 2 mg IV every hour as needed (PAIN 4-7)
<table>
<thead>
<tr>
<th>DVT prophylaxis:</th>
</tr>
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<tbody>
<tr>
<td>(Note: medications listed not applicable to patients receiving IV heparin)</td>
</tr>
<tr>
<td>□ None</td>
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<tr>
<td>□ TED hose</td>
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<tr>
<td>□ Sequential compression boots</td>
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<tr>
<td>□ Unaffected side only</td>
</tr>
<tr>
<td>□ Bilateral</td>
</tr>
<tr>
<td>□ Lovenox</td>
</tr>
<tr>
<td>□ 30 mg bid</td>
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<tr>
<td>□ 40 mg subcutaneous daily at ________</td>
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<tr>
<td>□ Coumadin protocol</td>
</tr>
<tr>
<td>□ Place anticoagulation flow sheet in chart</td>
</tr>
<tr>
<td>□ Place warfarin drug interaction sheet in chart</td>
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<th>Patient education:</th>
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<tr>
<td>□ Smoking cessation</td>
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<tr>
<td>□ Sodium restriction</td>
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<tr>
<td>□ Low-fat diet</td>
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<td>□ Disease-specific education: __________________________</td>
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<td>□ Start anticoagulation patient teaching post-op day 1 of X</td>
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<td>□ Other: __________________________</td>
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<td>□ No services anticipated</td>
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<td>□ Discharge planning initiated</td>
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<tr>
<td>□ Contact case manager or social worker</td>
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DVT prophylaxis
(Note: medications listed not applicable to patients receiving IV heparin)

- None
- TED hose
- Sequential compression boots
  - Unaffected side only
  - Bilateral
- Lovenox
  - 30 mg bid
  - 40 mg subcutaneous daily at _________
- Coumadin protocol
  - Place anticoagulation flow sheet in chart
  - Place warfarin drug interaction sheet in chart

Patient education:
- Smoking cessation
- Home-based physical therapy

DVT Prophylaxis

All patients should be evaluated for their risk of developing a deep venous thrombosis (DVT), and should receive patient education and early ambulation. Qualified patients should receive anticoagulation therapy.

DVT in the leg that travels to the lung can be fatal. The risk of DVT and pulmonary embolus (PE) remains elevated after surgery. In order to keep this risk at a minimum, patients should continue the mechanical or chemical prophylaxis for thrombosis during the hospital stay and, in most cases, for some period of time after returning home.

The type of prophylaxis for DVT and the length of prophylaxis are chosen by analysis of the relative risk reduction provided by various agents. Current evidence supports the use of low-molecular-weight heparin, factor Xa inhibitor, or dose-adjusted warfarin (Coumadin), or intermittent compression stockings for a minimum of 10 days after surgery.

The question regarding the length of time that prophylaxis should be continued remains unanswered. However, there is increasing evidence supporting the value of extended prophylaxis beyond 30 days. If the patient has additional risk factors for postoperative venous thromboembolism (VTE), then intermittent compression stockings in combination with low-molecular-weight heparin or adjusted-dose warfarin should be used (A1).
<table>
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<th>Date</th>
<th>Strength of Evidence</th>
<th>Practice Impact</th>
<th>LitAware Details</th>
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| 2/10/2006  | Moderate             | Moderate        | Ximelagatran May Be Superior  
Topic(s): Knee Replacement, Venous Thromboembolic Disease  
Hip Replacement - Discharge Order Set

Admission Diagnosis
- Osteoarthritis of hip
- Rheumatoid arthritis of hip
- Post-traumatic arthritis of hip
- Osteonecrosis of hip
- Ankylosing spondylitis
- Other: _______________________

Discharge Diagnosis
- s/p right hip arthroplasty
- s/p left hip arthroplasty

Physician(s)
- Attending: ________________
- Discharging: ________________

Comorbid Condition(s)
- CHF*
- COPD*
- Coronary artery disease*
- Dementia*
- Diabetes*
- Infection, specify: ________________
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<th>Status</th>
<th>Task Name</th>
<th>Type</th>
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Final Thoughts

- “The problem is the process”…(not the number of order sets)
- Technology is giving us in the healthcare industry new ways of working efficiently and effectively
Glossary

- **AJAX**—Asynchronous Javascript and XML...a collection of technologies that allow web-based applications to have desktop-like behavior.

- **CT**—collaboration technology (in distinction from “IT”—information technology)

- **Blog**—a type of a website where journal-like entries are typically written and displayed in reverse chronologic order.

- **Collaboration**—joint purposeful activity that is goal-focused.

- **Wiki**—a type of website that allows users to easily add, remove, or otherwise edit and change most available content, sometimes without the need for registration.