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Major Article

The attributable cost of catheter-associated urinary tract infections in the United States: A systematic review

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Catheter-associated urinary tract infection
Healthcare-acquired condition

Background: Catheter-associated urinary tract infections (CAUTIs) are the most common healthcare-acquired condition. The attributable cost of CAUTIs is frequently cited to be approximately $1,000. However, there is a paucity of recent literature that confirms this estimate. The purpose of this study was to perform a systematic review of the literature that estimates the attributable cost of CAUTIs in the United States.
Methods: A systematic review was conducted using Pubmed. Studies conducted between the years 2000 and 2017, conducted at a facility within the United States, and that used novel patient-level cost data were included. Attributable cost estimates were adjusted for inflation to 2016 U.S. dollars using the medical care component of the Consumer Price Index.
Results: Only 4 articles met our inclusion criteria. Adjusted to 2016 U.S. dollars, the attributable costs of a CAUTI as reported in these studies were: $876 (inpatient cost to the hospital for additional diagnostic tests and medications); $1,764 (inpatient cost to Medicare for non-intensive care unit [ICU] patients); $7,670 (inpatient and outpatient costs to Medicare); $8,398 (inpatient cost to the hospital for pediatric patients); and $10,197 (inpatient cost to Medicare for ICU patients).
Conclusions: The cost of a CAUTI ranges widely depending on population, patient acuity, and cost perspective. Attributable costs likely exceed $1,000. Additional research is needed to assess the full economic effect of CAUTIs.

Catheter-associated urinary tract infections (CAUTIs) are a common complication of indwelling catheters. In fact, CAUTIs are the most common healthcare-associated condition (HAC) in the United States.[1] Identifying the precise number of CAUTIs that occur in the United States is difficult. However, based on surveillance data reported to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN) in the year 2013, the incidence of CAUTIs ranged from 0.1 to 3.1 for adult inpatient floors, 1.2 to 5.3 for adult critical care units, and 1.4 to 3.4 for pediatric medical and critical care units (all were per 1,000 catheter days).[2] The incidence of CAUTIs in long-term care settings such as inpatient rehabilitation facilities and chronic care units ranged from 1.5 to 3.3 per 1,000 catheter days for adult and pediatric patients.[2]

There are several risk factors for CAUTIs, including older age, female sex, and diabetes.[3-5] The most important risk factor, however, is the use of an indwelling catheter, such as a Foley catheter. In fact, most CAUTI prevention interventions focus primarily on limiting the use and duration of urinary catheters.[6,7] Still, 15%-25% of all hospitalized patients receive urinary catheters,[8] and CAUTIs will likely remain a costly and preventable challenge for the foreseeable future.[9-11] A secondary bacteremia that develops from a CAUTI will add additional expense and should also be considered as contributing to the overall economic burden.

In 2008, Medicare ceased reimbursing hospitals for CAUTIs and other preventable HACs as part of the Hospital Acquired Conditions Reduction Program (HACRP), creating a financial incentive for prevention efforts. To appropriately respond to the financial incentive under the HACRP, hospitals need to know the full economic burden of CAUTIs. Currently, there is a paucity of studies available that provide an up-to-date and relevant perspective of the national economic burden of CAUTIs. An important part of estimating the national burden is first estimating the attributable costs of CAUTIs. Attributable costs of infections are excess costs—costs that are directly due to the infection. The purpose of this study was to perform a systematic review of the

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literature that estimates the attributable cost of CAUTIs in the United States.

METHODS

This study was a systematic review of the attributable costs of CAUTIs in the United States. PubMed was used to conduct an electronic search of the biomedical literature published from 2000 to 2017. To locate only studies conducted within the United States and studies that contained authentic patient-level cost data (versus meta-analyses), we chose PubMed as our sole database. Additionally, we assumed that databases that focus on specific diseases (eg, AIDS or cancer) would be unlikely to contain articles with a broad enough perspective. Thus, within PubMed, we searched for all studies that provided an estimate of the attributable costs of CAUTIs. The following search terms and combinations of search terms were used: "cauti," "ca-uti," "catheter-associated urinary tract infection," and "cost." The most recent search was performed on February 1, 2017.

Only studies in which cost data were collected as part of the study were included; systematic reviews, editorial articles, and studies that merely reported previous cost estimates were excluded. Cost studies were collected regardless of perspective (hospital, third-party payer, societal, etc.); however, studies that reported *charges* were excluded. Charges are the prices that providers set for their goods and services. However, providers do not expect to be paid full charges by most patients, because most patients are insured. Since hospital charges are often grossly inflated relative to actual cost, they do not accurately represent a cost from any relevant perspective (patients, providers, or payers). This fact has been well established in the literature.[12-14]

Because practice patterns and resource utilization regarding use of catheters can differ across countries, our review was further limited to only those studies performed in the United States and published in English-language journals. Studies were also excluded if they failed to use cost data and if they were published prior to 2000. Bibliographies of articles meeting our inclusion criteria were then reviewed to identify any additional studies missed in our electronic search.

Costs reported in the articles were adjusted for inflation to 2016 U.S. dollars using the medical care component of the Consumer Price Index, published by the Bureau of Labor Statistics.

RESULTS

Figure 1 presents a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram detailing the results

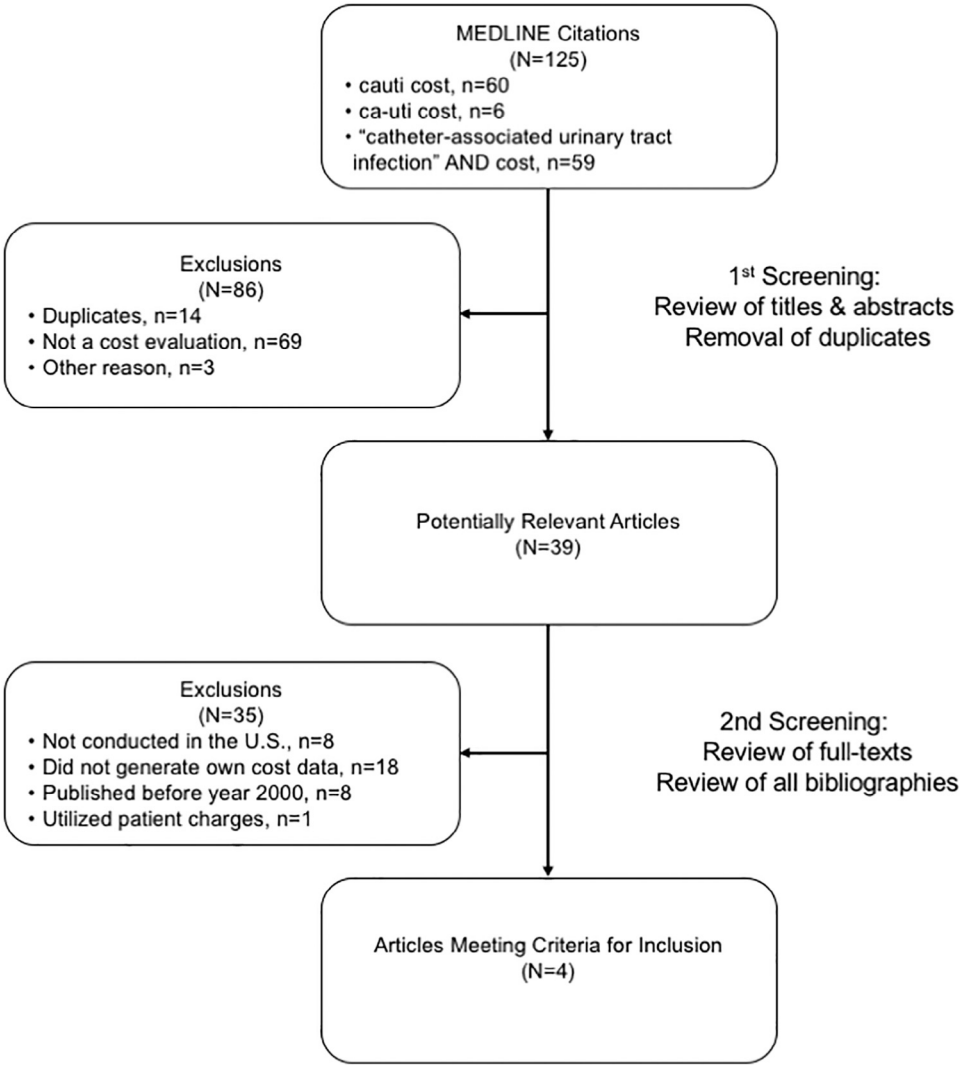

Fig 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of electronic literature search