

Estimating the health care costs associated with recurrent cellulitis managed in the outpatient setting

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Background: Recurrent cellulitis is diagnosed in 22% to 49% of all cellulitis cases, but little is known about the costs associated with these cases.

Objective: To characterize patients with recurrent cellulitis in the outpatient setting and estimate the associated costs.

Methods: A retrospective chart review was conducted for adult patients who presented to the outpatient facilities at our institution from January 1, 2007, to December 31, 2011, with recurrent cellulitis. Data provided by the Centers for Medicare and Medicaid Services were used.

Results: A total of 157 patients were identified; 56% were male, with a mean age of 62.7 years. The mean number of episodes of cellulitis per patient was 3. Antibiotics were prescribed for all patients with a diagnosis of recurrent cellulitis, with 93% treated with oral antibiotics and 17.6% treated with intravenous antibiotics. A total of 1081 laboratory and 175 radiologic imaging tests were ordered. The minimum average cost per cellulitis episode was \$586.91; the average cost per visit was \$292.50.

Limitations: Retrospective study; use of a single, large academic institution; and utilization of cost estimates that may not adequately reflect the variation of costs across closed-system sites or geographic regions. There was no accounting for the nonfinancial or opportunity costs associated with hospitalization, such as lost days of employment or child care and any long-term morbidities, among others.

Conclusions: Recurrent cellulitis in the outpatient setting costs about \$586.91 per episode. Although there is no criterion standard for diagnosis or treatment of cellulitis, our analysis demonstrates the need for more evidence-based management to achieve better outcomes and reduce the significant health care costs. (J Am Acad Dermatol <https://doi.org/10.1016/j.jaad.2017.09.010>.)

Key words: antibiotic use; cellulitis; cost analysis; cost estimate; outpatient setting; pseudocellulitis; recurrent cellulitis.

Cellulitis is a common diagnosis that is often made in the primary care setting. An estimated 14.2 million cases of cellulitis are diagnosed and treated annually in the United States alone, of which approximately 9.6 million cases are diagnosed in the outpatient setting.¹

An estimated 22% to 49% of all cellulitis cases are recurrent, defined as cellulitis with at least 1 previous episode within the prior year.²⁻⁴ Patients with recurrent cellulitis place a significant burden on busy outpatient providers. These patients undergo frequent monitoring, extensive diagnostic

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evaluations, and multiple courses of antibiotics, thereby utilizing a significant amount of health care resources.^{1,5,6} Consequently, these patients may receive care that is inappropriate and inconsistent.

Ambulatory costs associated with cellulitis have been estimated at \$3.7 billion annually.⁷ However, few studies have quantified and qualified the nature and financial burden of recurrent disease, and even fewer are clear about the metrics used for their cost estimates. The total costs associated with each diagnosis of recurrent cellulitis are likely greater than the total costs associated with a single episode of outpatient cellulitis. Cases of recurrent cellulitis are more likely to be refractory to first-line treatment and require longer hospitalizations, and they may require prophylactic antibiotic therapy.^{2,8-10} We have estimated the health care costs of outpatient diagnosis and management of recurrent cellulitis with actual procedure code data and characterized this subset of patients.

METHODS

Using the Partners HealthCare Research Patient Data Registry, we conducted a retrospective review of all adult patients who presented to 3 academic adult primary care practices, a medical walk-in clinic, and the emergency department (ED) at Massachusetts General Hospital from January 1, 2007, to December 31, 2011, and whose disease was diagnosed as cellulitis using the *International Classification of Diseases, Ninth Revision*, codes 681.x and 682.x. The study was approved by the Partners Institutional Review Board.

Patient data

We reviewed 1490 medical charts and included only patients with a diagnosis of cellulitis at the same anatomic site more than once within a 12-month period. The diagnoses were made at least 1 week apart. Patients whose condition was diagnosed as an abscess or paronychia or who presented to the ED and were subsequently admitted to the hospital were excluded. Each case was reviewed for patient demographics, number of episodes, number of follow-up visits, associated risk factors (lymphedema, history of trauma, diabetes, immunosuppression, etc.) (Table I), diagnostic work-up (laboratory tests and radiologic imaging), objective signs of

infection (fever and leukocytosis) (Table II), antibiotic treatment received, and adverse events associated with antibiotic use.

Cost data and analysis

We obtained the Healthcare Common Procedure Coding System codes associated with the dates of each cellulitis diagnosis and follow-up visit for each patient included in the study. We included all health care and physician costs incurred, including those of diagnostic imaging, laboratory tests, and office visits. National cost data provided by the Centers for Medicare and Medicaid Services were then obtained for each Healthcare Common Procedure Coding System code to provide national averages of payments.¹¹ National payment

estimates represent 2014 payment estimates in US dollars. Drug costs were calculated by using national averages of direct costs for antimicrobials, the frequency with which drugs were prescribed, and the total number of days for which they were prescribed. Costs associated with hourly or overnight stays in the ED observation unit (EDOU) and in the inpatient unit were excluded.

RESULTS

A total of 157 patients were identified as having had recurrent cellulitis between January 1, 2007, and December 31, 2011, and having received a diagnosis of cellulitis 459 times during that period (Table I). Of those 157 patients, 88 (56.1%) were male; the mean patient age was 62.7 years. The mean number of episodes per patient was 3 (range, 2-8), with an average of 2 episodes per year and 93 days between episodes. The total number of follow-up visits (defined as a visit related to the original diagnosis of cellulitis) was 462 (Fig 1). The mean number of follow-up visits per patient was 1 (range, 0-7).

Patients with recurrent cellulitis most often presented to a primary care physician's office (66.0%) or to a specialist (5.2%) (eg, obstetrician, dermatologist), accounting for more than 70% of all diagnoses (Fig 1). About 15.5% of patients presented to a walk-in clinic or urgent care center, and 13.3% presented to the ED. The vast majority (82.8%) of cases of recurrent cellulitis were diagnosed and managed in the outpatient setting. However, 51 (11.1%) and 28 (6.1%) of visits resulted in

CAPSULE SUMMARY

- Recurrent cellulitis comprises 22% to 49% of all cellulitis diagnoses.
- This study quantifies the diagnostic and treatment variability for recurrent cellulitis and estimates the average cost per cellulitis diagnosis at \$586.91.
- The cost and disparate diagnoses and treatment for recurrent cellulitis demonstrate the need for more evidence-based management.

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