Medicine Safety in Primary Care — Is It Worth the Cost? A systematic review of economic evidence to guide effective resource allocation

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Background: In England, an estimated 237 million medication errors occur annually. While several medication safety interventions exist, most economic evidence is focused on hospital-based interventions. Interventions in primary care are often costly and lack robust cost-effectiveness evidence, limiting their adoption in policy and practice.

Objectives: To identify and critically appraise existing economic evaluations of medication safety interventions in primary care to support policymakers in effective resource allocation.

Methods: This review adhered to the PRISMA 2020 guidelines. A systematic search of Econlit; MEDLINE; APA PsycInfo; and Embase databases (01/2004-04/2024) identified relevant economic evaluations of medication safety interventions in primary care that reported outcomes such as prescribing errors, adverse drug events, medication-related hospitalisations, or relevant disease-specific outcomes (e.g. gastrointestinal bleed). Abstracts, commentaries, theses, expert opinions, pharmacogenetic interventions, and non-English papers were excluded. Study quality was assessed using CHEERS, CONSORT, QHES, and AdViSHE checklists.

Results: The review identified 38 studies. These examined pharmacist-led medication reviews (n=18), multi-professional medication reviews (n=4), deprescribing (n=6), disease management (n=4), care transitions (n=4), and IT supported error identification (n=2). Few studies focused on interventions in care/nursing homes (n=9) and care transitions (n=4), despite high error risk in these settings. Studies mainly focused on older adults and prescribing and/or monitoring errors, overlooking other medication use process aspects. Methods used were cost-utility (n=14), cost-consequence (n=16), cost-effectiveness (n=5) and cost-benefit (n=3) analyses. Key outcomes were hospital readmissions and Quality of Life (QoL). Most analysis used trial data (n=22) and adopted a healthcare cost perspective (n=33). Ten studies used decision-analytic models: 4 decision trees, 3 decision tree–Markov hybrids, two state-transition simulation and one Markov model. Thirteen studies found the intervention cost-effective, of which seven were medication reviews. The reporting and methodological quality of the studies varied; cost-effectiveness and cost-utility analyses were generally higher quality than others. Most model-based studies lacked transparency in model validation methods.

Conclusion: The review identified several cost-effective interventions, mostly pharmacist-led interventions. Key gaps in the evidence include interventions not focused on the prescribing process, high-risk patient groups (e.g., patients in nursing homes and in care transitions), and improving digital functionality or interoperability. There was also a significant gap in the involvement of patients and the public (PPIE) in the design and conduct of studies. Future research should address these gaps, supported by innovative interventions, policy backing, and sustained funding to ensure effective implementation and long-term improvements in medication error management.

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A systematic review of economic evidence to guide effective resource allocation

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BACKGROUND

- Medications are the most common healthcare intervention, but errors can occur during prescribing, dispensing, administration, or monitoring.
- While several medication safety interventions exist, most economic evidence is focused on hospital-based interventions.
- Interventions in primary care are often costly and lack robust cost-effectiveness evidence, limiting their adoption in policy and practice.

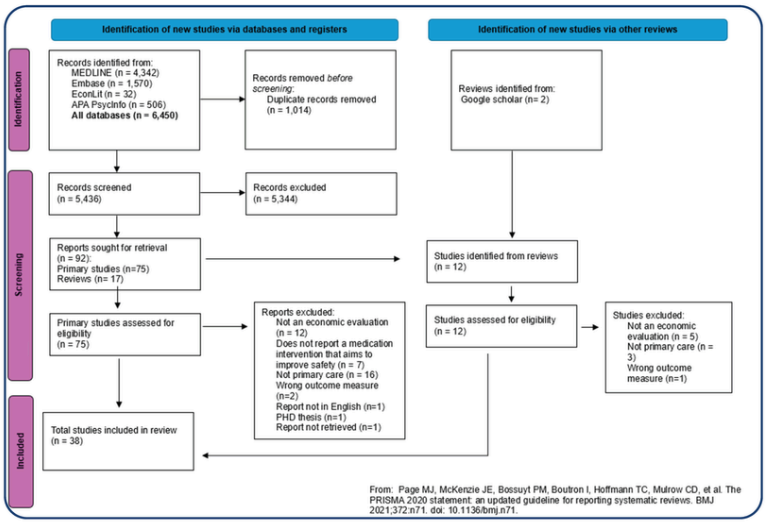
In England, an estimated 237 million medication errors occur annually.

AIM

To identify and critically appraise existing economic evaluations of medication safety interventions in primary care to support policymakers in effective resource allocation.

METHODS

- Following PRISMA 2020 guidelines, we systematically searched EconLit, MEDLINE, APA PsycInfo, and Embase (01/2004–04/2024) for economic evaluations of primary care medication safety interventions.
- Eligible studies reported outcomes such as prescribing errors, adverse drug events, hospitalisations, or disease-specific outcomes. We excluded abstracts, commentaries, theses, expert opinions, pharmacogenetic interventions, and non-English papers.
- Study quality was assessed using CHEERS, CONSORT, QHES, and AdViSHE checklists.



RESULTS

📚 **38 studies** evaluating interventions in general practice/ambulatory care (19), community pharmacy (10) and nursing/care/residential homes (9) met the inclusion criteria.

💊 **Intervention types** include pharmacist-led medication reviews (18), multi-professional reviews (4), deprescribing (6), disease management (4), care transitions (4), and IT supported error identification (2).

👥 Most studies focused on older adults and prescribing and/or monitoring errors, with limited attention to other medication use stages.

📊 **Economic methods** were mainly cost-utility (14) and cost-consequence (16), with fewer cost-effectiveness (5) and cost-benefit (3) analyses.

🩹 Most studies used trial data (22) and a healthcare cost perspective (33).

📈 Ten studies were model-based: four decision trees, three decision tree–Markov hybrids, two state-transition simulation and one Markov model.

🩺 Outcomes included prescribing errors (8), hospital utilization (13), health-related quality of life (13), falls (5), and adverse drug events (5).

💰 **Cost-effectiveness analysis results** conclude that 13 out of the 19 studies that conducted an incremental analysis found the intervention cost-effective, of which seven were medication reviews.

✅ **Reporting and methodological quality** of the studies varied, with a lack of transparent decision-analytic model design, inconsistent reporting of costs, and little consideration of indirect costs or the impact of loss of trust on future healthcare use. Most studies had limitations in handling uncertainty or discounting, and patient involvement in targeting or designing interventions was minimal. All ten studies using decision models scored poorly on model validation, and the quality of studies has not improved over time.

CONCLUSION

- Evidence suggests medication safety interventions can be cost-effective, despite variable study quality and poorly validated models.
- Key gaps in the evidence include interventions not focused on the prescribing process, high-risk patient groups (e.g., patients in nursing homes and in care transitions), and improving digital functionality or interoperability.
- There was also a significant gap in the involvement of patients and the public (PPIE) in the design and conduct of studies.
- Future research should address these gaps, supported by innovative interventions, policy backing, and sustained funding to ensure effective implementation and long-term improvements in medication error management.

REFERENCES

1.NHS Resolution. Learning from medication errors 2023. Available from: https://resolution.nhs.uk/2023/03/30/learning-from-medication-errors/.
2.Elliott RA, Camacho E, Jankovic D, Sculpher MJ, Faria R. Economic analysis of the prevalence and clinical and economic burden of medication error in England. BMJ Quality & Safety. 2021;30(2):96-105. doi: 10.1136/bmjqs-2019-010206.
3. Trooskin SZ. Low-technology, cost-efficient strategies for reducing medication errors. Am J Infect Control. 2002;30(6):351-4. doi: 10.1067/mic.2002.126426. PubMed PMID: 12360144.

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