Antimicrobial Stewardship & Healthcare Epidemiology (2024), **4**, e108, 1–8
doi:10.1017/ash.2024.349

SHEA

Review

Pharmacist-led antimicrobial stewardship at transitions of care from inpatient hospital to home: a scoping review

Mishka Danchuk-Lauzon PharmD[1,2]

[1]Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada and [2]Department of Pharmacy, Sunnybrook Health Sciences Centre, Toronto, ON, Canada

Abstract

Objective: To summarize available literature and highlight research gaps pertaining to the role of a pharmacist in providing antimicrobial stewardship (AMS) interventions for antibiotics at transitions of care (TOC) from inpatient hospital settings to home.

Design: Scoping review.

Methods: This scoping review follows the Arksey and O'Malley methodological framework. The literature search was conducted using the MEDLINE (OVID) database.

Results: The MEDLINE (OVID) search returned 45 results. Of these, 26 were excluded during title and abstract screening and 11 were excluded after full-text review. Overall, eight studies were included in this scoping review. In six of the studies, AMS interventions were pharmacist-led. In two studies, they were led by an AMS team which included a pharmacist. Six of the studies used a similar intervention where a pharmacist led the review of antibiotics prior to patient discharge and made recommendations to change therapy where appropriate. The details of how these interventions were carried out vary between studies.

Conclusions: Overall, all studies included in this scoping review concluded that pharmacists have a role in providing AMS interventions at TOC. This scoping review summarized available literature pertaining to the role of the pharmacist in providing AMS interventions for antibiotics at TOC. Research gaps that were highlighted are optimal level of AMS training for pharmacists providing AMS interventions, optimal workflow, ideal method of communication to the prescriber, and quality improvement metrics.

(Received 23 June 2023; accepted 6 May 2024)

Introduction

Antimicrobial resistance is a top global public health threat, affecting all countries at all income levels.[1] In 2019, an estimated 4.95 million deaths were associated with bacterial antimicrobial resistance.[2] Of those, approximately 1.27 million were attributable to bacterial antimicrobial resistance.[2] Antimicrobial resistance creates the need for more costly and intensive care, while also affecting the productivity of patients and their caregivers.[1] Notably, data from across the globe exhibits concerning rates of third-generation cephalosporin-resistant *E. coli* and methicillin-resistant *Staphylococcus aureus*.[1]

Antimicrobial stewardship (AMS) helps limit the development of organisms resistant to antimicrobials through the promotion of judicious use.[3] Many hospitals have a formal Antimicrobial Stewardship Program (ASP) which supports the implementation of interventions that improve and measure the appropriate use of antimicrobials (selection, dosing, duration of therapy, and route of administration).[3] Pharmacists often play a large role in ASP, with responsibilities that include but are not limited to (1) reviewing patient antimicrobial regimens; (2) influencing choice of antimicrobials through formulary restrictions, decision support systems, and practice guidelines; (3) offering guidance with regards to dosage, preparation, and administration of antimicrobials; (4) ensuring proper antimicrobial duration of therapy; and (5) assessing antimicrobial prescriptions provided at discharge.[4] Although antibiotics are commonly prescribed at transitions of care (TOC) (eg, inpatient hospital discharge to home), review of antibiotics at hospital discharge is not a common function of an ASP.

A study published in 2020 by Brower et al sought to assess total antibiotic duration for patients with select infectious disease (ID) diagnoses across TOC from the inpatient to outpatient setting.[5] This was done through retrospective analysis of discharge prescriptions for patients admitted to general surgery and medicine services at an academic medical center.[5] A total of 101 patients were included in the study.[5] The researchers found that most patients (81%) were prescribed antibiotics longer than was recommended by national guidelines with only 3% of patients receiving less than the recommendation.[5] These study results

Corresponding author: Mishka Danchuk-Lauzon; Email: mishka.danchuk.lauzon@mail.utoronto.ca

Cite this article: Danchuk-Lauzon M. Pharmacist-led antimicrobial stewardship at transitions of care from inpatient hospital to home: a scoping review. *Antimicrob Steward Healthc Epidemiol* 2024. doi: 10.1017/ash.2024.349

highlight a gap in patient care and a potential opportunity for evaluation of antibiotic use at TOC.[5]

Pharmacists, as medication experts, are well positioned to tailor antimicrobial therapy (eg, dosing, choice of antimicrobial, drug interactions) at the time of TOC from inpatient hospital settings to home. The extent of the literature published on this topic is not currently known, and research gaps have not yet been highlighted.

Objectives

The primary objective of this scoping review is to summarize available literature pertaining to the role of the pharmacist in providing AMS interventions for antibiotics at TOC from inpatient hospital settings to home. The secondary objective is to highlight research gaps pertaining to this topic.

Methods

This scoping review was conducted using the Arksey and O'Malley methodological framework.[6] This framework is comprised of five stages: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results.[6]

Identifying the research question

The research question for this scoping review was: *what is known from the existing literature about the role of pharmacists in AMS interventions at the time of hospital discharge?* From this, three key concepts were identified: pharmacists, AMS, and TOC. The author, Mishka Danchuk-Lauzon (MDL), consulted with a librarian to create a search strategy.

Identifying relevant studies

The literature search strategy used for this scoping review is provided in Appendix 1. The search was conducted through the MEDLINE database on January 3, 2023.

Study selection

After briefly screening the literature, inclusion and exclusion criteria were developed to help with study selection. Studies detailing pharmacist-led AMS interventions with regard to antibiotics at TOC (inpatient to outpatient/home) were included. The exclusion criteria for this study were as follows: focus on pediatric patients (<18 years of age), pharmacists included but not involved in a primary role, focus on a single disease state, and focus on an emergency medicine setting. The above were excluded as this scoping review was focused on adult patients with TOC from an inpatient hospital setting to outpatient/home with treatment of any disease. The role of pharmacists is a key element in the research question, and thus, they must have been involved in the AMS interventions. Figure 1 provides an overview of the study selection process. Study abstracts and titles were screened by MDL using Covidence software. Subsequently, full-text review of articles was completed by MDL. Citations were managed through EndNote 20.

Charting the data

Key information was charted in Microsoft Excel for Mac (version 16.73). The following information was recorded: authors, year published, country, study design, setting, time frame, TOC type, whether or not the intervention was pharmacist-led, intervention, number of participants in intervention group, control/comparator, number of participants in the control group, results, and conclusion.

Collating, summarizing, and reporting the results

The summarized data in table format can be found in Tables 1 and 2 and are described below. The *PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation* was completed to ensure this scoping review met required standards (see supplementary material).[7]

Results

Study characteristics

The MEDLINE search returned 45 results. Of these, 26 were excluded during the title and abstract screening (see Figure 1 for more detail). Subsequently, 19 studies were considered for inclusion in the scoping review. Of these, nine were excluded as they were focused on an emergency medicine setting; one was excluded as it focused on an outpatient setting (urgent care center), and one was excluded as it did not contain a specific intervention. Overall, eight studies were included in this scoping review.[8–15] All studies were conducted in the United States, except for the study by Chavada et al, which was conducted in Australia.[8–15] Five of the studies were prospective and three of them were retrospective.[8–15] The study time frame ranged from 4 weeks to 1 year, and the studies were all conducted between 2013 and 2021.[8–15] All studies were published between 2018 and 2022.[8–15] Most were single-center studies in a wide range of institutions such as teaching hospitals, non-teaching hospitals, community hospitals, tertiary care centers, and a quaternary care center.[8–12,14,15] The study by Mercuro et al was conducted in a health system that included one academic tertiary center and four community hospitals.[13] The number of participants in the intervention group ranged quite widely with the study by Leia et al, being the one with the most participants (1,100 participants), and the study by Manis et al, being the one with the least participants (20 participants).[8–15]

Overview of interventions

The type of intervention varied across the included studies. In six of the studies, AMS interventions were pharmacist-led.[9–14] In two studies, they were led by a team which included a pharmacist (these were AMS teams).[8,15] The type of TOC was not explicitly stated in any study. In Parsels et al, the type of TOC is not specified, but all prescriptions reviewed were sent to the outpatient hospital pharmacy.[14] It is implied in other studies that transitions are to an outpatient setting.[8–13,15] All studies concluded that pharmacists have a role in providing AMS interventions at TOC.[8–15]

Retrospective audit of interventions

The study by Chavada et al retrospectively audited patient discharge prescriptions that were processed by the pharmacy department and noted whether any interventions were performed by the AMS team (which included a pharmacist).[8] They found that of the discharge prescriptions that contained antimicrobials, 74% were appropriate for choice of antimicrobial, 64% for the dose and frequency, and 21% for the duration of therapy.[8] If the AMS team

https://doi.org/10.1017/ash.2024.349 Published online by Cambridge University Press

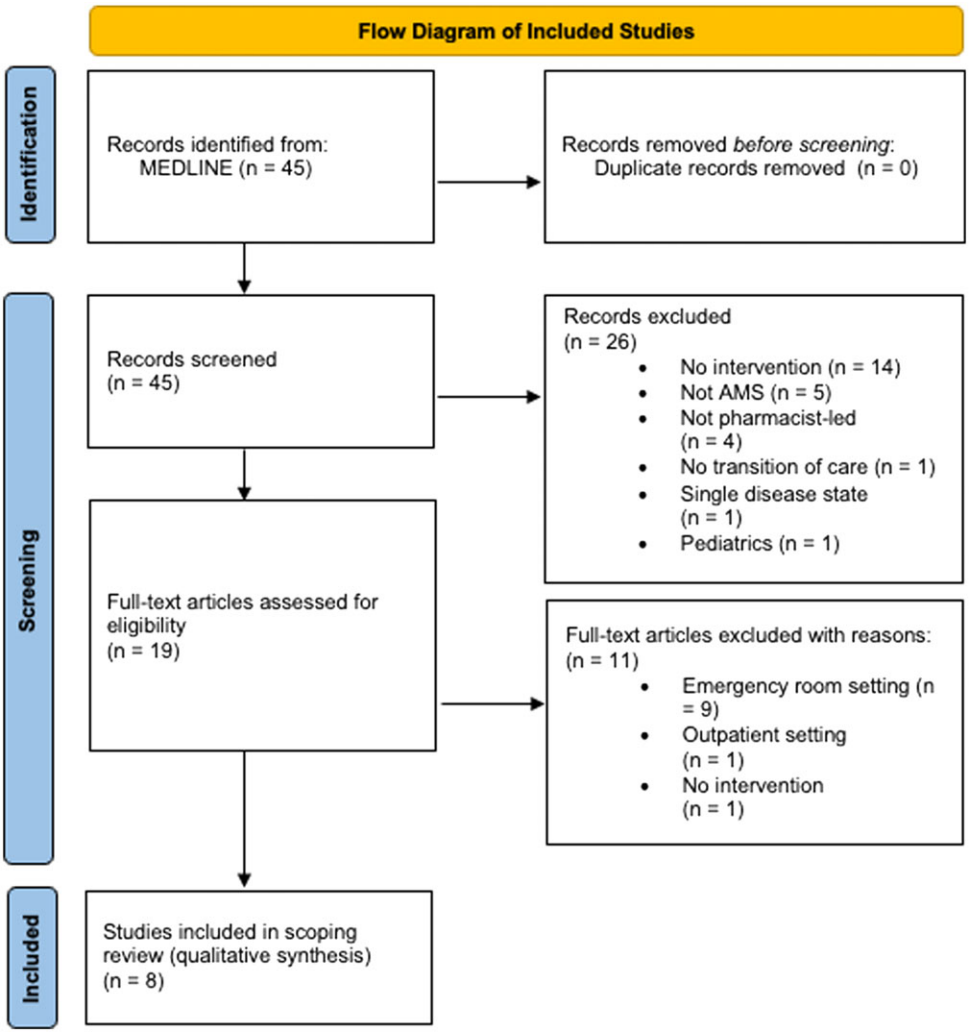

Figure 1. Flow diagram of included studies.

was involved, discharged prescriptions were more likely to be appropriate.[8]

Postdischarge intervention

The intervention in the study by Jones et al was conducted postdischarge.[10] In their study, they followed up on unresolved cultures and whether the pathogen was susceptible to the prescribed antimicrobials, if not susceptible, a recommendation to change therapy was made to the prescriber.[10] When compared to a historical cohort, there was a 3.6-fold increase in AMS-related interventions among the discharged patients; additionally, inappropriate outpatient antimicrobial use was reduced by 39%.[10]

Predischarge intervention

The remaining six studies all used a similar intervention where a pharmacist facilitated the review of antimicrobials prior to patient discharge and made recommendations to change therapy where appropriate.[9,11–16] The details of how these interventions were carried out vary slightly between studies.[9,11–16] For example, in the study by Parsels et al, discharge prescriptions for antimicrobials sent to the hospital outpatient pharmacy were reviewed by the inpatient ID pharmacist (who was alerted by the outpatient pharmacist of these).[14] Prescribers were then contacted if issues were identified and recommendations were made.[14] In the study by Leja et al, TOC pharmacists reviewed discharge medication lists to optimize their pharmacological therapy (including antimicrobials).[11] Prescribers were then contacted if issues were identified and recommendations were made.[11] Results of these studies are summarized in Tables 1 and 2.

Discussion

All studies included in the scoping review highlighted the opportunity or importance of pharmacist-led AMS interventions at discharge.[8–15] From the literature summarized in the scoping review, key elements have been identified that need to be considered for the successful implementation of AMS interventions by pharmacists at discharge.

AMS training

Pharmacists included in the studies had varied backgrounds, these included AMS, ID, TOC, and no specialization.[8–15] It is not clear from the literature whether an AMS intervention at TOC has the same impact when recommended by a pharmacist specialized in AMS/ID compared to a pharmacist with no specialization. This needs to be clarified as many ASPs may not be able to receive additional funding and expand their activities to patients at TOC.

https://doi.org/10.1017/ash.2024.349 Published online by Cambridge University Press

Table 1. Overview of studies

Study	Year	Country	Study design	Setting	Time frame	TOC type	Pharmacist-led intervention?
Chavada et al	2018	Australia	Retrospective audit	300-bed teaching hospital	Mar 2016 (4 weeks)	Not specified	No (ID physician and AMS pharmacist)
Giesler et al	2022	USA	Prospective, controlled pilot study	Large academic quaternary referral hospital	May 1, 2019, to Oct 31, 2019	Not specified	Yes
Jones et al	2018	USA	Prospective cohort study	583-bed integrated tertiary care center	Feb 3, 2016, to Mar 2, 2016	Not specified	Yes
Leja et al	2021	USA	Retrospective descriptive study	537-bed community teaching hospital	Jan 2017 to Jun 2018	Not specified	Yes
Manis et al	2022	USA	Quasi-experimental before-and-after study	252-bed community non-teaching hospital	Nov 2019 to May 2020	Not specified	Yes
Mercuro et al	2022	USA	QI, non-randomized stepped-wedge design (3 phases)	Health system including: 1 academic tertiary center and 4 community hospitals	Sep 1, 2018, to Aug 31, 2019	Not specified	Yes
Parsels et al	2022	USA	Retrospective descriptive study	472-bed, level 1 trauma, tertiary care academic medical center (and 72-bed pediatric hospital)	Sept 1, 2020, to Feb 28, 2021	Not specified (RXs sent to the hospital outpatient pharmacy)	Yes
Su et al	2019	USA	Prospective	416-bed community teaching hospital	Oct 2013 to May 2014	Not specified	No (ID physicians, ID clinical pharmacists, and PGY-2 ID resident)

TOC, transition of care; ID, infectious disease; AMS, antimicrobial stewardship; QI, quality improvement; RXs, prescriptions; PGY-2, postgraduate year two.

For pharmacists with no specialized training in AMS/ID, it would be helpful to define the type of training needed to provide AMS interventions, ensuring that this practice is generalizable.

Workflow

Workflows vary greatly across hospitals, as evidenced by the various approaches to AMS interventions described in studies included in this scoping review. Therefore, the optimal approach to implementing AMS interventions is likely site specific with established guiding principles. Establishing the AMS interventions as routine practice and communicating impact is likely important for consistency. AMS interventions may become a component of an already established workflow where a pharmacist is involved (such as medication reconciliation on discharge) for ease of implementation.

Additional research is needed regarding optimal timing for the AMS intervention. In five of the studies reviewed, the AMS intervention was conducted prior to discharge.[9,12–15] In one of the studies, it was conducted after discharge.[10]

Interprofessional communication

A crucial step in conducting AMS interventions is the communication to the prescriber of the recommendation.[9,10,12–15] Consideration should be made for the way in which AMS interventions are communicated for successful implementation while avoiding delays in patient care. Responsibilities regarding order adaptation and patient counseling also need to be defined.

For individual institutions, the process should be mapped prior to being implemented. There may be process barriers to implementation such as Electronic Health Record limitations, medical directives that need to be put into place, and inadequate staffing.

Quality improvement

Metrics need to be defined that can be used to assess the success of implementation of pharmacist-led AMS interventions at TOC. It will be important to track the impact of pharmacist-led AMS interventions on appropriate baseline metrics. This data can be used for continuous quality improvement, increased funding, and identification of gaps in the process.

Strengths and limitations

This scoping review has many strengths. First, this scoping review provides a comprehensive overview of the available literature related to the research question. Second, this scoping review highlights research gaps and provides direction for future research. Third, the methodology used to conduct this scoping review is commonly used and easily replicable. Finally, the literature included in this scoping review is quite diverse with regard to methodology, size, and type of intervention.

This scoping review carries some limitations. First, due to the nature of scoping review methodology, the quality of studies was not assessed. Second, only one database was searched for literature. However, MEDLINE OVID is one of the most widely used databases for medical research, and the search was conducted with the help of a librarian to ensure it was comprehensive.

Overall, the literature included in this scoping review suggests that pharmacist-led AMS interventions prior to discharge from an inpatient hospital setting to home is a potentially beneficial strategy for reducing inappropriate antibiotic use at TOC. Many

https://doi.org/10.1017/ash.2024.349 Published online by Cambridge University Press

Table 2. Comparison of studies

Study	Intervention	# of participants in intervention group	Control/comparator	# of participants in the control group	Results	Conclusion
Manis et al	1. Baseline data collected, followed by prescriber education on AMS to both units (education phase). 2. Pharmacist-led intervention took place in one unit (intervention phase)	20	Unit with no pharmacist-led intervention	12	From baseline to post education, no significant change in composite appropriateness was found in the control or intervention unit. There was no significant difference between the education and intervention phases in the control unit. In the intervention unit, a significant difference in composite appropriateness was found from the education to intervention phase	A pharmacist-led intervention improved appropriateness of oral antimicrobials prescribed at discharge. One-time education was insufficient for improving AMS
Mercuro et al	Pharmacists identified patients to be discharged with a prescription for oral antimicrobials and collaborated with primary teams to prescribe optimal therapy	400 participants in postintervention group	Preintervention group	400 participants in the preintervention group	Patients in the postintervention group were more likely to have an optimal antimicrobial prescription. There were no differences in clinical resolution or mortality. Fewer severe antimicrobial-related adverse effects were identified in the postintervention compared with the preintervention groups	Targeted AMS interventions during TOC were associated with increased optimal, guideline-concordant antimicrobial prescriptions at discharge
Parsels et al	ID pharmacist reviewed oral antimicrobial prescriptions sent to the hospital-operated outpatient pharmacy. Prescribers were contacted and recommendations were made to optimize drug therapy if needed	803 discharge oral antimicrobial prescriptions	N/A	N/A	Of the 803 discharge oral antimicrobial prescriptions reviewed, at least 1 DRP was identified in 43.1%. In total, 438 interventions were made and the acceptance rate was 75.6%. When interventions to reduce treatment duration were accepted, the median number of antimicrobial days decreased from 8 days to 4 days	An ID pharmacist's review of discharge oral antimicrobial prescriptions resulted in identification of DRPs and subsequent interventions in a substantial number of prescriptions
Su et al	Patients anticipated to be discharged within 48 hours who had a prescribed anti-infective agent were evaluated by the ASP team for appropriateness. Potential interventions were then communicated and discussed with the primary team physician or ID consultant prior to discharge	45 participants discharged on 59 anti-infective prescriptions	N/A	N/A	A ME was identified in 42% of anti-infective regimens. 70% of ASP team recommendations were accepted which resulted in an avoidance of MEs in 68% of patients with an ME prior to discharge	Developing a systematic process for a multidisciplinary ASP team to review all anti-infectives can be a valuable tool in preventing MEs at hospital discharge
Chavada et al	Patients with discharge medications processed by the pharmacy department were identified and any interventions performed by the AMS team were noted	46 discharge prescriptions with AMS intervention	No AMS intervention	217 D/C RXs with no AMS intervention	236 of 892 D/C RXs contained antimicrobials. Of those, 74% were appropriate for antimicrobial choice, 64% for dose, 64% for frequency, and 21% for duration. D/C antimicrobial RXs were more likely to be appropriate when the AMS team was involved	Clear need for AMS interventions to extend to antimicrobial therapy prescribed on discharge

(*Continued*)

Table 2. (*Continued*)

Study	Intervention	# of participants in intervention group	Control/comparator	# of participants in the control group	Results	Conclusion
Giesler et al	Pharmacist facilitated antibiotic timeout prior to discharge. The timeout addressed key elements of stewardship and was designed and implemented using iterative cycles with rapid feedback	417	No timeout	294	Pharmacists conducted 288 antibiotic timeouts. Timeouts were feasible and acceptable. Pharmacists recommended an antibiotic change in 25% of timeouts with 70% of changes being accepted. Compared to control, there were no differences in antibiotic use after D/C during the intervention	A pharmacist-facilitated antibiotic timeout at discharge was feasible and holds promise as a method to improve antibiotic use at discharge
Jones et al	If a pathogen nonsusceptible to all prescribed antimicrobials was identified postdischarge, a recommendation for therapy modification was communicated to the prescriber	38	Historical cohort discharged from the treatment facility without ASP outpatient follow-up between Sept 18, 2015, and Oct 18, 2015	63	When final culture susceptibilities were considered, 5 of 38 patients had been prescribed an inappropriate antimicrobial agent. An ASP pharmacist intervened in four of five patients. When compared to a historical cohort, TOC ASP yielded a 3.6-fold increase in antimicrobial-related interventions among discharged patients while reducing inappropriate outpatient antimicrobial therapy by 39%	AMS for patients in TOC may provide an opportunity to increase ASP interventions and reduce inappropriate antimicrobial therapy
Leja et al	TOC pharmacists identified eligible participants and reviewed their discharge medication lists to optimize pharmacological therapy, contacting the discharging prescriber if therapy changes were identified	1,100	N/A	N/A	A total of 2066 interventions were made. 298 (14.4%) of the interventions made by TOC pharmacists involved antimicrobial recommendations, affecting 255 (23.2%) patients. 66 patients received multiple interventions and 240 (80.5%) recommendations were accepted by the provider	An opportunity exists to optimize antimicrobial therapy surrounding the time of hospital discharge

AMS, antimicrobial stewardship; TOC, transitions of care; DRP, drug-related problem; ID, infectious disease; ASP, Antimicrobial Stewardship Program; ME, medication error; RXs, prescriptions; D/C, discharge.

evidence gaps were highlighted that need to be addressed for successful implementation of these interventions. Further research should be conducted to determine: optimal level of AMS training for pharmacists providing AMS interventions, ideal workflow, ideal method of communication with the prescriber, and quality improvement metrics.

Supplementary material. For supplementary material accompanying this paper visit https://doi.org/10.1017/ash.2024.349

Acknowledgments. Dr Savithiri Ratnapalan for inspiring this project and providing guidance, Elizabeth Uleryk for assisting with designing and performing the literature search, and Jennifer Lo for proofreading the draft manuscript and providing AMS input.

Author contribution. None.

Financial support. None reported.

Competing interests. The author reports no competing of interests relevant to this article.

References

1. Organization WH. Antimicrobial resistance. 2024. https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance
2. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. *Lancet* 2022;399(10325):629–655. https://doi.org/10.1016/s0140-6736(21)02724-0
3. Antimicrobial Stewardship. Public Health Ontario. https://www.publichealthontario.ca/en/health-topics/antimicrobial-stewardship. Accessed December, 2022
4. Pharmacists' and Nurses' Role in Antimicrobial Stewardship, Antimicrobial Resistance, and Sepsis Care. Institute for Safe Medication Practices. Accessed December, 2022. https://www.ismp.org/resources/pharmacists-and-nurses-role-antimicrobial-stewardship-antimicrobial-resistance-and-sepsis
5. Brower KI, Hecke A, Mangino JE, Gerlach AT, Goff DA. Duration of antibiotic therapy for general medicine and general surgery patients throughout transitions of care: an antibiotic stewardship opportunity for noninfectious disease pharmacists. *Hosp Pharm* 2021;56(5):532–536. https://doi.org/10.1177/0018578720928265
6. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;8(1):19–32. https://doi.org/10.1080/1364557032000119616
7. Tricco AC, Lillie E, Zarin W, *et al.* PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Ann Intern Med* 2018;169(7):467–473. https://doi.org/10.7326/m18-0850
8. Chavada R, Davey J, O'Connor L, Tong D. 'Careful goodbye at the door': is there role for antimicrobial stewardship interventions for antimicrobial therapy prescribed on hospital discharge? *BMC Infect Dis* 2018;18(1):225. https://doi.org/10.1186/s12879-018-3147-0
9. Giesler DL, Krein S, Brancaccio A, *et al.* Reducing overuse of antibiotics at discharge home: A single-center mixed methods pilot study. *Am J Infect Control* 2022;50(7):777–786. https://doi.org/10.1016/j.ajic.2021.11.016
10. Jones JM, Leedahl ND, Losing A, Carson PJ, Leedahl DD. A pilot study for antimicrobial stewardship post-discharge: avoiding pitfalls at the transitions of care. *J Pharm Pract* 2018;31(2):140–144. https://doi.org/10.1177/0897190017699775
11. Leja N, Collins CD, Duker J. Antimicrobial stewardship by transitions of care pharmacists at hospital discharge. *Hosp Pharm* 2021;56(6):714–717. https://doi.org/10.1177/0018578720951170
12. Manis MM, Kyle JA, Dajani D, *et al.* Evaluating the impact of a pharmacist-led antimicrobial stewardship intervention at discharge in a community, nonteaching hospital. *Ann Pharmacother* 2023;57(3):292–299. https://doi.org/10.1177/10600280221111795
13. Mercuro NJ, Medler CJ, Kenney RM, *et al.* Pharmacist-driven transitions of care practice model for prescribing oral antimicrobials at hospital discharge. *JAMA Netw* 2022;5(5):e2211331. https://doi.org/10.1001/jamanetworkopen.2022.11331
14. Parsels KA, Kufel WD, Burgess J, *et al.* Hospital discharge: an opportune time for antimicrobial stewardship. *Ann Pharmacother* 2022;56(8):869–877. https://doi.org/10.1177/10600280211052677
15. Su CP, Hidayat L, Rahman S, Venugopalan V. Use of an anti-infective medication review process at hospital discharge to identify medication errors and optimize therapy. *J Pharm Pract* 2019;32(5):488–492. https://doi.org/10.1177/0897190018761411
16. Canadian Antimicrobial Resistance Surveillance System Report (Public Health Agency of Canada) (2020).

Appendix

Appendix 1. MEDLINE (OVID) search strategy (Jan 3, 2023)

#	Searches	Results	Comment
1	antimicrobial stewardship/	3,191	
2	((antimicrobial* or antibiotic* or antibacterial* or "anti-bacterial*") adj2 stewardship).ti,ab,kf.	9,108	
3	((antimicrobial* or antibiotic* or antibacterial* or "anti-bacterial*") adj2 (utiliz* or utilis*) adj2 review*).ti,ab,kf.	25	
4	or/1–3 [****antimicrobial stewardship terms****]	9,741	AMS terms
5	"drug utilization review"/	3,887	
6	exp anti-bacterial agents/or exp anti-infective agents, urinary/	810,522	
7	5 and 6	722	AMS previous indexing
8	4 or 7 [****antimicrobial stewardship terms****]	10,352	AMS terms combined
9	Pharmacists/	20,895	
10	Pharmacy/	9,637	
11	Pharmaceutical services/or community pharmacy services/or medication therapy management/or pharmacy service, hospital/	28,853	
12	education, pharmacy, graduate/ or pharmacy residencies/	1,288	
13	(pharmacy or pharmacies or pharmacist*). ti,ab,kf.	83,656	
14	or/9–13 [****pharmacist terms****]	97,588	
15	aftercare/or hospital to home transition/or patient discharge/or patient handoff/or patient transfer/or retention in care/or transition to adult care/or transitional care/	59,960	
16	((post or hospital or patient*) adj2 (discharge* or handoff* or transfer*)).ti,ab,kf.	102,594	
17	(transition* adj2 (care or home)). ti,ab,kf.	8,070	
18	(home adj2 discharge*). ti,ab,kf.	14,324	
19	or/15–18 [****transition of care terms****]	154,323	
20	8 and 14 and 19	45	Final results

https://doi.org/10.1017/ash.2024.349 Published online by Cambridge University Press