Catheter-associated urinary tract infection, a common and potentially preventable complication of hospitalization, is 1 of the hospital-acquired complications chosen by the Centers for Medicare & Medicaid Services (CMS) for which hospitals no longer receive additional payment. To help readers understand the potential consequences of the recent CMS rule changes, the authors examine the preventability of catheter-associated infection, review the CMS rule changes regarding catheter-associated urinary tract infection, offer an assessment of the possible consequences of these changes, and provide guidance for hospital-based administrators and clinicians. Although the CMS rule changes related to catheter-associated urinary tract infection are controversial, they may do more good than harm, because hospitals are likely to redouble their efforts to prevent catheter-associated urinary tract infection, which may minimize unnecessary placement of indwelling catheters and facilitate prompt removal. However, even if forcing hospitals to increase efforts to prevent complications stemming from hospital-acquired infection is commendable, these efforts will have opportunity costs and may have unintended consequences. Therefore, how hospitals and physicians respond to the CMS rule changes must be monitored closely.

By failing to prepare, you are preparing to fail.

—Benjamin Franklin, inventor of the flexible urinary catheter

Catheter-associated urinary tract infection is the most frequent health care–associated infection in the United States (1, 2). Urinary catheter use is common, with approximately 1 in 5 patients admitted to an acute care hospital receiving an indwelling catheter (1, 3), and the rate of catheter use is even higher among Medicare patients (4). Infection frequently occurs after placement of urinary catheters; each day of catheter use is associated with an approximately 5% increase in bacteriuria (5), which is asymptomatic most of the time (3, 6) and usually requires no treatment. Because clinicians must distinguish asymptomatic bacteriuria from symptomatic urinary tract infection to avoid unnecessary administration of antimicrobial therapy, we provide a clinical definition of asymptomatic bacteriuria in Table 1 (7). Each episode of catheter-associated urinary tract infection costs at least $600 (3, 8, 9), and each episode of urinary tract–related bacteremia costs at least $2800 (3, 10). Because catheter-associated urinary tract infection is common, costly, and believed to be “reasonably preventable,” the Centers for Medicare & Medicaid Services (CMS) chose it as 1 of the complications for which hospitals no longer receive additional payment to compensate for the extra cost of treatment (as of 1 October 2008). Thus, from a hospital’s perspective, catheter-associated urinary tract infection may become an even more costly complication (11–13).

Because of the possible far-reaching consequences of the CMS rule changes and the high frequency of catheter-associated infection, our aim in this Perspective is to provide practical and timely information and guidance for hospital-based administrators, policymakers, epidemiologists, and clinicians. We first address the preventability of catheter-associated urinary tract infection, then discuss the CMS rule changes about payment for treatment of catheter-associated urinary tract infection. Finally, we offer our assessment of the possible consequences of the rule changes as well as our guidance for hospital administrators and clinicians.

**How Preventable Is Catheter-Associated Urinary Tract Infection?**

The Centers for Medicare & Medicaid Services were asked to select hospital-acquired complications that could reasonably be prevented through the application of evidence-based guidelines. Does catheter-associated urinary tract infection fit this criterion? Perhaps. More than 2 decades ago, the Centers for Disease Control and Prevention proposed some recommended practices for preventing catheter-associated urinary tract infection that appropriately emphasize the benefits of hand hygiene, aseptic catheter insertion, and proper maintenance by using a closed urinary drainage system (14). More recently, the Healthcare-Associated Infections Allied Task Force from the Society for Healthcare Epidemiology of America and the Infectious Diseases Society of America provided an evidence-based compendium of the various practices available (15, 16). With regard to catheter-associated urinary tract infection, the compendium focused on the importance of maintaining an appropriate infrastructure for infection surveillance and prevention, education, and training of health care personnel about catheter-associated urinary catheter use.
Table 1. Clinical Definition of Asymptomatic Bacteriuria*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Asymptomatic bacteriuria</td>
<td>Isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained in a manner that minimizes contamination</td>
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<tr>
<td></td>
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<tr>
<td><strong>Women</strong></td>
<td>2 consecutive voided urine specimens with isolation of the same bacterial strain in quantitative counts $\geq 1000,000,\text{CFU/mL}$ or a single catheterized urine specimen with 1 bacterial species isolated in a quantitative count $\geq 100,\text{CFU/mL}$</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td><strong>Men</strong></td>
<td>A single, clean-catch voided urine specimen with 1 bacterial species isolated in a quantitative count $\geq 100,000,\text{CFU/mL}$ or a single catheterized urine specimen with 1 bacterial species isolated in a quantitative count $\geq 100,\text{CFU/mL}$</td>
</tr>
</tbody>
</table>

* Adapted from reference 7.

CFU = colony-forming units.

Asymptomatic bacteriuria is isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained in a manner that minimizes contamination.

Perspective  Rule Changes for Catheter-Associated Urinary Tract Infection

Implementing multimodal interventions to prevent hospital-acquired catheter-associated urinary tract infection is not a new idea (18, 19). For example, more than 10 years ago, Dumigan and colleagues (19) used a multidisciplinary team approach to produce guidelines for appropriate catheter placement in addition to a protocol enabling nurses to remove unnecessary catheters without a physician order. When these interventions were implemented in 3 intensive care units, catheter-associated urinary tract infection rates decreased by 17% to 45%, with postintervention catheter-associated urinary tract infection rates of 8.3 to 11.2 per 1000 catheter-days. Several types of reminders to remove urinary catheters have been studied as interventions. Daily reminders from nurses to physicians after a catheter has been in place for a specified interval (such as 3 to 5 days) are part of several multimodal interventions (20–22). These before-and-after studies without a concurrent control group demonstrate significantly reduced incidence of catheter-associated urinary tract infection. Other forms of catheter removal reminders include electronic reminders to physicians that a urinary catheter was placed in the emergency department (23) and expiring urinary catheter orders (for example, “stop orders”) that remind clinicians to remove catheters after prespecified periods. The orders can target physicians (24) or can authorize nurses to remove unnecessary catheters (on the basis of specific criteria) without requiring an additional order from the physician (23, 25, 26). Multimodal studies including stop orders have had mixed results, ranging from no significant change—in the only randomized, controlled trial performed to evaluate this intervention (26)—to reduced catheter-associated urinary tract infection rates in before-and-after studies, including 2 studies that demonstrated more than a 50% reduction in rates of catheter-associated urinary tract infection (23, 25).

Other interventions that decrease inappropriate urinary catheter use include restricting use to acceptable indications for placement, usually by prompting physicians to designate an appropriate indication as part of the catheter placement order (24, 25, 27). The most impressive reductions come from interventions that use a reminder system to aid early removal of unnecessary catheters, often in combination with urinary catheter placement restrictions. Most of these studies, however, excluded patients who needed long-term catheterization, and the reminders did not completely eliminate risk for catheter-associated urinary tract infection. The bulk of the evidence is consistent with the view that multimodal strategies could prevent between 25% and 75% of catheter-associated urinary tract infections. On the basis of these findings, we conclude that reduction (not elimination) of catheter-associated urinary tract infection is possible.

Inaction, however, is common. In a national study conducted in 2005 of approximately 600 U.S. hospitals (28), 56% reported having no system for monitoring which patients had urinary catheters placed and 74% reported not monitoring how long a catheter had been in place. Only 9% used some type of catheter removal reminder or stop order (28).
additional payments when patients develop complications during their stay, including hospital-acquired infection. One approach is to hold hospitals financially accountable for failing to prevent complications. This strategy underlies the hospital payment rule change, implemented by CMS as the “Hospital-Acquired Conditions Initiative,” in which CMS will no longer pay hospitals extra when patients develop specified complications after admission (Table 2) (4, 29–31).

The Deficit Reduction Act of 2005 (Section 5001c) mandated the Secretary of Health and Human Services to choose at least 2 hospital-acquired complications that meet 3 criteria: complications with high cost, high volume, or both; complications that result in the assignment of the case to a diagnosis-related group that has a higher payment when present as a secondary diagnosis; and complications that could reasonably have been prevented through the application of evidence-based guidelines.

For discharges occurring on or after 1 October 2008, hospitals paid by the Inpatient Prospective Payment System will not receive additional payment for the following conditions when acquired during hospitalization: catheter-associated urinary tract infection, decubitus ulcer, vascular catheter–associated infection, serious preventable events (such as blood incompatibility), injury due to fall or trauma, serious glycemic control states, and specific postoperative infections and venous thromboembolic conditions (Table 2).

This initiative has 2 main components: mandated use of a code called a “present-on-admission indicator” that indicates whether each diagnosis occurred before or after hospital admission, and a payment change, mandating that specific hospital-acquired conditions no longer generate increased hospital payment (Table 2). The expected consequence of this policy is simple: With no potential for extra payment to compensate for care of hospital-acquired complications, hospitals will vigorously implement strategies to prevent the specified complications. However, the policy details are complex regarding documentation of diagnoses for which payment will be denied, creating potential for a negligible impact on hospital payment if the data used to identify complications are inaccurate. Therefore, we review the details of implementing the CMS policy on catheter-associated urinary tract infection.

The present-on-admission indicator reporting requirement applies to all diagnoses documented for payment generation (via the established diagnosis-related group–based Prospective Payment System) (32). It requires hospitals to indicate whether the diagnosis was present on admission or if it occurred after admission by using a new code, called the present-on-admission indicator. The present-on-admission indicator can be coded as Y (condition was present on admission), N (the condition was hospital-acquired), W (the provider has determined by data and clinical judgment that the time of the onset of the condition cannot be documented), or U (insufficient documentation to determine if condition was present on admission). The CMS will monitor whether hospitals are using these codes appropriately. “Present on admission” is defined as “present at the time the order for inpatient admission occurs.” As such, “conditions that develop during an outpatient encounter, including emergency department, observation, or outpatient surgery,” are considered present on admission. The present-on-admission status of a diagnosis is assigned by hospital coders, who have been given general instructions in the Appendix of the International Classification of Diseases, Ninth Revision, Clinical Modification, Official Guidelines for Coding and Reporting (33). Coders are instructed to assign a condition as “present on admission” if it is explicitly documented by the provider as present on admission; a long-term condition diagnosed before admission (such as asthma); or a condition “clearly present on admission” but not diagnosed until after admission occurred, such as a diagnosis suspected at admission because of symptoms but confirmed sometime later.

Although instructions provided to hospital coders include a few general examples of how to apply the present-on-admission indicator, the CMS has not provided specific instructions or examples about catheter-associated urinary tract infection. Coders will also depend on physicians and physician extenders (for example, physician assistants) to accurately and completely document whether a urinary tract infection was “catheter-associated”. Coders are in-

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**Table 2. Hospital-Acquired Conditions Not Eligible for Additional Payment**

<table>
<thead>
<tr>
<th>Condition</th>
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<tbody>
<tr>
<td>Catheter-associated urinary tract infection</td>
</tr>
<tr>
<td>Decubitus ulcer (pressure ulcers)</td>
</tr>
<tr>
<td>Vascular catheter–associated infection</td>
</tr>
<tr>
<td>Serious preventable “never events”</td>
</tr>
<tr>
<td>Foreign object retained after surgery</td>
</tr>
<tr>
<td>Air embolism</td>
</tr>
<tr>
<td>Blood incompatibility</td>
</tr>
<tr>
<td>Falls and trauma</td>
</tr>
<tr>
<td>Manifestations of poor glycemic control</td>
</tr>
<tr>
<td>Diabetic ketoacidosis</td>
</tr>
<tr>
<td>Nonketotic hyperosmolar coma</td>
</tr>
<tr>
<td>Hypoglycemic coma</td>
</tr>
<tr>
<td>Secondary diabetes with ketoacidosis or hyperosmolarity</td>
</tr>
<tr>
<td>Deep venous thrombosis or pulmonary embolism after certain orthopedic surgeries</td>
</tr>
<tr>
<td>Surgical site infections after certain surgical procedures</td>
</tr>
<tr>
<td>Mediastinitis after coronary artery bypass surgery</td>
</tr>
<tr>
<td>Certain orthopedic surgical site infections</td>
</tr>
<tr>
<td>Certain bariatric surgical site infections</td>
</tr>
</tbody>
</table>

*Adapted from references 4 and 29–31.*
Perspective: Rule Changes for Catheter-Associated Urinary Tract Infection

Figure. Coding for a hospital-acquired catheter-associated urinary tract infection, resulting in outcomes of no extra payment (if coded correctly) or potential extra payment by default (if coded incorrectly).*

1. International Classification of Diseases, Ninth Revision, Clinical Modification, diagnostic code
2. Present-on-admission indicator code
3. Catheter-association code

Using at least 1 code for urinary tract infection listed as not eligible for additional payment if hospital-acquired and catheter-associated:

112.2 = Candidiasis of other urogenital site
590.10 = Acute pyelonephritis without lesion of renal medullary necrosis
590.11 = Acute pyelonephritis with lesion of renal medullary necrosis
590.2 = Renal and perinephric abscess
590.3 = Pyeloureteritis cystica
590.80 = Pyelonephritis, unspecified
590.81 = Pyelitis or pyelonephritis in diseases classified elsewhere
595.0 = Acute cystitis
597.0 = Urethral abscess
599.0 = Urinary tract infection, site not specified

+ Urinary tract infection coded as NOT present on admission
+ Catheter-association code is listed: 996.64
+ No payment for diagnosis of catheter-associated urinary tract infection

Error: No code for urinary tract infection is listed, but instead a code is listed for another complication resulting from the hospital-acquired catheter-associated urinary tract infection

Examples: 790.7 = bacteremia or 038.42 = E. coli septicemia

+ Error: Did not list catheter-association code
= Paid extra for diagnosis of catheter-associated urinary tract infection

E. coli = Escherichia coli.

* The catheter-associated urinary tract infection diagnosis will increase payment if the patient has no other complications or comorbid conditions that would have generated the same level of illness as measured by the Medicare Severity Diagnosis-Related Group assignment used to determine payment rates.

† "Error" refers to an omission (incompleteness) or mistake in the codes assigned for billing, which can lead to an inaccurate misclassification of a hospital-acquired catheter-associated urinary tract infection to a condition that would generate payment (such as a non–catheter-associated urinary tract infection, or a catheter-associated urinary tract infection that was present on admission). Such errors could occur because the provider documentation did not accurately describe the conditions sufficient for the hospital coder to recognize, or because the hospital coder did not understand that all 3 codes were required for this specific condition.

structured only to use physician and physician extender documentation to determine diagnoses for requesting payment for care provided; coders are not permitted to collect diagnoses from nurses’ bedside flow sheets (where urinary catheter use is routinely documented) without physician verification. If physician documentation is unclear about whether the urinary tract infection was present on admission or catheter-associated, the coder is advised to ask the physician for clarification, and the physician is expected to correct the medical record. This process is likely to be burdensome for both the coder and the clinician.

The new CMS policy contains very detailed criteria for how to identify specific hospital-acquired complications by their International Classification of Diseases, Ninth Revision, Clinical Modification, codes. Some conditions (including catheter-associated urinary tract infection) will require coders to list several codes to identify a complication for which the CMS should not provide additional payment. As detailed in the Figure, hospitals may obtain payment for a urinary tract infection unless coders list each of 3 pieces of information correctly: a urinary tract infection code (any 1 of 10 codes, outlined in the Figure); a present-
on-admission indicator coded as “N,” indicating that the infection was not present on admission, or as “U,” indicating that the hospital coder could not determine status at admission due to insufficient documentation); and the “catheter-associated” code (996.64), identifying the infection specifically as a catheter-associated urinary tract infection.

If coders omit any 1 of these 3 codes or code the status inaccurately, the hospital could receive, by default, additional payment for the urinary tract infection as a comorbid condition.

The new CMS policy may have a substantial impact on hospital revenues. Recent analyses suggest that denying additional payment for hospital-acquired conditions could cost hospitals $800 million in Medicare payments (34). The additional payments at stake can be substantial, because they make up a proportion of the base payment the hospital would receive for an otherwise uncomplicated admission. For example, a patient admitted to the University of Michigan with pneumonia will yield a payment of $6072 if uncomplicated; $8346 if complicated by a minor condition, such as a simple catheter-associated urinary tract infection; and $11891 if complicated by a major complication, such as renal abscess associated with a urinary catheter. Under the new rules, however, the hospital will receive payment of $6072 for the pneumonia admission but no additional payment for treatment of hospital-acquired catheter-associated urinary tract infection. Thus, the amount of payment potentially lost per admission can be substantial.

Nonpayment for hospital-acquired conditions in Medicare patients could decrease or increase health care costs. Ideally, health care costs overall should decrease if hospitals can reduce the number of hospital-acquired complications, which would reduce costs incurred by hospitals and payers. Yet, health care costs could also increase. First, defensive testing to document bacteriuria as present on admission could lead to increased laboratory testing costs. Then, increased documented bacteriuria (even if asymptomatic) could result in more antibiotic use and antibiotic-related complications, such as infection due to Clostridium difficile (which may also prolong the hospital stay and qualify for outlier payments). Furthermore, cost-shifting could occur if hospitals shift the uncompensated cost of Medicare patient care to other hospital charges or non-Medicare payers.

**Probable Consequences: The Good and the Not-So-Good**

As with any intervention, the CMS rule changes will probably have expected and unexpected consequences.

**The Good**

*Increased Focus on Catheter-Associated Urinary Tract Infection*

Recent research suggests that preventing catheter-associated urinary tract infection has been a low priority for hospitals compared with other types of hospital-acquired infections (35). Many view catheter-associated urinary tract infection as the Rodney Dangerfield of nosocomial infections, because it gets no respect. The low priority of catheter-associated urinary tract infections means that many hospitals have yet to use even basic strategies for preventing catheter-associated urinary tract infection (35). Increased attention to catheter-associated urinary tract infection and its prevention will therefore probably improve patient care.

*Specific Education for Health Care Workers Focusing on Appropriate and Inappropriate Indications for Urinary Catheterization*

In addition to removing catheters in a timely fashion, restricting their use to patients who truly need them is extremely important. Therefore, health care workers involved in urinary catheter placement, including staff in the emergency department, intensive care units, extended care units, and even general medical wards, must know the appropriate indications for catheter use. In some particularly chaotic settings, such as the emergency department, education alone may not be sufficient, requiring more innovative strategies to facilitate appropriate catheter use (35). However, increased adherence to appropriate indications for catheter use is certainly a positive step.

*Increased Focus on Early Catheter Removal*

Although catheter-associated urinary tract infection is often a low priority for health care providers, everyone agrees that catheters should be removed as soon as possible, both to prevent catheter-associated urinary tract infection and to reduce patient discomfort, activity restrictions, and discharge delays (35, 36). For some patients, urinary catheters operate as a physical restraint, tantamount to binding them to the bed. We have even argued that the urinary catheter often acts as a “1-point restraint” (37) by restricting patient activity and promoting other nosocomial complications, such as venous thromboembolism. Consequently, early catheter removal will probably benefit patients.

*More Focus on Alternatives to Indwelling Catheterization*

Condom catheters and intermittent catheterization are alternatives that are less likely to cause bacteriuria in certain patient groups (38–44). Unfortunately, no ideal alternative to the indwelling urinary catheter is available, because all options have drawbacks. Condom catheters, for example, are useful only in men without bladder outlet obstruction.

**The Not-So-Good**

*More Urinalyses and Urine Cultures, Leading to More Antibiotic Treatment of Asymptomatic Bacteriuria*

Because of the importance of the present-on-admission indicator, hospitals may encourage urinalyses and urine cultures at the time of hospital admission to document the presence of infection. This increase in testing alone may increase health care costs. Of more concern, however, is that performing additional culture tests also increases the likelihood of more positive urine culture re-
Rule Changes for Catheter-Associated Urinary Tract Infection

...sults, which in turn leads to an increased use of antibiotics for treating patients with asymptomatic bacteriuria. Increased antibiotic resistance and cases of *C. difficile* infection may therefore result.

**Increased Opportunity for Fraud**

Coding is complicated, and at present, the code 996.64 (the “catheter-associated” code) is not commonly used (45). However, if hospitals do not use this code and the patient has a catheter-associated urinary tract infection, hospitals will be reimbursed even though the condition is hospital-acquired. Some facilities may therefore unwittingly commit fraud because of coding errors.

**Loss of Important Information for Research and Surveillance**

Because of the complexity of coding for complications, some diagnoses may simply disappear from the administrative discharge record. Currently, hospital coders are only obligated to list discharge diagnoses sufficient to justify the payment being requested by the hospital from the payer. If a hospital is not requesting payment for a specific diagnosis, the hospital coder is not obligated to list this diagnosis among the discharge diagnoses. Thus, because hospital-acquired catheter-associated urinary tract infections will generate no additional payment when coded correctly, hospitals have no incentive or obligation to list these complications among the discharge diagnoses. The loss of information in medical record claims may interfere with doing epidemiologic studies and tracking these conditions.

**Reduced Access for Some High-Risk Patients**

Certain patient populations (for example, elderly persons) are more likely to experience infectious complications while hospitalized (46–48). The CMS rule change may disproportionately affect hospital payments for these patients and ultimately could lead to reduced health care access for patient populations that are already among the most vulnerable and who often face other barriers to care.

**Opportunity Costs**

The resources used to address or enforce the rule change, including implementing new preventive and coding practices and monitoring for fraud, will no longer be available to support other activities. We must therefore be mindful of other opportunities that hospitals, CMS, and other payers might have to forgo to respond to this change.

**Practical Implications and Next Steps for Hospitals**

Hospitals should undertake several steps to meet the requirements of the CMS rule changes (Table 3). Equally important, hospitals should not obtain a urine culture from asymptomatic patients at admission. First, this would add substantially to hospital costs without additional benefit to patients. Second, this would increase the microbiology laboratory workload, perhaps hindering the ability to perform much more important indicated laboratory tests in a timely manner. Finally, this process is likely to identify a relatively large number of patients with asymptomatic bacteriuria, a condition for which treatment is seldom indicated (49).

Although the CMS rule changes related to catheter-associated urinary tract infection are controversial (50), we conclude that they may end up doing more good than harm, because hospitals are likely to redouble their efforts to prevent catheter-associated urinary tract infection, which will probably minimize catheter placement and facilitate removal of unnecessary indwelling catheters. In addition, this simple approach should reduce infection rates, whereas early catheter removal also improves patient comfort and function. We also suspect collaborative efforts to combat catheter-associated urinary tract infection will increase. For example, Michigan has developed a novel statewide initiative (the “bladder bundle”) that focuses on continuous assessment and early removal of urinary catheters.

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**Table 3. Recommendations for Hospitals to Address the Centers for Medicare & Medicaid Services Rule Changes Regarding Catheter-Associated Urinary Tract Infection**

1. **Develop or adopt existing protocols** to ensure that indwelling urinary catheters are used only when medically indicated and that they are inserted and maintained using proper technique, such as the following specific strategies:

   - Develop a list of indications for the use of indwelling urinary catheters and make sure that catheter use is limited to persons with an accepted indication. Indications for catheter insertion may include urinary retention, close monitoring of urinary output in critically ill patients, urinary incontinence that poses a risk to the patient (for example, associated with major skin breakdown or at risk for contaminating a surgical site), and some surgical procedures.
   - Develop training standards for those who insert catheters and manipulate urinary catheters and drainage bags in daily patient care.
   - Provide all necessary supplies for proper catheter insertion and maintenance.

2. **Develop systems to promote removal of urinary catheters when they are no longer indicated.** These systems may include:

   - Daily review of catheter necessity during medical, nursing, or multidisciplinary rounds.
   - Automated nurse or physician reminders of catheter presence.
   - A protocol that authorizes nurses to discontinue catheters without a physician order when patients meet established criteria.
   - Catheter stop orders that are entered automatically with each order for catheter insertion, so that discontinuation of the catheter becomes the default after a predesignated period.

3. **Educate clinicians about the appropriate use and interpretation of urinalysis and urine culture.**

   - Bacteriuria and pyuria are relatively common among patients with indwelling urinary catheters; these findings do not necessarily indicate the presence of infection or the need for treatment in the absence of symptoms.
   - Adequate knowledge of these issues may result in improved accuracy of documentation and more appropriate use of antimicrobial therapy.

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* Such as those in references 19, 23, and 25.
and vigilance about considering alternatives to indwelling catheterization. Furthermore, we agree with Pronovost and colleagues (13) that the CMS rule changes should be monitored closely to identify and ameliorate unintended consequences. Although we applauded CMS for encouraging hospitals to increase efforts to prevent complications stemming from hospital-acquired infections, the opportunity costs and potential for unintended complications are real.

From the Veterans Affairs Ann Arbor Healthcare System, University of Michigan Medical School, and the Veterans Affairs/University of Michigan Patient Safety Enhancement Program, Ann Arbor, Michigan, and Mount Sinai School of Medicine, New York, New York.

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Requests for Single Reprints: Sanjay Saint, MD, MPH, Division of General Medicine, University of Michigan Health System, 300 North Ingalls, Room 7E08, Campus Box 0429, Ann Arbor, MI 48109-0429; e-mail, saint@med.umich.edu.

Current author addresses are available at www.annals.org.

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Current Author Addresses: Dr. Saint: Division of General Medicine, University of Michigan Health System, 300 North Ingalls, Room 7E08, Campus Box 0429, Ann Arbor, MI 48109-0429.
Dr. Meddings: 300 North Ingalls, Room 7D10, Campus Box 0429, Ann Arbor, MI 48109-0429.
Dr. Calfee: Mount Sinai School of Medicine, Department of Medicine, One Gustave L. Levy Place, New York, NY 10029.
Ms. Kowalski and Dr. Krein: Health Services Research and Development (11H), Ann Arbor Veterans Affairs Medical Center, 2215 Fuller Road, Ann Arbor, MI 48105.

Author Contributions: Conception and design: S. Saint, D. Calfee.
Analysis and interpretation of the data: S. Saint, J.A. Meddings, C.P. Kowalski, S.L. Krein.
Drafting of the article: S. Saint, J.A. Meddings, D. Calfee, C.P. Kowalski.
Critical revision of the article for important intellectual content: S. Saint, J.A. Meddings, C.P. Kowalski, S.L. Krein.
Final approval of the article: S. Saint, J.A. Meddings, D. Calfee, C.P. Kowalski, S.L. Krein.
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