Pre-Procedural Statin Use Decreases MI Risk

Evidence of Pre-Procedural Statin Therapy: A Meta-Analysis of Randomized Trials.

Winchester DE, Wen X, et al:

J Am Coll Cardiol 2010; 56 (September 28): 1099-1109

Further studies outlining the optimal mode of statin therapy and procedures for which this is most likely to be effective are needed prior to broad prophylactic use.

Background: Invasive procedures carry a risk of post-procedure myocardial infarction (MI). The role of statins in minimizing this risk has been explored.

Objective: To determine whether use of statins prior to an invasive procedure reduces adverse cardiac events.

Design: Meta-analysis.

Participants: 21 studies (10 percutaneous coronary intervention (PCI), 8 coronary artery bypass grafting (CABG), 3 noncardiac surgery) in which a total of 4805 patients undergoing invasive procedures were randomized to statin versus control. Trials including organ transplantation and those utilizing multiple interventions were excluded.

Methods: Studies utilizing statins before procedures and reporting clinical outcomes were identified via database searches. Invasive procedures were defined as PCI, CABG, and noncardiac surgery. Data regarding baseline patient characteristics, trial intervention, statin treatment, and follow-up were abstracted by 3 authors. The primary outcome was post-procedural MI. Secondary outcomes included: all-cause mortality, revascularization, and atrial fibrillation. Data analysis was by intention-to-treat.

Results: In the studies included, PCI was most often elective. A variety of statins, doses, initiation times, and durations of follow-up were evaluated. The majority of patients were statin naïve. All PCI patients received statins following intervention; this was not true in surgical studies. Post-procedural MI was decreased by statin use as compared with control (RR, 0.57; P <0.0001). This was true in both the PCI and noncardiac surgical cohorts, but not with CABG. All-cause mortality was nonsignificantly reduced with statins as compared with control. For PCI, revascularization was not observed with statins, but was seen in the control group (RR, 0.26; P =0.09). Atrial fibrillation was reduced with statins in the CABG cohort (RR, 0.54; P =0.0001).

Conclusions: Pre-procedural statin therapy is beneficial. The number needed to treat to prevent 1 MI with PCI was 17.2 and for noncardiac surgery, 24.4. Across studies, all-cause mortality was not significantly reduced. For PCI studies, revascularization was nonsignificantly reduced and for CABG, atrial fibrillation was significantly reduced with statin therapy.

Reviewer's Comments: Though these results are compelling, the challenge for hospitalists lies in implementation, as it is not clear from this analysis which statin, which dose, and what timing is optimal for a given patient. Atorvastatin was commonly selected here for PCI and CABG, whereas fluvastatin was used most commonly for noncardiac surgery, but these questions need to be addressed in future studies. No current guidelines recommend statins for prevention of post-procedural complications, though there is some evidence that statin withdrawal can be harmful. This is an area of practice that is likely to evolve further. (Reviewer-Jennifer Best, MD).

Keywords: Statins, Preoperative Risk Reduction, Cardiovascular Outcomes

Print Tag: Refer to original journal article
Among patients not considered traditional operative candidates, transcatheter aortic-valve implantation lowers 1 year mortality and improves outcomes compared to standard medical therapy.

**Background:** This may sound like science fiction, but it's not. We now have an evidence-based Plan B when the heart surgeon says our patient with severe aortic stenosis is not a surgical candidate for valve replacement.

**Objective:** To report the outcomes with transcatheter aortic-valve implantation compared with standard therapy among patients in the PARTNER trial who were not suitable candidates for surgery.

**Participants/Methods:** 358 patients with severe aortic stenosis were randomized to standard medical therapy or percutaneous valve replacement. This procedure involves performing conventional balloon aortic valvuloplasty followed by the placement of a proprietary trileaflet bovine pericardial valve with a balloon-expandable stainless steel support frame. Investigators selected patients with NYHA Class II, III, and IV heart failure symptoms and severe aortic stenosis based on echocardiographic criteria. They excluded those with bicuspid or noncalcified aortic valves, those with an EF<20%, significant coronary disease needing revascularization, and severe aortic or mitral regurgitation. Patients were not considered operative candidates if their 30-day risk of postoperative death or serious irreversible injury was ≥50% as defined by the Society of Thoracic Surgeons risk score.

**Results:** Patients in the standard therapy group were treated with medications and 83% had traditional balloon aortic valvuloplasty performed (but not with the transcatheter bovine aortic valve replacement). Mortality at 1 year decreased from 50% in the standard therapy group to 30% in the intervention group, a number needed to treat of only 5 to save 1 life. Heart failure symptoms improved dramatically. As well, rehospitalization at 1 year decreased from 70% in the standard therapy group to 42% in the treatment group. These remarkable improvements, however, came at a price: more patients needing dialysis and a greater number of strokes and major bleeding. But the benefits in aggregate quite clearly outweighed these risks.

**Conclusions:** According to the authors, transcatheter aortic valve implantation “should be the new standard of care for patients with aortic stenosis who are not suitable candidates for surgery.”

**Reviewer’s Comments:** This industry-sponsored trial is quite impressive—almost too good to be true. While well structured and well conducted, its main limitation may be applicability. The authors describe that the interventional cardiologists and surgeons who performed the procedure experienced a learning curve and that earlier generation delivery systems were more likely to cause complications. Whether a skilled operator is available to perform this new procedure will likely be the rate-limiting step for some time to come. Look for this procedure to become increasingly common over the next months and years. (Reviewer-Mel L. Anderson, MD).

**Keywords:** Aortic Stenosis, Percutaneous Valve Replacement

**Print Tag:** Refer to original journal article
Does Stocking Length Matter in Stroke?

Thigh-Length Versus Below-Knee Stockings for Deep Venous Thrombosis Prophylaxis After Stroke: A Randomized Trial.

The CLOTS (Clots in Legs Or sTockings after Stroke) Trial Collaboration:

Ann Intern Med 2010; 153 (November 2): 553-562

Patients who were randomized to wear thigh-length stockings rather than below the knee stockings when immobilized after acute stroke had lower rates of deep venous thrombosis.

Background: Deep venous thrombosis (DVT) and pulmonary embolism are common complications for patients recently hospitalized for stroke. Despite suggestions that knee-length graduated compression stockings may be as effective as thigh-length stockings, this has not been tested in the stroke population.

Objective: To assess the effectiveness of thigh-length stockings in preventing proximal DVT in comparison with below the knee-length stockings in patients hospitalized with stroke.

Participants/Methods: 3114 patients who were hospitalized and immobilized with acute stroke were randomized to receive either thigh-length or below the knee graduated compression stockings. Patients wore the stockings while in the hospital, and were encouraged to continue their use after discharge. All patients received a bilateral compression duplex ultrasound within 7 to 10 days after enrollment, and a convenience sample received a second scan 25 to 30 days later. Patients also received ultrasonography for concerning symptoms. The main outcome was symptomatic DVT in the popliteal or femoral veins detected on screening or symptom-triggered scan.

Results: Of 1152 patients that received thigh-length stockings and the 1562 patients who received below-knee stockings, 98 (6.3%) and 138 (8.8%) patients had a proximal DVT, respectively. This difference of 2.5% translated into a number needed to treat (NNT) of 40 (P =0.008). In total, 75% of patients in both groups wore stockings for 30 days or until death, discharge, or until mobility was established. Skin breaks were more frequent in those who received thigh-length stockings (3.9% vs 2.9%) with a number needed to harm of 100.

Conclusions: Proximal DVT was more common in patients that wore below the knee graduated compression stockings as compared to thigh-length stockings, but with more skin breaks.

Reviewer's Comments: Contrary to the results published in a meta-analysis in 2006 that demonstrated knee-length graduated stockings to be as effective as thigh-length stockings in preventing DVT, this study demonstrated a difference of 2.5%, resulting in a NNT of 40 to prevent 1 DVT. The methodology of this study in proactively assessing for asymptomatic DVT at 2 time points, the in general longer duration of stocking adherence, and the specific population all may have been factors contributing to the different results in this study. The trade offs in stocking compliance and skin breakdown must be weighed with a potential decrease in DVTs. (Reviewer-Michelle Mourad, MD).

Keywords: Post-Stroke Prophylaxis, Deep Venous Thrombosis

Print Tag: Refer to original journal article
For terminally ill cancer patients, quality of life may be improved and caregiver psychiatric disease minimized by avoiding terminal hospitalizations.

**Background:** Patients with terminal cancer may not die at home, though many would prefer this. Additional research is needed to determine whether place of death correlates with end-of-life quality and associated bereavement responses in caregivers.

**Objective:** To determine whether place of death impacts cancer patients’ quality of life (QoL) prior to death or is associated with development of psychiatric disorders in caregivers.

**Design:** Prospective, longitudinal multisite cohort study.

**Participants:** English- or Spanish-speaking adult patients with terminal cancer and an informal caregiver participated. Patients with dementia, delirium, and spoken language other than English or Spanish were excluded.

**Methods:** Patients and caregivers were interviewed and charts reviewed at baseline and at death. Within 2 weeks of death, caregivers completed a questionnaire, and at 6 months, he or she was interviewed. Validated measures of patient QoL and psychiatric diagnosis, including the Structured Clinical Interview for the DSM IV and the Prolonged Grief Disorder scale, were utilized for assessment. A number of potential patient and caregiver confounders were also considered.

**Results:** 333 patients were included in the final cohort with death occurring a median of 4.5 months after enrollment. Most patients died at home with hospice and most caregivers were spouses. After adjustment, patients who died in the ICU or hospital had worse QoL, with highest QoL reported for patients who died at home, with or without hospice. Patients who died in the ICU had lower physical comfort than those who died elsewhere. ICU and hospital deaths were also associated with lower psychological well-being. Caregivers with preexisting psychiatric conditions were more likely to experience these during bereavement. After adjustment for preexisting mental illness, ICU and hospital deaths were associated with more psychiatric illness in caregivers, with higher rates of post-traumatic stress disorder (PTSD) and prolonged grief disorder (PGD).

**Conclusions:** Patients with terminal cancer who die in the ICU or hospital appear to have lower QoL prior to death and their caregivers are more likely to experience psychiatric illness, specifically PTSD or PGD.

**Reviewer’s Comments:** The precise reasons for these observed findings are unclear, and may relate to differences in care focus or more specific patient or caregiver experiences. One interesting finding here was the fact that home hospice did not appear to improve QoL more than a home death without hospice. As this study examined only English and Spanish speakers, there may be cultural differences represented by language groups that were not assessed here. This was not a randomized trial, for obvious reasons. Another limitation was the use of caregiver report as a surrogate for patient QoL. Still, this interesting study provides a springboard for future research. (Reviewer-Jennifer Best, MD).

**Keywords:** End of Life, Quality of Life, Cancer, Caregiving
In a small retrospective study, the shock index (heart rate/systolic blood pressure) in hospitalized patients was able to predict an increased risk of ICU transfer.

**Background:** In-hospital cardiac arrests and unplanned transfers to the intensive care unit (ICU) are often preceded by a period of physiologic instability; identification of the highest risk patients could improve patient outcomes.

**Objective:** To evaluate the association of the shock index (SI) with unplanned ICU transfers.

**Design:** Retrospective case-control study.

**Participants/Methods:** From 2003 to 2004, authors performed a review of patients who had an unplanned/unexpected ICU transfer at a single academic medical center. These patients were matched with control patients. Demographic and vital sign data were collected and the SI was calculated for all patients. The SI was calculated as heart rate/systolic blood pressure and is believed to be a noninvasive indication of left ventricular function. Healthy adults have a SI near 0.5 and increasing SI levels can be associated with shock. The SI was calculated using the "worst" set of vital signs in the 24 hours before ICU transfer.

**Results:** 50 patients were reviewed (with 50 controls) with a heterogeneous set of admission diagnoses (most pulmonary or infection NOS). There was a significant difference between the median values of the worst SI between cases and controls (0.87 vs 0.72; \( P < 0.005 \)). The SI was associated with unexpected ICU transfer at values of \( \geq 0.85 \) (odds ratio, 3.0; \( P < 0.02 \)). That is, all patients who had an SI >0.85 were at increased risk of unplanned ICU transfer.

**Conclusions:** The SI may be a useful predictor of increased risk for clinical deterioration requiring ICU transfer in hospitalized patients. More research on this subject is needed.

**Reviewer’s Comments:** This is an interesting study looking at the calculated shock index as a predictor of ICU transfer in the hospital. The study did not control for comorbidities and just looked at vital signs, and yet showed a statistically significant increased risk at a SI of >0.85 (for example, a patient with a heart rate of 120 and a systolic blood pressure of 100 mm Hg would have a shock index of 1.2). This index is probably not ready for primetime yet given the small and retrospective nature of this study, but it is intriguing given the simplicity. Future studies should examine the SI as a prospective predictor and compare it to other markers of illness including: vital signs alone, SIRS criteria, APACHE scores, etc. (Reviewer-Bradley A. Sharpe, MD).

**Keywords:** Intensive Care Unit, Shock Index, Unplanned Transfer

**Print Tag:** Refer to original journal article
Intensive blood pressure control may be beneficial for black patients with hypertensive renal disease and proteinuria.

**Background:** Hypertension (HTN) is a common cause of chronic kidney disease (CKD) and poor control has been shown to correlate with the rate of progression. It is unclear whether intensification of blood pressure (BP) control slows progression of CKD.

**Objective:** To compare the effects of intensive versus standard BP control on the progression of hypertensive CKD in African American patients.

**Design:** Randomized trial phase, subsequent nonrandomized cohort phase.

**Participants:** Black patients, aged 18 to 70 years, with hypertensive CKD were evaluated. Exclusion criteria were diabetes, urine protein-creatinine ratio (PCR) of >2.5, malignant or secondary HTN, serious systemic disease, heart failure, and indication for/contraindication to drug.

**Methods:** In the trial phase, patient were randomized to intensive (IC/MAP ≤92 mm Hg) or standard (SC/MAP 102 to 107 mm Hg) BP control and 1 of 3 drugs: ramipril, metoprolol, or amlodipine. In the cohort phase, patients without end-stage renal disease (ESRD) were invited to enroll and were treated with ramipril as tolerated. The final cohort BP target was 130/80 and was the same for all patients. Creatinine was measured at baseline and every 6 months; BP control was measured at baseline and every 2 years. Patients were stratified by PCR of ≤2.2. The primary outcome was progression of CKD (a doubling of serum creatinine), an ESRD diagnosis, or death. Secondary outcomes were grouped as CKD-related or clinical outcomes.

**Results:** 1094 patients were randomized in the trial phase. One third of patients had proteinuria and 29.9% of the trial participants developed the primary outcome. Mean BP was significantly lower in the IC group (130/78 vs 141/86). Throughout the study, there was no significant difference in the primary or secondary outcomes between IC and SC patients, though differences were observed with proteinuria; those with a PCR of >2.2 experienced a decrease in the primary outcome (HR, 0.73) and secondary outcomes (CKD related: HR, 0.76; clinical outcomes: HR, 0.67).

**Conclusions:** For all-comers, IC did not slow progression of hypertensive CKD for black patients when compared with SC, though benefits were seen for patients with a PCR of >2.2.

**Reviewer’s Comments:** That improved BP control alone did not improve clinical outcomes for all patients was surprising, (Reviewer-Jennifer Best, MD).

**Keywords:** Hypertension, Chronic Kidney Disease, Risk Reduction

**Print Tag:** Refer to original journal article
Higher Clopidogrel, Aspirin Dose Does Not Improve ACS Outcomes

Dose Comparisons of Clopidogrel and Aspirin in Acute Coronary Syndromes.

CURRENT-OASIS 7 Investigators:


In a large 2 x 2 trial, double-dose clopidogrel or higher-dose aspirin did not improve key clinical outcomes and there was a higher bleeding risk with the increased dose clopidogrel.

**Background:** The optimal dose of clopidogrel and aspirin in acute coronary syndrome (ACS) is unknown.

**Objective:** To determine if increasing the dose of clopidogrel or aspirin in ACS impacts cardiovascular or bleeding outcomes.

**Design:** Randomized 2 x 2 factorial design.

**Participants/Methods:** International sites enrolled participants who were aged >18 years and presented with a non-ST-elevation myocardial infarction (MI) or an ST-elevation MI (STEMI). All patients had angiography. Participants were randomized in a 2 x 2 fashion to double dose clopidogrel versus standard dose clopidogrel for the first 7 days (double-blinded: 600 mg then 150 mg daily vs 300 mg then 75 mg daily) and also to higher-dose versus lower-dose aspirin for the first 30 days (300 mg initially followed by 300 to 325 mg vs 75 to 100 mg).

**Results:** 24,835 patients were enrolled; 17,263 had percutaneous coronary interventions (PCI). The primary outcome of 30-day cardiovascular death, MI, or stroke occurred in 4.2% of patients in the double-dose clopidogrel group versus 4.4% in the standard-dose clopidogrel group (hazard ratio [HR], 0.94; *P* =0.30). There was no difference between the 2 groups for any of these individual outcomes. Major bleeding was higher in the double-dose clopidogrel group (2.5% vs 2.0%; *P* =0.01). There was no difference in the primary outcome or major bleeding between the higher-dose and lower-dose aspirin groups (4.2% vs 4.4%; *P* =0.61 and 2.3% vs 2.3%; *P* =0.90). There was no interaction between the clopidogrel and aspirin. The only significant positive finding was in the subgroup of patients who had PCI; the double-dose clopidogrel was associated with less stent thrombosis (HR, 0.68; *P* <0.001).

**Conclusions:** In a large 2 x 2 trial, double-dose clopidogrel or higher-dose aspirin did not improve key clinical outcomes and there was a higher bleeding risk with the increased dose clopidogrel.

**Reviewer's Comments:** This is an impressive randomized controlled trial examining the optimal dose of clopidogrel and aspirin in the setting of non-STEMI and STEMI. The overall take-home point for hospitalists is that increasing the dose of clopidogrel or aspirin in this setting did not improve any of the major clinical outcomes. An accompanying editorial comments that the study reveals that lower-dose aspirin is likely better (similar clinical outcomes with less minor bleeding) and advocates (based on prior studies) that the 600-mg loading dose of clopidogrel is beneficial in this setting, but only 75 mg daily should be continued. Sometimes, less is just better. (Reviewer-Bradley A. Sharpe, MD).

Keywords: Acute Coronary Syndrome, Clopidogrel, Aspirin, Percutaneous Coronary Intervention

Print Tag: Refer to original journal article
In this small study of hospitalists, provider estimates of the true cost of common inpatient services and tests were not accurate.

**Background:** Physician knowledge of the costs of diagnostic tests is generally poor, but it is not known if hospitalists have a better understanding.

**Objective:** To evaluate hospitalists’ awareness of the charges associated with inpatient care.

**Design:** Written survey.

**Participants/Methods:** Hospitalists from a private hospitalist group and an academically affiliated hospitalist service were surveyed. Participants were asked to estimate to the nearest dollar the charges for 14 common services, procedures, or tests associated with inpatient care (eg, complete blood count, urine culture, levofloxacin, etc). These estimates were compared to the “true” charges, which were what a hypothetical self-paying patient would pay.

**Results:** 25 hospitalists were surveyed in 2009. Overall, hospitalists were poor at estimating the true charge for these common inpatient services, procedures, and tests. Only 10.8% of all hospitalists’ estimates were within 10% of the actual charge, 17.8% within 20%, and 24.8% were within 30% of the true cost. The inaccuracy persisted across all tests, both inexpensive (urine culture) and expensive (computed tomography scan of the abdomen). Inter-hospitalist agreement about the true charge was also poor.

**Conclusions:** In this small study of hospitalists, provider estimates of the true cost of common inpatient services and tests were poor. Cost-efficiency associated with hospitalists is likely not related to knowledge of the cost of services. Future research should examine if enhanced cost-awareness can impact resource utilization.

**Reviewer's Comments:** This is an intriguing study showing that at least for this small group of hospitalists, awareness of the true cost of inpatient care is poor. In reading the study and seeing the true charges, I would have done poorly as well. Hospitalists may consider implementation of programs to improve knowledge of these costs in the hopes of limiting excessive testing or care (do you really need that phosphorus on the day of discharge)? This may be the next big trend in hospital medicine—decreasing resource utilization and focusing on cost effectiveness. (Reviewer-Bradley A. Sharpe, MD).

**Keywords:** Hospitalists, Cost, Charges
The use of a fall prevention toolkit to create a tailored plan based on a patient's individual fall risk reduces fall rates in hospitals.

**Background:** An unfamiliar environment, medical illness, and psychoactive medications all contribute to the increased fall rates in hospitals. Falls can increase morbidity and mortality, so hospitals continue to work on strategies to reduce falls.

**Objective:** To determine whether a fall prevention tool kit (FPTK) using decision support technology can prevent falls in the hospital.

**Methods:** The investigators worked with the nursing units to identify barriers to fall risk assessment and prevention strategies, and then created the FPTK, a decision support tool that risk stratified patients based on evidence-based fall risks. Based on an electronic risk assessment completed by a nurse, the FPTK produced fall posters, patient and family educational materials, and a fall prevention plan specifically tailored to the patients' individual fall risks. The investigators identified 8 medical units in 4 hospitals with higher than average fall rates and minimal fall prevention efforts. At each hospital, 1 unit was chosen as an intervention unit, which would receive the FPTK intervention; a matched control unit was chosen at that hospital with similar baseline fall rates. In the control units, usual care for fall prevention was instituted. The investigators used falls per 1000 patient-days as their primary outcome.

**Results:** In the 6-month period of the study, there were fewer patients with falls in the intervention units compared with the control units (67 vs 87; \(P=0.02\)). After adjusting for factors including hospital site, age, and sex, the fall rate was significantly decreased for those patients aged >65 years who received the intervention (2.66 vs 4.75; 95% CI, 0.61 to 3.56; \(P=0.003\)). The authors estimated that the FPTK interventions can prevent 1 fall per 862 patient-days, or 1 fall per 287 patients during a typical 3-day hospital stay. There was no difference in fall-related injuries between the 2 groups.

**Conclusions:** A decision support that can help both better identify patients at risk for falls and then tailor fall prevention interventions that are specific to a patient's fall risk decreased falls in the hospital.

**Reviewer's Comments:** This is an elegant, patient-centered intervention that proved effective at decreasing falls in the hospital. The authors clearly put a lot of thought and planning into intervention design and analysis. The lessons that we can take from this article are harder as the intervention seems very specific to the information technology innovation used. The general concept, however, that fall preventions should be patient specific and might entail different prevention strategies, education, and warnings is important. Most hospitals use a "one size fits all" strategy of fall prevention, which proved not to be as effective as this tailored approach. (Reviewer-Michelle Mourad, MD).

Keywords: Fall Prevention

Print Tag: Refer to original journal article
Patients with surgery-associated venous thromboembolism (VTE) who have received treatment are at low risk of recurrence, while those with unprovoked VTE remain at high risk.

**Background:** It is believed that the risk of recurrent venous thromboembolism (VTE) depends on the risk factors. The degree of risk difference is unknown.

**Objective:** To determine the impact of different risk factors on the risk of recurrent VTE in patients with symptomatic VTE.

**Design:** Systematic review.

**Participants/Methods:** The authors included all studies in which patients had a confirmed DVT or pulmonary embolism (PE) with documentation of the risk factors (if any), were treated for at least 3 months with anticoagulation, and were observed prospectively after stopping therapy. Risk for recurrence was estimated for patients with provoked and unprovoked VTE. For those with a clear risk factor, they were subdivided into patients with surgery-associated VTE and those with nonsurgical reversible risk factors (eg, immobilization, pregnancy, oral contraceptives, hospitalization, NOT cancer).

**Results:** 15 studies involving >2500 patients were included; these were a mix of observational studies and randomized-controlled trials. For all patients with a transient risk factor of any kind, the rate of recurrence was 3.3% per year. For the subgroup with surgery as a risk factor, the recurrence rate was 0.7% per year. For the subgroup with a nonsurgical risk factor, the rate was 4.2% per year. The rate of recurrence after an unprovoked VTE was much higher at 7.4% per year (2.5 times higher than all patients with a transient risk factor and 7 times higher than patients with surgery as a specific risk factor).

**Conclusions:** Risk of recurrent VTE after initial treatment depends on risk factors. Patients with surgery-associated VTE have a low risk, those with nonsurgical transient risk factors have an intermediate risk, and those with unprovoked VTE have a high risk. These risks can help guide duration of treatment.

**Reviewer's Comments:** This is a straightforward and well-done systematic review crystallizing the relationship between VTE recurrence and presence of risk factors. This study confirms that those with surgery-associated VTE can safely be treated with only 3 months of treatment. Those with a nonsurgical transient risk factor are at slightly increased risk, but the authors argue that it is still low enough to stop treatment at 3 months. It is likely still best to manage these patients on a case-by-case basis, but realize the risk of recurrence is low. This study confirms that those with unprovoked VTE are at much higher risk and should receive long-term anticoagulation (absent major risk factors for bleeding). (Reviewer-Bradley A. Sharpe, MD).

Keywords: Deep Venous Thrombosis, Recurrence, Risk Factors, Unprovoked, Provoked, Surgery

Print Tag: Refer to original journal article
A focused and multifactorial systems approach to improving flow in the emergency department improves all measures, including wait times, lengths of stay, and percent of people leaving without being seen.

**Background:** There are many reasons for overcrowding in the emergency department (ED), including fewer EDs in general, more people without insurance, and increasingly complex illnesses. Because of these issues, wait times have increased, leading some to leave before receiving appropriate evaluations and treatment. Although a number of systems improvements have been evaluated to ease overcrowding, few have been evaluated in combination.

**Objective:** To determine how a combination of systems changes affect key measures of quality in a pediatric ED.

**Design/Methods:** Observational study of 3 different time periods in a pediatric ED, as multiple systems were put in place to improve flow. These systems were known as "Be Quick" (or BEQK) and included the following: (1) Bedside Registration allowed patients to be moved into rooms without having to wait, (2) Bed-Ahead nurse supervisors identified rooms for admission as soon as they were available and made sure they were prepared. (3) Electronic Medical Records allowed for more efficient charting and orders. (4) Quick Triage used a 5-level system to allow for rapid, high-quality assessments. (5) Kids Express was a 4-bed fast-track unit for low-acuity patients. Charts were randomly audited to see how the system affected outcome measures, including patient wait times, lengths of stay, and rates of leaving without being seen.

**Results:** All benchmarks improved with use of BEQK. Over the study period, average wait time in the ED decreased from 46 minutes to 14 minutes 2 years later. Length of stay decreased from 151 minutes to 115 minutes. The rate of leaving without being seen decreased from 2.5% at the beginning of the study to 0.9% at 2 years later. Finally, scores of patient satisfaction increased from 79% at the beginning of the study to 87% at the end. All these changes were statistically significant.

**Conclusions:** A focused and multifactorial systems approach to improving flow in the ED improved all measures, including wait times, lengths of stay, and percent of people leaving without being seen.

**Reviewer's Comments:** Sometimes problems seem so large that it is difficult to know where to start. This study is unique in that it does not attempt to reinvent workflow improvement; instead, it takes a number of proven interventions and simultaneously uses them. Moreover, instead of a simple before/after design, many worked to continue to tinker and improve the process. This paid off handsomely, as improvements were seen across the board, with little to no detriment at all. (Reviewer-Aaron E. Carroll, MD, MS).

Keywords: Emergency Department Overcrowding, Workflow

Print Tag: Refer to original journal article
In patients undergoing hip replacement surgery, apixaban, an oral factor Xa inhibitor, is superior to enoxaparin in preventing VTE with similar bleeding rates.

**Background:** Early studies on the use of factor Xa inhibitors for venous thromboembolism (VTE) prophylaxis in surgical patients have been promising. Apixaban, a selective factor Xa inhibitor, could simplify perioperative prophylaxis given its fixed dosing and oral formulation.

**Objective:** To compare apixaban to enoxaparin in patients undergoing elective hip replacement.

**Design:** Randomized, multicenter, double-blind, double-dummy clinical trial.

**Participants:** Patients scheduled for either hip replacement surgery or revision of previous hip replacement were eligible. Exclusion criteria included active bleeding, contraindication to anticoagulation, or the need for ongoing anticoagulation.

**Methods:** Participants were randomized to either apixaban 2.5 mg twice daily orally or enoxaparin 40 mg subcutaneously daily for 35 days. All patients also received a dummy version of the drug to which they were not randomized. Enoxaparin (or the corresponding dummy injection) was initiated 12 hours before surgery. Apixaban (or the dummy pill) was started 12 to 24 hours after the surgical wound was closed. While in the hospital, patients were assessed as to whether there was a clinical concern for VTE or bleeding. Bilateral venography was performed on all patients at the completion of treatment (32 to 38 days). The primary outcome was a composite of symptomatic and asymptomatic episodes of VTE or death from any cause. A secondary composite outcome, major VTE, included proximal deep venous thrombosis, nonfatal pulmonary embolism, and death attributable to VTE. The major safety outcome was bleeding.

**Results:** 5407 patients were enrolled. The average age was 61 years, and roughly 70% of patients had interpretable venography and could be included in the primary analysis. The composite of all VTE and death from any cause occurred more frequently with enoxaparin than with apixaban (3.9% vs 1.4%; \( P < 0.001 \)). Major VTE episodes were much less common but did occur more frequently in the enoxaparin group (1.1% vs 0.5%). Of note is that symptomatic VTE was uncommon, occurring in only 0.4% of patients with enoxaparin and 0.1% with apixaban. Major bleeding was also uncommon, occurring in <1% of patients in both arms. Clinically important but no major bleeding occurred in similar rates in both groups (approximately 5%).

**Conclusions:** In patients undergoing hip replacement surgery, apixaban is superior to enoxaparin in preventing VTE with similar bleeding rates.

**Reviewer's Comments:** It appears that the options for anticoagulation will continue to expand. Dabigatran, an oral thrombin inhibitor, was approved recently for atrial fibrillation. Soon to follow are the oral factor Xa inhibitors. Fondaparinux was the first selective factor Xa inhibitor approved, but its use has been limited by the subcutaneous delivery. Now we have apixaban and rivaroxaban, oral drugs showing promising results in various settings. In this large study, apixaban certainly performed very well, reducing VTE rates better than enoxaparin. Given the simpler regimen, approval and cost appear to be the only barriers to rapid adoption. (Reviewer-Mark E. Pasanen, MD).

**Keywords:** Apixaban, Factor Xa Inhibitors, Venous Thromboembolism, DVT, Enoxaparin, Low Molecular Weight Heparin**

**Print Tag:** Refer to original journal article
Viral Pneumonia May Be Under-Recognized in Hospitalized Patients Undergoing CT

Chest CT Features of Community-Acquired Respiratory Viral Infections in Adult Inpatients With Lower Respiratory Tract Infections.

Shiley KT, Van Deerlin VM, Miller WT Jr:

J Thorac Imaging 2010; 25 (February): 68-75

Viral pneumonia should be considered when a CT reveals multifocal consolidation and/or ground-glass opacities.

**Background:** CT findings of respiratory viral infections have not been thoroughly described and may be under-diagnosed by radiologists.

**Objective:** CT findings in adult inpatients with respiratory viral infections are described to promote better diagnoses of viral infection in patients with lower respiratory tract infections (LRTI).

**Participants:** 375 adult inpatients at a large tertiary care academic center with positive viral assays, 57 of whom had CT examinations at the time of diagnosis of viral infection, were included. Fifteen patients were excluded due to superimposed pulmonary disorders, yielding 42 patients whose CT scans were analyzed.

**Design:** Health Insurance Portability and Accountability Act-compliant institutional review board-approved retrospective study reviewing CT examinations of patients diagnosed with community-acquired viral respiratory tract infections.

**Methods:** Viral testing was performed on nasopharyngeal swabs or bronchoalveolar lavage. Laboratory and clinical data were reviewed to exclude patients with other possible causes of CT abnormalities, including bacterial infection. Patients presenting with new onset cough, dyspnea, or sputum production were characterized as having viral LRTI if they had a positive viral assay. CT reports were analyzed for the presence or absence of tree-in-bud opacities, atelectasis, bronchial wall thickening, ground glass opacities, airspace consolidation, interstitial abnormalities, emphysema, and adenopathy. Patterns of disease that were observed included: (1) limited lower respiratory tract disease with no imaging findings; (2) CT findings suggestive of bronchitis and/or bronchiolitis including tree-in-bud opacities; and (3) areas of consolidation or ground glass abnormalities.

**Results:** Influenza was the most common virus detected, followed by adenovirus and respiratory syncytial virus (RSV), then parainfluenza. Thirty-three of 42 patients had findings on CT. Nine patients with clinical evidence of infection had no associated findings on CT. Tree-in-bud opacities and multifocal consolidation were the most common abnormality reported, followed by ground-glass opacities. Viral infection was suggested as an etiology in only a small percentage of the original radiology reports, and those reports where it was mentioned was in cases where there was evidence of bronchitis or bronchiolitis. It was never mentioned when the dominant finding was airspace consolidation or multifocal ground-glass opacities. In those cases, bacterial or aspiration pneumonia was suggested in 94% of reports.

**Conclusions:** In this study of patients with community-acquired viral respiratory infection, the following imaging features were noted: multifocal consolidation; multifocal ground-glass opacities; multifocal tree-in-bud opacities; and widespread bronchial wall thickening. While 1 in 5 patients with LRTI had no CT evidence of disease, the majority did have CT abnormalities associated with viral infection. However, only 10% of the original radiology reports suggested a viral etiology.

**Reviewer's Comments:** Patients with LRTI undergoing CT have typical abnormalities associated with viral infection. However, a viral etiology is infrequently suggested in the radiology report. Clinicians and radiologists alike should consider viral infection when evaluating patients for lower respiratory infection by CT, especially when multifocal consolidation, ground-glass, or multifocal tree-in-bud opacities are present. (Reviewer-Steve Montner, MD).
Keywords: Viral Pneumonia, Influenza, Parainfluenza, Respiratory Syncytial Adenovirus, CT

Print Tag: Refer to original journal article
Background: Chronic left ventricular (LV) dysfunction and adverse remodeling are the strongest predictors for mortality following ST-elevation myocardial infarction (STEMI). Infarct size is the most important factor that determines LV function and volumes after myocardial infarction (MI). Studies suggest a correlation between cardiac troponin I (cTnI), infarct size, and LV function in patients with STEMI. It remains unclear whether cTnI provides incremental information on the degree of LV function recovery or LV volume expansion once functional and volumetric parameters have been obtained in these patients.

Objective: To investigate the ability of cTnI to predict functional recovery and left ventricular remodeling in STEMI patients who undergo primary percutaneous coronary intervention (pPCI).

Design: Post hoc analysis of a prospective, multicenter, randomized study of patients with STEMI undergoing pPCI.

Methods: A substudy cohort (n=132) of the F.I.R.E. trial (a study of the cardioprotective effects of a novel compound in STEMI patients) was derived. All patients underwent cardiac magnetic resonance (CMR) imaging at 5 days and 4 months and cTnI sampling at 24 and 48 hours after STEMI. LV end-diastolic and end-systolic volumes and indices and change in LVEF were calculated. Patients were stratified into 3 groups with LVEF cutoffs at 40% and 50%. Results: Patients were grouped into 3 groups based on LVEF at 5 days (<40%, 40 to <50%, and ≥50%). Each group was subdivided into 2 based on cTnI values (whether or not above median). In linear regression models, the cTnI at 24 and 48 hours were independent predictors of changes in LV ejection fraction (LVEF) and LV volumes. cTnI was a stronger predictor of LV volume changes in anterior MI, whereas functional recovery was more closely associated with non-anterior MI.

Conclusions: This study shows a prognostic and risk stratification role for a single point cTnI measurement in the early post-STEMI patient. There is a definite association between cTnI and LV functional recovery in linear regression models. cTnI was found to be an independent predictor of an LVEF <40% at 4 months. Such an approach may help the clinician target patient populations for more aggressive anti-remodeling therapy, including device therapy.

Reviewer's Comments: The authors have shown that cTnI measured at 24 and 48 hours in STEMI patients who undergo pPCI provides prognostic information on changes in LV function and volumes during the first 4 months post-MI. cTnI measurements will help risk stratify patients with STEMI in a better way. Although the study cohort was derived from a well defined patient population, this is a post-hoc analysis. The authors used CMR to quantify LV function and volumes, which strengthens their observations. Since the authors used a more refined study cohort, the applicability of the findings to complex and heterogenous clinical situations may be less robust. (Reviewer-Anil George, MD).

Keywords: Left Ventricular Remodeling, Functional Recovery

Print Tag: Refer to original journal article
Patients with pulmonary hypertension undergoing total hip and total knee arthroplasty are at increased risk of perioperative mortality and complications.

**Objective:** To assess the mortality risk for patients with pulmonary hypertension (PHTN) undergoing total knee arthroplasty and total hip arthroplasty (TKA and THA, respectively) using the National Inpatient Sample (NIS) administrative database.

**Design/Participants:** Retrospective review of the NIS database for the period between 1998 and 2006, including patient data from primary THA and TKA.

**Methods:** The NIS is the largest all payer inpatient discharge database in the United States, containing information on inpatient discharges from almost 8 million hospital admissions yearly. Data with a primary procedure code of THA and TKA were included, identifying entries with diagnosis of chronic PHTN. Each patient with PHTN was matched with 3 non-PHTN patients within each distinct combination of matching variables. The primary outcome was in-hospital mortality. Secondary outcomes included ARDS, pulmonary embolism, and deep venous thrombosis.

**Results:** Identified were 670,510 entries for TKA and 360,119 for THA; of these, 2184 TKA patients and 1359 THA patients had PHTN (prevalence, 17.8% and 19.9% for TKA and THA, respectively). PHTN patients were older, were more likely to be female, and had a higher comorbidity burden. Mortality rates for patients with PHTN were increased by factor of 3.72 for THA and 4.55 for TKA. A fatal outcome was more frequent for patients with primary compared to non-primary PHTN for either procedure. The incidence of ARDS, pulmonary embolism, and deep venous thrombosis was higher in PHTN patients. Regression analysis identified PHTN, increasing age, male gender, and emergent admission to be independent risk factors for in-hospital mortality.

**Conclusions:** Patients with PHTN are at increased risk for perioperative morbidity and mortality after THA and TKA.

**Reviewer's Comments:** The study, as well as the NIS database, includes only inpatient data. The mechanisms causing the increased morbidity and mortality in the patients with PHTN, as well as why patients with primary PHTN suffer higher mortality compared to patients with secondary PHTN, were not identified. (Reviewer-K. George Bojanov, MD).

Keywords: Perioperative Mortality, Pulmonary Hypertension, Joint Replacement

Print Tag: Refer to original journal article
Should We Abandon Thoracic Epidural Catheters for Managing Postop Pain?

*Intravenous Lidocaine Is as Effective as Epidural Bupivacaine in Reducing Ileus Duration, Hospital Stay, and Pain After Open Colon Resection: A Randomized Clinical Trial.*

Swenson BR, Gottschalk A, et al:

Reg Anesth Pain Med 2010; 35 (July-August): 370-376

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The use of an intravenous lidocaine infusion may be an acceptable alternative to thoracic epidural analgesia for postoperative pain management after colon surgery.

**Objective:** To compare the effect of thoracic epidural analgesia against an intravenous lidocaine infusion on postoperative ileus and pain management.

**Design:** This clinical trial was prospective and randomized in design.

**Participants:** The study participants enrolled were adult patients aged 18 to 74 years scheduled for open colon resection between April 2005 and July 2006.

**Methods:** Patients were enrolled on the day of surgery and randomized to 1 of 2 groups: the thoracic epidural group or the intravenous lidocaine infusion group. All patients received a standardized general anesthetic with an inhalational agent. Patients in the thoracic epidural group had their epidural placed preoperatively somewhere between thoracic levels 8 and 12. An epidural infusion consisting of 0.125% bupivacaine in combination with hydromorphone 6 µg/mL was initiated at 10 mL/hr within an hour of the conclusion of surgery. Patients in the intravenous lidocaine group had their infusion started after the induction of general anesthesia. The rate was based on the patient's weight: those weighing <70 kg received 1 mg/min, and those weighing ≥70 kg received 2 mg/min. All patients received morphine patient-controlled analgesia on the floor with a maximum of 10 mg/hr to assess opioid consumption. Each patient was instructed to report the time of first flatus and bowel movement. On the day after recovery of bowel motility, the lidocaine or epidural infusion was stopped, and the study ended.

**Interventions:** If there was no return of bowel function as evidenced by flatus or bowel movement by postoperative day 5, the lidocaine infusion was terminated. However, for the epidural group, the epidural infusion could be continued based on the pain and surgical teams' preference.

**Results:** For the final analysis, 20 patients in the epidural group and 22 patients in the lidocaine group were included. No difference was found in time to first flatus or bowel movement. There was also no difference in median pain scores or opioid consumption. Both groups had similar hospitalization times.

**Conclusions:** An intravenous lidocaine infusion is just as effective as thoracic epidural analgesia in promoting return of bowel function and controlling postoperative pain.

**Reviewer's Comments:** I find it surprising that there was no difference in opioid consumption between groups. For instance, on postoperative day 1, the median morphine usage was 57 mg in the epidural group versus 48 mg in the lidocaine infusion group. This does not even take into account the morphine equivalents of the epidural hydromorphone or that a higher concentration of bupivacaine was being used. I have to say that, if I have a thoracic epidural in place with a patient requiring an additional 57 mg of intravenous morphine for break-through pain, I would have high suspicion that the epidural is not in the correct space. (Reviewer-Michelle L. Schlunt, MD).

**Keywords:** Intravenous Lidocaine, Thoracic Epidural, Local Anesthetics

**Print Tag:** Refer to original journal article