NICE National Institute for
Health and Care Excellence

Appendix A2: Summary of evidence from surveillance

2019 surveillance of medicines optimisation (2015) NICE guideline NG5

Summary of evidence from surveillance

Studies identified in searches are summarised from the information presented in their abstracts.

Feedback from topic experts who advised us on the approach to this surveillance review, was considered alongside the evidence to reach a view on the need to update each section of the guideline.

Systems for identifying, reporting and learning from medicines-related patient safety incidents

Recommendations in this section of the guideline

Improving learning from medicines-related patient safety incidents is important to guide practice and minimise patient harm. Medicines-related patient safety incidents are unintended or unexpected incidents that are specifically related to medicines use, which could have or did lead to patient harm. These include potentially avoidable medicines-related hospital admissions and re-admissions, medication errors, near misses and potentially avoidable adverse events.

1.1.1   Organisations should support a person-centred, 'fair blame' culture that encourages reporting and learning from medicines-related patient safety incidents.

1.1.2   Health and social care practitioners should explain to patients, and their family members or carers where appropriate, how to identify and report medicines-related patient safety incidents.

1.1.3   Organisations should ensure that robust and transparent processes are in place to identify, report, prioritise, investigate and learn from medicines-related patient safety incidents, in line with national patient safety reporting systems – for example, the National Reporting and Learning System.

1.1.4   Organisations should consider using multiple methods to identify medicines-related patient safety incidents – for example, health record review,

patient surveys and direct observation of medicines administration. They should agree the approach locally and review arrangements regularly to reflect local and national learning.

1.1.5   Organisations should ensure that national medicines safety guidance, such as patient safety alerts, are actioned within a specified or locally agreed timeframe.

1.1.6   Organisations should consider assessing the training and education needs of health and social care practitioners to help patients and practitioners to identify and report medicines-related patient safety incidents.

1.1.7   Health and social care practitioners should report all identified medicines-related patient safety incidents consistently and in a timely manner, in line with local and national patient safety reporting systems, to ensure that patient safety is not compromised.

1.1.8   Organisations and health professionals should consider applying the principles of the PINCER intervention to reduce the number of medicines-related patient safety incidents, taking account of existing systems and resource implications. These principles include:

- using information technology support

- using educational outreach with regular reinforcement of educational messages

- actively involving a multidisciplinary team, including GPs, nurses and support staff

- having dedicated pharmacist support

- agreeing an action plan with clear objectives

- providing regular feedback on progress

- providing clear, concise, evidence-based information.

1.1.9   Consider using a screening tool – for example, the STOPP/START* tool in older people – to identify potential medicines-related patient safety incidents in some groups. These groups may include:

- adults, children and young people taking multiple medicines (polypharmacy)

- adults, children and young people with chronic or long-term conditions

- older people.

*STOPP, Screening Tool of Older Persons' potentially inappropriate Prescriptions; START, Screening Tool to Alert to Right Treatment

1.1.10   Organisations should consider exploring what barriers exist that may reduce reporting and learning from medicines-related patient safety incidents. Any barriers identified should be addressed – for example, using a documented action plan.

1.1.11   Health and social care organisations and practitioners should:

- ensure that action is taken to reduce further risk when medicines-related patient safety incidents are identified

- apply and share learning in the organisation and across the local health economy, including feedback on trends or significant incidents to support continuing professional development. This may be through a medicines safety officer, controlled drugs accountable officer or other medicines safety lead.

Surveillance proposal

This section of the guideline should not be updated.

2019 surveillance summary

A systematic review(1) of 4 studies (n=1,925) assessed the STOPP/START tool compared with control in older adults. There was a reduction in potentially inappropriate medicine prescriptions, although meta-analysis was not possible because of heterogeneity.

An RCT(2) assessing computerised STOPP alerts for GPs (n= 23,976) compared with no alerts had no effect on prescriptions of potentially inappropriate medicines.

Intelligence gathering

No information relevant to this section was identified.

Impact statement

The findings from 2 studies suggest that the STOP/START tool may be effective for reducing potentially inappropriate prescribing in older adults whereas alerts based on STOPP criteria may not be effective in general practice. This could be because of the differences in populations, with older people possibly more likely to benefit from this intervention. These findings are consistent with current recommendations on screening tools in specific groups such as older people.

New evidence is unlikely to change guideline recommendations.

Medicines-related communication systems when patients move from one care setting to another

Relevant information about medicines should be shared with patients, and their family members or carers, where appropriate, and between health and social care practitioners when a person moves from one care setting to another, to support high-quality care. This includes transfers within an organisation – for example, when a person moves from intensive care to a hospital ward – or from one organisation to another – for example, when a person is admitted to hospital, or discharged from hospital to their home or other location.

Recommendations in this section update and replace recommendation 1.4.2 in Medicines adherence: Involving patients in decisions about prescribed medicines and supporting adherence (NICE guideline CG76).

1.2.1   Organisations should ensure that robust and transparent processes are in place, so that when a person is transferred from one care setting to another:

- the current care provider shares† complete and accurate information about the person's medicines with the new care provider and

- the new care provider receives and documents this information, and acts on it.

  Organisational and individual roles and responsibilities should be clearly defined. Regularly review and monitor the effectiveness of these processes. See also section 1.3 on medicines reconciliation.

† Take into account the 5 rules set out in the Health and Social Care Information Centre's A guide to confidentiality in health and social care (2013) when sharing information.

1.2.2   For all care settings, health and social care practitioners should proactively share complete and accurate information about medicines:

- ideally within 24 hours of the person being transferred, to ensure that patient safety is not compromised and

- in the most effective and secure way, such as by secure electronic communication, recognising that more than one approach may be needed.

1.2.3   Health and social care practitioners should share relevant information about the person and their medicines when a person transfers from one care setting to another. This should include, but is not limited to, all of the following:

- contact details of the person and their GP

- details of other relevant contacts identified by the person and their family members or carers where appropriate – for example, their nominated community pharmacy

- known drug allergies and reactions to medicines or their ingredients, and the type of reaction experienced (see the NICE guideline on drug allergy)

- details of the medicines the person is currently taking (including prescribed, over-the-counter and complementary medicines) – name, strength, form, dose, timing, frequency and duration, how the medicines are taken and what they are being taken for

- changes to medicines, including medicines started or stopped, or dosage changes, and reason for the change

- date and time of the last dose, such as for weekly or monthly medicines, including injections

- what information has been given to the person, and their family members or carers where appropriate

- any other information needed – for example, when the medicines should be reviewed, ongoing monitoring needs and any support the person needs to carry on taking the medicines. Additional information may be needed for specific groups of people, such as children.

1.2.4 Health and social care practitioners should discuss relevant information about medicines with the person, and their family members or carers where appropriate, at the time of transfer. They should give the person, and their family members or carers where appropriate, a complete and accurate list of their medicines in a format that is suitable for them. This should include all current medicines and any changes to medicines made during their stay.

1.2.5 Consider sending a person's medicines discharge information to their nominated community pharmacy, when possible and in agreement with the person.

1.2.6 Organisations should consider arranging additional support for some groups of people when they have been discharged from hospital, such as pharmacist counselling, telephone follow-up, and GP or nurse follow-up home visits. These groups may include:

- adults, children and young people taking multiple medicines (polypharmacy)

- adults, children and young people with chronic or long-term conditions

- older people.

Surveillance proposal

No new information was identified.

This section of the guideline should not be updated.

Editorial amendments

In the footnote to recommendation 1.2.1, the hyperlink to the Health and Social Care Information Centre's A guide to confidentiality in health and social care (2013) should be updated to reflect its current home on the NHS Digital website – the Health and Social Care Information Centre website has been archived.

Medicines reconciliation

Medicines reconciliation, as defined by the Institute for Healthcare Improvement, is the process of identifying an accurate list of a person's current medicines and comparing them with the current list in use, recognising any discrepancies, and documenting any changes, thereby resulting in a complete list of medicines, accurately communicated. The term

'medicines' also includes over-the-counter or complementary medicines, and any discrepancies should be resolved. The medicines reconciliation process will vary depending on the care setting that the person has just moved into – for example, from primary care into hospital, or from hospital to a care home.

1.3.1   In an acute setting, accurately list all of the person's medicines (including prescribed, over-the-counter and complementary medicines) and carry out medicines reconciliation within 24 hours or sooner if clinically necessary, when the person moves from one care setting to another – for example, if they are admitted to hospital.

1.3.2   Recognise that medicines reconciliation may need to be carried out on more than one occasion during a hospital stay – for example, when the person is admitted, transferred between wards or discharged.

1.3.3   In primary care, carry out medicines reconciliation for all people who have been discharged from hospital or another care setting. This should happen as soon as is practically possible, before a prescription or new supply of medicines is issued and within 1 week of the GP practice receiving the information.

1.3.4   In all care settings organisations should ensure that a designated health professional has overall organisational responsibility for the medicines reconciliation process. The process should be determined locally and include:

- organisational responsibilities

- responsibilities of health and social care practitioners involved in the process (including who they are accountable to)

- individual training and competency needs.

1.3.5   Organisations should ensure that medicines reconciliation is carried out by a trained and competent health professional – ideally a pharmacist, pharmacy technician, nurse or doctor – with the necessary knowledge, skills and expertise including:

- effective communication skills

- technical knowledge of processes for managing medicines

- therapeutic knowledge of medicines use.

1.3.6   Involve patients and their family members or carers, where appropriate, in the medicines reconciliation process.

1.3.7   When carrying out medicines reconciliation, record relevant information on an electronic or paper-based form. See section 1.2 on medicines-related communication systems.

Surveillance proposal

This section of the guideline should not be updated.

2019 surveillance summary

We found 6 studies on medicines reconciliation interventions (see Table 1 below), including a Cochrane review, 4 other systematic reviews and 2 randomised controlled trials (RCTs), all in mixed populations. Overall, the evidence for medicines reconciliation interventions was inconsistent. Medicines discrepancies were reported in 4 systematic reviews, which performed 9 analyses of slightly different measures, including number of discrepancies per person and number of discrepancies per medicine. Overall, no effect was seen in 5 of the 9 analyses.

One study of an intervention including both medicines reconciliation and medicines review found a reduction in preventable adverse drug reactions, whereas 3 studies of medicines reconciliation interventions saw no effect on preventable or potential adverse drug reactions. No effects were seen on admissions to hospital or healthcare service resource use.

Intelligence gathering

No information relevant to this section was identified.

Impact statement

The evidence identified in surveillance indicates that medicines reconciliation interventions may not be effective for improving adverse events or healthcare use outcomes. Although this appears to be inconsistent with NICE's recommendations to conduct medicines reconciliation, the

evidence available when developing the guideline was also inconsistent. In developing the guideline, 1 study (moderate quality evidence) found no effects of medicines reconciliation on medicines related outcomes, whereas 3 studies (very low quality evidence) did find improvements in medicines related outcomes. Many of the recommendations in this section of the guideline were developed by consensus. The committee noted that 'medicines reconciliation helps to identify unintentional discrepancies that might otherwise be unresolved' and that identifying discrepancies would be difficult in the control group of RCTs without having undergone medicines reconciliation. Additionally, it was not possible to tell much about the components of these interventions from the abstract-level review of these studies. So they may not cover the system-wide best practice approach recommended in the guideline.

Additionally, one study suggesting that conducting both medicines reconciliation and medicines review may reduce preventable adverse drug reactions. This finding is consistent with current guidance, which recommends both processes. For example, the process of medicines reconciliation may provide healthcare professionals with the information necessary for selecting patients for a structured medicines review.

New evidence is unlikely to change guideline recommendations.

Medication review

Medication review can have several different interpretations and there are also different types which vary in their quality and effectiveness. Medication reviews are carried out in people of all ages. In this guideline medication review is defined as 'a structured, critical examination of a person's medicines with the objective of reaching an agreement with the person about treatment, optimising the impact of medicines, minimising the number of medication-related problems and reducing waste'. See also recommendation 1.6.3.

1.4.1   Consider carrying out a structured medication review for some groups of people when a clear purpose for the review has been identified. These groups may include:

- adults, children and young people taking multiple medicines (polypharmacy)

- adults, children and young people with chronic or long-term conditions

- older people.

1.4.2   Organisations should determine locally the most appropriate health professional to carry out a structured medication review, based on their knowledge and skills, including all of the following:

- technical knowledge of processes for managing medicines

- therapeutic knowledge on medicines use

- effective communication skills.

    The medication review may be led, for example, by a pharmacist or by an appropriate health professional who is part of a multidisciplinary team.

1.4.3   During a structured medication review, take into account:

- the person's, and their family members or carers where appropriate, views and understanding about their medicines

- the person's, and their family members' or carers' where appropriate, concerns, questions or problems with the medicines

- all prescribed, over-the-counter and complementary medicines that the person is taking or using, and what these are for

- how safe the medicines are, how well they work for the person, how appropriate they are, and whether their use is in line with national guidance

- whether the person has had or has any risk factors for developing adverse drug reactions (report adverse drug reactions in line with the yellow card scheme)

- any monitoring that is needed.

Surveillance proposal

This section of the guideline should not be updated.

2019 surveillance summary

We identified 11 studies (reported in 12 publications) assessing medicines review (see

Table 2), including 2 Cochrane reviews, 5 other systematic reviews and 4 RCTs. Of these, 7 studies looked at older adult populations.

Overall, medicines review improved outcomes in 18 of 39 analyses (46%). This included medicines omissions in older adults. Reductions in potentially inappropriate prescriptions in older people showed inconsistent effects across studies. Additionally, mortality, admissions to hospital or attending the emergency department were not influenced by medicines reviews.

Intelligence gathering

No information relevant to this section was identified.

Impact statement

The inconsistent findings on the effect of medicines review appears to be at odds with NICE's recommendations to conduct medicines reviews in some people. However, in developing the guideline, the committee noted that the evidence on medicines review considered in developing the guideline also had 'mixed findings'.

However, in developing the guideline, the committee 'discussed and agreed that the purpose of doing a medication review is important in practice as it may be driven by a clinical need or by national/local incentives, which may lead to different clinical or patient-reported outcomes.'

New evidence is unlikely to change guideline recommendations.

Self-management plans

Self-management plans can be patient-led or professional-led and they aim to support people to be empowered and involved in managing their condition. Different types of self-management plan exist and they vary in their content depending on the needs of the individual person. Self-management plans can be used in different settings. In this guideline self-management plans are structured, documented plans that are developed to support a person's self-management of their condition using medicines. People using self-management plans can be supported to use them by their family members or carers who can also be

involved when appropriate during discussions – for example, a child and their parent(s) using a self-management plan.

1.5.1   When discussing medicines with people who have chronic or long-term conditions, consider using an individualised, documented self-management plan to support people who want to be involved in managing their medicines. Discuss at least all of the following:

- the person's knowledge and skills needed to use the plan, using a risk assessment if needed

- the benefits and risks of using the plan

- the person's values and preferences

- how to use the plan

- any support, signposting or monitoring the person needs.

Record the discussion in the person's medical notes or care plan as appropriate.

1.5.2   When developing an individualised, documented self-management plan, provide it in an accessible format for the person and consider including:

- the plan's start and review dates

- the condition(s) being managed

- a description of medicines being taken under the plan (including the timing)

- a list of the medicines that may be self-administered under the plan and their permitted frequency of use, including any strength or dose restrictions and how long a medicine may be taken for

- known drug allergies and reactions to medicines or their ingredients, and the type of reaction experienced (see the NICE guideline on drug allergy)

- arrangements for the person to report suspected or known adverse reactions to medicines

- circumstances in which the person should refer to, or seek advice from, a health professional

- the individual responsibilities of the health professional and the person

- any other instructions the person needs to safely and effectively self-manage their medicines.

1.5.3   Review the self-management plan to ensure the person does not have problems using it.

Surveillance proposal

This section of the guideline should not be updated.

Editorial amendments

A cross reference to Decision-making and mental capacity (NICE NG108) should be added in this section.

2019 surveillance summary

We identified 5 studies of patient self-management interventions, including 1 systematic review, 1 NIHR-funded randomised controlled trial, and 3 other RCTs (see Table 3).

Self-management interventions resulted in reduced viral load in people with HIV, and improved cholesterol, blood pressure and blood glucose in people with diabetes. However, self-management interventions did not improve patients' quality of life in 2 studies (in people with asthma and in uncontrolled epilepsy). In one study in people with asthma, quality of life was improved by online self-management after 3 months but not after 6 months.

Intelligence gathering

No information relevant to this section was identified.

Impact statement

Self-management interventions appear to have benefits for patient-oriented outcomes in asthma, diabetes and HIV, although quality of life may not be improved. The evidence therefore is consistent with the guideline, which recommends the use of self-management plans.

New evidence is unlikely to change guideline recommendations.

Patient decision aids used in consultations involving medicines

Many people wish to be active participants in their own healthcare, and to be involved in making decisions about their medicines. Patient decision aids can support health professionals to adopt a shared decision-making approach in a consultation, to ensure that patients, and their family members or carers where appropriate, are able to make well-informed choices that are consistent with the person's values and preferences.

1.6.1   Offer all people the opportunity to be involved in making decisions about their medicines. Find out what level of involvement in decision-making the person would like and avoid making assumptions about this.

1.6.2   Find out about a person's values and preferences by discussing what is important to them about managing their condition(s) and their medicines. Recognise that the person's values and preferences may be different from those of the health professional and avoid making assumptions about these.

1.6.3   Apply the principles of evidence-based medicine when discussing the available treatment options with a person in a consultation about medicines. Use the best available evidence when making decisions with or for individuals, together with clinical expertise and the person's values and preferences.

1.6.4   In a consultation about medicines, offer the person, and their family members or carers where appropriate, the opportunity to use a patient decision aid (when one is available) to help them make a preference-sensitive decision that involves trade-offs between benefits and harms. Ensure the patient decision aid is appropriate in the context of the consultation as a whole.

1.6.5   Do not use a patient decision aid to replace discussions with a person in a consultation about medicines.

1.6.6   Recognise that it may be appropriate to have more than one consultation to ensure that a person can make an informed decision about their medicines. Give the person the opportunity to review their decision, because this may change over time – for example, a person's baseline risk may change.

1.6.7   Ensure that patient decision aids used in consultations about medicines have followed a robust and transparent development process, in line with the IPDAS criteria.

1.6.8   Before using a patient decision aid with a person in a consultation about medicines, read and understand its content, paying particular attention to its limitations and the need to adjust discussions according to the person's baseline risk.

1.6.9   Ensure that the necessary knowledge, skills and expertise have been obtained before using a patient decision aid. This includes:

- relevant clinical knowledge

- effective communication and consultation skills, especially when finding out patients' values and preferences

- effective numeracy skills, especially when explaining the benefits and harms in natural frequencies, and relative and absolute risk

- explaining the trade-offs between particular benefits and harms.

1.6.10   Organisations should consider training and education needs for health professionals in developing the skills and expertise to use patient decision aids effectively in consultations about medicines with patients, and their family members or carers where appropriate.

1.6.11   Organisations should consider identifying and prioritising which patient decision aids are needed for their patient population through, for example, a local medicines decision-making group. They should agree a consistent, targeted

approach in line with local pathways and review the use of these patient decision aids regularly.

1.6.12   Organisations and health professionals should ensure that patient decision aids prioritised for use locally are disseminated to all relevant health professionals and stakeholder groups, such as clinical networks.

Surveillance proposal

This section of the guideline should not be updated.

Editorial amendments

A cross reference to Decision-making and mental capacity (NICE NG108) should be added in this section.

2019 surveillance summary

An RCT(3) (number of participants not reported in the abstract) assessed a patient decision aid for primary prevention of fracture in people with osteoporosis, which included 10 year fracture risk, medicines risks and benefits, and value elicitation. The intervention improved 'decisional conflict' but had no effect on making decision about treatment or starting treatment.

Intelligence gathering

No information relevant to this section was identified.

Impact statement

This study suggests that there may be little benefit of decision aids for people with osteoporosis. Because this population had no previous fractures, people may be less likely to choose to take drug treatments than people who have a symptomatic long-term condition such as chronic obstructive pulmonary disease. Additionally, it was not possible to tell whether the decision aid was used as part of a consultation process (as recommended in the guideline) or for patients use in their own time (not covered by the guideline) from the abstract-level review of this study.

New evidence is unlikely to change guideline recommendations.

Clinical decision support

Clinical decision support software is a component of an integrated clinical IT system providing support to clinical services, such as in a GP practice or secondary care setting. These integrated clinical IT systems are used to support health professionals to manage a person's condition. In this guideline the clinical decision support software relates to

computerised clinical decision support, which may be active or interactive, at the point of prescribing medicines.

1.7.1   Organisations should consider computerised clinical decision support systems (taking account of existing systems and resource implications) to support clinical decision-making and prescribing, but ensure that these do not replace clinical judgement.

1.7.2   Organisations should ensure that robust and transparent processes are in place for developing, using, reviewing and updating computerised clinical decision support systems.

1.7.3   Organisations should ensure that health professionals using computerised clinical decision support systems at the point of prescribing have the necessary knowledge and skills to use the system, including an understanding of its limitations.

1.7.4   When using a computerised clinical decision support system to support clinical decision-making and prescribing, ensure that it:

- identifies important safety issues

- includes a system for health professionals to acknowledge mandatory alerts. This should not be customisable for alerts relating to medicines-related 'never events'

- reflects the best available evidence and is up-to-date

- contains useful clinical information that is relevant to the health professional to reduce 'alert fatigue' (when a prescriber's responsiveness to a particular type of alert declines as they are repeatedly exposed to that alert over time).

Surveillance proposal

This section of the guideline should not be updated.

2019 surveillance summary

We identified 17 studies including a clinical decision support element (see Table 4), including 2 Cochrane reviews, 6 other systematic reviews and 9 RCTs. Overall, decision support interventions were effective in 33 of 48 analyses (69%). This included:

- In 5 studies of cardiometabolic conditions including cardiovascular

disease and diabetes, interventions involving decision support resulted in improved prescribing of antiplatelets, anticoagulants, and lipid-lowering drugs. Clinical outcomes showed variable effects, with blood pressure reduction seen in one study, but no effect on the more serious outcomes of

haemorrhage and stroke. In one study, transient ischaemic attack was increased, which could have been because of improved detection as a result of increased awareness. Psychological outcomes were improved in people with diabetes, including distress about diabetes and patients' satisfaction with medication.

- In 5 studies of infection, antibiotic prescribing increased in 2 studies, was not influenced by clinical decision support in one study and was reduced in one study that needed a typed justification for the prescription. However, in 2 studies improvements were seen in prescribing antibiotics appropriately or according to guidelines. Mortality was improved in a systematic review of decision support in hospital.

- In a Cochrane review of 12 studies (n=4,052), decision support in older people on 4 or more medicines improved appropriate prescriptions, prescribing omissions, but had inconsistent effects in potentially inappropriate medicines prescribing. Additionally, there was little or no effect on quality of life or admissions to hospital.

- In a systematic review of 34 studies, medicines errors were reduced in children in intensive care with several different interventions, including clinical decision support, protocols and guidelines, education

interventions and computerised physician order entry systems.

Intelligence gathering

No information relevant to this section was identified.

Impact statement

The evidence suggests that clinical decision support tools may improve prescribing. However, significant effects on clinical and patient-oriented outcomes were less common. Overall, the evidence supports the recommendations to consider computerised clinical decision support systems (taking account of existing systems and resource implications) to support clinical decision-making and prescribing.

It was not possible to tell whether all the interventions met the guideline's definition of decision support from the abstract-level review of these studies. In developing the guideline, the committee 'recognised that clinical decision support would need to be kept up-to-date in terms of clinical information and software versions and be applicable to local healthcare needs.' Therefore, the committee made consensus-based recommendations on the principles behind the information integrated into clinical decision support. The new evidence does not impact on the broad principles for clinical decision support systems noted in current recommendations.

New evidence is unlikely to change guideline recommendations.

Medicines-related models of organisational and cross-sector working

The introduction of skill mixing of various health and social care practitioners to meet the needs of different groups of people has led to different types of models of care emerging across health and social care settings. Cross-organisational working further provides seamless care during the patient care pathway when using health and social care services. The type of model of care used will be determined locally based on the resources and health and social care needs of the population in relation to medicines.

1.8.1   Organisations should consider a multidisciplinary team approach to improve outcomes for people who have long-term conditions and take multiple medicines (polypharmacy).

1.8.2   Organisations should involve a pharmacist with relevant clinical knowledge and skills when making strategic decisions about medicines use or when developing care pathways that involve medicines use.

Surveillance proposal

No new information was identified.

Areas not currently covered in the guideline

In surveillance, evidence was identified for areas not covered by the guideline. This new evidence has been considered for possible addition as a new section of the guideline.

Surveillance proposal

New sections of the guideline should not be added.

2019 surveillance summary

We identified 11 studies of interventions that are not currently covered by the guideline, including 2 Cochrane reviews, 4 other systematic reviews and 5 RCTs (see

Table 5). This included:

- A Cochrane review of 'medicines errors interventions' that found no effects on admissions to hospital, emergency department attendance or mortality.

- A Cochrane review suggesting that nurse-led titration in cardiovascular disease increased the chance of reaching the target dose, reduced admissions to hospital and all-cause mortality and increased event-free survival.

- Genetic profiling for people taking medicines with known genetic-based interactions had no effect on readmission to hospital or emergency department use at 1 month, but both outcomes were lower after 2 months (1 study, n=110).

- Feedback to healthcare staff on prescribing of steroids (1 study, n=721) or peers' antibiotic prescribing patterns (1 study, n=16,959) resulted in reduced parenteral steroid doses and antibiotic prescriptions.

- Educational or training interventions for healthcare workers, which were assessed in 4 studies. In one study, educational interventions increased quality of prescribing, but in 3 studies, educational interventions did not affect prescribing of medicines with potential interactions, prescription of potentially inappropriate medicines, medicines administration errors, admission to hospital, mortality or administration of prophylaxis for

venous thromboembolism in people in hospital.

- Several interventions reporting effects on prescribing included too little detail to know if they were relevant to any of the sections of the current guideline, for example, 'computerised interventions' 'pharmacist involvement' or 'interventions to reduce antimicrobial prescribing'.

Intelligence gathering

No information relevant to this section was identified.

Impact statement

Of the identified interventions, two appear to have promise: genetic profiling and giving doctors feedback on their prescribing or how their prescribing relates to their peers. However, the study on genetic profiling had follow-up of only 2 months, which is too short to evaluate effects on patients' outcomes.

The studies on providing feedback to healthcare staff suggest that this is a useful mechanism for improving prescribing. However, the identified evidence is relevant to only two populations – people being prescribed steroids and antibiotics for upper respiratory tract infections. This is consistent with NICE's guideline on antimicrobial stewardship recommends considering developing systems and processes for providing regular updates to prescribers and prescribing leads on individual prescribing benchmarked against local and national antimicrobial prescribing rates and trends. The evidence suggesting that feedback may also be useful for

reducing prescribed doses of parenteral steroids was based on one study from Iran, which may limit its applicability to the UK setting, particularly if parenteral steroid prescribing patterns differ between these countries.

New evidence is unlikely to impact on the guideline.

Research recommendations

Is a medication review more clinically and cost effective at reducing the suboptimal use of medicines and medicines-related patient safety incidents, compared with usual care or other interventions, in children?

Summary of findings

No new evidence relevant to population specified in the research recommendation (that is, children) was found and no ongoing studies were identified.

Is a medication review more clinically and cost effective at reducing the suboptimal use of medicines and improving patient-reported outcomes, compared with usual care or other intervention in the UK setting?

Summary of findings

New evidence relevant to the research recommendation was found (see

Table 2). Overall, the evidence appears to be inconsistent so is insufficient to answer this research recommendation at this time. See the section on medicines review above for discussion of the evidence and its impact on the guideline.

The proposed format of the research recommendation noted that a follow-up duration of 1–2 years would be useful to capture longer-term outcomes. The abstracts of studies identified in surveillance rarely reported the duration of follow-up, and of those that did, almost all were of 1 year or shorter. Therefore, no conclusions could be drawn on the frequency of medicines reviews.

What is the clinical and cost effectiveness of using clinical decision support systems to reduce the suboptimal use of medicines and improve patient outcomes from medicines, compared with usual care, in the UK setting?

Summary of findings

New evidence relevant to the research recommendation was found (see Table 4

Table 2). Overall, the evidence appears to be support current recommendations but is insufficient to answer inform the use of decision support tools in the NHS. See the section on clinical decision support above for discussion of the evidence and its impact on the guideline.

What models of cross-organisational working improve clinical and cost effectiveness in relation to the suboptimal prescribing of medicines – for example, between NHS and social care, or primary and secondary care, or between NHS and commercial organisations?

Summary of findings

No new evidence relevant to the research recommendation was found and no ongoing studies were identified.

Evidence tables

Table 1 Medicines reconciliation interventions

Study	Type*	Studies	n	Population	Intervention	Comparator	Outcome	Result
Redmond et al. 2018(4)	SR-C	4	597	Mixed	Medicines reconciliation intervention	Usual care	Admission to hospital or emergency department use	No significant effect with intervention
		4	1,363				Adverse drug reactions	No significant effect with intervention
		20	4,629				Medication discrepancies	Improved with intervention
		2	3,595				Medicines discrepancies (number per medicine)	No significant effect with intervention
		4	1,963				Medicines discrepancies (number per person)	No significant effect with intervention
		3	1,253				Preventable adverse drug reactions	No significant effect with intervention
		5	1,206				Readmission to hospital (unplanned)	No significant effect with intervention
Cheema et al. 2018(5)	SR	18	6,038	Mixed	Medicines reconciliation (pharmacist-led)	Unspecified control	Adverse drug reactions (potential)	No significant effect with intervention
							Health service resource use	No significant effect with intervention
							Medication discrepancies	Improved with intervention
							Preventable adverse drug reactions	No significant effect with intervention
Mekonnen et al. 2016(6)	SR	10		Mixed (in hospital)	Medicines reconciliation	Usual care	Medicine omission errors	Improved with intervention
							Medicines discrepancies (number of discrepancies)	Improved with intervention

Study	Type*	Studies	n	Population	Intervention	Comparator	Outcome	Result
							Medicines discrepancies (number of discrepancies)	No significant effect with intervention
							Medicines discrepancies (number of people)	No significant effect with intervention
Wang et al. 2018(7)	SR	13		Mixed	Medicines reconciliation interventions	Unspecified control	Medicines discrepancies (number of discrepancies)	Improved with intervention
							Medicines discrepancies (number of people)	No significant effect with intervention
Al-Hashar et al. 2018(8)	RCT		587	Mixed	Medicines intervention (reconciliation, review and counselling)	Usual care	Health service resource use	No significant effect with intervention
							Preventable adverse drug reactions	Improved with intervention
Tamblyn et al. 2018(9)	RCT			Mixed	Computerised medicines reconciliation	Unspecified control	Completed medicines reconciliations	Improved with intervention

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Table 2 Medicines review interventions

Study	Type*	Studies	n	Population	Intervention	Comparator	Outcome	Result
Alldred et al. 2016(10)	SR-C	2		Mixed (65 years or older living in care homes)	Medicines optimisation intervention†	Unspecified control	Adverse drug reactions	No significant effect with intervention‡
		8					Duration of hospital admission	Little or no effect with intervention‡
		2					Health-related quality of life	Mixed success of intervention‡
		5					Medicines appropriateness	Improved with intervention‡
		5					Medicines costs	No significant effect with intervention‡

Study	Type	Studies	N	Population	Intervention	Control	Outcome	Result
		7					Medicines-related problems (identification and resolution)	Improved with intervention‡
		6					Mortality	No significant effect with intervention‡
Christensen and Lundh 2016(11)	SR-C	7	2,843	Mixed (adults in hospital)	Medicines review (by a physician, pharmacist or other healthcare professional)	Usual care	Emergency department use	No significant effect with intervention
		9	3,218				Mortality	No significant effect with intervention
		7	2,843				Readmission to hospital	No significant effect with intervention
Hohl et al. 2015(12)	SR	7	3,292	Mixed (in hospital)	Medicines review (pharmacist-led)	Unspecified control	Duration of hospital admission	No significant effect with intervention
							Emergency department use	No significant effect with intervention
							Mortality	No significant effect with intervention
							Readmission to hospital	No significant effect with intervention
Loh et al. 2016(13)	SR	25	15,341	Mixed (65 years and older, community-based)	Medicines review (pharmacist-led)	Unspecified control	Costs	No significant effect with intervention
							Health perception	Worse with intervention
							Pain	Worse with intervention
							Quality of life	No significant effect with intervention
Meid et al. 2015(14)	SR	6	1,469	Mixed (65 years and older)	Medicines review	Unspecified control	Medicines omitted (mean)	Improved with intervention
		8	1,833				Medicines omitted (number of patients)	Improved with intervention
Tesfaye et al. 2017(15)	SR	49		Kidney disease (chronic)	Clinical pharmacist feedback	Unspecified control	Inappropriate prescribing	Improved with intervention
Thomas et al. 2014(16)	SR	3		Cardiovascular disease (heart failure, older adults)	Pharmacist-led interventions	Unspecified control	Admission to hospital	Improved with intervention (meta-analysis not possible because of heterogeneity)

		27		Mixed (older adults)			Admission to hospital (unplanned)	No significant effect with intervention
Clyne et al. 2015, Clyne et al. 2016(17,18)	RCT		196	Mixed (70 years and older in general practice)	Medicines review (internet-based algorithm with recommended alternative treatment suggestions) plus academic detailing plus tailored patient information leaflets	Usual care with simple patient-level feedback on potentially inappropriate prescribing	Number of people prescribed potentially inappropriate medicines	Improved with intervention
							Number of potentially inappropriate medicines prescribed	Improved with intervention
							Potentially inappropriate medicines prescribed (any)	No significant effect with intervention
							Prescription of proton pump inhibitors (reduction)	Improved with intervention
							Proton pump inhibitors prescribed (reduction)	Improved with intervention
Lalonde et al. 2017(19)	RCT		442	Kidney disease (chronic)	Medicines management intervention (pharmacists' online training tool, access to patients' clinical summaries and to the chronic kidney disease clinic)	Unspecified control	Medication-related problems	Improved with intervention
							Patients' clinical attributes (such as blood pressure and glycated haemoglobin concentration)	No significant effect with intervention
							Pharmacists' clinical competencies	Improved with intervention
							Pharmacists' knowledge	Improved with intervention
Nipp et al. 2018(20)	RCT		60	Cancer (breast, gastrointestinal or lung, undergoing first-line chemotherapy,	Pharmacist-led medicines management and vaccination administration	Unspecified control	Medicine discrepancies	No significant effect with intervention
							Potentially inappropriate medicines prescribed	No significant effect with intervention

Study	Type*	Studies	n	Population	Intervention	Comparator	Outcome	Result
				65 years or older)			Uptake of influenza vaccination	Improved with intervention
							Uptake of pneumonia vaccination	Improved with intervention
Tsuyuki et al. 2015(21)	RCT		248	Cardiovascular disease (hypertension, uncontrolled)	Pharmacist-led cardiovascular risk assessment, patient education about hypertension, prescribing antihypertensives	Paper-based blood pressure recording	Blood pressure (controlled)	Improved with intervention
							Blood pressure (systolic)	Improved with intervention

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†Medication review was a component of 10 studies. 4 studies involved multidisciplinary case-conferencing, 5 studies involved an educational element for health and care professionals and 1 study evaluated the use of clinical decision support technology. ‡ Meta-analysis not possible because of heterogeneity.

Table 3 Self management interventions

Study	Type*	Studies	n	Population	Intervention	Comparator	Outcome	Result
Ahmed et al. 2016(22)	RCT		100	Asthma (adolescents)	Online self management	Usual care	Quality of life (asthma-related)	Improved with intervention at 3 months
								No significant effect with intervention at 6 months
de Bruin et al. 2017(23)	RCT		221	Infection (HIV)	Nurse-led self management strategy (aiming to improve adherence)	Usual care	Viral load	Improved with intervention
Morrison et al. 2016(24)	RCT		51	Asthma	Online self management	Unspecified control	Quality of life (asthma-related)	No significant effect with intervention
Ridsdale et al. 2018(25)	RCT-NIHR		404	Epilepsy (uncontrolled on at least 2 antiepilptics)	Self management education (intensive 2-day training)	Usual care	Quality of life	No significant effect with intervention
van Eikenhorst et al. 2017(26)	SR	24	3,610	Diabetes (unspecified)	Pharmacist-led self management (such as education on medicines, complications,	Unspecified control	Cholesterol	Improved with intervention
							Blood pressure (diastolic)	Improved with intervention

| | | | | | lifestyle and teaching self management skills) | | Blood pressure (systolic) | Improved with intervention |
| | | | | | | | Glycated haemoglobin | Improved with intervention |

*Type of study SR = systematic review; SR-C = Cochrane review; SR-HTA = NIHR-funded systematic review (Health Technology Assessment); SR-NMA = systematic review with network meta-analysis; RCT = randomised controlled trial; RCT-NIHR = NIHR-funded randomised controlled trial; CE = cost-effectiveness study.

n = number of participants. The number of participants was not always reported in the abstract.

Table 4 Clinical decision support interventions

Study	Type*	Studies	n	Population	Intervention	Comparator	Outcome	Result
Mazzaglia et al. 2016(27)	RCT		27,317	Cardiometabolic conditions (diabetes type, myocardial infarction, stroke)	Computerised decision support (primary care)	Standard software	Antiplatelets prescribed to people with diabetes	Improved with intervention
							Days on medicines with potential interactions (people with stroke only)	Improved with intervention
							Lipid-lowering drugs prescribed to people with diabetes	Improved with intervention
Silbernagel et al. 2016(28)	RCT		889	Cardiovascular disease (atrial fibrillation suspected, not on oral anticoagulants)	Computerised alert recommending prescription of oral anticoagulants	Usual care	Oral anticoagulants or antiplatelets prescribed	Improved with intervention
							Oral anticoagulants prescribed	Improved with intervention
Holt et al. 2017(29)	RCT			Cardiovascular disease (atrial fibrillation)	Electronic reminders about starting oral anticoagulants (in general practice consultations)	Usual care	Incidence of haemorrhage	No significant effect with intervention
							Incidence of stroke	No significant effect with intervention
							Incidence of transient ischaemic attack	Worse with intervention
							Oral anticoagulants prescribed	No significant effect with intervention
Duan et al. 2017(30)	SR	46	13,875	Cardiovascular disease (hypertension)	Telemonitoring plus additional support (such as counselling, education, behavioural management, medicines	Telemonitoring without additional support	Blood pressure (diastolic)	Improved with intervention
							Blood pressure (systolic)	Improved with intervention

					management with decision support)			
Heisler et al. 2014(31)	RCT			188	Diabetes	Decision support tool	Standard educational material	Patient distress about diabetes	Improved with intervention
								Patient satisfaction (with medication)	Improved with intervention
Baysari et al. 2016(32)	SR	45			Infection (antibiotics)	Computerised intervention (decision support, computerised provider order entry, antimicrobial approval, or surveillance systems)	Unspecified control	Appropriate antimicrobial use	Improved with intervention
Curtis et al. 2017(33)	SR	13			Infection (antibiotics, hospital-based)	Computerised decision support	Unspecified control	Antibiotic coverage adequacy	Improved with intervention
		20						Mortality	Improved with intervention
Blair et al. 2017(34)	RCT			501	Infection (respiratory, antibiotics, children)	Clinical decision support	Usual care	Antimicrobial prescribing (reduction)	Worse with intervention (evidence of recruitment of sicker children into the intervention arm)
Meeker et al. 2016(35)	RCT			16,959	Infection (upper respiratory tract, antibiotics in general practice)	Typed justification for prescription	Usual care	Antimicrobial prescribing (reduction)	Improved with intervention
						Reminders about non-antimicrobial alternatives			No significant effect with intervention
Vellinga et al. 2016(36)	RCT				Infection (urinary tract antibiotics)	Antimicrobial prescribing intervention (clinician education, practice audit report, with computerised reminders about first-line treatment or delayed prescribing)	Unspecified control	Antimicrobial prescribing (reduction)	Worse with intervention
								Antimicrobial prescribing according to guidelines	Improved with intervention
Awdishu et al. 2016(37)	RCT			1,278	Kidney disease	Decision support tool for doctors with alerts recommending dose adjustment or stopping medicines)	Decision support tool without alerts	Appropriate medicines prescribed	Improved with intervention

Rankin et al. 2018(38)	SR-C	12	4,052	Mixed (65 years and older, on 4 or more medicines)	Polypharmacy care (computerised decision support or multicomponent pharmaceutical care intervention)	Unspecified control	Admission to hospital	Little or no effect with intervention‡
		5	517				Appropriate medicines prescribed	Improved with intervention
		11	3,079				Number of people prescribed potentially inappropriate medicines	No significant effect with intervention
		7	1,832				Number of potentially inappropriate medicines prescribed	Improved with intervention
		2	569				Potential prescribing omission (number of omissions)	Improved with intervention
		5	1,310				Potential prescribing omission (number of people)	Improved with intervention
		12	3,211				Quality of life	Little or no effect with intervention‡
Maaskant et al. 2015(39)	SR-C	7		Mixed (children in hospital)	Medication errors intervention (pharmacist-led, or computerised order or administration systems or structured prescribing form or checklist plus feedback)	Unspecified control	Medicines errors	Improved with intervention‡
							Patient harm caused by medicines errors	No significant effect with intervention
Manias et al. 2014(40)	SR	34		Mixed (children in intensive care)	Computerised physician order entry	Unspecified control	Medicines errors	Improved with intervention
					Education interventions	Unspecified control	Medicines errors	Improved with intervention
					Protocols and guidelines	Unspecified control	Medicines errors	No significant effect with intervention
					Clinical decision support	Unspecified control	Medicines errors	No significant effect with intervention
					Pharmacist involvement	Unspecified control	Medicines errors	No significant effect with intervention

Nuckols et al. 2014(41)	SR	16		Mixed (hospital-based)	Computerised physician order entry	Unspecified control	Medicines errors	Improved with intervention
							Preventable adverse drug reactions	Improved with intervention
Liebschutz et al. 2017(42)	RCT		985	Mixed (opioid prescriptions)	Digital decision tools, electronic registry, nurse care management, 1-on-1 'academic detailing'	Digital decision tools	Dose reduction by 10% or stopping treatment	Improved with intervention
							Early prescription refill (fewer considered better)	No significant effect with intervention
							Guideline-concordant care[†]	Improved with intervention
							Morphine-equivalent daily dose (lower)	Improved with intervention
							Patient–primary care clinician agreement	Improved with intervention
							Undergone at least 1 urinary drug test	Improved with intervention

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n = number of participants. The number of participants was not always reported in the abstract.

[†] Guideline-concordant care defined as a patient and primary care clinician agreement recorded in the electronic health record and at least 1 urine drug test. ‡ Meta-analysis not possible because of heterogeneity.

Table 5 Interventions not currently covered by the guideline

Study	Type*	Studies	n	Population	Intervention	Comparator	Outcome	Result
Driscoll et al. 2015(43)	SR-C	4	556	Cardiovascular disease (heart failure, beta blockers or angiotensin receptor blockers)	Nurse-led titration	Usual care	Admissions to hospital	Improved with intervention
		4	556				Admissions to hospital for heart failure	Improved with intervention
		9	902				Mortality (all cause)	Improved with intervention
		3	370				Survival (event free)	Improved with intervention
		5	966				Target dose reached	Improved with intervention
Khalil et al. 2017(44)	SR-C	13	152,237	Mixed	Medication errors intervention (organisational-level)	Unspecified control	Admissions to hospital (number of people)	No significant effect with intervention
		11	6,203				Admissions to hospital (total number)	No significant effect with intervention
		5	1,819				Emergency department use	No significant effect with intervention
		12	154,962				Mortality	No significant effect with intervention
		1	3,661		Medication errors intervention (healthcare professional-level)	Unspecified control	Admissions to hospital (number of people)	No significant effect with intervention
		2	3,889				Admissions to hospital (total number)	No significant effect with intervention
		2	1,067				Emergency department use	No significant effect with intervention
		1	3,538				Mortality	No significant effect with intervention
Berdot et al. 2016(45)	SR	7		Mixed (in hospital)	Nurse training or technology intervention	Unspecified control	Medicines administration errors	No significant effect with intervention

Hu et al. 2016(46)	SR	13		Infection (upper respiratory tract infection in children, antibiotics)	Patient-doctor communication about antimicrobial prescribing	Usual care	Antimicrobial prescribing (reduction)	Improved with intervention
					Interventions to reduce antimicrobial prescribing (any type)		Antimicrobial prescribing (reduction)	Improved with intervention
					Interventions to reduce antimicrobial prescribing aimed at both patients and doctors		Antimicrobial prescribing (reduction)	Improved with intervention
					Interventions to reduce antimicrobial prescribing aimed at either patients or doctors		Antimicrobial prescribing (reduction)	No significant effect with intervention
Zavala-Gonzalez et al. 2017(47)	SR	12		Mixed (general practice)	Computerised interventions	Unspecified control	Quality of prescribing	Improved with intervention
					Pharmacist involvement in healthcare team		Quality of prescribing	Improved with intervention
					Educational interventions		Quality of prescribing	Improved with intervention
Elliott et al. 2017(48)	RCT		110	Mixed (50 years and older, taking a medicine with known genetic-based interactions)	Genetic profiling	Usual care including pharmacist-led medicines management	Emergency department use (at 1 month)	No significant effect with intervention
							Emergency department use (at 2 months)	Improved with intervention
							Readmission to hospital (at 2 months)	Improved with intervention
							Readmission to hospital) at 1 month)	No significant effect with intervention
Franchi et al. 2016(49)	RCT		697	Mixed (65 years and older, in hospital)	Online educational programme for healthcare workers	Usual care	Medicines with potential interactions prescribed	No significant effect with intervention
							Medicines with potential severe interactions prescribed	No significant effect with intervention
							Mortality	No significant effect with intervention

								Potentially inappropriate medicines prescribed	No significant effect with intervention
								Readmission to hospital	No significant effect with intervention
Lau et al. 2017(50)	RCT		933	Mixed (in hospital)	Interactive education for nurses	Non-interactive education		Administering prophylaxis for venous thromboembolism	No significant effect with intervention
Meeker et al. 2016(35)	RCT		16,959	Infection (upper respiratory tract, antibiotics in general practice)	Peer-comparison with lowest antibiotic prescribers	Usual care		Antimicrobial prescribing (reduction)	Improved with intervention
Nejad et al. 2016(51)	RCT		721	Mixed (general practice)	Text messaging for healthcare staff (feedback on defined daily doses of parenteral steroids prescribed)	Paper-based feedback		Defined daily doses of steroids prescribed (reduction considered better)	No significant effect with intervention
					Text messaging or paper-based feedback for healthcare staff on defined daily doses of parenteral steroids prescribed	Unspecified control		Defined daily doses of steroids prescribed (reduction considered better)	Improved with intervention

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