



September 2009 – SUPPORT Summary of a systematic review

What are the impacts of interventions to reduce patient safety incidents?

A patient safety incident (PSI) is an event or circumstance which could have resulted, or did result, in unnecessary harm to a patient. The term encompasses the more frequently used terms medical error and system failure, and is now preferred. PSIs are a common cause of morbidity and mortality in a variety of health care settings. Some situations, as complex or urgent care, carry a greater risk, but significant errors may occur in any setting.

Key messages

- All studies identified in this review were conducted in high-income countries.
- PSIs were common in all the settings evaluated, ranging from 10% to 63%. All studies were conducted in high-income countries.
- Eight interventions to reduce prescription errors are probably effective in reducing some form of PSIs, but it is not known if they reduce serious errors or mortality (computerized reminders, multidisciplinary approach, patient-oriented leaflets, automated bedside dispensing, syringe marked with doses, self-medication program, illumination in the workplace, pharmacist participation in rounds).
- Four interventions evaluated to reduce diagnostic errors may not lead to any difference (utilization of protocol by triage nurse, teaching acute illness observation scales to mothers, pain relief for abdominal pain needing possible surgical resolution, nurse practitioner vs. junior doctor providing care).
- Two interventions evaluated probably decrease management errors (computerized reminders, multidisciplinary approach).



Who is this summary for?

People making decisions concerning the implementation of interventions aimed to reduce medical errors in health care.

! This summary includes:

- Key findings from research based on a systematic review
- Considerations about the relevance of this research for low- and middle-income countries

X Not included:

- Recommendations
- Additional evidence not included in the systematic review
- Detailed descriptions of interventions or their implementation

This summary is based on the following systematic review:

Ioannidis JP, Lau J. Evidence on interventions to reduce medical errors: an overview and recommendations for future research. *J Gen Intern Med.* 2001;16(5):325-34.

What is a systematic review?

A summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise the relevant research, and to collect and analyse data from the included studies.

SUPPORT – an international collaboration funded by the EU 6th Framework Programme to support the use of policy relevant reviews and trials to inform decisions about maternal and child health in low- and middle-income countries. www.support-collaboration.org

Glossary of terms used in this report: www.support-collaboration.org/summaries/explanations.htm

Background references on this topic: See back page.

Background

PSIs are common and have important consequences for patients and the health care system. Some situations, as complex or urgent care, carry a greater risk, but significant errors may occur in any setting.

Given the multifaceted dimension of this phenomenon, there is a wide array of possible interventions. Nowadays, different ways of categorizing interventions to diminish PSIs are in use (see related literature). In this review they are classified into prescription (errors in the prescription, dosing or omission of pharmaceutical interventions), diagnosis (errors related to the prescription of inappropriate/harmful diagnostic test or misdiagnosis errors beyond the inherent limitations of applied diagnostic tests) or management errors (different from prescription or diagnosis). Also, there are many possible definitions of a medical error. This review considered any definition, provided that authors explicitly stated reduction of error as an outcome.

How this summary was prepared

After searching widely for systematic reviews that can help inform decisions about health systems, we have selected ones that provide information that is relevant to low- and middle-income countries. The methods used to assess the quality of the review and to make judgements about its relevance are described here:

www.support-collaboration.org/summaries/methods.htm

Knowing what's not known is important

A good quality review might not find any studies from low- and middle-income countries or might not find any well-designed studies. Although that is disappointing, it is important to know what is not known as well as what is known.

About the systematic review underlying this summary

Review objective: To critically review the existing evidence on interventions aimed at reducing errors in health care delivery.

	What the review authors searched for	What the review authors found
Interventions	Randomized controlled trials (RCTs) that evaluated an intervention versus placebo or no intervention and specified the aim of reducing medical errors. Authors also looked for other study designs. Since conclusions did not change, they focused on RCTs, and so does this summary.	Thirteen RCTs were found. All of them evaluated a different intervention: Utilization of protocol by triage nurse, teaching acute illness observation scales to mothers, pain relief for abdominal pain needing possible surgical resolution, nurse practitioner vs. junior doctor providing care, computerized reminders, multidisciplinary approach, leaflets, automated bedside diagnosis, syringe marked with doses, team intervention, self-medication program, illumination in the workplace, pharmacist participation in rounds.
Participants	Any health care facility	Pediatric outpatient (2), psychiatric outpatient (1), army outpatient (1), pediatric emergency room (1), adult emergency room (1), inpatient medical (1), acute hospital (3), inpatient geriatric units (1), surgical unit (2).
Settings	Any setting	All studies were conducted in high-income countries: USA (8), Canada (2), UK (3).
Outcomes	Any definition of medical error was considered, provided that authors explicitly stated reduction of error as an outcome	Medication errors (9), Diagnosis errors (4), Other management errors (3). Reported errors were not serious. No study reported on mortality and only 2 studies reported clinical harm to patient.

Date of most recent search: March 2000

Limitations: This systematic review has moderate limitations, mainly because the search is not very comprehensive and has not been updated since 2000. It was not possible to pool the studies, since the populations, interventions, comparisons and outcomes were too diverse. The high proportion of positive findings reported raise concerns about the possibility of publication bias.

Ioannidis JP, Lau J. Evidence on interventions to reduce medical errors: an overview and recommendations for future research. *J Gen Intern Med.* 2001;16(5):325-34.

Summary of findings

This review found thirteen studies conducted in many different settings in high-income countries. Each study evaluated a different intervention. Nine studies addressed interventions to reduce errors in medication, four interventions to reduce errors in diagnosis and three interventions to reduce other management errors.

Error rates in the control groups of these studies were common, ranging from 10% to 63%.

1) Interventions to reduce medication errors

Nine studies evaluated very different interventions aimed to diminish prescription, dosing or omission errors. Eight out of nine interventions evaluated may decrease medication errors, but serious errors or mortality were not measured in these studies.

- **Computerized reminders of “corollary orders” (suggestions oriented to detect or ameliorate adverse reactions) probably decrease errors of prescription in medical inpatients. This intervention consisted of interview with the patient, review of chart, presentation of medication concerns and recommendations during team conference, as well as follow-up of recommendations by clinical pharmacologist.**
- **A multidisciplinary approach coordinated by a “senior care unit” probably decreases the choice of inappropriate drugs in acute hospitals.**
- **Patient-oriented leaflets that are easier to read probably increase adherence (number of pills taken) by psychiatric outpatients.**
- **Automated bedside dispensing probably decrease medication errors in surgical units.**
- **Syringe marked with the correspondent dose probably decrease dose errors from parents of pediatric outpatients.**
- **A self-medication program probably diminishes medication errors in inpatient geriatric units.**
- **Better illumination in the workplace probable decreases prescription errors.**
- **Pharmacist participation in rounds may decrease prescription errors**
- **A team intervention coordinated by a pharmacist may not lead to any difference in the number of serious medication errors in acute hospitals, when added to a computerized physician order entry.**

About the quality of evidence (GRADE)

⊕⊕⊕⊕

High: Further research is very unlikely to change our confidence in the estimate of effect.

⊕⊕⊕○

Moderate: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

⊕⊕○○

Low: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

⊕○○○

Very low: We are very uncertain about the estimate.

For more information, see last page

2) Interventions to reduce diagnostic errors

Four studies evaluated very different interventions aimed to diminish prescription of inappropriate/harmful diagnostic test or misdiagnosis errors beyond the inherent limitations of applied diagnostic tests. None of the four interventions evaluated seemed to decrease diagnosis errors.

- **A protocol to evaluate extremity trauma by triage nurses in pediatric emergency room slightly decreases waiting times but may increase missed fractures, dislocation or effusion after trauma.**
- **Teaching acute illness observation scales to mothers may not lead to any difference in recognition of severity of disease in pediatric outpatients.**
- **Pain relief for acute abdominal pain may not lead to a better management (operate or not) in surgical patients.**
- **It is not known if nurse practitioners make more or less significant diagnostic errors than junior doctors in an adult emergency.**

3) Interventions to reduce management errors

Three studies evaluated very different interventions aimed to diminish management errors. Two of the three interventions evaluated seemed to probably decrease them. Two of the three interventions were categorized as interventions to reduce management errors as well as interventions to reduce medication errors (Computerized reminders of “corollary orders”, multidisciplinary approach coordinated by a “senior care unit”). They are described above.

- **It is not known if nurse practitioners make more or less significant management errors than junior doctors in an adult emergency.**

Relevance of the review for low- and middle-income countries

→ Findings

▷ Interpretation*

APPLICABILITY

- All studies were conducted in High-income countries
- Nine of thirteen interventions evaluated probably decrease medication, diagnosis or management PSIs. The magnitude of the effect was often very large.
- All the interventions were very different, as were the populations and settings.

- ▷ *The majority of the studies did not evaluate serious errors or mortality, so the relevance of the results for the decision making is difficult to ascertain.*
- ▷ *PSIs are multifaceted and context-specific and none of the interventions were evaluated in more than one study, so it is difficult to be certain on reproducibility.*
- ▷ *In countries with weak health systems the causes of medical errors might be different.*
- ▷ *Resources available for reducing PSIs need to be considered when assessing whether the intervention effects are likely to be transferable to settings in low-and middle-income countries.*

EQUITY

- The included studies provide no data about differential effects of the intervention in disadvantaged populations.

- ▷ *Some interventions such as computerised reminder system or automated bedside dispensing rely on technologies that may not always be widely available in low-income settings. Implementation of such interventions in low-income countries may exacerbate health inequities or fail to reduce them.*
- ▷ *Some interventions such as multidisciplinary teams or pharmacist participation rely on availability of human resources that may not be available in low-income settings. Implementation of such interventions in low-income countries may exacerbate health inequities or fail to reduce them.*

ECONOMIC CONSIDERATIONS

- The included studies provide no data about cost of the interventions.

- ▷ *The cost-benefit of these interventions is difficult to anticipate based on the available information. There is no information in costs and the majority of the studies did not evaluate serious PSIs or mortality, which are critical to the decision-making process.*

MONITORING & EVALUATION

- This review found evidence on 13 interventions that may reduce medication, diagnosis or management errors.
- Evaluations in the majority of included studies did not focus on serious errors or mortality.
- Medical errors were very common in all the studies, ranging from 10 to 63%

- ▷ *There are many potential interventions to reduce PSIs. Monitoring systems to understand where and why errors are produced might be important to decide which interventions are more likely to work.*
- ▷ *Future studies should provide clear definitions of a PSI and its consequences. Using international definitions as those provided by the International Classification for Patient Safety may facilitate comparison of different initiatives.*
- ▷ *Research on the causes of PSIs in specific context or settings may help decide which interventions might be implemented.*
- ▷ *There is probably a large room for improvement, so a monitoring system will provide an estimation of the reduction of the error but also of the remanent error rate.*

*Judgements made by the authors of this summary, not necessarily those of the review authors, based on the findings of the review and consultation with researchers and policymakers in low- and middle-income countries. For additional details about how these judgements were made see: <http://www.support-collaboration.org/summaries/methods.htm>

Additional information

Related literature

Elder NC, Dovey SM. Classification of medical errors and preventable adverse events in primary care: a synthesis of the literature. *J Fam Pract.* 2002 Nov;51(11):927-32.

Runciman W, Hibbert P, Thomson R, Van Der Schaaf T, Sherman H, Lewalle P. Towards an International Classification for Patient Safety: key concepts and terms. *Int J Qual Health Care.* 2009 Feb;21(1):18-26.

World alliance for patient safety. Summary of the evidence on patient safety: implications for research. World alliance for patient safety, 2009.

Hodgkinson B, Koch S, Nay R. Strategies to reduce medication errors with reference to older adults. *International Journal of Evidence-Based Healthcare* 2006;4(1):2-41.

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Conflict of interest

None declared. For details, see: www.support-collaboration.org/summaries/coi.htm

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This summary should be cited as

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Keywords

All Summaries: evidence-informed health policy, evidence-based, systematic review, health systems research, health care, low- and middle-income countries, developing countries, primary health care, medical errors, diagnostic errors, medication errors.

About quality of evidence (GRADE)

The quality of the evidence is a judgement about the extent to which we can be confident that the estimates of effect are correct. These judgements are made using the GRADE system, and are provided for each outcome. The judgements are based on the type of study design (randomised trials versus observational studies), the risk of bias, the consistency of the results across studies, and the precision of the overall estimate across studies. For each outcome, the quality of the evidence is rated as high, moderate, low or very low using the definitions on page 3.

For more information about GRADE:

www.support-collaboration.org/summaries/grade.htm

SUPPORT collaborators:

The Alliance for Health Policy and Systems Research (HPSR) is an international collaboration aiming to promote the generation and use of health policy and systems research as a means to improve the health systems of developing countries. www.who.int/alliance-hpsr

The Cochrane Effective Practice and Organisation of Care Group (EPOC) is a Collaborative Review Group of the Cochrane Collaboration: an international organisation that aims to help people make well informed decisions about health care by preparing, maintaining and ensuring the accessibility of systematic reviews of the effects of health care interventions.

www.epocoslo.cochrane.org

The Evidence-Informed Policy Network (EVIPNet) is an initiative to promote the use of health research in policymaking. Focusing on low- and middle-income countries, EVIP-Net promotes partnerships at the country level between policy-makers, researchers and civil society in order to facilitate both policy development and policy implementation through the use of the best scientific evidence available. www.evipnet.org

For more information:

www.support-collaboration.org

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