# What is the impact of medication-related risk prioritisation tools on patient safety and workforce outcomes? An umbrella review

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**Background:** This umbrella review synthesises evidence from systematic reviews on risk prioritisation tools for identifying adult inpatients at risk of preventable medication-related harm, exploring their impact on patient safety and workforce outcomes and highlighting key aspects of tools' development, integration and implementation. Research questions are: What is the impact of risk prioritisation tools on medication-related patient safety and workforce outcomes? What are the different tools that healthcare professionals use to risk prioritise hospital inpatients? What are the key dimensions/aspects to be considered when evaluating prioritisation tools? What are the barriers, facilitators and enablers of implementing risk prioritisation tools into practice?

**Methods:** MEDLINE, Embase, Cochrane Database of Systematic Reviews, CINAHL, Pubmed, Scopus databases were searched from January 2000 until May 2025. Abstract and title screening, full text review and data extraction was performed by three reviewers. Narrative synthesis was used to map main themes across included reviews, exploring key concepts associated with tools' development and integration into clinical practice.

**Results:** Seven systematic reviews met the inclusion criteria. Medication-related patient safety and workforce-related outcomes were underreported due to the absence of implementation and impact studies. No reviews examined the tools' impact on health equity, such as among people with disabilities or those from diverse ethnic or cultural backgrounds. Patient and public involvement in development was not reported. Internal and external validation studies demonstrated tools' potential to reduce preventable medication-related harm through identification of at-risk patients. Despite some tools' promising performance, none are routinely implemented in clinical practice. Barriers to adoption include limited impact evidence and concerns with generalisability and applicability to different care settings. Enablers include digital integration within electronic health records and use of easily interpretable risk scores. Facilitators include user-friendliness, improved patient prioritisation and potential to support clinician's decision-making.

**Conclusion:** Existing risk prioritisation tools require external validation across diverse populations and clinical settings. Further research should prioritise real-world implementation, particularly integration into electronic health systems, facilitation of remote patient prioritisation and review, and evaluation of their impact on health equity among people with disabilities and those from diverse ethnic and cultural backgrounds.

# What is the impact of risk prioritisation tools on medication-related patient safety and workload outcomes? An umbrella review.


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## What is known?

In England, MRH contributes to:
181 626 bed-days per year
1708 deaths per year

Medication Errors are the most common preventable cause of MRH

Estimated annual costs:
$42 billion global costs
£98 million in England

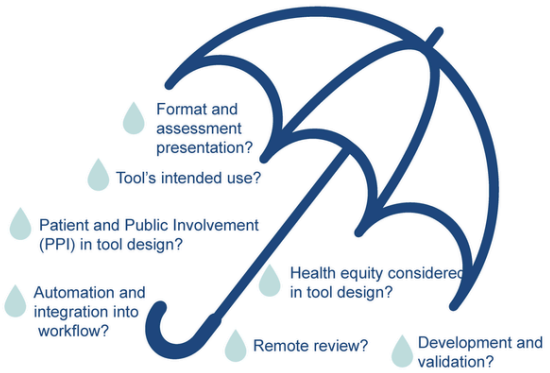
**Medication-related Harm (MRH)[1]**

Ethnic minority background, low socioeconomic status and low health literacy are *associated with higher MRH risk*[2]

World Health Organisation calls to reduce preventable MRH by 50% over a period of 5 years

**Potential solution – risk prioritisation tools that detect inpatients at risk of MRH**

## What is still unknown?




## Aim

**To provide a comprehensive high-level synthesis and summary of evidence on the actual/perceived impact of risk prioritisation tools on patient safety and workload outcomes.**

## Research Questions

To evaluate the impact of risk prioritisation tools on medication-related patient safety and workload outcomes, it is essential to explore key concepts associated with their development and implementation.

- What types of tools are used by healthcare professionals (HCP) to risk prioritise inpatients?
- What are the key dimensions associated with development and implementation of risk prioritisation tools?
- What are the barriers, enablers and facilitators to implementation of risk prioritisation tools?

## Methods

**Inclusion criteria**

Peer-reviewed systematic reviews* on risk prioritisation tools published in any language between 2000-2025.
**Reviews that meet Cochrane's definition of a systematic review.*

**Search strategy**

CINAHL, Embase, Medline, Pubmed, Scopus databases.
Keywords (risk prediction, medication-related harm, systematic review) and related terms combined with AND/OR operators.

**Data extraction and data synthesis**

Data extracted with Joanna Briggs Institute (JBI) Data Extraction Tool.
Narrative synthesis of data.

**Methodological quality assessment**

Performed with JBI Critical Appraisal Tool and AMSTAR-2.

## Results

6 systematic reviews and one scoping review (which reported a total of 48 primary studies, including 36 tool development studies) were included in the umbrella review.

Table 1. Key findings from reviews.

| Item explored | Evidence |
|---|---|
| Impact on medication-related patient safety | • **Scarce impact studies.**<br>• One randomised controlled trial (RCT) simulation and one RCT-level impact studies indicated that risk prioritisation tools are useful in identifying inpatients for medication-focused interventions. |
| Impact on workload | • **Scarce impact studies.**<br>• Two tools included decision curve analysis, demonstrating *potential role* in guiding clinical-decision making. |
| Types of tools reported | • **Mostly risk prediction tools**, although two reviews reported triage/screening/medication reconciliation tools and clinical decision rules embedded into electronic prescribing system. |
| Development and validation | • **Only five tools externally validated** – four are intended for use in older age patients and only one model externally validated across four European countries.<br>• Heterogeneous development methodology - risk predictors chosen through literature review and/or consensus-based methods and/or multivariate regression analysis.<br>• Most common validation studies measured statistical, temporal, content validity. |
| HCP involvement in tool design | • **Professional involvement (mainly pharmacists) in development and outcome classification common.** |
| Intended use, format and assessment presentation | • All tools interpreted as intended for explicit assessment (against risk predictors).<br>• Three risk prediction tools designed in fully electronic format; two tools used electronic calculators.<br>• Varied assessment presentation – results as odds ratios; risk scores and risk groups. |
| Integration into clinical workflows | • **One tool developed as a real-time tool embedded within electronic health records.** |
| Health equity considerations | • **Indirectly explored.**<br>• Only one tool explicitly considered visual impairment and medication handling challenges as risk predictors. |
| PPI in tool design | **Not reported.** |
| Potential for remote review | **Not reported.** |

**Barriers**

- Lack of external validation and impact studies
- Inconsistent definitions of medication-related outcomes
- Potential of perpetuating health inequities
- Arbitrary tool outcome presentation

**Enablers**

- Robust external validation
- Impact studies using RCT-level studies, including comparison studies of tool vs. clinician-guided prioritisation decisions
- Integration into electronic health records/electronic prescribing systems

**Facilitators**

- User-friendliness
- Easy to interpret assessment outcome
- Multidisciplinary team involved in tool design and development
- PPI in tool design

## Conclusions and future research

**PPI was not reported in design and development of medication-related risk prioritisation tools.**
**Scarce health equity considerations.**

**None of the reviews recommend any of the explored tools due to limited external validation and lack of impact studies.**

Perform external validation studies across various sites and care settings to determine tool generalisability and applicability.

Include PPI and health equity considerations in future tool development.

Fully automate and integrate tools into electronic health records to enable real-time and remote review of patients.

Perform impact studies to determine effect on patient safety and workload outcomes

[1]Measuring and mitigating preventable medication-related harm' (2024) in *Global burden of preventable medication-related harm in health care: a systematic review*. https://iris.who.int/bitstream/handle/10665/376203/9789240088887-eng.pdf?sequence=1
[2]Suen, K., Shrestha, S., Osman, S. and Paudyal, V. (2025) in *Association Between Patient Race/Ethnicity, Health Literacy, Socio-Economic Status, and Incidence of Medication Errors: A Systematic Review*. https://pubmed.ncbi.nlm.nih.gov/40180697/.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