Scoping review of the challenges identified by patients and health care professionals when diagnosing lower limb cellulitis

Authors

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Background

Cellulitis is a common skin and soft tissue infection. It is an infection of the deep dermis and subcutaneous tissue, usually bacterial through a break in the skin [1]. Clinical presentation is typically an acute, spreading erythema with signs of inflammation [1]. 60% of cellulitis cases affect the lower limb [2], with the 35% of cases affecting the upper limb [2] most often seen amongst intravenous drug users [3]. Antibiotics are used in the treatment of cellulitis [1]. A subtype of cellulitis with more pronounced superficial inflammation is known as erysipelas [4]. There are other non-skin and soft tissue infections that also uses the term 'cellulitis', such as orbital cellulitis or retropharyngeal cellulitis. However, these present and are managed in a distinct way by different specialists and are a different entity to limb cellulitis. For the purpose of this review, we will focus on lower limb cellulitis as it is the most common form.

Diagnosing cellulitis is important as it recurs within a year in almost 14% of patients [5] and this rate increases to 45% within three years [6]. Complications of cellulitis include sepsis and necrotising fasciitis, resulting in hospital admission: in 2013-2014, there were 104,598 recorded cases of cellulitis managed in secondary care in the UK [7]. Patients admitted with cellulitis took up to 360,000 bed days [8], with an annual cost of £133m for bed stay alone [9].

An important priority for cellulitis research, identified by both patients and health care professionals, is diagnosis [10]. This is because, despite cellulitis being a common pathology, an incorrect diagnosis is often made and can have a significant impact clinically, socially and economically. 28% of patients are misdiagnosed with lower limb cellulitis [11], with 85% having an avoidable hospital admission and 92% receiving unnecessary antibiotics [12]. One reason suggested as a challenge in the diagnosis of cellulitis, is that the core features of cellulitis: rubor, dolor, calor and tumor are also present in other conditions that mimic cellulitis [1].

A preliminary search on the Cochrane Database of Systematic Reviews, JBI systematic review database, Prospero and PubMed found no previous systematic reviews looking at the challenges encountered by patients or health professionals when making a diagnosis of cellulitis. Identifying challenges is an exploratory research question, therefore a scoping review is ideal to answer this question as we seek a broad overview of this topic, with key concepts and theories from heterogeneous sources [13]. A scoping review will also identify gaps for future research on diagnosis in lower limb cellulitis. In this review, we define patients as including carers of patients with lower limb cellulitis.

The main aim of this scoping review is to explore the challenges identified by patients and health professionals in diagnosing lower limb cellulitis.

Research objective

To examine and map out the challenges identified by patients and health professionals in diagnosing lower limb cellulitis.

Research question

What are the key challenges identified by patients and health care professionals when diagnosing lower limb cellulitis?

Population inclusion criteria

Patients with lower limb cellulitis

Concept

Challenges in diagnosis

Context

Primary and secondary care setting including the emergency department

Study types

Inclusion criterion – All research types, all ages, gender and ethnicity, if the site of cellulitis is not clearly stated, if the article discusses misdiagnosis of lower limb cellulitis (include if the site of cellulitis is not clearly stated)

Exclusion criterion – Animal studies, laboratory in-vitro studies, the terms 'cellulitis', 'erysipelas' or 'skin and soft tissue infection' not in the title or abstract, 'diagnosis' not discussed in the abstract, explicitly discusses non-lower limb cellulitis only, not a patient or carer of a patient with lower limb cellulitis or health care professionals' views or findings of lower limb cellulitis, non- English articles will be excluded if there is not a colleague in the department proficient in that language

Search strategy

This review will aim to include both published and unpublished literature. MEDLINE In-Process & Non-Indexed Citations and OVID MEDLINE 1946 to present (Ovid) and EMBASE (1980-2017) databases will be searched. The timeframe for the search will be from the earliest date available on the databases to the day of the search, which is justified knowing that cellulitis remains an under-researched topic and therefore searches before this timeframe is unlikely. For grey literature, additional articles from the first 100 results in Google Scholar will be screened when entering the search 'challenges in the diagnosis of

lower limb cellulitis'. The reference list of all articles will also be searched for additional articles. Authors will be contacted for any missing or irretrievable full texts.

A search strategy has been developed using the key words 'cellulitis', 'diagnosis' and 'challenges' with controlled vocabulary (MeSH term and Emtree) and free text headings (see Appendix 1).

Study selection

Following the search, all identified citations will be collated and uploaded into EndNote X8 and duplicates removed manually by one reviewer (MP). Titles and abstracts will then be screened against the inclusion and exclusion criteria for the review by two reviewers independently (MP and SIL) using a title and abstract screening template and algorithm (see Appendix 2). Specifically, to help narrow the broad search, if the term 'cellulitis', 'erysipelas' or 'skin and soft tissue infection' is not in the title or abstract then the article will be excluded. If the abstract does not discuss 'diagnosis' then the search will be excluded. At this stage, if the site of cellulitis is not clearly stated in the title or abstract then the article will be included to avoid missing any data. If misdiagnosis of lower limb cellulitis is highlighted, or misdiagnosis of cellulitis where the site is unclear, the search will be included. If the abstract is not available, then the full paper will be retrieved if possible and included in the title and abstract screening stage.

Studies that may meet the criteria will be retrieved in full by MP. Full text studies that then do not meet the inclusion and exclusion criteria, using a full text screening template and algorithm (see Appendix 3), will be excluded. Reasons for exclusion will be provided in an appendix in the final scoping review report in a PRISMA flow diagram. Studies that are not reported in English language and where a colleague in the department is not proficient in that language will be excluded. The PRISMA flow diagram will also show the result of the complete search. Any disagreements that arise between the two reviewers will be resolved through discussion, or with a third independent reviewer (KST or JK).

Data extraction

Data will be extracted from papers included in the review, using a data extraction template (Appendix 4) by two independent reviewers (MP and SIL). A data extraction pilot using three papers will initially be carried out by two reviewers (MP and SIL). The data extracted will include the study aim, study type, study population and findings describing the challenges in diagnosis. Any disagreements that arise between the reviewers will be resolved through discussion or with a third independent reviewer (KST or JK). Authors of papers will be contacted to request missing or additional data where required.

Data presentation

A qualitative method of thematic analysis [14] will provide key themes (see Figure 1). Coding and theme development will be carried out by one reviewer (MP), however a second reviewer (SIL) will check the themes against the paper for accuracy and will be discussed

with a third reviewer (KST or JK) if disagreements arise. Quantitative data will be collated and summarized as a numerical summary.

Figure 1: Flowchart showing how the thematic analysis will be completed

This protocol was developed using the methodological framework suggested by the Joanna Briggs Institute [13] and will be published on the Centre of Evidence Based Dermatology website under protocol registration.

Conflicts of Interest

None

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References

1. Raff AB, Kroshinsky D. (2016). Cellulitis: A Review. JAMA. 316(3):325-337.
2. Lazzarini L, Conti E, Tositti G, de Lalla F. (2005). Erysipelas and cellulitis: clinical and microbiological spectrum in an Italian tertiary care hospital. J Infect. 51(5):383-9.
3. Ginsberg MB. (1981). Cellulitis: analysis of 101 cases and review of the literature. South Med J. 74(5):530-3.
4. Morris AD. (2008). Cellulitis and erysipelas. BMJ Clin Evid. 2008; 01:1708.
5. Bergkvist PI, Sjöbeck K. (1998). Relapse of erysipelas following treatment with prednisolone or placebo in addition to antibiotics: a 1-year follow-up. Scand J Infect Dis. 30(2):206-207.
6. Pavlotsky F, Amrani S, Trau H. (2004). Recurrent erysipelas: risk factors. J Dtsch Dermatol Ges. 2(2):89-95.
7. Health & Social Care Information Centre. Hospital Episode Statistics.
8. Department of Health. Hospital episode statistics for England, 2001–2. Available from URL: www.doh.gov.uk/hes/free_data/index.html.
9. NHS. (2008). Institute for innovation and improvement. Quality and service improvement tools. Available from URL: www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/length_of_stay.html.
10. Thomas KS, Brindle R, Chalmers JR, et al. (2017). Identifying priority areas for research into the diagnosis, treatment and prevention of cellulitis (erysipelas): results of a James Lind Alliance Priority Setting Partnership. Br J Dermatol. 177(2):541-543.
11. Weng QY, Raff AB, Cohen JM, et al. (2017). Costs and Consequences Associated With Misdiagnosed Lower Extremity Cellulitis. JAMA Dermatol. 153(2):141–146.
12. David CV, Chira S, Eells SJ, et al. (2011). Diagnostic accuracy in patients admitted to hospitals with cellulitis. Dermatol Online J. 17(3):1.
13. Peters MD, Godfrey CM, Khalil H et al. (2015). Guidance for conducting systematic scoping reviews. Int J Evid Based Healthc. 13(3):141–146.
14. Thomas J, Harden A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Med Res Methodol. 8:45.

Appendix 1

Database search terms

OVID MEDLINE

1. diagnos$.mp. 2. differentiat$.mp. 3. discriminat$.mp. 4. determinin$.mp. 5. confirmat$.mp. 6. ascertainment.mp. 7. detect$.mp. 8. characteris$.mp. 9. characteriz$.mp. 10. identification.mp. 11. identify.mp. 12. exp diagnosis/ 13. or/1-12 14. exp diagnostic errors/ 15. challenge$.mp. 16. error$.mp. 17. mistake$.mp. 18. inaccurac$.mp. 19. delay$.mp. 20. misdiagnos$.mp. 21. mimic$.mp. 22. or/14-21 23. exp cellulitis/ 24. cellulitis.mp. 25. exp erysipelas/ 26. erysipelas.mp. 27. soft tissue infection.mp 28. exp soft tissue infections/ 29. soft tissue infections.mp. 30. skin soft tissue infection.mp. 31. skin soft tissue infections.mp 32. SSTI.mp. 33. or/23-32 34. 13 and 22 and 33

EMBASE

1. diagnos$.mp. 2. differentiat$.mp. 3. discriminat$.mp. 4. determinin$.mp. 5. confirmat$.mp. 6. ascertainment.mp. 7. detect$.mp. 8. characteris$.mp. 9. characteriz$.mp. 10. identification.mp. 11. identify.mp. 12. exp diagnosis/ 13. or/1-12 14. exp diagnostic errors/ 15. challenge$.mp. 16. error$.mp. 17. mistake$.mp. 18. inaccurac$.mp. 19. delay$.mp. 20. misdiagnos$.mp. 21. mimic$.mp. 22. or/14-21 23. exp cellulitis/ 24. cellulitis.mp. 25. exp erysipelas/ 26. erysipelas.mp. 27. soft tissue infection.mp 28. exp soft tissue infections/ 29. soft tissue infections.mp. 30. skin soft tissue infection.mp. 31. skin soft tissue infections.mp 32. SSTI.mp. 33. or/23-32 34. 13 and 22 and 33

Appendix 2

Title and abstract screening template and algorithm

Name of reviewer	
Date	
Author	
Journal	
Title	
Year	
Eligibility algorithm	1. If the answer to any of the following are yes, then stop screening and exclude the search immediately without completing the full algorithm: Is this an animal study? ☐ No ☐ Yes - exclude Is this a laboratory in-vitro study? ☐ No ☐ Yes – exclude Is this explicitly about non lower limb cellulitis? (if unsure, the site of cellulitis is not clear or about misdiagnosis then do not exclude and continue the algorithm) ☐ No ☐ Yes – exclude 2. If the answer to any of the following are no, then stop screening and exclude the search immediately without completing the full algorithm: Are the terms 'cellulitis', 'erysipelas' or 'skin and soft tissue infection' in the title or abstract? ☐ No – exclude ☐ Yes Discusses 'diagnosis' in abstract? ☐ No - exclude ☐ Yes A patient or carer of a patient with lower limb cellulitis or health care professionals' view or finding? ☐ No - exclude ☐ Yes If the search has not been excluded based on the above, then include the search from this screening stage

Appendix 3

Full text screening template and algorithm

Name of reviewer	
Date	
Author	
Journal	
Title	
Year	
Eligibility algorithm	1. If the answer to any of the following are yes, then stop screening and exclude the text immediately without completing the full algorithm: Is this an animal study? ☐ No ☐ Yes - exclude Is this a laboratory in-vitro study? ☐ No ☐ Yes – exclude Is this explicitly about non lower limb cellulitis? (if unsure, the site of cellulitis is not clear or about misdiagnosis then do not exclude and continue the algorithm) ☐ No ☐ Yes – exclude 2. If the answer to any of the following are no, then stop screening and exclude the search immediately without completing the full algorithm: Does this paper discuss challenges in the diagnosis of lower limb cellulitis? (if site of cellulitis is unclear then do not exclude) ☐ No - exclude ☐ Yes A patient or carer of a patient with lower limb cellulitis or health care professionals' view or finding? ☐ No - exclude ☐ Yes An associate expert available for non –English language texts? ☐ No – exclude ☐ Yes If the search has not been excluded based on the above, then include the search for data extraction

Appendix 4

Data extraction template for papers included

Name of reviewer	
Date	
Title	
Author (s)	
Year of publication	
Country of origin	
Funding source – commercial or industry	
Study aim (either specified in or inferred from the paper)	
Study type and description	
Study population	
Study inclusion/exclusion criteria	
Sample size recruited	
Key findings	Criterion ☐ Investigations ☐ Differential diagnoses ☐ Knowledge ☐ Other…….. ……
Comments – by the authors and your opinions	

Further information to help the reviewer during data extraction

Country of origin
Where was the study undertaken?

Study aim
What are the main aims of the study? If this is not described clearly, then look at the outcomes from the results/discussion.

Study type and description
Is this a case report/review article/ observational study etc?

Study population
Provide information on the age range, ethnicity, gender, co-morbidities and disease characteristics. Where was the study undertaken – primary care/secondary or emergency care?

Study inclusion/exclusion criteria
If included state what they were

Sample size
The number of patients in the study: document cases and controls separately.

Key findings
Provide results for any challenges in the diagnosis of cellulitis. This can include reasons for misdiagnosis, problems with investigation results, lack of knowledge.

Comments
This includes the strengths and limitations on the methods used, analysis of data and how the data was interpreted. What were the strengths/limitations described in the discussion and do you agree?