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Safely Centralized Telemetry Off-site in a Multi-hospital System

Deborah J. DeWaay, MD, FACP and Kenneth P. Steinberg, MD, FACP, Editor

Dr. DeWaay and Dr. Steinberg report no financial relationships in this field of study.

SYNOPSIS: The hospitals in this study outsourced their cardiac telemetry to an off-site central monitoring center without an increase in adverse events.

SOURCE: Cantillon D, et al. Association between off-site central monitoring using standardized cardiac telemetry and clinical outcomes among non-critically ill patients. *JAMA* 2016;316(5):519-524.

Telemetry is traditionally monitored on-site in hospitals and is associated with high levels of alarm fatigue since most alerts do not have clinical relevance. Alarm fatigue has been associated with an increase in severe adverse events since real events are missed and resources are wasted on false-positive events. As a result, the 2014 National Patient Safety Goal was written by The Joint Commission mandating that this problem will be addressed by 2016. In addition, to address the global overutilization of telemetry, the Society of Hospital Medicine advocated that non-intensive care unit cardiac telemetry monitoring must be protocol-driven. When telemetry is utilized according to the 2004 American Heart Association recommendations, there is a 70% reduction in use without an increase in deaths. In addition, having a trained nurse devoted to continuous rhythm monitoring is associated with increased reliability rhythm interpretation. The current study sought to determine if an off-site central monitoring unit (CMU) could maintain high quality, standardized telemetry monitoring.

The Cleveland Clinic main campus and 3 regional hospitals had a dedicated off-site facility which delivered telemetry monitoring before there was telemetry standardization. Within this system, 48 patients are monitored by 1 technician. There are also lead technicians that assist with oversight during events in real time. Patient monitoring is a shared responsibility between CMU and the nursing staff with the patients. A phone system is used for protocol-driven CMU communication to nursing staff of events. Nursing is responsible for informing the CMU of staff rosters during each shift. The authors of the study estimated the costs based on institutional

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[INSIDE]

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contracts with the particular vendors and the vendor specific technologies used. A ratio of 5.2 full-time employees per 48 monitored patients was used to estimate personnel costs.

All CMU notifications were categorized as arrhythmia or hemodynamic notification or non-arrhythmia and hemodynamic notifications (includes low battery, lead failures etc). When a patient was suspected of declining precipitously, both nursing and the emergency response team (ERT), made up of a physician, nurse and respiratory therapist, were contacted simultaneously. Beginning in 2014, this health system implemented a protocol for telemetry usage based upon the 2004 American Heart Association (AHA) guidelines. When the telemetry order is entered, the nurse electronically notes the order, applies the electrodes and submits a task completion notification. Within the CMU, the technician begins monitoring per the parameters. Every 72 hours, there is notification by the health record for the telemetry order to be reevaluated and reordered as necessary.

Data was collected for the 13 months after telemetry standardization was put in place and then compared to the previous 13 months. Specifically, throughout the study period, authors looked to see if there was accurate identification and notification of rhythm and rate alarms within the 1 hour prior to ERT activation. In addition, during the study period and the previous 13 months, all cardiopulmonary arrest events on monitored and unmonitored patients were counted. A lead technician entered all ERT activations into the study database with the rhythm strips of the event and the 1 hour prior. There was an independent audit of the database.

99,048 patients were put on telemetry during the study period. The most common indications were known or suspected atrial or ventricular tachyarrhythmias. Metabolic derangement, respiratory disorders, seizure monitoring, stroke, deep vein thrombosis/pulmonary embolism, and drug exposure are not recommended reasons for the use of telemetry by the AHA yet they were common reasons for utilization in this study. The cost of implementing the CMU was between $2.3 and 4.7 million. Compared to the prior 13 months, the implementation of standardized cardiac telemetry decreased the weekly telemetry census by a mean of 15.5% immediately and consistently across the study period. There were 126 cardiopulmonary arrests in the pre-intervention phase and 122 in the post-intervention phase. During the study period, 410,534 notifications were sent to 61 nursing units across all of the campuses. Lead failure was the predominant reason (80%) of non-arrhythmia or hemodynamic notification. 57%, 3243 patients, of ERT events occurred on monitored patients. Of these activations, 30%, 979 patients, had a rhythm or rate change within 1 hour of ERT being called. The CMU detected 79% of these patients accurately. Of the 21%, 207 patients, that were not detected, 85% were missed events, 8% were simultaneous alarm events with ERT activation and 7% were process failures. On the main campus, CMU directly notified the ERT in conjunction with nursing 105 times for findings including monomorphic ventricular tachycardia (n=44), asystole (n=36), polymorphic ventricular tachycardia or fibrillation (n=14), and other (n=11). 27 of these patients had cardiopulmonary arrest events, 25 of which had a return of spontaneous circulation. The 10 patients who met criteria for defibrillation received it within 3 minutes. There were 2 deaths.

■ COMMENTARY

In this study, the CMU offered centralized monitoring without an increase in adverse events. The implementation of a guideline driven protocol decreased the census of telemetry patients, which mirrors other studies in the literature. In addition, CMU allowed for increased oversight with lead technicians in order to mitigate lapses in monitoring. Finally, this study demonstrated that it is possible to integrate a CMU with the ERT team. The primary limitations to this study are that there was no randomization, that it was a pre-post study design that might not have accounted for other temporal changes occurring in the system, and that 2 changes were employed concurrently making it difficult to ascribe the results to one or the other.

This study demonstrates that centralized telemetry can take place off-site and this model may be of interest to hospital systems. The start-up cost is significant and may be prohibitive for some systems. It is unclear if the cost savings is in the implementation of the CMU or

of the guideline based protocol. The CMU appears to increase quality of the monitoring delivered. This ongoing discussion regarding the best way to implement telemetry is important for hospitalists since they are key stake holders in this process as physicians to these patients and leaders in quality improvement. ■

Growing Threat of Pyelonephritis Caused by Antibiotic-resistant *Escherichia coli*

By Richard R. Watkins, MD, MS, FACP, FIDSA

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Dr. Watkins discloses that he has received research support from Actavis.

SYNOPSIS: In patients with acute pyelonephritis due Escherichia coli presenting to one of 10 emergency departments, the prevalence of fluoroquinolone resistance ranged from 6.3% to 19.9%, and the prevalence of extended-spectrum beta-lactamase production was 2.6% to 12.2%. Of those patients with resistant organisms, more than 50% received inactive empiric antibiotics.

SOURCE: Talan DA, Takhar SS, Krishnadasan A, et al. Fluoroquinolone-resistant and extended-spectrum ß-lactamase-producing *Escherichia coli* infections in patients with pyelonephritis, United States. Emerg Infect Dis 2016;22:1594-1603.

Escherichia coli is the most common cause of community-acquired pyelonephritis and is becoming increasingly resistant to first-line empiric antibiotics. Traditionally, extended-spectrum beta-lactamase (ESBL)-producing *E. coli* has been associated with healthcare acquisition and rarely originated in the community. Talan and colleagues aimed to determine the prevalence of antibiotic-resistant *E. coli* in adults with acute pyelonephritis who were seen in U.S. emergency departments (EDs).

The study was conducted using a network of 10 university-affiliated urban EDs called EMERGEncy ID NET. Enrolled patients included those aged ≥ 18 years who presented with flank pain or costovertebral tenderness; fever ≥ 38°C; a presumptive diagnosis of acute pyelonephritis; and a urine specimen that grew a single uropathogen at ≥ 104 CFU/mL. Urine cultures that grew more than one organism were considered to be contaminated and were excluded from the study. Furthermore, patients were classified as having complicated pyelonephritis if they met one of the following criteria: pregnant, male, preexisting urinary tract abnormality, or current immunocompromising condition.

After exclusions, the study population included 521 patients. The median age was 37 years and the majority of patients (87.3%) were female. Most infections were community-acquired (85.6%) and uncomplicated (54.9%). *E. coli* was the most common pathogen cultured (86.9%). Among those with uncomplicated pyelonephritis, 17 of 272 *E. coli* isolates (6.3%) were resistant to fluoroquinolones. The range of prevalence by site was 0.0% to 23.1%. For complicated pyelonephritis, 36 (19.9%) were fluoroquinolone-resistant (range by site was 0.0% to 50.0%). ESBL production was found in seven of 272 *E. coli* isolates (range 0.0% to 8.3%) from cases of uncomplicated pyelonephritis and in 22 of 181 *E. coli* isolates (range 0.0% to 17.2%) in patients with complicated pyelonephritis. When analyzed by site, the prevalence of ESBL-producing *E. coli* corresponded with the prevalence of fluoroquinolone-resistant strains. Only 41% of the ESBL-producing strains were susceptible to trimethoprim-sulfamethoxazole, 18% to ciprofloxacin, 21.7% to levofloxacin, and 41.4% to gentamicin.

Another disconcerting finding from the study was the number of patients with pyelonephritis who received the wrong empiric antibiotics. Of the 53 patients with a fluoroquinolone-resistant uropathogen, 24 were treated initially with an antibiotic that was inactive in vitro. Moreover, 22 out of the 29 patients with an infection from ESBL-producing *E. coli* were started initially on an inactive antibiotic. Of nine patients with ESBL-producing *E. coli* pyelonephritis who were discharged from the ED, seven were sent out with an in vitro-inactive antibiotic. The investigators did not include any information regarding outcomes in these patients, such as mortality or whether they re-presented to the ED and were then hospitalized. Among the 20 patients admitted with ESBL-producing *E. coli* pyelonephritis, 15 initially were treated with inactive antibiotics.

■ COMMENTARY

Talan and colleagues have presented data that show an alarming increase in the prevalence of antibiotic-resistant *E. coli* in patients presenting to EDs with pyelonephritis. This unfortunate situation makes the decision about empiric antibiotics more challenging.

The latest Infectious Diseases Society of America (IDSA) guidelines for treating pyelonephritis in women recommend a threshold of 20% for using trimethoprim-sulfamethoxazole, and when this number is exceeded, an alternative antibiotic should be used.[1] The present study provides solid evidence that the current IDSA guidelines need to be updated. Moreover, since the spread of antibiotic resistance is ongoing and shows no signs of abating, it seems likely that the resistance patterns presented by Talan will soon be out of date as well. Until new guidelines are published, clinicians should make empiric antibiotic choices based on local resistance patterns. Also, it is important to keep in mind risk factors for fluoroquinolone resistance and the possibility of an ESBL-producing organism, such as recent antibiotic use, travel outside North America, recent hospitalization, and a previous urinary tract infection from a fluoroquinolone-resistant or ceftriaxone-resistant pathogen. However, in the present study, approximately one-third of patients with an ESBL-producing *E. coli* had none of these risk factors. One rational empiric antibiotic for pyelonephritis, especially if the patient has a risk factor(s) for antibiotic resistance, is ertapenem. All of the uropathogens in the Talan et al study were susceptible to this drug. However, potential drawbacks of ertapenem include disruption of the anaerobic gut flora, no easy oral conversion, and the very real risk of increasing carbapenem resistance. When treating pyelonephritis, clinicians should be pragmatic about the risks and benefits of empiric antibiotics and mindful about antibiogram data for urinary isolates from their community. ■

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Influence of Sacubitril/Valsartan on 30-day Readmission After Heart Failure

By Harold L. Karpman, MD, FACC, FACP

Clinical Professor of Medicine, David Geffen School of Medicine at UCLA

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

SYNOPSIS: Compared with enalapril, treatment with sacubitril/valsartan is more effective in reducing 30-day readmissions for any cause following discharge from congestive heart failure hospitalization.

SOURCE: Desai AS, Claggett BL, Packer M, et al. Influence of sacubitril/valsartan on 30-day readmission after heart failure hospitalization. *J Am Coll Cardiol* 2016;68:241-248.

Despite the development of effective medical therapy for the treatment of patients who experience congestive heart failure (CHF), such patients remain at high risk for recurrent rehospitalization within 30 days of discharge, and nearly 50% of patients are readmitted within six months.[1,2] Since 2010, U.S. hospitals with higher-than-expected risk-standardized readmission rates at 30 days are at risk for substantial financial penalties as part of the Hospital Readmissions Reduction Program. Therefore, economists and clinicians alike welcome any therapeutic approach to reducing readmission rates. The effect of the angiotensin receptor neprilysin inhibitor sacubitril/valsartan on CHF hospital admission rates was compared to enalapril in the PARADIGM-HF trial. In this randomized, double-blind, prospective comparison study, subjects suffering from chronic CHF and presenting with an ejection fraction of < 40% (subsequently lowered to < 35%) received twice-daily drug therapy.[4] Researchers randomized 8,399 participants. Rates of hospital readmission were 17.8% in the sacubitril/valsartan group, compared with 21% in enalapril-assigned subjects.[3]

■ COMMENTARY

Nearly one in five CHF hospitalization events during the trial was followed by a repeat hospitalization within 30 days, of which more than 50% were related to recurrent CHF. Although the mechanisms by which neprilysin inhibition may facilitate readmission reduction early after discharge following CHF hospitalization remains unclear, the findings further support the potential benefits of sacubitril/valsartan on slowing the clinical progression of patients suffering from CHF after hospital discharge.

While the study results suggested that sacubitril/valsartan-treated patients experienced fewer any-cause readmission hospitalizations than the enalapril group, the data require more detailed analysis before drawing final conclusions. Additionally, the mechanisms by which neprilysin inhibition may facilitate reduction in the readmission rates early after CHF hospitalization

remain unclear. However, the data further support the potential benefits of this approach on slowing the clinical progression of patients surviving a CHF hospitalization. As the authors said, the apparent differences in readmission rates noted in the analysis could be attributed to clinical differences between the two treatment groups of patients who were hospitalized.

Desai et al suggested that the data demonstrating fewer all-cause and heart failure readmissions at 30 days in CHF patients with reduced ejection fraction following treatment with sacubitril/valsartan (compared to enalapril) provide additional rationale for the use of the drug combination not only in hospitalized patients but also in patients suffering from chronic, symptomatic CHF with reduced ejection fraction. ■

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Noninvasive Ventilation Delivered Via Helmet May Decrease Intubation Rates

By Betty Tran, MD, MSc, Editor

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

SYNOPSIS: In this single-center, randomized, clinical trial, among patients suffering from acute respiratory distress syndrome, the use of helmet noninvasive ventilation was associated with a reduction in intubation rates, ICU length of stay, and hospital and 90-day mortality.

SOURCE: Patel BK, Wolfe KS, Pohlman AS, et al. Effect of noninvasive ventilation delivered by helmet vs face mask on the rate of endotracheal intubation in patients with acute respiratory distress syndrome: A randomized clinical trial. *JAMA* 2016;315:2435-2441.

Previous work has shown a 51% failure rate of noninvasive ventilation (NIV) among patients suffering from acute respiratory distress syndrome (ARDS) who subsequently require endotracheal intubation.[1] This is thought to be related to the inability to deliver high levels of positive end-expiratory pressure (PEEP) with a face mask due to patient intolerance and mask leak. In this study from the University of Chicago, Patel et al sought to determine whether NIV delivered via a helmet interface, which allows for increased titration of positive airway pressure without substantial air leak and improved patient tolerability, could reduce the need for endotracheal intubation in addition to improving other patient outcomes.

In this single-center, randomized, clinical trial, consecutive patients admitted to the adult medical ICU were screened for eligibility. Patients > 18 years of age who met Berlin criteria for ARDS and who required face mask NIV for at least eight hours were eligible for enrollment. The primary outcome was the proportion of patients who required endotracheal intubation based on a priori criteria, which included: neurologic deterioration, persistent or worsening respiratory failure (e.g., oxygen saturation < 88%, respiratory rate > 36 breaths/minute), intolerance of face mask or helmet, airway bleeding, or copious secretions. Secondary outcomes (which were considered exploratory) were 28-day invasive ventilation-free days, ICU and hospital length of stay, hospital and 90-day mortality, and adverse events.

Of the 740 patients admitted with acute respiratory failure requiring NIV, 83 were ultimately randomized: 39 to receive NIV via face mask and 44 to receive NIV via helmet. The authors ended the study early after meeting criteria for efficacy, but also based on work published at the time that suggested increased mortality among patients treated with face mask NIV compared to high-flow nasal cannula.[2] Median time on NIV to randomization was not significantly different between the two groups. The intubation rate in the face mask group was 61.5% vs. 18.2% in the helmet group (absolute difference -43.3%; 95% confidence interval [CI], -62.4% to -24.3%; $P < 0.001$). In the exploratory secondary analyses, the helmet group experienced more ventilator-free days (28 vs. 12.5 days; absolute difference, 8.4; 95% CI, 13.4-3.4; $P < 0.001$), shorter ICU length of stay (4.7 vs. 7.8 days; absolute difference, -2.76; 95% CI, -6.07 to 0.54; $P = 0.04$), and

lower hospital and 90-day mortality (hazard ratio, 0.51; 95% CI, 0.23-0.99; *P* = 0.047). Adverse events were few; three patients in the face mask group developed a nose ulcer, and three patients in the helmet group developed neck ulcers.

■ COMMENTARY

Although it featured a small number of enrolled patients because it ended early, this study suggests that a change in delivery interface could significantly influence the effect of NIV in patients with ARDS. Compared to patients receiving NIV via face mask, those randomized to NIV via helmet had higher median sustained PEEP levels (8.0 cm H_2O vs. 5.1 cm H_2O; *P* = 0.006) and were less tachypneic after randomization (24.5 breaths/min vs. 29.1 breaths/min; *P* < 0.001). The most common reason for intubation among patients in the face mask group was respiratory failure; in the helmet group, it was neurologic failure. The significant reduction in intubation rate among those receiving NIV via helmet and low rate of adverse events makes it an attractive option in this patient population. Although the study could not be blinded, use of a priori criteria to determine failure of NIV, as well as standard protocols to titrate and wean NIV, helped decrease bias.

There are a few other points worth mentioning. The study ended early and, as such, the magnitude of the effect seen may be exaggerated. Second, helmet delivery devices may not be available or commonly used in all hospitals, and proper training with regard to use and titration is needed to ensure the outcomes seen in this study can be reproduced. Finally, results from this study should not be used as overwhelming evidence for the role of NIV in ARDS. Enrollment of patients did not occur until they were receiving NIV for at least eight hours; although not reported by the authors, I suspect that a sizable number of patients admitted with acute respiratory failure due to ARDS were intubated before the eight-hour mark. Regardless, this study's outcomes are intriguing, and further multicenter trials should focus on whether these findings can be replicated. ■

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Heart Failure with Recovered Ejection Fraction: A Distinct Phenotype

By Van Selby, MD

Assistant Professor of Medicine, University of California, San Francisco, Cardiology Division, Advanced Heart Failure Section

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

SYNOPSIS: Patients suffering from systolic heart failure who subsequently improve their ejection fraction experience a more favorable clinical course compared to those presenting with persistently reduced ejection fraction or heart failure with preserved ejection fraction.

SOURCE: Kalogeropoulos AP, Fonarow GC, Georgiopoulou V, et al. Characteristics and outcomes of adult outpatients with heart failure and improved or recovered ejection fraction. *JAMA Cardiol* 2016;1:510-518.

Patients presenting with chronic heart failure (HF) typically are divided into those with preserved (HFpEF) or reduced left ventricular ejection fraction (HFrEF). Although the management of the two conditions differs significantly, overall prognosis is relatively similar for the two diagnoses. However, it is recognized that some HFpEF patients initially presented with HFrEF and experienced significant improvement in ejection fraction. The characteristics and outcomes of these patients with "recovered" ejection fraction have not been well described.

Kalogeropoulos et al retrospectively evaluated the medical records of all patients who were treated at the Emory University cardiology practice for a diagnosis of chronic heart failure between Jan. 1 and April 30, 2012. Patients were assigned to one of three groups: HFrEF (defined as EF < 40%), HFpEF (defined as current and all previous EF measurements > 40%), or heart failure with recovered ejection fraction (HFrecEF, defined as EF > 40% but any previously documented EF < 40%).

Of 2,166 patients with chronic HF, 350 (16.2%) had HFrecEF, 466 (21.5%) had HFpEF, and 1,350 (62.3%) had HFrEF. Those with recovered EF predominantly were male and featured significantly lower rates of diabetes, coronary artery disease, and hypertension (*P* < 0.01 for all). Over three years of follow-up, age- and sex-adjusted mortality was significantly lower among

patients with HFrecEF (4.8%) compared to those with HFrEF or HFpEF (16.3% and 13.2%, respectively; $P < 0.001$). Patients with HFrecEF also experienced significantly fewer all-cause hospitalizations, cardiovascular hospitalizations, and HF-related hospitalizations.

The authors concluded that outpatients with HFrecEF experience a different clinical course than patients with HFpEF or HFrEF, with lower mortality and less frequent hospitalizations, and should be investigated separately in future clinical trials.

■ COMMENTARY

Data from large clinical trials and registries support the concept that appropriate use of evidence-based therapies for systolic HF, such as beta-blockers and ACE inhibitors, leads to improvement in ejection fraction for a significant portion of patients presenting with HFrEF. These patients often are diagnosed with HFpEF. In their single-center cohort, Kalogeropoulos et al found HFrecEF patients represented approximately 43% of all patients with HF and an EF > 40%. The authors also demonstrated fairly convincingly that these patients have different clinical characteristics and substantially better outcomes than those with persistently reduced EF or true HFpEF.

Although it is clear myocardial recovery is possible, the exact underlying mechanisms remain poorly understood. Patients suffering from HFrecEF may experience reverse remodeling, leading to improvements in neurohormonal activation and therefore better outcomes. The lower frequency of coronary artery disease (and presumably myocardial scar) in the HFrecEF group may have improved their ability to reverse remodel. Refining our ability to identify HFrEF patients with potential for remodeling and recovering systolic function would improve risk stratification and guide clinical decision making.

This study has important limitations. As a single-center, academic cohort, the findings may not be generalizable to broader clinical practice. Categorization was based solely on available clinical echocardiographic data, and may have led to misclassification of cases. The authors used a strict EF cutpoint of 40% to differentiate HFpEF and HFrEF, instead of including a "borderline EF" category, as some have recommended. One question that arises frequently in HFrecEF is how long to continue medical therapy for HFrEF once the ejection fraction has recovered. Unfortunately, there is minimal evidence to guide these decisions, and a retrospective study such as this cannot be used to make recommendations regarding clinical management.

From here, prospective studies are needed to determine predictors of improvement in EF, and the optimal treatment strategies for these patients once the EF has recovered. As the authors suggested, patients presenting with HFrecEF may need to be studied as a distinct group in future HF clinical trials. For now, the findings guide the way we categorize patients with HF and are especially useful when discussing prognosis in patients with HFrEF who subsequently recover systolic function. ■

Ticagrelor vs. Aspirin: Post-TIA and Stroke

By Louis Kuritzky, MD

Clinical Assistant Professor, University of Florida

Louis Kuritzky, MD, is a retained consultant for AbbVie, Allergan, AstraZeneca, Janssen, Lilly, Lundbeck, Medscape, Novo Nordisk, and Sanofi Aventis; he serves on the speakers bureau of Lilly and Lundbeck

SOURCE: Johnston SC, Amarenco P, Albers GW, et al. Ticagrelor versus aspirin in acute stroke or transient ischemic attack. *N Engl J Med* 2016;375:35-43.

The first 90 days after a transient ischemic attack (TIA) or ischemic stroke is a high-risk period for recurrence of cardiovascular thrombotic events. Even with aspirin treatment, recurrences occur in as many as 10-15% of patients. Ticagrelor is an inhibitor of the P2Y12 receptor on platelets, similar in mechanism to clopidogrel. Ticagrelor is indicated for reduction of thrombotic events in persons with acute coronary syndromes or ST-elevation myocardial infarction. Might a different mechanism of action than aspirin treatment, as provided by ticagrelor, reduce thrombotic events in patients who experience a TIA?

The SOCRATES trial enrolled patients (n = 13,199) who had suffered an ischemic stroke or TIA within 24 hours of the event. Study subjects were randomized to ticagrelor (180 mg loading dose, then 90 mg twice per day) or aspirin (300 mg loading, then 100 mg once per day) for 90 days. The primary outcome was a composite of stroke, myocardial infarction, or death.

Although results trended favorably in the ticagrelor treatment arm (hazard ratio = 0.89), they were not statistically significant. Since the treatment costs of aspirin are substantially less than ticagrelor, and the adverse bleeding effect profile is similar, aspirin should remain the drug of choice, except for patients who are aspirin intolerant. ■

CME INSTRUCTIONS

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CME QUESTIONS

1. Which of the following is not an indication for telemetry per the 2004 American Heart Association guidelines?

a. Atrial fibrillation with rapid ventricular response

b. Bradycardia

c. Acute coronary syndrome

d. Pulmonary embolism

2. In the study by Talan and colleagues, the rate of fluoroquinolone resistance in E. coli cultured from patients with complicated pyelonephritis was found to be:

a. 3%

b. 11%

c. 19.9%

d. 68%

3. The randomized study by Desai et al. demonstrated that sacubitril/valsartan led to what outcomes compared to enalapril alone in patients with heart failure with a reduced ejection fraction:

a. Sacubitril/valsartan led to an increased rate of acute kidney injury requiring dialysis

b. Sacubitril/valsartan led to significantly reduced rate of 30-day readmission for heart failure

c. Sacubitril/valsartan was associated with a higher case fatality rate than enalapril

d. All of the above

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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