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Original Study

Current Prescribing Practices for Skin and Soft Tissue Infections in Nursing Homes

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A B S T R A C T

Objectives: Antibiotic stewardship has been called for across all sites of health care, including nursing homes (NHs). Skin and soft tissue infections (SSTIs) are the third most common indication for antibiotics in the NH, and so should be a focus of stewardship. This study audited medical records to identify signs and symptoms of SSTIs treated with antibiotics in relation to the McGeer criteria for surveillance, the Loeb minimum criteria for antibiotic initiation, and prescribing recommendations of the Infectious Disease Society of America.
Design: Cross-sectional study.
Setting: Thirty-one NHs in Southeastern United States.
Measurements: Chart data from a random sample of 161 antibiotic prescriptions for SSTIs were abstracted. To meet the McGeer criteria, pus was present at a suspected SSTI site, or at least four of the following findings were documented as present at the site: new or worsening warmth, redness, swelling, tenderness, serous drainage, or a constitutional finding. The Loeb minimum criteria for initiating antibiotics included findings of new or increasing purulent drainage at a suspected SSTI site or at least two of the following findings: fever or new or worsening redness, tenderness, warmth, or swelling at the suspected site. Audits also collected the name, route, and duration of the associated antibiotic. Analyses calculated the types of diagnoses and evaluated associations between published criteria and prescribing.
Results: Cellulitis, skin/soft tissue injury with infection, and abscess were diagnosed in 37% (N = 59), 18% (N = 29), and 16% (N = 26) of cases, respectively; 27% (N = 43) had less specific diagnoses. The McGeer criteria were met in 25% (N = 40), and the Loeb minimum criteria were met in 48% (N = 77) of cases. Doxycycline was the most frequently prescribed antibiotic. The mean treatment length was 9.6 days (standard deviation, 5.6), and the median length of treatment was 8.5 days (range, 3-45).
Conclusion: SSTIs are not routinely diagnosed or treated according to recommended standards of care, and prescriptions for systemic antibiotics appear to be frequently initiated without regard to recommended definitions of infection or therapies for the associated diagnoses. These findings indicate that SSTIs present various opportunities to improve antibiotic stewardship.

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As many as one-third of nursing home (NH) residents carry one or more multidrug-resistant organisms (MDROs),[1] with colonization of new residents tending to occur shortly following admission.[2] To limit further resistance, the U.S. Centers for Disease Control and Prevention recently encouraged all NHs to develop antibiotic stewardship programs as a new standard in care.[3] In addition, the U.S. Centers for Medicare and Medicaid Services is considering mandating that all NHs have antibiotic stewardship programs.[4] When determining the focus of these programs, it is important to recognize that skin and soft tissue infections (SSTIs) are the third most common indication for antibiotics in NHs[5,6] and therefore an important target for antibiotic stewardship.

Antibiotic stewardship for skin infections in NHs presents unique challenges. NH residents have a particularly high prevalence of comorbid health illnesses, such as peripheral vascular disease, venous stasis disease, and pressure ulcers,[7] which contribute to chronic skin changes. These conditions can obscure the distinction between acute changes and chronic findings. Also, many NH residents have chronic wounds that are colonized with bacteria[8] and potentially harbor MDROs. In addition, dementia is common, which hinders diagnoses by limiting information gathering regarding symptoms. Finally, NH residents live in a communal environment and receive assistance from caregivers who move from resident to resident, often using shared medical supplies, which facilitates the spread of infectious organisms.[9]

A number of criteria have been promulgated by experts to identify when antibiotics are appropriate for SSTIs in NHs. Loeb and colleagues developed minimum consensus criteria for antibiotic initiation in commonly encountered NH bacterial infections.[10] Although there is evidence that adherence to the Loeb criteria is not associated with antibiotic prescribing decisions,[11] these remain the most popular criteria for prospective use in determining antibiotic initiation. Another set of consensus criteria, the McGeer criteria, were introduced in 1991 to direct surveillance of common infections in NHs[12] and were revised in 2012.[13] An additional set of guidelines for antibiotic use in SSTIs, those of the Infectious Disease Society of America (IDSA), was developed in 2014 for SSTIs in community-dwelling patients.[14] Whether and to what extent these criteria can or do influence decision making in NHs is unknown.

Given the importance of SSTIs in NH practice and the mounting pressure for antibiotic stewardship, surprisingly little data exist regarding how presumed SSTIs are actually diagnosed and managed in NH practice. To address this knowledge gap, we studied 161 antibiotic prescriptions for SSTIs in 30 NHs in North Carolina. We audited medical records for documentation of signs and symptoms related to an SSTI according to the definitions in the recently updated McGeer criteria and Loeb minimum criteria. We also present the treatment courses in relation to the IDSA guidelines. The results are highly informative to guide antibiotic stewardship efforts in NHs.

Methods

As part of a dissemination research study of infection management and antibiotic stewardship in NHs, we enrolled 31 NHs in North Carolina and, within each, audited a random sample of antibiotic prescriptions for SSTIs. We collected chart documentation regarding any signs and symptoms of a possible SSTI as articulated in the modified McGeer criteria and the Loeb minimum criteria and related these clinical data to the IDSA recommendations for empirical antibiotic therapy.

Eligible NHs were affiliated with either a regional NH chain or a regional long-term care medical practice group. A total of 35 NHs were approached for participation. Four refused, and the remaining 31 (89%) enrolled in the study. Participating NHs provided monthly lists of all antibiotic prescriptions and the diagnoses as reported for each by the NH between September 2014 and March 2015; during this period, 30 NHs (97%) reported antibiotic prescriptions for one or more SSTI. A team of geriatricians and research staff visited each NH and conducted chart audits of up to eight prescriptions for SSTIs from the month prior to the audit, yielding a sample of 161 cases of treated SSTIs from 30 NHs.

The medical and nursing records of the selected charts of residents who received an antibiotic for an SSTI were systematically audited for documentation of elements of the modified McGeer criteria and the Loeb minimum criteria recorded in the 48 hours prior to the initiation of the antibiotic. The McGeer criteria were met if pus was present at a suspected SSTI site or if at least four of the following were present at the site: new or worsening warmth, redness, swelling, tenderness, serous drainage, or a constitutional finding. According to these criteria, constitutional findings included fever, leukocytosis, acute change in mental status and functional decline; however, change in mental status and function were excluded from data collection and analysis because no NH documented them in the manner specified by the McGeer criteria.[13] We recorded fever as a single oral temperature >37.8°C (100°F) or > 37.2°C (99°F) 48 hours before a prescription, similar to but not consistent with the revised McGeer criteria (which insist on two oral temperatures for the lower threshold).[13] Documentation of the other constitutional finding, leukocytosis (>14,000 leukocytes/mm^3 or > 6% bands or > 1,500 bands/mm^3) was collected within 72 hours of a prescription. Additional data including the source, type, and results of SSTI cultures were gathered. Audits also recorded the frequency of emergency department visits, hospitalizations, and deaths in the 7 days following an antibiotic prescription.

The Loeb minimum criteria share many of the clinical findings of the McGeer criteria. They recommend antibiotic initiation for an SSTI if new or increasing purulent drainage is noted at a wound, skin, or soft-tissue site—or at least two of the following findings: fever (temperature >37.9°C [100°F] or an increase of 1.5°C [2.4°F] above baseline temperatures taken at any site) or new or worsening redness, tenderness, warmth, or swelling at the site.[10] Our audits collected all of these data.

Diagnoses were recorded verbatim from notes written by medical providers (physicians, nurse practitioners, or physician assistants) or, if no diagnosis was present in a provider note, it was obtained from the nursing notes. Diagnoses were then aggregated into up to three ICD-9 (International Classification of Diseases, 9th revision) categories by project staff, under the direction of two geriatricians (D.F. and P.D.S.). Cases with nonspecific diagnoses such as “skin infection” were coded as ICD-9 709.9 “unspecified disorder of skin and subcutaneous tissue.”[15]

Analyses calculated the percent of diagnostic types and evaluated associations between published criteria and antibiotic prescribing for the three most common ICD-9 categories; that is, for each of the three diagnostic categories, the proportion of prescriptions that met the modified McGeer criteria and the Loeb minimum criteria was calculated. Analyses adjusted for differences in the method of measuring temperature by subtracting 0.75°F from rectal and tympanic readings and adding 0.75°F to axillary readings, to obtain an oral temperature equivalent.[16] In addition, empirical antibiotic choices were compared to those recommended by the IDSA for a specific diagnosis. The study was approved by the University of North Carolina Institutional Review Board.

Results

The mean bed size of the 31 participating NHs was 113 (standard deviation [SD], 50; range, 40-217); the mean occupancy was 87%; 74% were part of a chain, and 81% were for profit. The mean quality rating from *Nursing Home Compare* was 3.3 of a maximum score of 5.[17] None of these values was significantly different from those of NHs across the nation (all $P > .05$). In the past 5 years, the average study NH had two