



Review of Scabies in the Elderly

Jodi Raffi · Raagini Suresh · Daniel C. Butler

Received: August 5, 2019 / Published online: September 11, 2019
© The Author(s) 2019

ABSTRACT

Scabies, an ectoparasitic infestation of the skin by the mite *Sarcoptes scabiei*, is a clinical problem of particular significance in the elderly population because of unique vulnerability factors. Such factors include reduced mobility, residency in grouped living facilities, and difficulty with implementation of certain treatments. There is also risk of transmission to nearby caretakers and cohabitants. Furthermore, the diagnosis of scabies can be difficult, as this condition can closely resemble other dermatologic diseases. Complicating the diagnosis in this group is the variety of medical settings in which these patients are evaluated, some of which may not be equipped to follow diagnostic guidelines. The diagnosis itself can be complex because of varying clinical presentation and mite burden. Finally, the transmissibility of scabies, especially in grouped living

arrangements, makes prompt and proper treatment of this condition paramount. All of these factors present a unique challenge for the clinician treating elderly patients. This article aims to describe the susceptibility factors, clinical presentation, diagnosis, and management considerations specific to elderly adults with scabies.

Keywords: Elderly; Geriatric dermatology; Scabies

OVERVIEW OF SCABIES

Scabies is a common ectoparasitic infestation of the skin by the mite *Sarcoptes scabiei* [1]. Classically, it manifests as an intensely pruritic eruption with a characteristic distribution in the sides and webs of the fingers, wrists, axillae, areolae, and genitalia. In the developed world, elderly patients are a particularly vulnerable group for this infestation [2]. Reduced mobility that affects many elderly patients not only makes bathing and scratching difficult but may also contribute to treatment challenges. The grouped living arrangements of many elderly patients additionally render this population vulnerable to scabies, which is transmitted by skin-to-skin contact, infested clothing, and infested bedding. Finally, the diagnosis of scabies can be challenging; unequal resource

Enhanced Digital Features To view enhanced digital features for this article go to <https://doi.org/10.6084/m9.figshare.9767717>.

J. Raffi · R. Suresh · D. C. Butler (✉)
Department of Dermatology, University of
California San Francisco, Divisadero St. 1701,
San Francisco, CA 94110, USA
e-mail: Daniel.butler@ucsf.edu

J. Raffi
School of Medicine, University of California Irvine,
1001 Health Sciences Road, Irvine, CA 92617, USA

availability, variety of clinical presentations, and varying mite burden all contribute to a complex diagnostic process. These elements create challenging clinical scenarios that geriatricians and dermatologists should be well informed about to properly deliver care.

The goal of this article is to provide a clinically useful tool for practitioners, patients, and caregivers who are concerned with the diagnosis or treatment of scabies.

METHODS

The primary purpose of this review was the evaluation of the epidemiology and diagnostic and treatment modalities of scabies in the older adult population. In October 2018, we conducted a search using PubMed/MEDLINE and The Cochrane Library with the search terms “scabies in elderly,” “epidemiology of scabies,” “diagnosis scabies elderly,” “scabies older people,” “scabies aging adults,” “scabies geriatrics,” “scabies care homes,” “scabies nursing home,” “scabies assisted living home,” and “treatment scabies elderly.” We included retrospective and prospective studies as well as general and systematic reviews that reported validated clinical information about scabies in the elderly population.

Compliance with Ethics Guidelines

This article is based on previously conducted studies and does not contain any studies with human participants or animals performed by any of the authors.

PRESENTATION OF SCABIES IN THE ELDERLY

Scabies presents uniquely in elderly patients. Different from a younger cohort, elderly patients may demonstrate complete sparing of the finger webs and can present with lesions in the face [3]. Experts also note that lesions can present in the groin, under clothes areas, which can be missed on the standard examination without disrobing. The intense pruritus

associated with scabies is a result of a delayed-type hypersensitivity reaction to the mite, mite feces, and mite eggs [4]. Symptoms begin 3–6 weeks after primary infestation in the disease-naïve or 1–3 days in those previously infected [5]. Multiple small, erythematous, and often excoriated papules can be observed in many populations with scabies. While many patients exhibit burrows as well, elderly patients are more often found to have burrows on the soles of the feet [1]. The pruritus associated with scabies can help decrease the mite load as the scratching helps mechanically remove mites [6]. This process may be impaired in elderly patients with neuropathy, cognitive impairment, or limited mobility. Moreover, cognitive impairment may alter a patient’s ability to communicate symptoms of itching or discomfort which can further confound the diagnosis.

Some patients can present with a subset of scabies called crusted scabies. While classic scabies is associated with a relatively low mite burden of approximately 10–15 mites, crusted scabies is associated with up to millions of mites on the body [7]. A review by Guldbakke and Khachemoune divided the major risk factors for crusted scabies into three categories: altered immune response, nutritional deficiencies, and a modified host response (e.g., older adults and cognitively impaired individuals) [7]. Given the tremendous mite burden in these patients, individuals with crusted scabies are thought to be “core transmitters,” or major contributors to mite transmission and scabies outbreaks [8, 9].

DIAGNOSIS OF SCABIES AND ISSUES SPECIFIC TO THE ELDERLY

Diagnosis of scabies can be made on physical examination by identifying serpiginous white lines of mite burrows with aid of dermoscopy [1]. Definitive diagnosis of scabies can be made through examination of skin scrapings under light microscopy for the scabies mite, eggs, or feces (also known as scybala) [10]. When crusted scabies is suspected, potassium hydroxide (KOH) can be applied to the specimens to dissolve excess keratotic debris [11]. A negative

result does not exclude the diagnosis of scabies [12]. Low mite burden can also delay or produce a false negative result [8]. Presumptive diagnosis and empirical treatment can be made if based upon a consistent history of exposure and characteristic examination [12].

Even following diagnostic guidelines, establishing a definitive diagnosis of scabies in this population can be challenging. The elderly patient population presents for medical evaluation in a variety of settings: primary care, institutional settings such as nursing home, geriatric clinics, and emergency rooms. For this reason, standard diagnostic methods may not be available nor may practitioners be familiar with nuanced presentations or diagnostic practices. Even in settings with all means of diagnosis available, the variety of presentation and low mite burden can make the establishment of a definitive diagnosis difficult. This idea is further supported by a consensus paper of world experts who published criteria for the diagnosis of scabies. While not elderly or geriatric specific, the consensus acknowledges that a diagnosis can be made without confirmed scabies visualization and rather from clinical and historical details [13].

It should be noted that hand hygiene has not been associated with decreases in scabies infestation despite propagated myth. This is important for counseling patients and close contacts regarding habits for avoidance and management [14].

TREATMENT OF SCABIES IN THE ELDERLY

Management of scabies in the elderly involves eradication of mites, management of symptoms and complications, and treatment of close contacts to minimize transmission.

Pharmacotherapy for Mite Eradication in the Elderly

Classic Scabies

First-line therapy for classic scabies includes topically administered permethrin and orally

administered ivermectin. Topically administered permethrin is highly effective, with reported cure rates greater than 90% [15]. Permethrin 5% cream should be thoroughly massaged from the head to the soles of the feet and left on for 8–14 h. While one application is generally curative, a second application 14 days after is recommended for those with confirmed disease. In elderly patients in whom there is a higher chance of scalp involvement, treatment should also be applied to the hairline, neck, scalp, temple, and forehead [4].

The use of orally administered ivermectin for geriatric patients with scabies has been a controversial topic in the literature. A report published in 1997 by Barkwell and Shiels suggested that there was an increased risk of death associated with orally administered ivermectin use in the elderly population [16]. These findings were not replicated in other studies [17]; orally administered ivermectin no longer appears to be controversial and should be considered safe in older patients. In fact, orally administered ivermectin was used to treat a community epidemic of scabies in 34 nursing home patients in 1993 [18]. In 1999, Del Giudice et al. retrospectively studied the outcomes of these patients and found no evidence of increased death [19]. Orally administered ivermectin, administered at 200 µg/kg in two doses, is considered appropriate off-label therapy for classic scabies in patients who are treatment-resistant or unable to tolerate topical medications [4]. Orally administered ivermectin should be taken with food to increase the bioavailability in the epidermis [4]. The second dose should be administered in between day 8 and day 15 as ivermectin has limited ovicidal activity and may not prevent recurrences due to eggs present during the initial treatment [4, 20]. In the past decade, topically administered ivermectin has also become available. One group reported it to have similar efficacy as permethrin, but it is a high-cost agent and may not be practical for all patients [21].

Additional topical treatments for classic scabies include sulfur, benzoyl benzoate, lindane, crotamiton, and malathion, although these agents have not demonstrated superior efficacy to topically administered permethrin and in

some cases have an unfavorable side effect profile [15, 22]. Many of these treatments can, however, be more cost-effective. The use of precipitated sulfur in petrolatum was found to have therapeutic efficacy, low cost, and a favorable side effect profile limited to mild dermatitis [23].

Benzoyl benzoate (5%, 10%, or 25%), though commonly used in resource-poor countries owing to low cost, is not available in the USA. Though treatment regimens vary, the European Guideline for the Management of Scabies instructs patients to apply the drug once daily at night on two consecutive nights, with a repeat treatment cycle after 7 days [24].

Lindane, which is no longer available for use in the USA, is infrequently used because of the risk for systemic toxicity including seizures and death [20, 24]. In years past it was intended for use only in patients who could not tolerate other therapies or are completely treatment-refractory. If used, a single treatment with a thin layer of lindane 1% was to be applied to all areas of the body from the neck down and thoroughly washed off after 8 h [20]. The risk for lindane toxicity cannot be understated, and European and Japanese guidelines recommend against lindane use altogether. Lindane is contraindicated in patients with cutaneous disorders that may result in increased absorption of topical therapy such as psoriasis or atopic dermatitis. Furthermore, lindane was found to have an adverse effect on water quality in California, where its pharmaceutical use was banned in 2002 [25].

Crotamiton appears less effective than permethrin in randomized clinical trials [22, 26]. The treatment regimen for crotamiton is not standardized but the Food and Drug Administration recommends application to the entire body from the chin down, reapplication 24 h later, and a thorough wash 48 h after the last application [26, 27]. While malathion 0.05% lotion has been used for scabies in previous case series that suggest efficacy, it has disadvantages including high cost and danger due to its flammability [22]. Malathion lotion should be applied to the skin at night and washed off after 8–12 h [24].

Crusted Scabies

Although permethrin 5% cream is technically off-label for the treatment of crusted scabies, it is a critical component of the first-line regimen. It should be applied daily for 7 days, and then twice weekly until symptoms have resolved. A single 200 µg/kg dose of ivermectin should be given orally concomitantly on days 1, 2, 8, and 15, and potentially on days 22 and 29 for severe cases [28]. When patients are unable to tolerate permethrin, other second-line topical agents such as benzoyl benzoate, sulfur, crotamiton, and malathion may replace it. The US Centers for Disease Control and Prevention recommends topical administration of 5% benzoyl benzoate cream as a permethrin alternative for patients with crusted scabies [20].

Difficulties with Topical Therapy in the Elderly

Although many topical therapies exist for the treatment of both classic and crusted scabies, elderly patients may have difficulty applying topical therapy because of limited mobility. When possible, patients should receive appropriate assistance with treatment application. In cases of significant difficulty, orally administered ivermectin may be preferred.

Management of Symptoms and Complications in the Elderly

In addition to mite eradication, the symptoms and complications of scabies including pruritus, secondary infection, and cutaneous nodules should be managed. Pruritus, which may persist up to 4 weeks after successful treatment, is frequently treated with antihistamines [12]. However, first-generation H₁-antihistamines should be used with caution if at all in adults 65 years of age and older as they are associated with central nervous system adverse effects such as drowsiness, fatigue, dizziness, impaired thinking and memory, agitation, and hallucinations [29]. They are listed on the American Geriatrics Society's Beers List of potentially inappropriate medication in older adults. Instead, we prefer the use of second-generation antihistamines or low-dose gabapentin for pruritus in this population [3]. When there is clinical suspicion for

secondary infection, appropriate systemic antibiotics should be used [30].

Nodules from scabies may persist after the eradication of mites. They can be treated with once- to twice-daily application of a potent topical steroid for 2–3 weeks or intralesional injection of a corticosteroid such as triamcinolone acetonide (5–10 mg/mL) [30]. Limited data suggest that topical calcineurin inhibitors such as tacrolimus 0.03% ointment or cryotherapy may have some value in the improvement of nodules [31, 32].

Methods to Treat Close Contacts and Minimize Transmission and Recurrence

Measures should be implemented to treat close contacts and minimize transmission and recurrence, particularly in institutional settings because of the potential for widespread transmission in a short period of time.

The onset of scabies-related symptoms is often delayed for several weeks. Patients' close personal contacts may have active scabies even in the absence of symptoms. Simultaneous treatment of cohabitants is recommended to avoid a continuous cycle of transmission and reinfestation [33].

Interventions for preventing the spread of infestation in close contacts have not been studied satisfactorily [34]. Well-designed randomized controlled trials should be conducted examining potential utility of prophylactic treatments. In Fiji, a single 200 µg/kg dose of orally administered ivermectin was an effective method for scabies prevention and control in a large population [35]. While not studied adequately in aging adult care homes, the method of mass drug administration (MDA) continues to show promising success in community settings. This may prove to be an effective treatment strategy in care home settings if administered appropriately [36, 37]. One consideration is that ivermectin-resistant scabies has been reported [38]. It is unclear if treatment methods play a role in the development of these resistant mites and thus should not dictate treatment approach. However, it should remain

a consideration in the setting of clear non-responders.

Classic Scabies

When classic scabies is identified in the institutional setting, staff should adhere to appropriate infection control measures when handling patients. Direct skin-to-skin contact should be avoided until at least 8 h after treatment. Individuals with prolonged skin-to-skin contact with affected patients should be treated. Clothing and bedding of the affected patient should be laundered with a washing machine and dryer using hot water and hot, dry cycles. Cleaning and vacuuming of the patient's room should be undertaken after the room is vacated [38].

Crusted Scabies

When crusted scabies is identified in the institutional setting, institutional infection-control personnel should be promptly involved. The affected patient should be isolated from other patients and a dedicated care team should be assigned for the patient to minimize exposure of staff. Strict contact precautions including avoidance of direct skin-to-skin contact with the patient and use of personal protective equipment including gowns, gloves, and shoe covers should be used until the patient has been treated and a scabies preparation is negative. Frequent cleaning of the patient's room should ensue to remove contaminated scales and crusts. Laundering of clothing and bedding should be undertaken as described previously, and laundry personnel should use protective clothing and gloves. All individuals who came in contact with the patient or clothing, bedding, or furniture should be treated [39].

CONCLUSION

The elderly face a number of unique diagnoses not commonly encountered by the larger adult population. Infection with the mite *Sarcoptes scabiei* is one such example of a diagnosis that is largely specific to older adults, especially those residing in group living facilities. Because scabies occurs most commonly in elderly patients,

and can resemble other dermatologic diseases such as atopic dermatitis or psoriasis, it is often part of the differential diagnosis a practitioner must consider when treating older patients. However, the clinical presentation and diagnostic evaluation of scabies is often more challenging than straightforward. Furthermore, elderly patients may be more susceptible to crusted scabies given the greater portion of patients in this group with an altered immune response, nutritional deficiency, or a modified host response (declining cognitive function, inability to properly maintain personal hygiene, indicate medical needs, etc.) [7].

Patients present for evaluation in a variety of settings, with a variety of caretakers and practitioners. Negative diagnostic testing does not preclude infection; thus, the practitioner must take into account the entire clinical picture including the history, physical examination, and diagnostic testing in order to make a clinical decision. In this population, early diagnosis and treatment of scabies is crucial to prevent development of sequelae such as secondary infections and sepsis. Given the transmissibility of scabies and the often sedentary, group-style living of some of this population, a missed diagnosis can lead to medical consequences for close contacts as well. This makes scabies a concern for patients, families, caregivers, and practitioners. Dermatologists play a key role in the management of this disease as well as in educating others within the house of medicine who care for older patients with concern for scabies; thus, it is imperative to acknowledge the nuances of this challenging disease in a high-risk population.

ACKNOWLEDGEMENTS

Funding. No funding or sponsorship was received for this study or publication of this article.

Authorship. All named authors meet the International Committee of Medical Journal Editors (ICMJE) criteria for authorship for this article, take responsibility for the integrity of

the work as a whole, and have given their approval for this version to be published.

Authorship Contributions. Jodie Raffi, Raagini Suresh, and Daniel Butler all contributed equally substantially to the creation of this article. Jodie Raffi contributed to drafting the manuscript and the acquisition and analysis of data in literature. Raagini Suresh contributed to the acquisition and analysis of data in literature and editing the manuscript. Daniel Butler contributed to the article concept and design, editing the manuscript, and project supervision.

Disclosures. Jodie Raffi, Raagini Suresh, and Daniel Butler have nothing to disclose.

Compliance with Ethics Guidelines. This article is based on previously conducted studies and does not contain any studies with human participants or animals performed by any of the authors.

Open Access. This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any non-commercial use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

REFERENCES

1. Anderson KA, Strowd LC. Epidemiology, diagnosis, and treatment of scabies in a dermatology office. *J Am Board Fam Med.* 2017;30(1):78–84. <https://doi.org/10.3122/jabfm.2017.01.160190>.
2. Hewitt KA, Nalabanda A, Cassell JA. Scabies outbreaks in residential care homes: factors associated with late recognition, burden and impact. A mixed methods study in England. *Epidemiol Infect.* 2015;143:1542–51. <https://doi.org/10.1017/s0950268814002143>.
3. Berger TG, Steinhoff M. Pruritus in elderly patients—eruptions of senescence. *Semin Cutan*

- Med Surg. 2011;31(2):113–7. <https://doi.org/10.1016/j.sder.2011.04.002>.
4. Currie BJ, McCarthy JS. Permethrin and ivermectin for scabies. *N Engl J Med*. 2010;362(8):717. <https://doi.org/10.1056/NEJMct0910329>.
 5. Chosidow O. Scabies and pediculosis. *Lancet*. 2000;355(9206):819. [https://doi.org/10.1016/S0140-6736\(99\)09458-1](https://doi.org/10.1016/S0140-6736(99)09458-1).
 6. McCarthy JS, Kemp DJ, Walton SF, et al. Scabies: more than just an irritation. *Postgrad Med J*. 2004;80:382–7. <https://doi.org/10.1136/pgmj.2003.014563>.
 7. Guldbakke KK, Khachemoune A. Crusted scabies: a clinical review. *J Drugs Dermatol*. 2006;5:221–7.
 8. Roberts LJ, Huffam SE, Walton SF, Currie BJ. Crusted scabies: clinical and immunological findings in seventy-eight patients and a review of the literature. *J Infect*. 2005;50:375–81. <https://doi.org/10.1016/j.jinf.2004.08.033>.
 9. Cassell JA, et al. Scabies outbreaks in ten care homes for elderly people: a prospective study of clinical features, epidemiology, and treatment outcomes. *Lancet Infect Dis*. 2018;18(8):894–902.
 10. Leung V, Miller M. Detection of scabies: a systematic review of diagnostic methods. *Can J Infect Dis Med Microbiol*. 2011;22(4):143–6.
 11. Micheletti RG, Dominguez AR, Wanat KA. Bedside diagnostics in dermatology: parasitic and noninfectious diseases. *J Am Acad Dermatol*. 2017;77(2):221. <https://doi.org/10.1016/j.jaad.2016.06.035>.
 12. Chosidow O. Clinical practices. Scabies. *N Engl J Med*. 2006;354(16):1718. <https://doi.org/10.1056/NEJMcp052784>.
 13. Engelman D, Fuller LC, Steer AC. Consensus criteria for the diagnosis of scabies: a Delphi study of international experts. *PLoS Neglect Trop Dis*. 2018;12(5):e0006549.
 14. Cinotti E, Perrot JL, Labeille B, et al. Inefficacy of alcohol-based hand rub on mites in a patient with hyperkeratotic scabies. *Clin Exp Dermatol*. 2015;40(2):177–81. <https://doi.org/10.1111/ced.12467>.
 15. Strong M, Johnstone P. Interventions for treating scabies. *Cochrane Database Syst Rev*. 2007;3:CD000320.
 16. Barkwell R, Shiels S. Deaths associated with ivermectin treatment of scabies. *Lancet*. 1997. [https://doi.org/10.1016/S0140-6736\(05\)63020-6](https://doi.org/10.1016/S0140-6736(05)63020-6).
 17. Diazgranados JA, Costa JL. Deaths after ivermectin treatment. *Lancet*. 1997. [https://doi.org/10.1016/S0140-6736\(05\)62668-2](https://doi.org/10.1016/S0140-6736(05)62668-2).
 18. Marty P, Gari-Toussaint M, Le Fichoux Y, Gaxofte P. Efficacy of ivermectin in the treatment of an epidemic of sarcoptic scabies. *Ann Trop Med Parasitol*. 1994;88(4):453.
 19. Del Giudice P, Marty P, Gari-Toussaint M, Le Fichoux Y. Ivermectin in elderly patients. *Arch Dermatol*. 1999;135(3):351–2.
 20. Workowski KA, Bolan GA. Sexually transmitted disease guidelines. *Cent Dis Control Recommend Rep*. 2015;64(3):102–3.
 21. Chhaiya SB, Patel VJ, Dave JN, Mehta DS, Shah HA. Comparative efficacy and safety of topical permethrin, topical ivermectin, and oral ivermectin in patients of uncomplicated scabies. *Indian J Dermatol Venerol Leprol*. 2012;78(5):605–61.
 22. Johnstone P, Strong M. Scabies. *BMJ Clin Evid*. 2014;2014:1707.
 23. Diaz M, Cazorla D, Acosta M. Efficacy, safety, and acceptability of precipitated sulphur petrolatum for topical treatment of scabies at the City of Coro, Falcon State, Venezuela. *Rev Invest Clin*. 2004;56(5):615–22.
 24. Salavastru CM, Chosidow O, Boffa MJ, Janier M, Tiplica GS. European guideline for the management of scabies. *J Eur Acad Dermatol Venerol*. 2017;31(8):1248.
 25. Humphreys EH, Janssen S, Heil A, Hiatt P, Solomon G, Miller MD. Outcomes of the California ban on pharmaceutical lindane: clinical and ecologic impacts. *Environ Health Perspect*. 2008;116(3):297–302.
 26. Pourhasan A, Goldust M, Rezaee E. Treatment of scabies, permethrin 5% cream vs. crotamiton 10% cream. *Ann Parasitol*. 2013;59(3):143.
 27. Eurax. Food and Drug Administration, 2003. www.accessdata.fda.gov/drugsatfda_docs/label/2003/06927slr030,09112slr021_eurax_lbl.pdf.
 28. Ortega-Loayza AG, McCall CO, Nunley JR. Crusted scabies and multiple dosages of ivermectin. *J Drugs Dermatol*. 2013;12(5):585. <http://jddonline.com/articles/dermatology/S1545961613P0584X/1>.
 29. American Geriatrics Society. Beers criteria update expert panel. *J Am Geriatr Soc*. 2015;2015(63):2227–46.

30. Karthikeyan K. Treatment of scabies: newer perspectives. *Postgrad Med J*. 2005;81(951):7. <https://doi.org/10.1136/pgmj.2003.018390>.
31. Mittal A, Garg A, Agarwal N, Gupta L, Khare AK. Treatment of nodular scabies with topical tacrolimus. *Indian Dermatol Online J*. 2013;4(1):52–3.
32. Zavar V, Pawar M. Liquid nitrogen cryotherapy in the treatment of chronic, unresponsive nodular scabies. *J Am Acad Dermatol*. 2017;77(2):e43.
33. Chambliss ML. Treating asymptomatic bodily contacts of patients with scabies. *Arch Fam Med*. 2000;9(5):473–4.
34. FitzGerald D, Grainger RJ, Reid A. Interventions for preventing the spread of infestation in close contacts of people with scabies. *Cochrane Database Syst Rev*. 2014;2:CD00009943. <https://doi.org/10.1002/14651858.cd009943.pub2>.
35. Romani L, Whitfield MJ, Koroivueta J, et al. Mass drug administration for scabies control in a population with endemic disease. *N Engl J Med*. 2015;373:2305–13. <https://doi.org/10.1056/NEJMoa1500987>.
36. Romani L, Marks M, Sokana O, et al. Efficacy of mass drug administration with ivermectin for control of scabies and impetigo, with coadministration of azithromycin: a single-arm community intervention trial. *Lancet Infect Dis*. 2019;19(5):510–8. [https://doi.org/10.1016/S1473-3099\(18\)30790-4](https://doi.org/10.1016/S1473-3099(18)30790-4).
37. Romani L, Whitfield MJ, Koroivueta J, et al. Mass drug administration for scabies—2 years of follow-up. *N Engl J Med*. 2019;381(2):186–7. <https://doi.org/10.1056/NEJMc1808439>.
38. Currie BJ, Harumal P, McKinnon M, Walton S. Resistance in *Sarcoptes scabiei*. *Clin Infect Dis*. 2004;39(1):e8–12.
39. Center for Disease Control and Prevention. Treatment of scabies. Retrieved from www.CDC.gov/parasites/scabies/inidex.html