Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 10:2025
DOI: 10.5281/zenodo.18052476

MULTIDISCIPLINARY INTERVENTIONS IN PHARMACY, DENTISTRY, LABORATORY, AND NURSING: A SYSTEMATIC REVIEW OF PATIENT SAFETY, CLINICAL PROTOCOLS, AND HEALTHCARE OUTCOMES

AHMED ABDULLAH ALJABR
Adult Critical Care Medicine, National Guard Hospital.

TURKI ABDULAZIZ ALSOHAIBANI
Adult Critical Care Medicine, National Guard Hospital.

NAWAF FAHAD ALHARBI
Pharmacy Technician, National Guard Hospital.

SHAROG KHAZIEM ALENEZI
Nurse, National Guard Hospital.

MANAL SADOUN ALMUTAIRI
Nursing, National Guard Hospital.

MAHA HAMDI ALHUMAIDAN
Dental Assistant, National Guard Hospital.

SAMI SADDAH M ALANAZI
Paramedic Specialist, National Guard Hospital.

Abstract

Background: Transitions of care (TOC) and medication management for complex patients are high-risk periods prone to information loss and adverse drug events (ADEs). Multidisciplinary interventions, particularly those involving pharmacists, are increasingly utilized to bridge these gaps. This review evaluates the effectiveness of professional-led interventions, including antimicrobial stewardship (AMS), medication reconciliation, and specialized clinical protocols, on patient safety and clinical outcomes. **Methods:** Following PRISMA guidelines, we searched electronic databases (PubMed, Google Scholar, DOAJ) for studies published between 2012 and 2025. Data were extracted from 15 studies focusing on hospital-based and long-term care interventions. **Results:** Pharmacist-led AMS programs significantly reduced antibiotic use density by 22.28% in tertiary settings and up to 40% in ICUs. Transition of care services and community reconciliation effectively identified medication discrepancies and reduced ADEs. In emergency settings, pharmacist intervention corrected medication history errors in 93.1% of cases. Specialized protocols showed mixed results: perioperative oral care reduced postoperative pneumonia, whereas chlorhexidine was ineffective for ventilator-associated pneumonia. Closed-loop smartphone communication and manual call centers improved the accuracy of critical laboratory notifications over automated systems. **Conclusion:** Multidisciplinary, pharmacist-supported interventions are essential for reducing medication errors and optimizing drug therapy. Success is dependent on standardized, evidence-based protocols and robust communication frameworks across the healthcare continuum.

Keywords: Antimicrobial Stewardship, Medication Reconciliation, Transition of Care, Patient Safety.

INTRODUCTION

The transition of care (TOC) is a critical period in healthcare delivery, often associated

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 10:2025
DOI: 10.5281/zenodo.18052476

with an increased risk of medication-related problems and adverse drug events (Alhmoud et al. 2024). As patients move between healthcare settings, such as from hospital to home, the lack of continuity can lead to information loss, resulting in poor clinical outcomes and increased hospital readmissions (Weeda et al. 2023). Pharmacist-led interventions have emerged as a vital strategy to mitigate these risks through structured medication reconciliation and transition of care services (McNab et al. 2018).

Beyond medication reconciliation, specialized interventions such as antimicrobial stewardship programs (ASPs) are essential for addressing global challenges like antimicrobial resistance (Karanika et al. 2016). While these programs are well-established in hospital settings, their implementation in long-term care facilities (LTCFs) presents unique challenges due to differing patient populations and available resources (Wu et al. 2019). Furthermore, managing medication safety for older adults is increasingly complex, as this population is particularly vulnerable to adverse drug reactions (ADRs) (Gray et al. 2023).

Effective communication and standardized protocols also play a significant role in patient safety. For example, the timely notification of critical laboratory values is essential for acute care, though the effectiveness of automated systems versus manual call centers remains a subject of investigation (Liebow et al. 2012). In critical care, even widely used interventions like oral chlorhexidine for the prevention of ventilator-associated pneumonia have been scrutinized for their actual clinical efficacy (De Cassai et al. 2024). This systematic review aims to evaluate the effectiveness of these diverse clinical interventions in improving patient outcomes and healthcare efficiency.

METHODS

Search Strategy and Data Sources

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a rigorous and transparent methodology. A systematic search was conducted across several online free electronic databases, including PubMed/MEDLINE, Google Scholar, and the Directory of Open Access Journals (DOAJ). These platforms were selected to ensure a broad capture of peer-reviewed clinical literature. The search period was defined from 2016 to 2025 to capture the most recent advancements in multidisciplinary healthcare interventions. Search strings utilized a combination of Medical Subject Headings (MeSH) and keywords: "antimicrobial stewardship," "pharmacist-led intervention," "medication reconciliation," "postoperative pneumonia," and "clinical communication."

Study Selection and Inclusion Criteria

Studies were eligible if they were original research focusing on professional-led interventions to improve patient safety or clinical efficiency. Inclusion criteria were: human subjects in hospital settings (ICU, Emergency, Surgery); interventions involving pharmacists, dental professionals, or specialized communication technology; and quantitative reporting of clinical outcomes. Exclusion criteria included review articles,

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 10:2025
DOI: 10.5281/zenodo.18052476

editorials, and studies without full-text availability. Initial screening of titles and abstracts was performed, followed by a detailed full-text appraisal of seven core studies.

Data Extraction and Quality Assessment

Data were extracted into standardized templates, focusing on study design, country, sample size, and primary outcomes (Antibiotic Use Density, infection rates, or error percentages). For the randomized clinical trial (Bravo-Olmedo et al.), risk of bias was considered regarding blinding and allocation.

For observational and retrospective studies (Qian et al., Yu et al., Soutome et al.), the focus was on how authors controlled for confounding variables, such as the use of propensity score matching (PSM) to ensure comparable groups.

Synthesis of Results

Given the diverse nature of the interventions, ranging from pharmaceutical management in China to surgical prophylaxis in Spain, a narrative synthesis approach was adopted. Outcomes were grouped into three thematic areas: antimicrobial stewardship and infection control; medication safety and error detection; and clinical communication and perioperative specialized care.

This allowed for a holistic evaluation of how specialized professional roles impact broader hospital safety metrics. Statistical significance across all included studies was established at a threshold of $p < 0.05$. This methodological framework ensured that the conclusions drawn were based on high-quality, relevant, and contemporary clinical evidence gathered from accessible digital repositories.

RESULTS

Antimicrobial Stewardship and Infection Control

The synthesis of the included studies reveals that structured; professional-led interventions significantly improve infection-related outcomes. In the realm of antimicrobial stewardship (AMS), pharmacist-driven programs demonstrated high efficacy. Qian et al. (2025) observed a 22.28% reduction in hospital-wide Antibiotic Use Density (AUD) over a five-year period ($p < 0.001$). This was mirrored in specialized settings; Yu et al. (2023) found that pharmacist-led audits in a neurosurgical ICU reduced the empiric use of anti-pseudomonal beta-lactams from 60.99% to 43.92%, which directly correlated with a significant decline in multi-drug resistant organism (MDRO) infections ($p < 0.001$).

Furthermore, in surgical prophylaxis, Bravo-Olmedo et al. (2025) demonstrated that while a 2g amoxicillin dose did not influence early dental implant failure, it drastically reduced postoperative infection rates compared to a placebo group (2.6% vs. 12.3%, $p = 0.028$).

Medication Safety and Error Correction

Pharmacist intervention proved critical in mitigating medication errors during transitions of care. Goulas et al. (2023) reported that 93.1% of medication histories obtained by

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 10:2025
DOI: 10.5281/zenodo.18052476

physicians in the emergency department contained at least one error. Crucially, over half of the drugs involved in adverse drug events (ADEs) were associated with these history errors, highlighting the pharmacist's role in accurate detection. In oncology, Son et al. (2016) showed that Comprehensive Medication Review (CMR) by pharmacists identified numerous drug-related problems and successfully reduced the financial burden of pharmaceutical waste.

Clinical Communication and Specialized Care

Beyond medication, specialized care protocols significantly impacted patient recovery. Soutome et al. (2017) utilized propensity score matching to show that perioperative oral care provided by dental professionals was a vital factor in preventing postoperative pneumonia following esophageal cancer surgery.

Additionally, the implementation of technology to bridge communication gaps was successful; Heneghan et al. (2021) found that using team-specific smartphones for closed-loop communication significantly improved the speed and reliability of critical laboratory value notifications.

Collectively, these results underscore that integrating specialized professionals into the clinical workflow leads to superior antibiotic regulation, fewer errors, and reduced surgical complications.

Table 1: Study Characteristics and Methodology

Study	Country	Study design	Setting and population	Sample size	Primary Intervention
Qian et al. (2025)	China	5-year Retrospective	Tertiary Hospital	Hospital-wide	Pharmacist-driven Antimicrobial Stewardship (AMS)
Yu et al. (2023)	China	postCohort	Neurosurgical ICU	1,013	Pharmacist-led AMS with prospective audits
Goulas et al. (2023)	France	Prospective	Emergency Dept.	735	Pharmacist-led medication history correction
Bravo-Olmedo (2025)	Spain	RCT	Dental Implant Surgery	96	2g Amoxicillin vs. Placebo prophylaxis
Soutome et al. (2017)	Japan	Case-Control (PSM)	Esophageal Surgery	420	Perioperative oral care by professionals
Heneghan et al. (2021)	USA	Quality Improvement	Pediatric Inpatients	N/A	Smartphone-based closed-loop communication
Son et al. (2016)	S. Korea	Prospective	Gynae-Oncology	N/A	Pharmacist-led medication reconciliation (CMR)

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 10:2025
DOI: 10.5281/zenodo.18052476

Table 2: Outcomes and results

Study (Author, Year)	Primary Outcome	Key Results and Statistical Significance
Qian et al. (2025)	Antibiotic Density	AUD decreased by 22.28% over 5 years ($p < 0.001$).
Yu et al. (2023)	MDRO Infection	APBL use fell (61% to 44%) and MDROs decreased ($p < 0.001$).
Goulas et al. (2023)	History Errors	93.1% error rate in physician lists; impacts ADE detection.
Bravo-Olmedo (2025)	Post-op Infection	Infection: 2.6% (Antibiotic) vs 12.3% (Placebo) ($p = 0.028$).
Soutome et al. (2017)	Pneumonia Rate	Oral care significantly reduced postoperative pneumonia risk.
Heneghan et al. (2021)	Notification Speed	Improved timeliness of critical laboratory value reporting.

DISCUSSION

The findings of this systematic review underscore the significant impact of multidisciplinary and pharmacist-led interventions on clinical outcomes. Pharmacist-supported transition of care services, particularly in regions like the Middle East and North Africa, have shown promise in reducing medication-related issues, although the consistency of these interventions varies widely (Alhmoud et al. 2024). Similarly, pharmacist-led medication reconciliation in the community after hospital discharge is intended to reduce harm and increase efficiency, but its overall effectiveness remains a complex area requiring standardized implementation (McNab et al. 2018).

Antimicrobial stewardship programs demonstrate their value in hospital settings by reducing total antimicrobial consumption by approximately 19% and restricted agent use by nearly 27% (Karanika et al. 2016). These effects are even more pronounced in intensive care units, where consumption can decrease by nearly 40% (Karanika et al. 2016). In long-term care facilities, multifaceted stewardship interventions are necessary to overcome resource limitations and effectively manage antibiotic use (Wu et al. 2019).

Patient safety is further enhanced through interventions targeting specific risks. For older adults, optimizing medication use has been shown to reduce ADRs by 21% and serious reactions by 36% (Gray et al. 2023).

In acute settings, while automated laboratory notifications are promising, manual call centers remain the "evidence-based best practice" for ensuring timely critical value reporting (Liebow et al. 2012). Conversely, some traditional practices, such as the use of oral chlorhexidine for preventing ventilator-associated pneumonia, may not be as effective as previously believed, regardless of the concentration used (De Cassai et al. 2024).

Collectively, these studies highlight that while professional-led interventions, especially those involving pharmacists, significantly improve safety and reduce costs, the success of these programs depends on standardized protocols, clear communication, and adaptation to specific clinical environments (Weeda et al. 2023, Liebow et al. 2012).

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 10:2025
DOI: 10.5281/zenodo.18052476

CONCLUSION

Multidisciplinary, pharmacist-led interventions significantly enhance patient safety by reducing medication errors and optimizing drug therapy. Evidence from 15 studies confirms that hospital-based antimicrobial stewardship programs (ASPs) reduce antibiotic consumption by up to 40%. Furthermore, pharmacist-led medication reconciliation in emergency and transition-of-care settings effectively identifies discrepancies and reduces adverse drug events. The success of these interventions relies on standardized, evidence-based protocols and robust, closed-loop communication systems. Integrating specialized professionals into clinical workflows is essential for achieving superior patient outcomes and long-term healthcare efficiency across diverse clinical environments.

References

1) Alhmoud EN, Alrawi SFF, El-Enany R, et al. Impact of pharmacist-supported transition of care services in the Middle East and North Africa: a systematic review and meta-analysis. J Pharm Policy Pract. 2024;17(1):2323099.

2) Bravo-Olmedo F, Reyes-Botella C, Ocaña-Peinado FM, et al. Effect of Antibiotic Prophylaxis in Dental Implant Surgery: A Randomized Controlled Clinical Trial. Dent J. 2025;13(11):500.

3) De Cassai A, Pettenuzzo T, Busetto V, et al. Chlorhexidine is not effective at any concentration in preventing ventilator-associated pneumonia: a systematic review and network meta-analysis. J Anesth Analg Crit Care. 2024; 4:30.

4) Goulas C, Lohan L, Laureau M, et al. Involvement of Pharmacists in the Emergency Department to Correct Errors in the Medication History and the Impact on Adverse Drug Event Detection. J Clin Med. 2023;12(1):376.

5) Gray SL, Perera S, Soverns T, et al. Systematic Review and Meta-analysis of Interventions to Reduce Adverse Drug Reactions in Older Adults: An Update. Drugs Aging. 2023; 40:965-979.

6) Heneghan M, Westphal K, Bergman L, et al. Closed loop communication using provider team-specific smartphones improves the critical laboratory value notification process in paediatric inpatients. BMJ Open Qual. 2021;10: e001420.

7) Karanika S, Paudel S, Grigoras C, et al. Systematic Review and Meta-analysis of Clinical and Economic Outcomes from the Implementation of Hospital-Based Antimicrobial Stewardship Programs. Antimicrob Agents Chemother. 2016; 60:4840-4852.

8) Liebow EB, Derzon JH, Fontanesi J, et al. Effectiveness of Automated Notification and Customer Service Call Centers for Timely and Accurate Reporting of Critical Values: A Laboratory Medicine Best Practices Systematic Review and Meta-analysis. Clin Biochem. 2012;45(12):979-987.

9) McNab D, Bowie P, Ross A, et al. Systematic review and meta-analysis of the effectiveness of pharmacist-led medication reconciliation in the community after hospital discharge. BMJ Qual Saf. 2018; 27:308-320.

10) Qian C, Yuan T, Zhang F, et al. Impact of a pharmacist-driven antimicrobial stewardship program on inpatient antibiotic consumption in a Chinese Tertiary Hospital: a 5-year retrospective study. Front Med. 2025; 12:1583134.

11) Son H, Kim J, Kim C, et al. Pharmacist-led interdisciplinary medication reconciliation using comprehensive medication review in gynaecological oncology patients: a prospective study. Eur J Hosp Pharm. 2016; 24:311-315.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 58 Issue: 10:2025
DOI: 10.5281/zenodo.18052476

12) Soutome S, Yanamoto S, Funahara M, et al. Effect of perioperative oral care on prevention of postoperative pneumonia associated with esophageal cancer surgery: A multicenter case-control study with propensity score matching analysis. Medicine (Baltimore). 20117;96: e74362.

13) Weeda E, Gilbert RE, Kolo SJ, et al. Impact of pharmacist-driven transitions of care interventions on post-hospital outcomes among patients with coronary artery disease: a systematic review. J Pharm Pract. 20323;36(3):668-678.

14) Wu JHC, Langford BJ, Daneman N, et al. Antimicrobial Stewardship Programs in Long-Term Care Settings: A Meta-Analysis and Systematic Review. J Am Geriatr Soc. 2019; 67:392-399.

15) Yu J, Liu Y, Qu R, et al. Evaluation of a clinical pharmacist-led antimicrobial stewardship program in a neurosurgical intensive care unit: a pre-and post-intervention cohort study. Front Pharmacol. 2023; 14:1263618.