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# Hospital Medicine

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Abstract & Commentary

# The New Guidelines Put *C. difficile* on the Run

***By Deborah J. DeWaay, MD, FACP***

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**Dr. DeWaay reports no financial relationships in this field of study**

SOURCE: Brown AT, Seifert CF. Effect of Treatment Variation on Outcomes in Patients with *Clostridium difficile*. *Am J Med*. 2014; 127(9):865-870

SYNOPSIS: Patients have decreased disease recurrence and mortality when physicians follow the IDSA/Society for Healthcare Epidemiology of America guidelines for the treatment of *C difficile* infection.

There is an increasing focus on *Clostridium difficile* (*C. diff*) given its increasing prevalence, incidence and treatment failures. This gram-positive, anaerobic, cytotoxic bacterium is the most common cause of nosocomial diarrhea in industrialized countries. In 2010, the Infectious Disease Society of America (IDSA) and the Society of Healthcare Epidemiology of America (SHEA) published guidelines for the treatment of *Clostridium difficile*. Their recommendations for *C. diff* colitis were as follows:

- A mild to moderate case, whether initial or first recurrence, should be treated with 10-14 days of Metronidazole 500 mg PO TID.
- An initial severe case as defined by leukocytosis (WBC ≥ 15,000 cells/μL) or a serum creatinine ≥ 1.5 times normal for the patient or the second recurrence should be treated with 10-14 days of vancomycin 125 mg PO 4x per day.
- An initial severe/complicated case, defined by the presence of shock, megacolon or ileus, should be treated with vancomycin 500 mg 4x per day by mouth (or feeding tube) AND metronidazole 500 Q8 hours intravenously.

Complications from a *C. diff* infection include, but are not limited to, recurrence, toxic megacolon requiring surgery, and death. Authors of this study hypothesized that adherence to the treatment

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guidelines would decrease the known complications of *C. diff*.

The authors conducted a retrospective case-control study of patients treated for *C. diff* infection during a five-month period in 2011. The patients included in the study were at least 18 years old, identified from the International Classification of Diseases-9th Revision with a diagnosis code of "intestinal infection due to *C.diff* (008.45) and received treatment for their infection. The electronic health records used were from a single, tertiary care teaching hospital in Texas. The patient information was collected via chart review and placed in a standardized form. Patients were independently classified as mild/moderate, severe, or severe/complicated based on IDSA/SHEA guidelines by two authors, who subsequently concurred on the classifications. After patients were classified, the authors reviewed the charts and divided the patients into two groups: guideline-concordant and guideline-discordant. The authors then compared the complication rate of recurrence, surgery, toxic megacolon or death between the two groups. Any patient who received treatment that was more aggressive than the guidelines was put in the "guideline-concordant" group. The Shapiro-Wilk test for normality, Mann-Whitney U and Kruskal-Wallis tests were used to analyze the continuous data. Nominal data was analyzed using Pearson chi-squared and Fisher's exact tests. Complications, recurrence and mortality were analyzed using multiple logistic regression analysis.

180 out of 207 patients were included after the exclusion criteria were applied.

64.4% of all patients had antibiotic exposure within 8 weeks of developing *C. diff*.

55.6% of patients had taken a proton-pump inhibitor within 8 weeks of developing *C.diff*. The guideline-concordant and guideline-discordant groups had similar demographics except the guideline-concordant group was older (67 ± 22.7 years vs. 58 ± 24 years; *P* = .008). The guideline-concordant group was less likely to have a recurrence when compared to the discordant group (14% vs. 35.6%; *P*=.0007). The mortality rate was also less in the concordant group versus the discordant group (5.4% vs. 21.8%; *P*=.0012) leading to a decreased overall complication rate in the concordant group versus the discordant group (17.2% vs. 53.6%; *P* < .0001). The clinical cure rate was increased in the guideline-concordant group compared to the discordant group (93.5% vs. 71.3%; *P*<.0001). Patients with mild/moderate *C. diff* infection were more likely to have received guideline-concordant therapy as compared to patients who had a severe or severe/complicated infection (82.1% vs. 35.3%; *P*<.0001). The patients with severely complicated infections were older (67 vs. 59.5 vs 61; *P* = .0083) and had higher complication (54.1% vs. 38.2% vs. 22.4%; *P* = .0004) and mortality rates (26.2% vs. 20.6% vs. 1.2%; *P*<.0001) compared to the severe and mild/moderate groups.

Recurrence of disease was 72.5% less likely in patients who received guideline-based therapy (OR 0.2747; 95% CI 0.1308-0.5769; *P* = .0004). The most common pattern of discordant therapy among those with recurrent mild-moderate *C. diff* was treating with metronidazole monotherapy rather than vancomycin in a tapered or pulsed schedule. Only 19.7% of severe/complicated patients were treated per the guidelines. Most often there was a failure to add IV metronidazole to PO vancomycin or the patient was treated with PO metronidazole alone.

## ■ COMMENTARY

This study demonstrates that there may be clinical benefit to guideline-concordant therapy. The patients who received guideline-based therapy had less recurrence and decreased mortality. Unfortunately, in this study, only slightly over half of the patients received treatment per the guidelines. The authors make the point that only one-half of Americans receive guideline-based therapy when they see a doctor in general. Oral vancomycin was available at the hospital this study was performed, so resources were not limited. They suggest that the main problem is a lack of familiarity by physicians with the guidelines. With the rising infection rates of *C. diff*, preventing hospitalizations will be challenging. Preventing recurrence of disease when possible will be essential to minimizing

hospitalizations, and following the guidelines for treatment will be an important way to prevent recurrence and also mortality.

There are several limitations to this study. First, it is a retrospective, case-control study so causality cannot be assessed. Second, authors could not always be sure that the markers for severity of disease were secondary to *C. diff*. Third, this was a single-center study so generalizability is questionable. Fourth, there was no follow-up as an outpatient, so patients could potentially have had uncounted outpatient treatment failures.

*C. diff* infection is a common illness that hospitalists must understand how to diagnose and treat in their patients. I believe this study offers several key lessons that can be applied to a practice in hospital medicine. First, as *C. diff* causes increasing illness in our patients, physicians must be up to date on how to treat it according to the guidelines. It is not surprising that the mild/moderate group was more likely to have guideline-concordant therapy, since the treatment for this group is the traditional treatment of *C. diff*. In patients with more severe disease, guidelines were not followed as often and outcomes were worse. Second, it is a reminder of the importance of being up to date in the literature in general and the severe consequences that can occur if the patients are not given the most evidence-based treatments possible. Although these are very simple and obvious points, I believe their simplicity is what makes them profound. Physicians, in general, are trying to give the best care possible, yet we are not successful in doing so a significant portion of the time. The quality improvement movement will hopefully help change the course of this reality. ■

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Abstract & Commentary

# Can We Reduce Unnecessary Head CT Scans in Patients with Delirium?

***By Kenneth P. Steinberg, MD, FACP, Editor***

*Professor of Medicine, University of Washington School of Medicine, Seattle, WA*

**Dr. Steinberg reports no financial relationships in this field of study.**

SOURCE: Theisen-Toupal J, et al. Diagnostic yield of head computed tomography for the hospitalized medical patient with delirium. *J Hosp Med* 2014; 9:497-501.

This study was a retrospective review of medical records of hospitalized general medicine patients with head CT imaging performed for the evaluation of delirium. It was conducted at a large academic medical center in Boston, MA. All patients admitted to the medical services (general medicine, nephrology, hepatology, cardiology, or oncology) with a head CT done over a period of nearly two years were included. Patients in the ICU were excluded. Patients were included if a chart review revealed the indication for the head CT to be delirium, altered mental status, confusion, encephalopathy, somnolence, or unresponsiveness. Scans were excluded if there was a documented fall or trauma, or a new focal neurological deficit, or an admitting diagnosis of an intracranial lesion (e.g., stroke or subdural hematoma). A positive head CT was defined as an intracranial process that could explain delirium. An equivocal head CT was defined as the presence of a finding of unclear significance in relation to the delirium.

There were 1,714 head CT studies done on hospitalized medical patients during the study period. 398 were done for an indication of delirium, altered mental status, confusion, encephalopathy, somnolence, or unresponsiveness. 178 studies were excluded and thus there were 220 scans on 210 patients included in the study. Of these 220 scans, only 6 (2.7%) were positive and 4 (1.8%) were equivocal. Thus, less than 5% of the scans revealed findings that might have explained the new-onset delirium. However, all 10 of the positive or equivocal head CT scans resulted in a change in management. The 4 patients with equivocal scans all had a repeat scan, none of which identified a cause of delirium. The 6 patients with positive scans had a change in management ranging from a higher platelet transfusion threshold, reversal of anticoagulation, repeat advanced head imaging, neurosurgical consultation, and a change in goals of care. None of the patients underwent neurosurgical intervention. Because of the small number of

positive scans, no risk factor associations could be made from this study.

## ■ COMMENTARY

This study demonstrated that the diagnostic yield of head CT scans in hospitalized medical patients with new onset delirium is very low and may be unnecessary. It is important to remember that these patients did not have a history of a recent fall or trauma and did not have a new focal neurological deficit. While in my opinion this is a good study, it does have some weaknesses. It is a retrospective chart review study and is prone to the errors inherent in relying on the medical record. There may have been clinically relevant information not completely captured in the chart. Also, the study took place a single, large, academic institution and the results might not be relevant to other clinical settings.

The authors point out that since not all hospitalized patients with delirium get a head CT, the true rate of positive findings on head CT imaging is likely to be even lower than they observed. If that's true, it strengthens the argument that head CT scans in this population are over-utilized. However, in the very small number of patients with positive or equivocal findings (<5%), there were potentially important changes in the clinical management of those few patients. One of the real challenges in today's clinical environment is to practice high-value, cost-conscious care. In this patient population, clinicians need to know that the diagnostic yield of a head CT is very low. They need to balance that low diagnostic yield and the potential harms thereof (unnecessary cost, resource utilization, false positive results, and radiation exposure) with the risk of a delayed or missed diagnosis of an intracranial process that might require a change in management. The authors point out that the routine use of head CT in this population seems unwarranted, yet in some high-risk patients, the test may well be justified. I agree with their conclusion. While minimizing the routine use of head CT scans for hospitalized medical patients with acute delirium, clinicians still need to use their assessment and judgment to ferret out the high-risk patients until further research illuminates a better approach. ■

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ABSTRACT & COMMENTARY

# Peri-procedural Management of New Oral Anticoagulants

***By Michael H. Crawford, MD***

*This article originally appeared in the October 2014 issue of* Clinical Cardiology Alert. *It was peer reviewed by Susan Zhao, MD. Dr. Crawford is Professor of Medicine, Chief of Clinical Cardiology, University of California, San Francisco, and Dr. Zhao is Director, Adult Echocardiography Laboratory, Associate Chief, Division of Cardiology, Department of Medicine, Santa Clara Valley Medical Center. Dr. Crawford and Dr. Zhao report no financial relationships relevant to this field of study.*

SOURCE: Beyer-Westendorf J, et al. Peri-interventional management of novel oral anticoagulants in daily care: Results from the prospective Dresden NOAC registry. *Eur Heart J* 2014;35:1888-1896.

Due to the short half-life and rapid onset of action of the new oral anticoagulants (NOACs), peri-procedural anticoagulant free time intervals should be shorter than with warfarin. Thus, there is uncertainty about the use of heparin bridging. These investigators from Germany analyzed the Dresden NOAC registry data to assess peri-procedural NOAC management and safety until 30 days post-procedure. The primary effectiveness outcome was a combination of centrally adjudicated cardiovascular events, including death. The primary safety outcome was the rate of major bleeding events. Among the 2179 patients, 27% underwent procedures (16% minimal, 74% minor, and 10% major). Most of the patients were on rivaroxaban (76%) for stroke prevention in atrial fibrillation (81%). Peri-procedure, 1% of these patients had a major cardiovascular event and 1.2% had major bleeding. The rates of these complications were highest for major procedures (5% and 8%, respectively). During the 863 procedures, NOACs were continued in 22%, temporarily stopped in 49%, or stopped with heparin bridging in 29%. The median time of NOAC interruption was 3 days (2 days before and 1 day after the procedure). Major cardiovascular event rates were similar for those with and without heparin bridging (1.6% vs. 0.8%, $P$ = NS), but major bleeding complications

were higher with heparin bridging (2.27% vs. 0.5%, $P = 0.01$). However, on multivariate analysis, major procedures were independently associated with major bleeding (odds ratio [OR], 16.8; $P < 0.001$), but heparin bridging, which was more commonly used with major procedures, was not. The authors concluded that continuation or brief interruptions in NOAC therapy for most procedures is safe, but heparin bridging may be useful in selected high-risk patients.

## ■ COMMENTARY

This is the first report of the use of NOACs peri-procedurally and provides reassuring data about their safety and effectiveness. The data are similar to a post-hoc analysis of the RE-LY trial of dabigatran vs. warfarin, looking at the patients that had a procedure done. Like the RE-LY analysis, this study shows low cardiovascular event rates, which in RE-LY were similar to warfarin. However, this study shows lower major bleeding rates (1.2%) vs. RE-LY (4-5%), despite the fact that heparin bridging rates were higher in this study (30%) vs. RE-LY (16%). Whether this difference is just due to the different study designs or to the different drugs used is unknown. RE-LY used dabigatran and this registry mainly represented rivaroxaban use (76%) with some dabigatran (23%) and apixaban use (1%).

The data on heparin bridging were also informative in that it did not reduce thromboembolic events, but did seem to increase major bleeding events. These results are somewhat similar to a meta-analysis of warfarin use with heparin bridging that showed reduced thromboembolic events, but increased bleeding (OR = 5). Thus, heparin bridging has been questioned recently. In this study, heparin bridging increased the absolute major bleeding rate, but it was not an independent factor in the multivariate analysis by the authors' definition. A major surgical procedure was the strongest predictor of major bleeding (OR, 16.8; $P < 0.001$); whereas heparin bridging was second (OR, 5; $P = 0.02$). So, concern about the bleeding risks of heparin bridging with NOACs persists and the authors suggest a case-by-case approach. In practice, the main reason to heparin bridge on warfarin therapy has been mechanical prosthetic valves, but NOACs are not indicated for this use, so presumably were not used for such patients in this German study. Thus, the need for heparin bridging with NOACs should be infrequent.

The limitations of this study are that it is observational. Also, the physicians were given no instructions on how to use NOACs. So there could be selection biases. In addition, event rates were low, especially for death. The strengths of the study include the large number of procedures (863), central adjudication of events, and a low rate of lost to follow-up (1%). Thus, until randomized trials are done (unlikely), this study represents the best current data we have on the use of NOACs peri-procedurally. It suggests that it is safe to either continue NOACs for more minor procedures or briefly stop them for more major procedures, and that heparin bridging is usually not needed and may increase bleeding risks. ■

ABSTRACT & COMMENTARY

# Health Care Utilization in the Aftermath of Severe Sepsis

***By Betty T. Tran, MD, MSc***

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**Dr. Tran reports no financial relationships relevant to this field of study.**

*This article originally appeared in the October 2014 issue of* Critical Care Alert. *It was edited by David J. Pierson, MD, and peer reviewed by William Thompson, MD. Dr. Pierson is Professor Emeritus, Pulmonary and Critical Care Medicine, University of Washington, Seattle, and Dr. Thompson is Associate Professor of Medicine, University of Washington, Seattle. Drs. Pierson and Thompson report no financial relationships relevant to this field of study.*

SYNOPSIS: This observational cohort study of survivors of severe sepsis found that the post-discharge needs of this population are substantial. Severe sepsis survivors spent more days admitted to facilities after their acute hospitalization than prior and had greater mortality, a steeper decline in days at home, and a greater increase in proportion of days alive in a facility compared to survivors of non-sepsis hospitalizations.

SOURCE: Prescott HC, et al. Increased 1-year healthcare use in survivors of severe sepsis. *Am J Respir Crit Care Med* 2014;190:62-69.

Short-term mortality rates for severe sepsis have declined over the last 20 years, which translates to more patients surviving to hospital discharge, but little is known about their clinical course afterwards.[1] Using Medicare-linked data from participants in the Health and Retirement Study (1998-2005), Prescott and colleagues measured health care use among survivors of severe sepsis in two ways: 1) comparing their post-discharge inpatient health care use to their pre-sepsis use, and 2) comparing their post-discharge inpatient health care use to those of matched survivors of non-sepsis hospitalizations. Matching was done on age, sex, Charlson Comorbidity Index score, baseline disability as measured by deficiencies of activities of daily living, hospitalization length, and intensive care use. Severe sepsis was defined based on claims documenting infection and acute organ dysfunction. Using Medicare claims, the investigators were also able to determine the daily inpatient location of each patient (hospital, long-term acute care, or skilled nursing facility) in the 2 years surrounding their acute hospitalization. Patients who were known to be alive and not admitted to an inpatient facility were assumed to be at home, with the caveat that patients residing in nursing homes could not be identified on a daily basis.

After matching sepsis to non-sepsis hospitalizations, 1083 severe sepsis hospitalizations (93.2% of all severe sepsis hospitalizations without inpatient mortality) and 1083 non-sepsis hospitalizations were included in the analysis. The unmatched severe sepsis patients (n = 77) tended to be younger, had longer hospitalizations, were more likely to use intensive care services, and had greater post-sepsis resource use and mortality.

Severe sepsis survivors spent more days (median, 16 vs. 7 days, $P < 0.001$) and had a higher proportion of days alive (median, 9.6% vs. 1.9%, $P < 0.001$) admitted to an inpatient facility in the year after compared to the year prior to their severe sepsis hospitalization. Most of this utilization occurred in the first 90 days after discharge. This increase in facility days was also observed in the non-sepsis cohort. However, because the severe sepsis survivors had higher 90-day (27.5% vs. 15.5%, $P < 0.01$) and 1-year mortality (44.2% vs. 31.4%, $P < 0.01$), they had a steeper decline in the number of days spent at home (difference-in-differences, -38.6 days, $P < 0.001$) and a steeper rise in proportion of days spent in an inpatient facility (difference-in-differences, 5.4%, $P < 0.001$).

## ■ COMMENTARY

This study is unique in presenting the degree of resource consumption among severe sepsis survivors in a straightforward, but relevant manner. Post-discharge inpatient health care utilization can be accurately captured, and is clinically significant not only to third-party payers, but also to treating physicians, patients, and their families. In addition, the degree of resource consumption presented here is likely an underestimate, given the inability to measure non-inpatient services, such as nursing home usage and home care needs, and due to the exclusion of the unmatched severe sepsis patients who were sicker overall.

Although we tend to regard severe sepsis as a highly acute process, especially in the critical care setting, findings from this study suggest it behaves like any other chronic disease in terms of health care utilization if patients survive to hospital discharge. The within-person (pre- and post-sepsis) results highlight that a single episode of severe sepsis is often a pivotal event in terms of the patient's health trajectory and, subsequently, health care consumption. Furthermore, although inpatient health care utilization rises similarly after non-sepsis hospitalizations, because severe sepsis survivors have markedly higher mortality, they have a dramatic increase in the proportion of days alive spent in an inpatient facility when compared to their non-sepsis peers.

The question remains as to what accounts for this excess post-discharge morbidity and mortality experienced by survivors of severe sepsis. This knowledge could direct targeted interventions and more focused attention during the critical 90-day transition period. However, it would also be worthwhile to ask whether we can prevent or effectively alter the course of many of these events. In this study, the severe sepsis population tended to be older, have a moderate comorbidity burden, and have at least mild-to-moderate functional limitations already at baseline. Therefore, a targeted, post-discharge intervention may also need to include palliative care consultation if we are truly dedicated to high quality, post-hospital care for survivors of severe sepsis. ■

## REFERENCE

1. Stevenson EK, et al. Two decades of mortality trends among patients with severe sepsis. *Crit Care Med* 2014;42:625-631.

ABSTRACT & COMMENTARY

# Nasal High-Flow Oxygen Lowers Reintubation Rate

*By Leslie A. Hoffman, RN, PhD*

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*This article originally appeared in the October 2014 issue of* Critical Care Alert. *It was edited by David J. Pierson, MD, and peer reviewed by William Thompson, MD. Dr. Pierson is Professor Emeritus, Pulmonary and Critical Care Medicine, University of Washington, Seattle, and Dr. Thompson is Associate Professor of Medicine, University of Washington, Seattle. Drs. Pierson and Thompson report no financial relationships relevant to this field of study.*

SYNOPSIS: Use of nasal high-flow oxygen was associated with better comfort, fewer desaturations and interface displacements, and a lower reintubation rate.

SOURCE: Maggiore SM, et al. Nasal high-flow versus venturi mask oxygen therapy after extubation. Effects on oxygenation, comfort, and clinical outcome. *Am J Respir Crit Care Med* 2014;190:282-288.

In this study, 105 patients were randomized to either Venturi mask (n = 52) or nasal high-flow cannula (NHF, n = 53) for oxygen delivery after extubation. Patients were eligible for study entry if they successfully passed a spontaneous breathing trial and had a $PaO_2/FIO_2 \leq 300$ mmHg at the end of the trial. Patients were excluded if they had a tracheostomy or if noninvasive ventilation (NIV) would be used following extubation based on the following criteria: > 3 consecutive failures of a spontaneous breathing trial and a $PaCO_2 > 45$ mmHg with a respiratory rate > 25 breaths/min before the spontaneous breathing trial. Patients were 64 ± 17 years of age with a Simplified Acute Physiologic Score II of 43 ± 15. Mean duration of mechanical ventilation was 4.9 ± 3.9 days. At enrollment, mean $PaO_2/FIO_2$ was 240.6 ± 46.7 mmHg and mean $PaCO_2$ was 35.3 ± 7.3 mmHg.

All outcome variables significantly improved in the NHF group. With NHF, $PaO_2/FIO_2$ was significantly higher at 24 hours after extubation (287.2 ± 74.3 vs. 247.4 ± 80.6 mmHg; $P = 0.03$), discomfort related to the device was less ($P = 0.016$), and fewer patients in the NHF group had interface displacements (89 vs. 20; $P < 0.001$), oxygen desaturation to < 92% detected on the bedside clinical monitor (178 vs. 40; $P < 0.001$), or required reintubation (11 vs. 2; $P < 0.005$).

## ■ COMMENTARY

In this study, the most interesting finding relates to the lower reintubation rate in patients randomized to NHF oxygen therapy. There was also a lower incidence of device displacement, a finding that likely resulted from improved comfort with use of the NHF system. During the 48-hour study period, 22 patients experienced post-extubation distress requiring ventilator support, with 4 patients (7.5%) in the NHF group and 18 (34.6%) in the Venturi group. Fewer patients received NIV or required reintubation in the NHF group. In this study, patients expected to require NIV post-extubation were excluded. Thus, those enrolled in the study were expected to tolerate extubation without need for further support. NIV can be used in the post-extubation period to shorten the duration of invasive ventilation, prevent extubation failure, and rescue a failed extubation.

Substantial evidence supports benefit in selected patients. However, use of NIV is somewhat complex and therefore requires an experienced team and adequate personnel and equipment resources. NHF therapy also requires specialized equipment, but is comparatively easier to implement. NHF confers the ability to deliver fully humidified high-flow oxygen (up to 60 L/min) through a nasal cannula. By delivering oxygen at flow rates that exceed the patient's peak inspiratory flow, the system provides a constant $FIO_2$. In addition, the high gas flow generates the effect of continuous positive airway pressure and results in dead space washout. Through these mechanisms, NHF therapy improves oxygenation and, in comparison to NIV, provides a more comfortable interface. Findings of this study suggest potential benefit in avoiding reintubation through use of NHF therapy in those who experience respiratory distress after extubation. ■

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## CME QUESTIONS

**1. What is the treatment, per the 2010 IDSA/SHEA guidelines, for the treatment of an initial severe/ complicated case of *C. diff*?**

a. Metronidazole 500 mg by mouth 3 times a day for 10-14 days

b. Vancomycin 125 mg by mouth 4 times a day for 10-14 days

c. Vancomycin 500 mg by mouth 4 times a day by mouth, plus metronidazole 500 mg Q8 hours IV

d. Vancomycin 500 mg intravenously every 8 hours

e. Metronidazole 500 mg intravenously every 8 hours

**2. In the retrospective study by Theisen-Toupal and colleagues of the diagnostic utility of head CT for the hospitalized medical patient, what percent of head CT scans were either positive or equivocal for a cause of delirium?**

a. Zero

b. Less than 5%

c. 18%

d. 27%

e. 45%

**3. In the analysis of a registry in Germany reported by Beyer-Westendorf and co-authors, the peri-procedural continuation or brief interruption of newer oral anticoagulants versus the use of heparin bridging led to which of the following clinical outcomes?**

a. Increased risk of a major cardiovascular event compared to heparin bridging

b. Decreased risk of a major cardiovascular event compared to heparin bridging

c. Increased risk of major bleeding compared to heparin bridging

d. Decreased risk of major bleeding compared to heparin bridging

## CME OBJECTIVES

Upon completion of this educational activity, participants should be able to:

- discuss pertinent safety, infection control and quality improvement practices;
- explain diagnosis and treatment of acute illness in the hospital setting; and;
- discuss current data on diagnostic and therapeutic modalities for common inpatient problems.

## [IN FUTURE ISSUES]

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