

A. Hub and spoke search strategy

Review aim:

To identify and evaluate the application and implementation of HSM in AMS programmes

Review question:

Primary: How is the HSM model implemented within AMS programmes?

Secondary: What is the effectiveness of the HSM model in delivering interventions in AMS programmes?

To develop the search strategy, the following steps were used:

Define a research question

Identify key concept

Identify MeSH terms

Search for keywords

Find alternate search terms

Use truncation, boolean operators

Define search limits

Model	Aspect	Interventions-effectiveness	Key term 4	Intervention- implementations	Miscellaneous
Hub and spoke	Antimicrobial	Knowledge	implementati on	Adopt*ion	CFIR
Hub and spoke model	Antimicrobial stewardship	Training of healthcare professionals	barrier*	Implementat ion	Proctor et al
Hub-and-spoke model	Antibiotic stewardship	Establishment of ASP	facilitator*	Reach	RE-AIM
ECHO	AMS	Development of antibiogram	Barriers and facilitator*	effectiveness	Project ECHO

Hub and spoke network	Antimicrobial stewardship programme	Development of policies or guidelines	Barriers & facilitator*	adoption	Implementation frameworks
Star network	Healthcare	Pre- and post-intervention surveys <ul style="list-style-type: none"> - Identification of pattern of use of medication - Change in classes of antibiotics used - Acceptability and feasibility by healthcare professionals of the hub and spoke model - Barriers to the application of the hub and spoke model 	determinant*	maintenance	One health-Animals
	Infection		implement*	Accept*abili	health

	Infectious / Infectious diseases			ty	
	Medicine*		challenge*	Penetration	Health care
	Drug Resistance, Microbial		limit*ation	Sustain*ability	healthcare
	Antimicrobial resistance		evaluation	Appropriat*eness	Health and social care
	AMR		Program evaluation	Cost*	
	Antibiotic resistance			Feasibility	
				Fidelity	
				evaluation	

Search criteria/limitation

English language-

Inception- (no year filter)

Full papers

Excluding abstracts- IPC abstracting- needed full papers

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> AMS related articles that applied the HSM with an economic, clinical or humanistic outcome Application of HSM in AMS context in 	<ul style="list-style-type: none"> Articles focused on diagnosis of diseases, gene therapy, digital health and surgical outcomes Studies conducted in a single setting

<ul style="list-style-type: none"> ● both adult and/or pediatric populations ● Application of HSM in antimicrobial prescribing/use ● Studies discussing the application of HSM in AMS context (including protocols and commentaries) ● Studies evaluating or exploring the barriers and facilitators of applying HSM in AMS context 	<ul style="list-style-type: none"> ● Studies focusing on veterinary medicine ● Studies focusing only on educational activities e.g. ECHO training model
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B. Search strategies:

Database: PubMed

Search: PubMed Advanced Search Builder

1. hub and spoke model* OR hub-and-spoke model AND antimicrobial stewardship (1)
2. hub and spoke model* AND antibiotic stewardship (0)
3. hub-and-spoke model* AND AMS (1)
4. hub-and-spoke model* AND healthcare* (215)
5. 4 AND Free full text (0)
6. 5 AND from 2013 - 2023 (188)
7. 5 AND 6 (181)
8. 4 AND 7 AND Full text (113)
9. 8 AND Review (20)
10. 9 OR Books and Documents (21)
11. hub-and-spoke model* AND medicine* AND Free full text AND Full Text AND Books and Documents OR Review (0)
12. hub-and-spoke model* AND medicine* (195)
13. 12 AND from 2013 - 2023 (178)
14. 13 AND Full text (173)
15. 14 AND Free full text (103)
16. hub-and-spoke model* AND infection* AND Free full text AND Full text (37)
17. 16 AND Review (0)
18. hub-and-spoke model* AND infection* (56)

19. 18 AND from 2013 - 2023 (53)
20. 19 AND Free full text (36)
21. 16 and 19 (36)
22. 21 AND Review (3)
23. 22 OR Books and Documents (3)
24. Project ECHO AND antimicrobial stewardship (0)
25. 24 AND Free full text AND Full text AND Books and Documents OR Review (0)
26. Project ECHO AND antibiotic* (7)
27. 26 AND from 2013 - 2023 (6)
28. 27 AND Free full text (3)
29. 28 AND Free full text AND Full text (3)
30. hub-and-spoke model* AND antibiotic* (1)
31. 30 AND Free full text AND Full text (1)
32. Project ECHO AND antibiotic stewardship (0)
33. 32 AND Free full text AND Full text (0)
34. Project ECHO AND healthcare* (427)
35. 34 AND from 2013 - 2023 (404)
36. 35 AND Free full text (241)
37. 35 AND 36 AND Full text (241)
38. Project ECHO and AMS AND Free full text AND Full text AND Review (0)
39. Project ECHO and AMS (4)
40. 39 AND Free full text (3)
41. 40 AND Full text (3)
42. Project ECHO AND medicine* (700)
43. 42 AND Free full text AND Full text (380)
44. 43 AND from 2013 - 2023 (343)
45. 44 AND Review (11)
46. 45 OR Books and Documents (11)

- 47. Project ECHO AND infection* (147)
- 48. 47 AND From 2013 - 2023 (132)
- 49. 48 AND Free full text AND Full text AND Books and Documents OR Review (6)
- 50. hub-and-spoke model* AND Free full text AND Full text AND Books and Documents OR Review (34)
- 51. 47 AND 50 AND 43 From 2013 - 2023 (588)

Cochrane Review

Cochrane Library Advanced Search Builder

- 1. Project ECHO AND Infection AND July 2013 – January 2024 (0)
- 2. Project ECHO AND Medicine AND July 2013 – January 2024 (0)
- 3. Project ECHO AND Healthcare AND July 2013 – January 2024 (0)
- 4. Project ECHO AND Antibiotic AND July 2013 – January 2024 (0)
- 5. Hub and Spoke Model AND Infection AND July 2013 – January 2024 (0)
- 6. Hub and Spoke Model AND medicine AND July 2013 – January 2024 (0)
- 7. Hub and Spoke Model AND Healthcare AND July 2013 – January 2024 (0)
- 8. Hub and Spoke Model AND AMS AND July 2013 – January 2024 (0)
- 9. Hub and Spoke Model AND Antibiotic Stewardship AND July 2013 – January 2024 (0)
- 10. Hub and Spoke Model AND Antimicrobial Stewardship AND July 2013 – January 2024 (0)
- 11. Hub and Spoke Model OR Hub-and-Spoke-Model AND Antimicrobial Stewardship AND July 2013 – January 2024 (0)

ScienceDirect

Science Direct Advanced Search Builder

- 1. Hub and Spoke Model OR Hub-and-Spoke-Model AND 2013 – 2024 AND Open access & Open archive AND Review Articles OR Research Articles (370)
- 2. 1 AND Antimicrobial Stewardship (9)
- 3. 1 AND Antibiotic Stewardship (6)
- 4. 1 AND AMS (2)
- 5. 1 AND Healthcare (257)
- 6. 1 AND Infection (147)
- 7. Project ECHO AND 2013 – 2024 AND Open access & Open archive AND Review Articles OR Research Articles (380)
- 8. 7 AND antimicrobial stewardship (18)
- 9. 7 AND AMS (20)
- 10. 7 AND antibiotic stewardship (15)
- 11. 7 AND healthcare (2786)
- 12. 7 AND Infection (1300)
- 13. 6 AND 7 AND 2 AND 3 (379)

Google Scholar:

1. Initial search combining main concepts:
("hub and spoke model" OR "hub-and-spoke model") AND "antimicrobial stewardship"
2. Expanded search with related terms:
("hub and spoke model" OR "hub-and-spoke model" OR "Project ECHO") AND ("antimicrobial stewardship" OR "antibiotic stewardship" OR AMS)
3. Inclusion of healthcare context:
("hub and spoke model" OR "hub-and-spoke model" OR "Project ECHO") AND ("antimicrobial stewardship" OR "antibiotic stewardship" OR AMS) AND (healthcare OR medicine OR infection)
4. Application of filters:
 - Date range limited from 2013 to 2023
 - "Articles" selected to exclude patents and citations
 - "Review articles" chosen when focusing on literature reviews
5. Utilization of advanced search features:
 - "with all of the words" field: hub spoke antimicrobial stewardship
 - "with the exact phrase" field: "hub and spoke model"
 - "with at least one of the words" field: antibiotic AMS ECHO
6. Exploration of term combinations:
("hub and spoke" OR "hub-and-spoke" OR ECHO) AND (antimicrobial OR antibiotic) AND stewardship AND (healthcare OR medicine OR infection)
7. Refinement using Boolean operators:
("hub and spoke model" OR "hub-and-spoke model" OR "Project ECHO") AND ("antimicrobial stewardship" OR "antibiotic stewardship" OR AMS) AND (healthcare OR medicine OR infection) NOT logistics
8. Focus on implementation and effectiveness:
("hub and spoke model" OR "hub-and-spoke model" OR "Project ECHO") AND ("antimicrobial stewardship" OR "antibiotic stewardship" OR AMS) AND (implementation OR effectiveness OR evaluation)
9. Full-text article search:
"filetype:pdf" added to searches to locate full-text articles
10. Related article exploration:
"Related articles" links utilized to find similar papers

11. Citation chaining:

"Cited by" feature used for relevant articles to identify more recent citing papers

12. Result refinement:

Search within initial results performed for specific terms like "implementation" or "effectiveness"