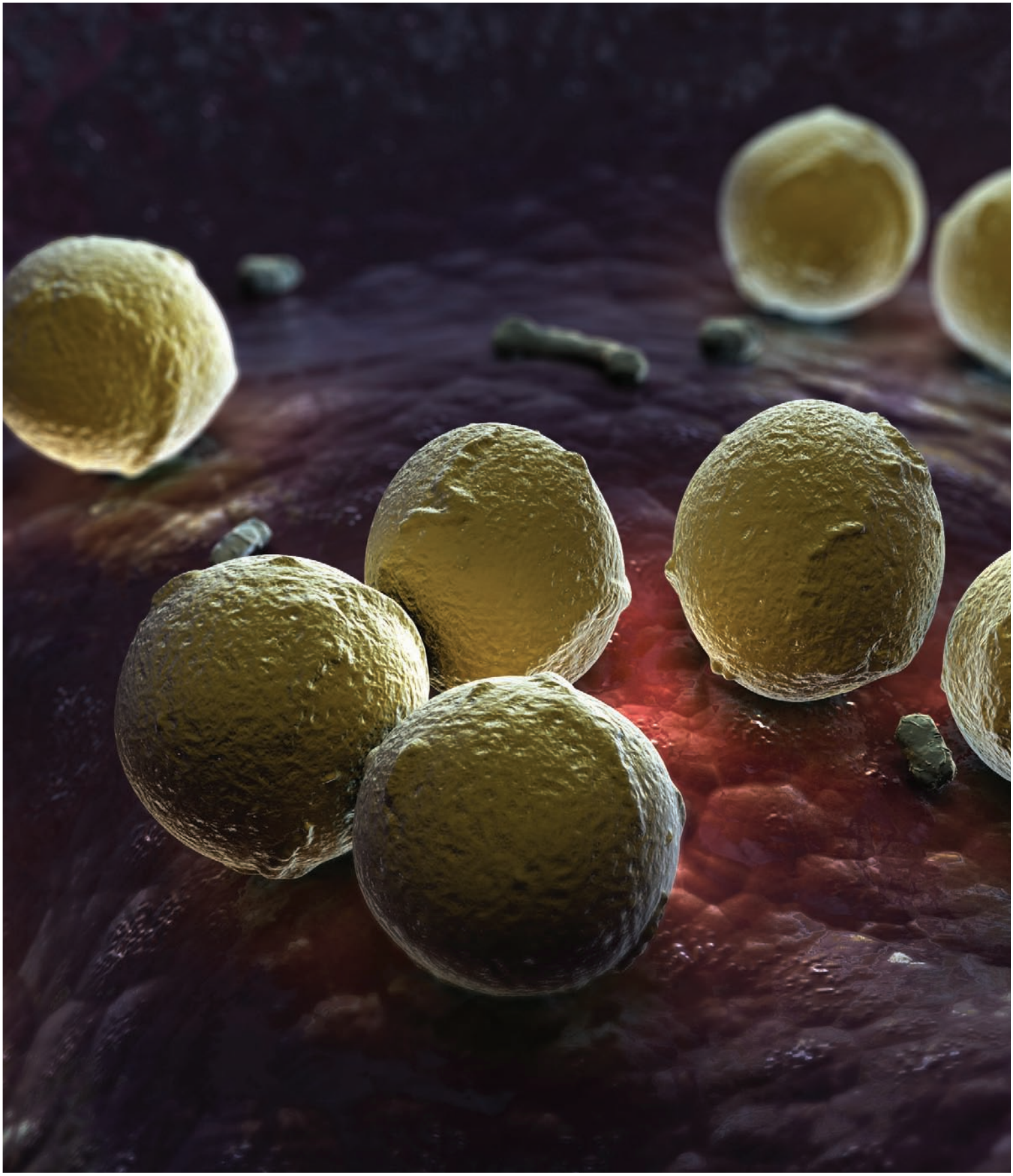

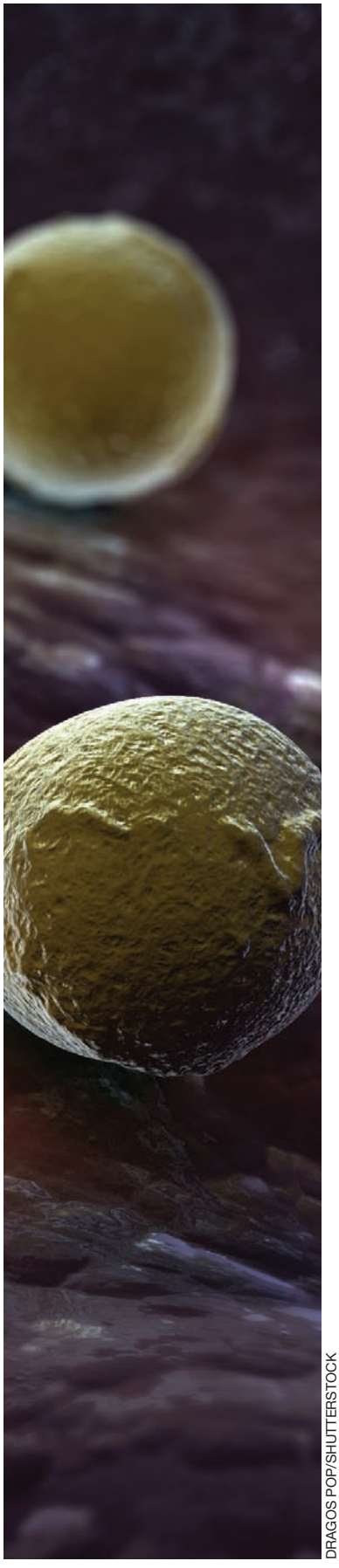

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NCPD 1.5 ANCC CONTACT HOURS

Rx 0.5 PHARMACOLOGY HOUR

The nurse's role in the care of patients with cellulitis

Get to know this bacterial skin infection that affects the deep dermis and subcutaneous tissue.

By Megan Lucey; Michael M. Evans, PhD, MSEd, RN, ACNS, CMSRN, CNE; Kiernan Riley, BSN, RN; Kaléi Kowalchik, BSN, RN; Lucy Adams; and Logan DeSanto

Mr. C, a 72-year-old male patient, presents to the ED with complaints of pain, fever, swelling, and redness to his right lower extremity (RLE) for 7 days. He has a past medical history of heart failure, type 2 diabetes mellitus, hypertension, obstructive sleep apnea, chronic back pain, hyperlipidemia, obesity, osteopenia, and gastroesophageal reflux disease. His past surgical history includes a cholecystectomy, laminectomy of L5-S1, and a tonsillectomy as a child. He has no known allergies. Current medications include furosemide 40 mg by mouth (PO) daily; potassium chloride, 20 mEq PO daily; insulin glargine, 40 units subcutaneously every night; metformin, extended release 500 mg PO daily; lisinopril, 40 mg PO daily; simvastatin, 40 mg PO daily at bedtime; vitamin D, 50,000 units PO once a week on Thursdays; omeprazole, 40 mg PO daily; and acetaminophen, 650 mg PO every 6 hours as needed for mild discomfort. He's a retired nurse who resides at home with his wife.

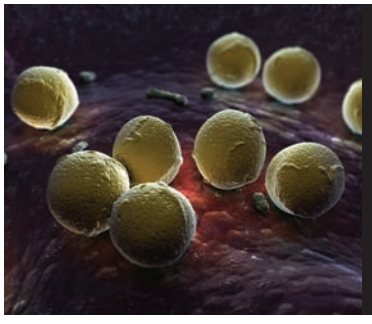
Mr. C's vital signs are temperature, 101.8° F; pulse, 112 beats/minute; respirations, 18 breaths/minute and shallow; BP, 154/92 mm Hg; and oxygen saturation, 94% on room air. He indicates pain to his RLE of a 7/10 on a 0-to-10 pain scale. Mr. C's skin color is pale but warm to touch. He's awake, alert, and oriented times four.

Upon evaluation, the ED nurse discovers that Mr. C's right calf and shin are red and warm to touch. He has a 4 cm x 6 cm open area on the right lateral calf that's draining serous drainage. Mr. C is noted to have 2+ edema to the RLE. He has 1+ pedal pulses and brisk capillary refill to his toes. He admits that he fell outside on ice about 2 weeks ago and scraped his leg. He has noticed that the scrape on his leg has gotten progressively worse since this fall. After assessing Mr. C and speaking with the nurse, the ED physician believes that he most likely has RLE cellulitis, worsened by diabetes and heart failure.

After receiving orders from the ED physician, labs are drawn for a complete blood cell (CBC) count and a complete metabolic panel (CMP). A wound culture is also ordered. A bedside blood glucose level is obtained, with a result of 228 mg/dL. In addition, a 20 g I.V. is started in Mr. C's left antecubital fossa and normal saline solution (NSS) is infused at 50

mL/h to help with hydration. Additionally, acetaminophen, 650 mg PO, and ceftriaxone, 2 g I.V. daily, are prescribed.

Labs reveal that Mr. C has an elevated white blood cell (WBC) count of 18.4 k/uL, indicative of an infection. Other abnormal lab values include hemoglobin, 11.5 g/dL; hematocrit, 36%; blood urea nitrogen, 22 mg/dL; and creatinine, 1.3 mg/dL, which are consistent with mild anemia and mild renal insufficiency, most likely caused by his long-standing diabetes and heart failure.



In patients who are mistakenly diagnosed with cellulitis, 92% received unnecessary antibiotic therapy.

Mr. C is admitted to the general medical unit with the following orders:

- *continue all home medications; NSS at 50 mg/h I.V.; and ceftriaxone, 2 g I.V. daily, pending wound culture results*
- *1,800 calorie diet with no concentrated sweets and no added salt*
- *bedside glucose monitoring before meals and at bedtime with an insulin lispro subcutaneous coverage scale as follows: less than 150, no coverage; 151 to 200, 2 units; 201 to 250, 4 units; 251 to 300, 6 units; 301 to 350, 8 units; 351 to 400, 10 units; above 400, call the hospitalist*
- *tramadol, 50 mg PO every 6 hours as needed for RLE pain*
- *heparin, 5,000 units subcutaneous every 8 hours for deep vein thrombosis prevention*
- *repeat CBC and CMP in the morning*
- *daily wound care: clean the open area to the RLE with NSS and pat dry, cover with a nonstick 4 x 4 gauze pad, stretch conforming gauze, and tape*
- *activity as tolerated.*

Background

Affecting 700,000 people in the US annually, cellulitis occurs when bacteria enter the dermis, which can be due to abrasions and ulcerations. Increased surface bacteria, further placing a person at risk, can contribute to a low surface pH or low body temperature. According to the CDC, the most common cause of cellulitis is group A streptococcus, but it can also be caused by staphylococcus organisms.

Although cellulitis can occur anywhere on the body, it most often presents in the legs and feet. The affected area may appear with erythema, pain, and swelling. Blisters or pitted skin may accompany the infection. Fever may or may not be present. Risk factors for cellulitis include being overweight and having chronic or acute edema. There are differing opinions about other potential risk factors, including smoking and diabetes.

Cellulitis is typically diagnosed via visual inspection but may include swabs of the affected area. The typical course of pharmacologic treatment following diagnosis is antibiotics. Serious complications aren't common, but may include bacteremia, suppurative arthritis, osteomyelitis, and endocarditis.

Best practices

Nurses play a critical role in the diagnosis and treatment of cellulitis. A thorough medical history and physical exam are essential for accurate diagnosis. Approximately 30% of patients with cellulitis are

misdiagnosed; cellulitis is commonly mistaken for eczema, lymphoedema, or lipodermatosclerosis. In patients who are mistakenly diagnosed with cellulitis, 92% received unnecessary antibiotic therapy.

Medical history

When assessing a patient for cellulitis, ask the patient for a complete history of the presenting illness. The history should be focused on how the cellulitis originated. It's important to ask the patient about any recent travel, trauma or injuries, history of I.V. drug use, or insect/animal bites to the affected area. The patient's use of antibiotics should also be considered because inappropriate use of antibiotics may indicate antibiotic resistance in the causative organism. While obtaining the patient's past medical history, it's crucial to note any medical conditions that predispose the patient to cellulitis, including diabetes mellitus, lymphedema, peripheral vascular disease, chronic tinea pedis, previous cellulitis, venous stasis, heart failure, and edema of the lower extremities.

Physical assessment

Physical findings of cellulitis include an area of poorly demarcated erythema that's swollen and warm and tender to touch (see *Picturing cellulitis*). For a diagnosis of cellulitis to be made, at least two of these characteristics must be present. The infection may present anywhere on a spectrum from localized erythema to rapidly spreading erythema, commonly found with necrotizing fasciitis and sepsis. Symptoms of cellulitis consist of generalized malaise, fever, and fatigue.

If pain is severe and the cellulitis has been spreading rapidly, necrotizing fasciitis—an infection causing inflammation and necrosis of the fascia tissue under the skin—should be considered. Cellulitis may also trigger sepsis, which can be identified by a much higher or lower body temperature than

Picturing cellulitis

Cellulitis surrounding an ulcer

Source: *Lippincott's Visual Nursing: A Guide to Diseases, Skills, and Treatments*. 2nd ed. Philadelphia, PA: Wolters Kluwer Health; 2012.

Cellulitis leading to septic shock

This middle-aged female patient was admitted with septic shock secondary to cellulitis. She had marked erythema and bullous changes, and rapidly improved on I.V. antibiotics.

Source: Elder D. *Atlas of Dermatopathology*. 4th ed. Philadelphia, PA: Wolters Kluwer Health; 2020.

Cellulitis of the hand

When this patient arrived at the ED, he had developed cellulitis of the hand after repair of a laceration secondary to a dog bite. His sutures were removed to allow for drainage and he received treatment with I.V. antibiotics.

Source: Fleisher GR, Ludwig W, Baskin MN. *Atlas of Pediatric Emergency Medicine*. Philadelphia, PA: Lippincott Williams & Wilkins; 2003.

Cellulitis signs and symptoms

cheat sheet

- Erythema
- Pain
- Edema
- Warmth
- Fever
- Drainage

normal, symptoms of an infection, mental decline, severe pain, discomfort, or shortness of breath.

Cellulitis can be differentiated from common misdiagnoses by the timing and evolution of the infection. If the infection was precipitated by an injury to the skin allowing bacteria to enter, cellulitis should be suspected. When assessing skin for cellulitis, note any potential portals of entry, such as micro abrasions, injuries, insect bites, or pressure injuries. The affected area should also be demarcated with a marker to monitor for spread of infection. Upon palpation of the affected area, observe for the presence of warmth, tenderness, or purulent drainage. Imaging of the affected area isn't recommended, except in patients with febrile neutropenia. Blood cultures, aspirates, or biopsies should be considered in patients who are immunocompromised or those who experienced an animal bite or show signs of sepsis.

Pain relief

Rest and elevation of the affected area are important in both the treatment and prevention of cellulitis. Nonpharmacologic pain relief methods, including ice and heat, are recommended to repair the skin barrier. Analgesics, such as nonsteroidal anti-inflammatory drugs and hydrocodone-acetaminophen, may be used based on pain severity.

Antibiotics

For most patients with cellulitis, antibiotic therapy is initiated depending on the severity of the infection. Antibiotic coverage should be narrowed based on culture results from the affected area and/or the response after 24 to 48 hours. Oral antibiotic therapy is initiated for patients presenting with mild symptoms in the affected area and no systemic symptoms, such as fever, tachycardia, and tachypnea.

Antibiotic therapy is determined based on multiple factors, including the presenting symptoms, comorbidities, and lab results. If there's no purulent drainage from the affected area, cephalexin, 500 mg every 6 hours, is recommended for at least 5 days. When the affected area is an abscess or contains purulent drainage, a combination of antibiotic therapy is initiated to cover against methicillin-resistant *S. aureus* (MRSA), whether or not MRSA symptoms are present. The antibiotic combination given to these patients includes trimethoprim-sulfamethoxazole, 800 mg/160 mg twice daily, in addition to cephalexin, 500 mg.

I.V. therapy is used for patients who present with systemic symptoms of cellulitis or when other treatments have failed. I.V. antibiotics, such as vancomycin or ceftriaxone, are administered with coverage over group A streptococcus and MRSA. The duration of antibiotic treatment can range from 5 days in uncomplicated cases to at least 2 weeks in more complex cases, necessitating the need for a peripheral or central venous access device, such as a peripherally inserted central line.

Because treatment is centered around antibiotic therapy, monitor patients for allergic reactions and ensure that data about allergies and previous allergic reactions are collected during patient intake. For patients with allergies to penicillin or cephalosporins, antibiotic therapy may be initiated using clarithromycin or doxycycline. Discuss with the patient the importance of completing the course of antibiotics, especially considering the effects of antibiotic misuse in patients with cellulitis.

Wound care

Wound management, in combination with antibiotic therapy, is critical to improve the patient's recovery from cellulitis. Thorough wound assessment is also necessary to track the progress of treatment. Clean wounds with NSS and cover them with dressings of the appropriate size to maintain a moist environment and provide a barrier against further bacterial or fluid contamination. Assess wounds each time dressings are changed, including size, color, shape, and the presence of odor. Negative-pressure wound therapy may be used depending on the degree and severity of the infection.

Preventive measures

Currently, the only treatment shown to reduce the risk of cellulitis reoccurrence is long-term, low-dose antibiotic therapy. However, there's hesitance surrounding this intervention because of the potential for antibiotic resistance and adverse reactions. Educate patients on methods to prevent reoccurrence without using antibiotic therapy. Webb and colleagues found that compression therapy on legs using compression garments, such as compression socks or elastic bandages, was successful in preventing reoccurrence.

Remind patients to evaluate their skin for damage and immediately report any wounds to their healthcare provider. Other preventive measures include foot exams, dry skin care, and treatment of comorbid conditions. For patients with comorbid conditions, such as diabetes mellitus, lymphedema, heart failure, and/or venous insufficiency, management is critical in the prevention of cellulitis reoccurrence. Stress the importance of adhering to the treatment regimens associated with these conditions.

Lifestyle modifications, such as a healthy diet and exercise, may also be recommended. Teasdale and colleagues found that many patients with cellulitis are willing to attempt the recommended modifications; nurses can incorporate these interventions into discharge teaching as a preventive measure.

key points

Nursing considerations

- Take a thorough medical history to avoid unnecessary treatment. In patients who were mistakenly diagnosed with cellulitis, 92% of them received unnecessary antibiotic therapy.
- Suspect cellulitis if the patient has an area of poorly demarcated erythema that's warm to touch, swollen, and tender to touch.
- Implement pain relief measures because of the painful nature of cellulitis, including rest and elevation of the affected area, as well as the use of ice, heat, NSAIDs, and opioids.
- Educate the patient about antibiotic therapy. Antibiotics will be narrowed based on culture results from the affected area.
- Monitor for allergic reactions due to antibiotic therapy and emphasize to the patient the importance of completing the entire course of antibiotics.
- Perform wound care to maintain a moist environment and a barrier against further bacterial contamination.
- Assess the wound and dressing each time it's changed, including noting the size, shape, color, and odor of the wound.
- Provide education regarding the prevention of cellulitis recurrence by emphasizing the use of compression garments, healthy diets, skin self-checks, and proper skin care.

Barriers to care

Care of patients with cellulitis can be complex and difficult for healthcare providers to navigate. The literature discusses several barriers to care, such as the accurate diagnosis of cellulitis, patient management of cellulitis prevention, and patient participation in the treatment plan. Understanding provider- and patient-perceived barriers will help healthcare systems better implement services and diagnostic aids to overcome systemic challenges.

Patients with cellulitis are often misdiagnosed with other disease processes, which can lead to avoidable hospital admissions and inappropriate medication management. Healthcare systems may lack universal inclusion of diagnostic aids, such as assessment tools, predictive testing, and imaging, which directly impacts the timely

on the web

CDC:
www.cdc.gov/groupastrep/diseases-public/Cellulitis.html

Mayo Clinic:
www.mayoclinic.org/diseases-conditions/cellulitis/diagnosis-treatment/drc-20370766

Mount Sinai:
www.mountsinai.org/health-library/diseases-conditions/cellulitis

UK National Health Service:
www.nhs.uk/conditions/cellulitis

diagnosis and management of cellulitis. Implementation of outpatient services such as cellulitis clinics to help healthcare systems appropriately diagnose cellulitis can improve patient-focused assessment, diagnosis, and treatment of cellulitis. Integration of specialized outpatient care can allow patients and providers to avoid inappropriate hospital admissions and medication administration.

Patients often express a lack of knowledge or understanding of cellulitis as a barrier to receiving care, leading patients and/or their caregivers to delay seeking care to manage early signs of cellulitis. Another patient-perceived barrier is the lack of health information and patient-provider communication during the management of cellulitis. This challenge often leads to patients not comprehending their care plan or ways to prevent further cellulitis episodes.

Lastly, a lack of patient-centered interventions is often seen as a barrier to care. Integration of outpatient clinics, educational tools, and patient-focused interventions can help patients better manage cellulitis. As research continues, better guidelines and interventions will help patients overcome the challenges associated with cellulitis care.

Case study update

Mr. C's wound culture is positive for group A streptococcus that's sensitive to ceftriaxone. Following 4 days of I.V. antibiotic therapy, his condition is improving. Repeat lab work shows Mr. C's WBC count is down to 12.4 k/uL and he has been afebrile for the past 48 hours. Additionally, his right calf shows decreased redness, warmth, and swelling. Drainage is now minimal from the open area.

Mr. C is to be discharged home on cefalexin, 500 mg PO every 12 hours for 7 days, and is to continue all previous home medications as prescribed. Home health is consulted to continue monitoring the cellulitis for signs of worsening infection, completing wound care and follow-up blood work, and ensuring medication adherence. Home physical therapy will also be consulted to review safe gait training. Mr. C is advised to collaborate with his medical team to maintain glycemic control and stable weight to help with the healing of the infection.

Careful consideration

When caring for patients with cellulitis, there are important considerations to keep in mind. For cellulitis to be appropriately diagnosed and treated, nurses need to be aware of its signs, symptoms, and causative agents. A thorough physical assessment and review of the patient's medical history are essential to diagnosis and treatment. Furthermore, patient teaching is a crucial part of the management and prevention of cellulitis. Although barriers to diagnosis and treatment exist, nurses are in a unique position to advocate for patients experiencing cellulitis by overcoming barriers to care and following best practices for treatment. ■

REFERENCES

Brown BD, Hood-Watson KL. *Cellulitis.* Treasure Island, FL: StatPearls Publishing; 2020.

Carter K, Kilburn S, Featherstone P. Cellulitis and treatment: a qualitative study of experiences. *Br J Nurs.* 2007;16(6):S22-S28.

Centers for Disease Control and Prevention. Cellulitis: all you need to know. 2020. www.cdc.gov/groupastrep/diseases-public/Cellulitis.html.

Centers for Disease Control and Prevention. Necrotizing fasciitis: all you need to know. 2019. www.cdc.gov/groupastrep/diseases-public/necrotizing-fasciitis.html.

Cranendonk DR, Lavrijsen APM, Prins JM, Wiersinga WJ. Cellulitis: current insights into pathophysiology and clinical management. *Neth J Med*. 2017;75(9):366-378.

Dalal A, Eskin-Schwartz M, Mimouni D, et al. Interventions for the prevention of recurrent erysipelas and cellulitis. *Cochrane Database Syst Rev*. 2017;6(6):CD009758.

Leong HN, Kurup A, Tan MY, Kwa ALH, Liau KH, Wilcox MH. Management of complicated skin and soft tissue infections with a special focus on the role of newer antibiotics. *Infect Drug Resist*. 2018;11:1959-1974.

Mayo Clinic. Cellulitis. 2020. www.mayoclinic.org/diseases-conditions/cellulitis/diagnosis-treatment/drc-20370766.

Patel M, Lee SI, Thomas KS, Kai J. The red leg dilemma: a scoping review of the challenges of diagnosing lower-limb cellulitis. *Br J Dermatol*. 2019;180(5):993-1000.

Raff AB, Kroshinsky D. Cellulitis: a review. *JAMA*. 2016;316(3):325-337.

Santer M, Lalonde A, Francis NA, et al. Management of cellulitis: current practice and research questions. *Br J Gen Pract*. 2018;68(677):595-596.

Sepsis Alliance. Cellulitis. 2021. www.sepsis.org/sepsisand/cellulitis.

Sullivan T, de Barra E. Diagnosis and management of cellulitis. *Clin Med (Lond)*. 2018;18(2):160-163.

Teasdale EJ, Lalonde A, Muller I, et al. Patients' understanding of cellulitis and views about how best to prevent recurrent episodes: mixed-methods study in primary and secondary care. *Br J Dermatol*. 2019;180(4):810-820.

Tleyjeh IM, Burdette SD, Baddour LM. Cellulitis. Antimicrobe. www.antimicrobe.org/new/e1.asp#top.

Webb E, Neeman T, Bowden FJ, Gaida J, Mumford V, Bissett B. Compression therapy to prevent recurrent cellulitis of the leg. *N Engl J Med*. 2020;383(7):630-639.

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