

Communicating with Physicians to Influence Practice Rapid Review Update

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Key Messages

Communication strategies shown to be effective in influencing physician practice include:

1. Academic detailing;
2. Interactive continuing medical education;
3. Computerized decision support systems;
4. Local opinion leaders;
5. Multifaceted interventions;
6. Audit and feedback;
7. Printed educational materials; and
8. Electronic medical records reminders.

Certain factors such as source, format, and content of information or feedback increase the effectiveness of these interventions.

Didactic lecture-based continuing medical education and passive dissemination of printed educational materials were considered weak interventions to change physician practice.

Executive Summary

Research Question

What are effective strategies for communicating with physicians to influence practice?

Issue and Purpose

Peel Health needs to effectively engage with physicians on urgent and routine public health matters. The purpose of this rapid review was threefold; 1) update the previous review with new research on the effectiveness of previously identified interventions for influencing practice; 2) determine if any new research is available to support other methods of influencing physicians' behaviour using newer technology or social media; and 3) provide recommendations that will support public health practice with physicians.

Literature Search and Assessment

From a total of 176 papers, three overviews of systematic reviews and eight systematic reviews were included in this review. They examined the effectiveness of a wide variety of interventions for communicating with physicians. The interventions included audit and feedback, academic detailing, continuing medical education (CME), opinion leaders, multifaceted interventions, printed educational materials (PEM), decision support systems, email, and electronic medical record (EMR) reminders. Outcomes addressed included physician behaviour change; patient, healthcare, or clinical outcomes; process improvements; and cognitive outcomes. Of the 11 papers, eight were strong quality and three were moderate quality.

Key Findings

Academic detailing, active forms of CME and internet-based CME, decision support systems, local opinion leaders and multifaceted interventions positively influenced physician practice. Audit and feedback, printed educational materials and computer-generated reminders delivered on paper, and electronic medical record reminders can positively influence physician practice. Certain factors such as source, format, and content of information or feedback increase the effectiveness of these interventions. Didactic lecture-based continuing medical education and passive dissemination of printed educational materials were considered weak interventions to change physician practice.

Recommendations

Communication strategies shown to be effective in influencing physician practice included:

- 1. Academic detailing*

- a. Academic detailing can favourably change physician prescribing rates.

- 2. Interactive continuing medical education*

- a. To make CME most effective, use active forms and internet-based continuing medical education (webinars or online teaching modules).

3. *Computerized decision support systems*

- a. To make decision support systems and electronic medical record reminders most effective, they should be automatically part of the clinical workflow and used only if IT support is available.

4. *Local opinion leaders*

- a. Local opinion leaders can influence physician practice, however, they may be difficult to identify and are labour intensive to evaluate.

5. *Multifaceted interventions*

- a. Multifaceted interventions were effective at influencing physician practice; however, there is no relationship between the effect size and the number of components beyond two in the interventions.

6. *Audit and feedback*

- a. Audit and feedback was most effective when healthcare providers were not performing well, the person responsible for the audit and feedback was a supervisor or colleague, it was provided more than once, it was given both verbally and in writing, and it included clear targets and an action plan. It was most effective at changing prescribing behaviour compared to improving adherence to guidelines and diagnosis, improving laboratory/radiology testing or complex areas such as disease management.

7. *Printed Educational Materials (PEM)*

- b. Computer-generated reminders delivered on paper and printed educational materials may be effective in improving care. For computer-generated reminders delivered on paper, physician practices must have a computer in the office that produces the reminder for eligible patients or selects patients for whom the clinician receives a reminder. Having space available for healthcare professionals to enter a response and an explanation of the content/advice increases the effect size.

8. *Electronic Medical Record (EMR) reminders*

- a. EMR reminders were effective at changing physician behaviour, and influenced some patient outcomes.

The following interventions were considered weak:

- 1. Didactic lecture-based continuing medical education and passive dissemination of printed educational materials were considered weak interventions to change physician practice

1 Issue

Physicians interact and make many decisions with patients every day. Peel Public Health (PPH) wants to engage with physicians to communicate urgent and routine messages which influence their behaviour and patient outcomes. In 2010, Peel Public Health conducted a rapid review to answer the question “What are effective strategies for communicating with physicians to influence behaviours related to public health practice?” New technologies have emerged since that review was written, and clinical practice has evolved. We have updated the review to include any new research on effective interventions to influence physician behaviour.

By way of example, Peel Public Health follows up every reported case of gonorrhoea with physicians’ offices by phone call and/or fax. Through this follow-up, PPH knows that physicians continue to prescribe cefixime 400 mg by mouth, despite increasing resistance to oral cephalosporins (the first-line treatment for gonorrhoea changed to ceftriaxone 250 mg by injection and 1g azithromycin by mouth in 2013). Peel Public Health has tried to influence physician prescribing behaviour by offering continuing medical education at family practice hospital rounds and the use of a faxed and emailed communication. Peel Public Health needs an effective intervention with the appropriate reach and impact in order to achieve sustained change in physician prescribing habits.

2 Context

The Region of Peel is home to 1,599 physicians; 939 are General Practitioners (GPs) or Family Physicians (FPs) and 660 are specialists. The intersection between their clinical

practice and public health is important. Examples of this intersection include vaccine provision, and notice of infectious and vector-borne diseases such as West Nile Virus and Lyme Disease. Communicating effectively with these physicians is essential to the health of Peel's population. Currently, PPH provides information in two ways: passively using faxed and emailed *Health Professionals Updates* and on a smaller scale, actively, through interactive continuing medical education (CME), academic detailing, and audit and feedback.

Currently, 90% of physicians receive Peel's *Health Professionals Update* by fax and 10% by email. The majority of these communications are directed to FPs and GPs, but may include certain specialties. During public health emergencies, these communications are delivered to many types of physicians. These updates serve to create awareness of particular issues to physicians but do not necessarily change their clinical behaviour. Restricted resources limit PPH to this method of communication in order to reach all of our physicians; however we do not expect large scale behaviour change as a result.

In 2010, PPH conducted a rapid review on communicating effectively with physicians to influence practice (1) and found:

- Interventions with larger positive effects include audit and feedback, continuing education combining both didactic and interactive components, and educational outreach visits.
- Print materials and didactic meetings have a smaller beneficial effect on physician practices as compared to other interventions.

Since the completion of this literature review, PPH has begun to implement these more effective strategies.

The purpose of this rapid review was threefold; 1) to update the previous review with new research on the effectiveness of previously identified interventions for influencing practice; 2) to determine if any new research is available to support other methods of influencing physicians' behaviour using newer technology or social media; and 3) to provide recommendations that will support public health practice with physicians.

3 Literature Review Question

The research question was:

What are effective strategies for communicating with physicians to influence behaviours?

In PICO format, this question was:

| | |
|-------------------------|---|
| P (Population) | Physicians (in primary care settings) |
| I (Intervention) | Any physician-targeted intervention (academic detailing, audit & feedback, continuing medical education, multi-intervention, email, social media, Facebook, Twitter, electronic medical records, advocacy, other) |
| C (Comparison) | None |
| O (Outcome) | Change in practice |

4 Literature Search

We conducted a search of published and grey literature between April 2015 and June 2015. Both searches were restricted to synthesized evidence in English published in

the last five years (i.e. 2010 onwards) because of the large volume of research. The databases searched included National Institute for Health and Care Excellence (NICE), The Cochrane Database of Systematic Reviews, The Centres for Disease Control and Prevention (CDC), PubMed, TRIP database, Ovid Medline, Ovid Healthstar, the Canadian Agency for Drugs and Technologies in Health (CADTH), Cochrane Effective Practice and Organisation of Care Group (EPOC), Agency for Healthcare Research and Quality (AHRQ), Health Systems Evidence, Health Evidence, and Global Health. Two separate searches were done; one search strategy focused on new technologies and one more broadly on communication with physicians. In addition, one review was identified by a colleague. Refer to Appendix A for the detailed search strategy.

5 Relevance Assessment

Three reviewers independently assessed relevance of the search results based first on title and abstract, and in a second phase, on full-text. Discrepancies were resolved through discussion. To ensure little overlap in the primary studies, a review of duplication of included studies was undertaken across the included reviews.

Inclusion Criteria:

- Synthesized research (e.g. overviews of systematic reviews, systematic reviews, guidelines, meta-analyses); focused on physicians practicing in the primary care setting; focused on effectiveness of any physician-targeted intervention (academic detailing, audit and feedback, CME, multi-intervention, email, social media [e.g. Facebook, Twitter] electronic medical record [EMR], advocacy, and other); outcomes focused on physician practice change (e.g. behaviour change,

patient/healthcare/clinical outcomes, process outcomes, and cognitive outcomes); published in 2010 or later (a previous review conducted by M. Gillespie at Peel Public Health included research up to 2010); and English language.

Exclusion Criteria:

- Interventions involving payment or financial incentives to physicians, interventions where the targeted study population was less than 50% primary care practitioners, focusing on specialists practising in an acute care setting, describing an intervention but not its effectiveness, and papers containing significant overlap in the primary studies or systematic reviews were excluded.

6 Results of the Search

The search yielded 176 articles (45 journal articles, and 131 overviews and/or reviews). Based on the title review, 152 did not meet the relevance criteria. Twenty-four articles were retrieved in full-text and assessed for adherence to the inclusion criteria, resulting in 12 articles being excluded. The remaining 12 articles (three overviews and nine systematic reviews) were reviewed for quality. See Appendix B for search results flowchart.

7 Critical Appraisal

Three reviewers independently critically appraised nine systematic reviews and three overviews using the Health Evidence Quality Assessment Tool. Discrepancies were resolved through discussion. Eight papers were rated as strong (one overview and

seven systematic reviews) and three as moderate (two overviews, one systematic review) and were included in this review. One systematic review was rated weak and was excluded.

8 Description of Included Studies

The included articles assessed a variety of interventions and many different outcomes. There was little duplication across the 277 primary studies and 52 systematic reviews in the selected three overviews and eight systematic reviews. Each of the included studies in the articles addressed one intervention and one type of outcome. For example, one study may have examined the effectiveness of a local opinion leader on guideline adoption, whereas another study may have examined the effectiveness of local opinion leaders on the management of a clinical problem such as asthma care. Table 1 lists the papers included in this review and the intervention(s) and outcome(s) assessed.

Table 1: Included Studies

| Systematic Overviews | | |
|--|---|--|
| Paper | Intervention(s) | Outcome(s) |
| <p>Boaz et al., 2011. <i>Effective implementation of research into practice: An overview of systematic reviews of the health literature.</i></p> <ul style="list-style-type: none"> • Included 13 systematic reviews • Rated as moderate | <ul style="list-style-type: none"> • Audit and feedback, • Computerized decision support • Opinion leaders • Multifaceted interventions | <ul style="list-style-type: none"> • Prescribing • Preventative care • Disease management • Adherence to guidelines • Diagnosis |

| Systematic Overviews | | |
|---|---|--|
| Paper | Intervention(s) | Outcome(s) |
| <p>Mostofian et al., 2015. <i>Changing Physician Behavior; What Works?</i></p> <ul style="list-style-type: none"> • Included 14 systematic reviews • Rated as strong | <ul style="list-style-type: none"> • Audit and feedback • Computerized decision support systems • Continuing medical education • Financial incentives • Local opinion leaders • Marketing • Passive dissemination of information • Patient-mediated intervention • Reminders • Multifaceted interventions | <ul style="list-style-type: none"> • Physician compliance • Physician performance • Physician behaviour • Physician practice patterns • Patient results |
| <p>Squires et al., 2014. <i>Are multifaceted interventions more effective than single-component interventions in changing health-care professionals' behaviours? An overview of systematic reviews.</i></p> <ul style="list-style-type: none"> • Included 25 systematic reviews • Rated as moderate | <ul style="list-style-type: none"> • Multifaceted (defined as including two or more components) compared to single component interventions. • Components of multifaceted interventions not described. | <ul style="list-style-type: none"> • Prescription of antibiotics • Guideline utilization • Hand hygiene improvement |
| Systematic Reviews | | |
| Paper | Intervention(s) | Outcome(s) |
| <p>Arditi et al., 2012. <i>Computer-generated reminders delivered on paper to healthcare professionals; effects on professional practice and health care outcomes.</i></p> <ul style="list-style-type: none"> • Included 32 studies (controlled trials) • Rated as strong | <ul style="list-style-type: none"> • Computer-generated reminders delivered on paper (printed educational materials) | <ul style="list-style-type: none"> • Healthcare professionals' practice • Processes of care • Outcomes of care • Patient care including prescribing, vaccination test ordering, and professional-patient communication |

| Systematic Reviews | | |
|---|---|--|
| Paper | Intervention(s) | Outcome(s) |
| <p>Chhina et al., 2010. <i>Effectiveness of academic detailing to optimize medication prescribing behaviour of family physicians.</i></p> <ul style="list-style-type: none"> • Included 15 studies (RCTs, Observational studies)] • Rated as moderate | <ul style="list-style-type: none"> • Academic detailing | <ul style="list-style-type: none"> • Drug prescription changes |
| <p>Ferguson et al., 2012. <i>Factors influencing the effectiveness of multisource feedback in improving the professional practice of medical doctors: A systematic review.</i></p> <ul style="list-style-type: none"> • Included 16 studies (randomized control trials [RCTs], cross sectional survey questionnaires, mixed methods, qualitative methods) • Rated as strong | <ul style="list-style-type: none"> • Audit and feedback | <ul style="list-style-type: none"> • Change in professional practice • Change in behaviour • Change in performance • Communication with patients • Timely task completion • Demonstration of responsibility and accountability • Patient follow-up • Medical record maintenance • Stress management |
| <p>Giguere et al., 2012. <i>Printed education materials: effect on professional practice and healthcare outcomes.</i></p> <ul style="list-style-type: none"> • Included 45 studies (RCTs, interrupted time series) • Rated as strong | <ul style="list-style-type: none"> • Printed educational materials | <ul style="list-style-type: none"> • Healthcare professionals' practice (number of tests ordered, drug prescriptions) • Patient outcomes (blood pressure, complications after surgery, clinical depression remission) |

| Systematic Reviews | | |
|---|---|--|
| Paper | Intervention(s) | Outcome(s) |
| <p>Goyder et al., 2015. <i>Email for clinical communication between healthcare professionals.</i></p> <ul style="list-style-type: none"> • Included one meta-analysis • Rated as strong | <ul style="list-style-type: none"> • Email or electronic medical reminders | <ul style="list-style-type: none"> • Health professional outcomes (execution of recommended care such as bone mineral density measurement, prescription of osteoporosis medication) • Patient outcomes (calcium intake, regular physical activity and caloric expenditure) |
| <p>Grudniewicz et al., 2015. <i>What is the effectiveness of printed educational materials on primary care physician knowledge, behaviour, and patient outcomes: a systematic review and meta-analysis.</i></p> <ul style="list-style-type: none"> • Included 40 studies (RCTs, quasi randomized trials, controlled before and after studies, and interrupted time series analyses) • Rated as strong | <ul style="list-style-type: none"> • Printed educational materials | <ul style="list-style-type: none"> • Primary care physician knowledge and behaviour • Patient outcomes |
| <p>Ivers et al., 2012. <i>Audit and feedback: Effects on professional practice and healthcare outcomes.</i></p> <ul style="list-style-type: none"> • Included 49 RCTs • Rated as strong | <ul style="list-style-type: none"> • Audit and feedback | <ul style="list-style-type: none"> • Appropriate prescribing • Laboratory or radiology test utilisation • Cardiovascular disease or diabetes patient management • Patient outcomes (smoking status or blood pressure) • Guideline compliance |

| Systematic Reviews | | |
|---|--|--|
| Paper | Intervention(s) | Outcome(s) |
| <p>McCormack et al., 2013. <i>Communication and Dissemination Strategies to Facilitate the Use of Health-related Evidence.</i></p> <ul style="list-style-type: none"> • Included 61 studies (RCTs, Cluster RCTs, Quasi-experimental trials, nonrandomized trials) • Rated as strong | <ul style="list-style-type: none"> • Multifaceted interventions | <ul style="list-style-type: none"> • Clinician behaviour • Patient health-related decisions or behaviours • Patient clinical outcomes |

9 Description of Interventions and Outcomes

Interventions:

Academic detailing: Also known as educational outreach visits. This was a form of continuing medical education (CME) in which a trained health care professional visited physicians in their offices to provide evidence-based information on a selected topic.

Audit & feedback: Also known as clinical performance feedback or multisource feedback. This was a summary of clinical performance of healthcare provider(s) over a specified period of time. An individual's professional practice or performance was

measured and then compared to professional standards or targets. The feedback may have included recommendations for clinical action and was delivered in a written, electronic or verbal format.

Continuing medical education: Continuing medical education was the transfer of information through participation in educational conferences, lectures, workshops, or meetings that occur outside the physician's office.

Local opinion leaders: Healthcare providers who were nominated or considered by their colleagues to be "educationally influential" and who were perceived as credible, likeable, trustworthy and were likely to be persuasive agents of behavioural change. They helped individuals identify the evidence underlying best practice and facilitated behaviour change.

Printed educational materials and computer-generated reminders delivered on paper: Passive information transfer through the distribution of printed recommendations for clinical care. It was typically in paper format such as monographs, publication in peer-reviewed journals and clinical guidelines delivered personally or through mass mailing. They could have been in electronic form such as PDFs, other document files (e.g. Microsoft Word documents), and non-interactive webpages.

Reminders automatically generated through a computerized system and delivered on paper were also considered printed educational materials. Information was usually obtained from computerized medical records or a computerized database. Once generated, the reminder was then delivered on paper, which included fax, but not on a computer screen, email or text message.

Decision support systems: Information systems designed to improve clinical decision making through the analysis of patient-specific clinical variables (E.g. diagnosis, preventive care, disease management, drug dosing, and prescribing). These systems may have been manual or computerized. An example of a decision support system from the primary studies was computerized advice on drug dosage.

Email or electronic medical record (EMR) reminders: A form of communication which included unsecured standard email, secure email which was encrypted, or web messaging, whereby a message was entered into a template and then sent to a specific email account, the address of which was not available to the sender. EMR reminders were defined as patient-specific EMR “in-basket” messages that primary care providers receive for their enrolled patients. “In-basket” messages were an EMR-based email communication used exclusively for patient care activities.

Multifaceted interventions: Any intervention containing more than one of the above components.

Outcomes:

Behaviour change: Changes in the drugs prescribed, more appropriate prescribing, guideline implementation, improvement in hand hygiene, and better management of a clinical problem such as cardiovascular disease or diabetes.

Patient/healthcare/clinical outcomes: Either dichotomous or continuous. They include outcomes such as hypertension, calcium intake, regular activity, calorific expenditure, clinical depression remission, and physical functioning of patients.

Process outcomes: Activities, such as ordering tests, or measures of how providers delivered care such as duration of therapy (this outcome was defined separately from

behaviour change in the included papers although both behaviour change and process outcomes may have had similar activities included in their definitions).

Cognitive outcomes: Awareness, knowledge, discussion about evidence, self-efficacy to use evidence, or intent to use or apply evidence.

10 Synthesis of Findings

The following section provides a synthesis of the effectiveness of each intervention across the included literature. Effect sizes are noted where available.

Academic Detailing

Academic detailing favourably changed prescribing rates. Although variable, the magnitude of the effect size was moderate (2). The median difference in relative change of prescription rate among studies was 21% (IQR¹ 43.75%) for randomized control trials, and 9% (IQR 8.5%) for observational studies.

Continuing Medical Education

Active forms of CME and internet-based CME were more effective at influencing physician behaviour than passive interventions. Didactic lecture-based CME was identified as a weak intervention to change physician practice (3).

Local Opinion Leaders

Local opinion leaders could successfully promote evidence-based practice. However, due to the difficulty in identifying opinion leaders and the labour-intensive nature of assessing their impact, their usefulness as a knowledge transfer intervention may be limited (4).

¹ Interquartile range is the difference between the largest and smallest values in the middle quartiles (middle 50%) of the data set.

Decision Support Systems

Decision support systems were effective at changing prescribing practice by providing physicians with more confidence in prescribing, and effectively improved clinical practice when automatically part of the clinical workflow (3,4).

Multifaceted Interventions

Multifaceted interventions were more effective at changing physician behaviour compared to single interventions (3, 5, 6). Multifaceted interventions were effective at promoting the use of clinical practice guidelines (4). There was no relationship between the effect size and the number of components beyond two in the interventions. It is unclear whether multifaceted interventions were effective at changing clinical outcomes (6).

Audit and Feedback

Audit and feedback positively influenced physician practice; certain factors enhanced its effectiveness (3, 4, 7, 8). Audit and feedback effectively changed the following physician behaviours:

- Communicating effectively with patient and family, 35% performance improvement (95% CI, 11.0% to 58.0%)²;
- Timeliness of completing task, 30% performance improvement (95% CI, 7.9% to 53.0%), and
- Demonstrating responsibility and accountability, 26% performance improvement (95% CI, 2.9% to 49.0%) (7).

² Confidence interval is the range of values within which we are 95% certain that the true value of the population lies.

- Increasing compliance with desired practice had small but positive increases; 4.3% increase in one group of 49 studies, and 1.3% increase in a second group of 21 studies. The range in adjusted risk difference measures (ARD)³ among the individual studies was highly variable (9% decrease to 139% increase) (8).

Audit and feedback proved more effective when (8):

- Healthcare providers were not performing well to start with;
- The person responsible for the audit and feedback was a supervisor or colleague (expected difference in ARD = 11%);
- It was provided more than once (expected difference in ARD = 7%);
- It was given both verbally and in writing (expected difference in ARD = 8%);
and
- It included clear targets and an action plan (expected difference in ARD = 5%).

Feedback was influenced by the following factors (7):

- Source of feedback: feedback was perceived as useful if the raters had sufficient knowledge of physicians' work. As well, receiving comments from different sources facilitated the use of the feedback.

³ Adjusted risk difference is the difference between the risk in the exposed and unexposed group, adjusting for potential modifying factors.

- Format of feedback: facilitated feedback positively influenced feedback acceptance, written feedback was preferred over numerical feedback, and facilitation from an appraiser, mentor, facilitation, supervisor or coach enabled acceptance of feedback.
- Content of feedback: physicians who received negative feedback contemplated or initiated more change than those who did not receive negative feedback.
- Response to feedback: Facilitated reflection on the feedback was an important factor in its use.

Audit and feedback was more effective at changing prescribing behaviour (RD⁴ = 11.1%) compared to managing complex disease (cardiovascular disease RD = 5.9%), ordering laboratory/radiology testing (RD = 4.2%), and adhering to guidelines and diagnosis (4, 8).

Results were inconclusive as to whether audit and feedback was more effective when combined with other interventions at changing physician performance or changing desired patient outcomes (3, 8).

Printed Educational Materials

Printed educational materials may have a small, beneficial effect on physician practice, and certain factors increase its' impact. Results varied from consistently positive results (3), small positive effects (2% absolute improvement) (9) to no effect on physician behaviour (10). A few characteristics of printed educational materials (e.g. source of

⁴ Risk difference is the difference between the risk in the exposed and unexposed group.

information, tailoring the message to individuals or groups, clinical specialty, type of targeted behaviour, format of the printed educational material, mode of delivery, frequency of delivery) may increase their impact on professional practice, however this is based on a limited number of studies (9).

Printed educational materials were effective at influencing practice (4.5% median improvement [IQR 0.5% to 7%]) (11):

- When space for response to be entered by a healthcare professional was included in the printed educational material, the median effect size increased to 13.7% vs. 4.3 % for no space.
- When an explanation of the content or advice was included, the median effect size was 12.0% vs. 4.2% for no explanation.
- When the desired behaviour change was related to processes such as prescribing, vaccination, ordering tests, and professional-patient communication. The largest improvement was seen in vaccination (median improvement 13.1%, [IQR 12.2% to 20.7%]).

Printed educational materials had no impact on processes of care, regardless of the number of behaviours targeted (11).

Printed educational materials had mixed results on cognitive outcomes and outcomes of care (9, 10, 11).

Passive dissemination of PEMs was identified as weak interventions to change physician practice patterns (3).

Electronic Medical Record Reminders

EMR reminders were effective at changing physician behaviour and one patient outcome:

- EMR reminders improved processes and outcomes of care compared to usual care (median improvement 5.7%) (6).
- EMR reminders effectively changed physician outcomes for osteoporosis care in the intervention group:
 - Bone mineral density measurement, OR⁵ 31.17; (95% CI 4.13 to 235.51);
 - Bone mineral density measurement or osteoporosis medication, OR 16.80; (95% CI 6.75 to 41.85); and
 - Osteoporosis medication only, OR 3.27; (95% CI 1.02 to 10.51) (12).
- Patients in the usual care group were more likely to receive neither a bone mineral density measurement, nor osteoporosis medication, OR 0.06; (95% CI 0.02 to 0.15) (12).
- Calcium intake was significantly higher in patients whose physicians received an EMR reminder compared to the usual care group (P= 0.02) (12).

EMR reminders produced mixed results on the patient outcomes of regular physical activity and calorific expenditure (12).

⁵ OR – odds ratio is the odds of an event (or outcome) occurring in the intervention group compared to the control group.

Types of Messaging and Strategies

Loss-framed messages (i.e. emphasizing what is lost by taking action or making a choice) in conjunction with narratives (i.e. in the form a story, testimonial, or entertainment education) were more effective than other types of messaging. Both ability strategies (e.g. additional resources or information; skills-building efforts to use and apply evidence) and reach strategies (e.g. telephone; postal mail/email; electronic/digital media, social media, mass media, interpersonal outreach that increase reach to a variety of audiences across many settings) were effective at influencing clinician behaviour. However, there was no difference when examining comparative effectiveness (5).

See Appendix C for further details and effect sizes. The full data extraction is found in Appendix D.

Comparison with Findings from 2010 Literature Review

This review is an update to a previous review completed in 2010 (1). Findings were consistent in that:

- Academic detailing positively influences prescribing behaviour.
- Audit and feedback positively influences physician behaviour, particularly when they are not performing well to begin with. New information has been described in this review on factors that influence the effectiveness of audit and feedback.
- Active forms of CME positively influence physician practice. Didactic lecture-based CME is a weak intervention to influence physician practice. The previous

review identified conferences and lectures as having lower effect sizes compared to mixed didactic/interactive content.

- Local opinion leaders may be effective at influencing physician practice.
- Printed educational materials have a small beneficial effect on physician practice. New information has been included in this review on factors that influence their effectiveness.
- Multifaceted interventions are more effective at changing physician behaviour compared to single interventions. There is no relationship between the effect size and the number of components beyond two in the interventions.

New findings on interventions to influence physician practice include:

- Favourable evidence for the use of new technologies such as electronic medical record reminders and computerized decision support systems to influence physician practice. The previous review identified mixed results for the use of reminder systems and the need to explore the effectiveness of this strategy further.

Summary of Findings

Effectiveness of Physician Interventions on Physician Practice

The following table summarizes the effectiveness of physician interventions on physician practice. For further details on effect sizes for specific interventions and outcomes, refer to Appendix C.

| Interventions | Outcomes |
|---|---|
| | Influence on Physician Practice |
| Academic Detailing | Positively influences physician practice. |
| Audit & Feedback | May positively influence physician practice and certain factors may enhance its effectiveness. |
| Continuing Medical Education | Active forms of CME and internet-based CME positively influence physician practice. Passive CME does not. |
| Local Opinion Leaders | Positively influence physician practice |
| Printed Educational Materials, Computer-generated Reminders Delivered on Paper | May positively influence physician practice and certain factors may enhance their effectiveness. |
| Decision Support Systems | Positively influence physician practice. |
| Email, Electronic Medical Record Reminder | May positively influence physician practice. |
| Multifaceted Interventions | May positively influence physician practice. |

11 Applicability and Transferability

Peel Public Health supervisors, managers and Associate Medical Officers of Health discussed the applicability and transferability of this review within Peel Region.

Applicability

Political Acceptability

Physicians are currently undergoing contract negotiations for billing of services with the Ontario Medical Association. Billing is a sensitive issue in this challenging environment of trying to control the healthcare budget. Any of the effective interventions identified in this review that require a change in practice, takes away billable time, requires extra time that is not billable, or has no proposed or anticipated remuneration may be met with poor uptake from physicians.

Social Acceptability

Peel Public Health is seen as a trusted source of data and evidence by physicians and they appreciate evidence-based approaches. PPH needs to focus on providing the right information, at the right time in a concise manner when there is ambiguity for a physician making a public health decision.

Available Essential Resources

Some effective strategies to influence physician practice are costly in terms of staffing and dollars, and could only be implemented on a targeted basis. Peel Public Health has limited internal Information Technology (IT) support required for the development of decision support systems. PPH is also limited by external IT support at the Ministry of Health and Long-Term Care and their current Panorama system for immunization.

Many physician practices lack their own internal IT support for their EMR systems. Physicians lamented the inability to bill for some services they provide, indicating the lack of financial resources in their practice.

The Physician Outreach Specialist (POS) was identified as a limited resource within the organization. Discussion arose about the potential for other PPH professionals to provide academic detailing to physicians.

Organizational Expertise and Capacity

The effective interventions listed in this rapid review are in line with the 10-Year Strategic Plan, specifically with the infrastructure priority End-to-End Public Health Practice and the use of the best available evidence. PPH can use these interventions to influence physician practice to achieve desired outcomes. The POS promotes cross-divisional thinking and collaboration and is a cross-divisional support.

One of the main organizational barriers identified was the lack of IT capacity. There is little opportunity to influence the 11 EMR systems that have been adopted by physician practices in Peel Region. A reminder or decision support system implemented in all of these different EMRs would be costly and providing updates with multiple revisions would be challenging. An organization such as Ontario MD may be able to enhance collaboration with EMR vendors in order to take advantage of EMR reminders to influence physician behaviour change.

PPH is in a good position to accept the new evidence on the effectiveness of EMR reminders and decision support systems with limitations in our organizational capacity in mind.

Transferability

Magnitude of Health Issue in the Local Setting

Peel Public Health needs to better understand the types of problems in physician practices that prevent the achievement of public health goals. These problems are often not understood because there are little data available to define them (e.g. number of vaccine administration errors, number of incorrect prescriptions for gonorrhoea treatment, etc.).

Magnitude of the “Reach” and Cost Effectiveness of the Interventions Above

The interventions listed in this review are not scalable for use with all physicians in the Region of Peel. In addition, there is a need for a strong evaluation component for physician outreach activities which is not fully developed at PPH. This is needed in order to assess whether selected interventions have made an impact in a cost-effective way.

12 Recommendations

Communication strategies shown to be effective in influencing physician practice included:

1. Academic detailing

- a. Academic detailing can favourably change physician prescribing rates.

2. Interactive continuing medical education

- a. To make CME most effective, use active forms and internet-based continuing medical education (webinars or online teaching modules).

3. *Computerized decision support systems*

- a. To make decision support systems and electronic medical record reminders most effective, they should be automatically part of the clinical workflow and used only if IT support is available.

4. *Local opinion leaders*

- a. Local opinion leaders can influence physician practice, however, they may be difficult to identify and are labour intensive to evaluate.

5. *Multifaceted interventions*

- a. Multifaceted interventions were effective at influencing physician practice, however, no there is no relationship between the effect size and the number of components beyond two in the interventions.

6. *Audit and feedback*

- c. Audit and feedback was most effective when healthcare providers were not performing well, the person responsible for the audit and feedback was a supervisor or colleague, it was provided more than once, it was given both verbally and in writing, and it included clear targets and an action plan. It was most effective at changing prescribing behaviour compared to improving adherence to guidelines and diagnosis, improving laboratory/radiology testing or complex areas such as disease management.

7. *Printed educational materials*

- d. Computer-generated reminders delivered on paper and printed educational materials may be effective in improving care. For computer-generated reminders delivered on paper, physician practices must have a computer in the office that produces the reminder for eligible patients or selects patients for whom the clinician receives a reminder. Having space available for healthcare professionals to enter a response and an explanation of the content/advice increases the effect size.

8. *Electronic Medical Record (EMR) reminders*

- a. EMR reminders were effective at changing physician behaviour, and were effective at influencing some patient outcomes.

The following interventions were considered weak:

1. Didactic lecture-based continuing medical education and passive dissemination of printed educational materials were considered weak interventions to change physician practice.

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Appendices

Appendix A: Search Strategy

Appendix B: Literature Search Flowchart

Appendix C: Synthesis of results of physician interventions according to behavioural change, patient/healthcare outcomes/clinical outcomes, process improvements and cognitive outcomes

Appendix D: Data Extraction Tables

Appendix A: Search Strategy

| | |
|---|---|
| <p>Date: March 16, 2016</p> <p>Source: Cochrane Database of Systematic Reviews</p> | <p>Search terms: Grimshaw (author)</p> <p>Results: 30</p> |
| <p>Date: April 1, 2016</p> <p>Source: Agency for Healthcare Research and Quality</p> | <p>Search terms: hand searching</p> <p>Results: 1</p> |
| <p>Date: April 27, 2015</p> <p>Source: Cochrane Database of Systematic Reviews, Global Health, Ovid Healthstar, Ovid MEDLINE, Ovid MEDLINE In-Process & Other Non-Indexed Citations</p> | <p>Search terms: Physician, Behaviour Change</p> <p>Results: 4</p> |
| <p>Date: May 8, 2015</p> <p>Source: Cochrane Database of Systematic Reviews, Global Health, Ovid Healthstar, Ovid MEDLINE, Ovid MEDLINE In-Process & Other Non-Indexed Citations</p> | <p>Search terms: Physician, Social Media, Technology</p> <p>Results: 45</p> |
| <p>Date: May 20, 2015</p> <p>Source: Health Systems Evidence</p> | <p>Search terms: behav*</p> <p>Results: 32</p> |

| | |
|--|--|
| Date: May 20, 2015 Source: Journal of Healthcare Management | Search terms: hand searching Results: 0 |
| Date: December 7, 2015 Source: Colleague | Search terms: N/A Results: 1 |

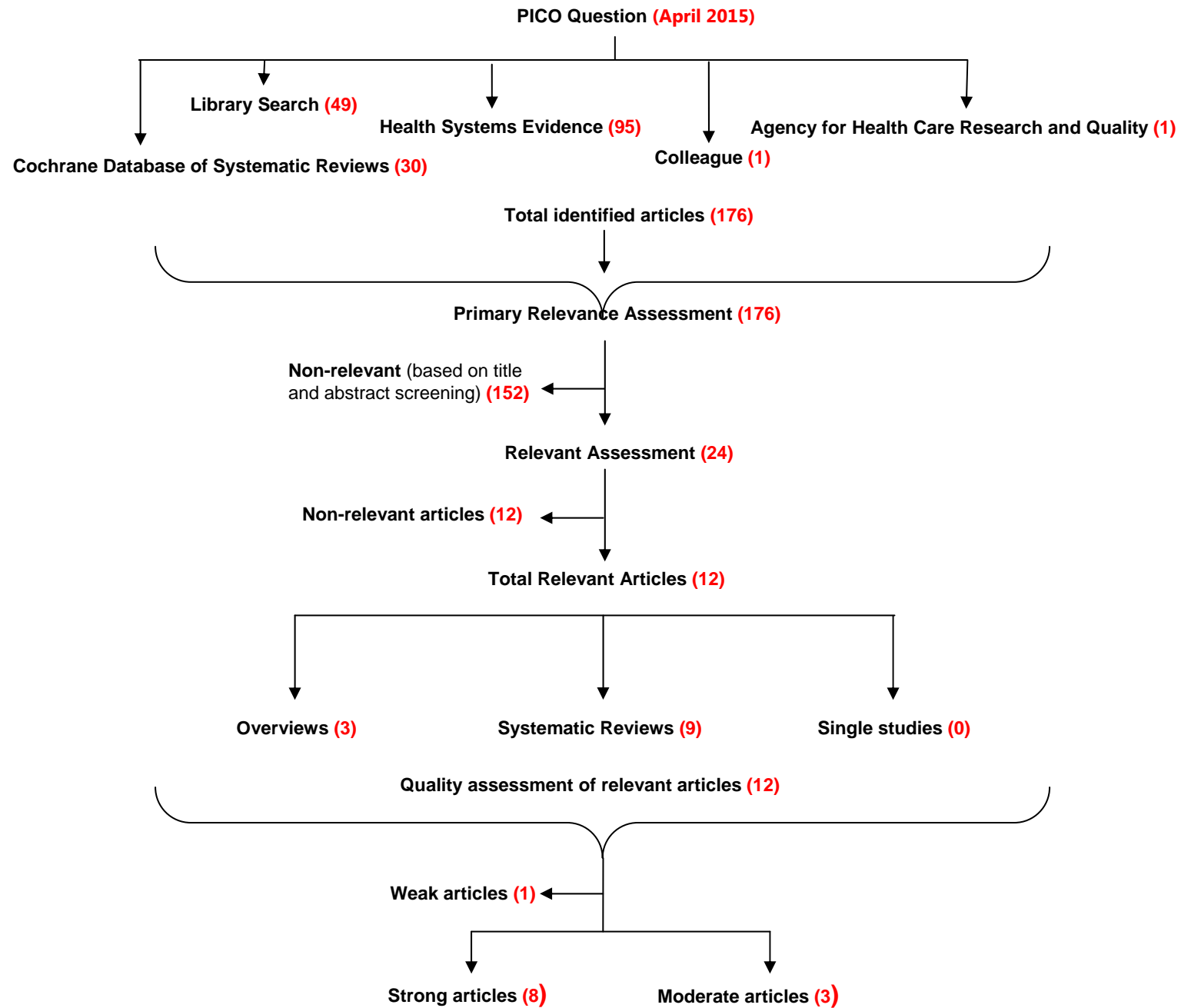
Search Strategy #1:

- 1 physician*.ti. (163553)
- 2 doctor*.ti. (61348)
- 3 exp physicians, family/ (29357)
- 4 exp physicians, primary care/ (3055)
- 5 1 or 2 or 3 or 4 (244446)
- 6 behaviour chang*.ti. (1085)
- 7 behavior chang*.ti. (2461)
- 8 6 or 7 (3543)
- 9 5 and 8 (33)
- 10 physician behav*.ti. (380)
- 11 9 or 10 (406)
- 12 remove duplicates from 11 (204)
- 13 systematic review*.ti,ab. (132799)
- 14 meta-analys*.ti,ab. (153193)
- 15 13 or 14 (240938)
- 16 12 and 15 (5)
- 17 limit 16 to yr="2009 -Current" (4)

Search Strategy #2:

- 1 exp physicians, family/ (29374)
- 2 exp physicians, primary care/ (3090)
- 3 exp social media/ (3531)
- 4 exp reminder systems/ (4942)
- 5 social media.ti. (1849)
- 6 reminder*.ti. (2913)
- 7 exp twitter/ (108282)
- 8 twitter.ti. (491)
- 9 exp technology/ (617964)
- 10 web.ti. (23849)
- 11 exp smartphones/ (5607)
- 12 physician*.ti. (163870)
- 13 doctor*.ti. (61449)
- 14 1 or 2 or 12 or 13 (244898)
- 15 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 (738830)
- 16 14 and 15 (6058)
- 17 limit 16 to yr="2009 - 2015" (1828)
- 18 remove duplicates from 17 (908)
- 19 limit 18 to english language [Limit not valid in CDSR; records were retained] (833)
- 20 limit 19 to yr="2010 -Current" (707)
- 21 3 and 20 (45)

Appendix B: Literature Search Flowchart



Adapted from: healthevidence.org *Keeping Track of Search Results: A Flowchart*. [Retrieved January 13, 2010]

Appendix C: Synthesis of results of physician interventions according to behavioural change, patient/healthcare outcomes/clinical outcomes, process improvements and cognitive outcomes

| Behaviour Change (drug prescription changes, appropriate prescribing, use of guidelines, improving hand hygiene, general management of a clinical problem such as cardiovascular or diabetes management) | |
|---|--|
| Intervention | Outcome |
| Academic Detailing (one review) | <ul style="list-style-type: none"> • Effective in one review. • Effective (one review)²: <ul style="list-style-type: none"> ○ In 11 RCTs and four observational studies, academic detailing changed prescribing practice in 60% of the studies reviewed. ○ The median difference in relative change of prescription rate among studies was 21% (IQR 43.75%) for randomized control trials, and 9% (IQR 8.5%) for observational studies. ○ The magnitude of the effect size was moderate. |
| Audit & Feedback and Multisource feedback (two overviews, two reviews) | <ul style="list-style-type: none"> • Effective in one overview and two reviews, mixed results in one overview. • Small effect (one overview)⁴: <ul style="list-style-type: none"> ○ One review found a small effect on changing prescribing behaviour; less effect on complex areas such as disease management, adherence to guidelines and diagnosis. • Effective (one review)⁷: <ul style="list-style-type: none"> ○ In 16 studies, multisource feedback led to significant changes in: <ul style="list-style-type: none"> ▪ Physician communication with patients, 35% improvement (95% CI, 11.0% to 58%) ▪ Timeliness of completing task, 30% improvement (95% CI 7.9% to 53%) ▪ Demonstrating responsibility and accountability, 26% improvement (95% CI, 2.9% to 49.0%) ○ The following factors influence the effectiveness of MSF: |

**Audit & Feedback
and Multisource
feedback (two
overviews, two
reviews)**

- Greater effect when source of feedback is familiar with physicians' work or were patients and unbiased (three studies).
 - Greater effect when facilitated, provided by someone in a senior position, and in written free-text format (not numerical) (19 studies)
 - Unclear if feedback would be effective if not facilitated (two studies).
 - Negative feedback and the use of several sources of feedback initiated more changes versus positive feedback (five studies).
 - Physicians taking part in audit and feedback were more likely contemplate and intend to change their behaviours rather than actually implement changes.
- Small Effect (one review)⁸:
 - Small effect overall of audit and feedback various measures of desired practice. Change in compliance ranged from 1.3%-4.3% (range in ARD was 9% decrease to 139% increase).
 - It is most effective:
 - When the health professionals are not performing well to start with
 - The person responsible for the audit and feedback is a supervisor or colleague (expected difference in adjusted RD = 11%)
 - It is provided more than once (expected difference in adjusted RD = 7%)
 - It is given both verbally and in writing (expected difference in adjusted RD = 8%)
 - It includes clear targets and an action plan (expected difference in adjusted RD = 5%)
 - On behaviours such as prescribing (RD = 11.1%) compared to diabetes or cardiovascular disease management (RD = 5.9%), and laboratory or radiology testing (RD = 4.2%)
 - Unclear if it is more effective when combined with other interventions
 - If combined with reminders:
 - Reduced x-ray utilisation by 46%
 - No effect on improving the management of impacted molars or quality of cholesterol management in hospitals;
 - If combined with small group education such as a seminar, positive results:
 - Increased MRI guideline adherence unadjusted RD= 4%
 - Reduced inappropriate antibiotic prescribing adjusted RD= 7.1%;
 - If combined with printed educational materials, mixed results

| | |
|---|--|
| | <ul style="list-style-type: none"> • Mixed results (one overview)³: <ul style="list-style-type: none"> ○ Two reviews found audit and feedback more effective than no intervention or audit alone or feedback alone in changing physician compliance (ARR 0.99-1.30). ○ One review found inconclusive results (ARR -0.16-0.70). ○ One review found feedback alone is most effective when presented close to the time of decision making in clinical practice. |
| <p>Continuing Medical Education (one overview)</p> | <ul style="list-style-type: none"> • Active forms of CME effective, passive forms of CME weak interventions in one overview³: <ul style="list-style-type: none"> ○ In four reviews, the majority of studies found active forms of CME (58% of 99 studies) or internet-based CME (webinars or online teaching modules) (77% of 99 studies) improved or maintained physician performance. ○ In five reviews, didactic lecture-based CME and passive dissemination of PEMs were identified as weak interventions to change physician practice patterns. |
| <p>Decision Support, Computerized Decision Support Systems (one overview and one review)</p> | <ul style="list-style-type: none"> • Effective in one overview. • Effective (one overview)³: <ul style="list-style-type: none"> ○ In one review, the majority (68%) of studies found the intervention significantly improved clinical practice when automatically part of the clinical workflow. • Effective (one review)²: <ul style="list-style-type: none"> ○ One study found it may lead to more effective prescribing practice. |
| <p>Local Opinion Leaders (one overview and one review)</p> | <ul style="list-style-type: none"> • Effective in one overview and one review. • Effective (one overview)²: <ul style="list-style-type: none"> ○ One review found they can promote evidence-based practice, but they are hard to identify and evaluate their impact. |

| | |
|--|---|
| <p style="text-align: center;">Multifaceted (Two overviews and one review)</p> | <ul style="list-style-type: none"> • Effective in two overviews and one review. • Effective (one overview)³: <ul style="list-style-type: none"> ○ In four reviews, a combination of active interventions: audit and feedback, reminders, local consensus or marketing, academic outreach and interactive education, changed physician practice patterns. ○ In one review, multifaceted interventions were more effective than single interventions. ○ In three reviews, interactive methods were more effective than passive educational methods in changing physician practice patterns. • Effective (one review)⁵: <ul style="list-style-type: none"> ○ Seven studies found multicomponent strategies (reach, ability or motivation) appear to be more effective than one strategy for affecting clinicians' behaviour. • Small Effect (one overview)⁶: <ul style="list-style-type: none"> ○ One review found multifaceted interventions compared to single interventions improved processes and outcomes of care (median improvement 1.9%). • Number of components not influential (one overview)⁶: <ul style="list-style-type: none"> ○ Two of three reviews of effective interventions found the number of components did not influence effect size (single compared to usual care or multifaceted compared to single did not change effect size). |
| <p style="text-align: center;">Printed Educational Materials, Reminders, Computer- generated reminders delivered on paper (one overview and two</p> | <ul style="list-style-type: none"> • Effective in one overview and one review, ineffective in one review. • Effective (one overview)³: <ul style="list-style-type: none"> ○ In four reviews, reminders (concurrent and automatic) were recommended. • Effective (one review)⁹: <ul style="list-style-type: none"> ○ 25 studies found significant improvements in professional practice outcomes after the introduction of PEMs (Increase in the number of procedures of 0.13 per 1000); 10 studies found a small improvement |

| | |
|---|---|
| <p>reviews) Printed Educational Materials, Reminders, Computer-generated reminders delivered on paper (one overview and two reviews)</p> | <p>or no change compared to no intervention (2% absolute improvement).</p> <ul style="list-style-type: none"> ○ 22 studies found the following factors influence the effectiveness of PEMS: source of information, tailoring, clinical areas, type of targeted behaviour, purpose and level of evidence and format; mode, frequency or duration of delivery had no influence. ● Ineffective (one review)¹⁰: <ul style="list-style-type: none"> ○ Five meta-analyses and nine studies found PEMS compared to no interventions, single or multi-component interventions had no (or mixed) effect. |
| <p>Email, EMR Reminder (one overview)</p> | <ul style="list-style-type: none"> ● Effective in one overview and one review. ● Effective (one overview)⁶: <ul style="list-style-type: none"> ○ Computer reminders compared to usual care improved processes and outcomes of care (median improvement 5.7%). ● Effective (one review)¹²: <ul style="list-style-type: none"> ○ In one study, patients received improved care compared to those receiving usual care: <ul style="list-style-type: none"> ▪ Bone mineral density (BMD) measurement, OR 31.17; 95% CI 4.13 to 235.51 ▪ BMD or osteoporosis medication, OR 16.80; CI 6.75 to 41.85 ▪ Osteoporosis medication only, OR 3.27; 95% CI 1.02 to 10.51 ○ Patients in the usual care group were more likely to receive neither a BMD measurement, nor osteoporosis medication OR 0.06; 95% CI 0.02 to 0.15. |
| <p>How information is delivered (Tailoring the message, Targeting the message to audience segments, Framing the message (one</p> | <ul style="list-style-type: none"> ● One review⁵: <ul style="list-style-type: none"> ○ Four studies found no difference between ability strategies (increase peoples' ability to use and apply the evidence such as additional resources, skills building) and reach strategies (telephone, postal mail/email, electronic/digital media, social media, mass media, and interpersonal outreach) related to clinician behaviour (low strength of evidence). ○ Results were inconclusive in three trials for tailoring vs. targeting interventions aimed at promoting screening. |

| review) | |
|---|--|
| Patient Outcomes/Healthcare Outcomes/Clinical Outcomes | |
| Intervention | Outcome |
| Audit & Feedback and Multisource feedback (one review) | <ul style="list-style-type: none"> • Mixed results in one review. • Mixed results (one review)⁸: <ul style="list-style-type: none"> ○ 12 comparisons found minimal discernible effect on dichotomous outcomes (0.4% decrease, IQR -1.3% to 1.6%) and a positive effect on continuous outcomes (17% increase, IQR 1.5% to 17%) when audit and feedback is the single intervention or is the core, essential feature of a multifaceted intervention. |
| Multifaceted (one overview and one review) | <ul style="list-style-type: none"> • Effective in one review, mixed results in one overview. • Effective (one review)⁵: <ul style="list-style-type: none"> ○ Six studies found multicomponent strategies (reach, ability, or motivation) more effective than one strategy alone for clinical outcomes, although many comparisons examining clinical outcomes were not significant (low strength of evidence). • Mixed results (one overview)⁶: <ul style="list-style-type: none"> ○ Four reviews found multifaceted interventions more effective than single interventions and another four found mixed or no effect in direct comparisons. ○ 23 reviews assessed single and multifaceted interventions compared to usual care: <ul style="list-style-type: none"> ▪ Nine reviews showed they were effective. ▪ 13 had mixed results. ▪ One review had no effect. |

| | |
|---|---|
| <p>Printed Educational Materials, Reminders, Computer-generated reminders delivered on paper (three reviews)</p> | <ul style="list-style-type: none"> • Mixed results in one review, ineffective in two reviews. • Mixed results (one review)⁹: <ul style="list-style-type: none"> ○ One study found increased clinical depression remission compared to no intervention (13% improvement). ○ Three studies found mixed results for different outcomes. • Ineffective (one review)¹¹: <ul style="list-style-type: none"> ○ Computer-generated reminders on paper were not associated with improved outcomes of care. ○ Five studies found PEMs compared to interventions or single interventions had no impact. • Ineffective (one review)¹⁰: <ul style="list-style-type: none"> ○ One study found PEMs had a significant effect on one of four patient outcomes compared to no intervention or to other single- or multi-component educational interventions. |
| <p>Email, EMR Reminder (one review)</p> | <ul style="list-style-type: none"> • Mixed results in one review. • Mixed results (one review)¹²: <ul style="list-style-type: none"> ○ Patients had significantly higher calcium intake compared to the usual care group (P= 0.02). ○ No difference between groups in: <ul style="list-style-type: none"> ▪ Regular physical activity. ▪ Calorific expenditure. ▪ Patient satisfaction with care and services received for bone health. |

| Process Improvements | |
|--|---|
| Intervention | Outcome |
| Multifaceted (one review) | <ul style="list-style-type: none"> • Effective in one review. • Effective (one review)⁴: <ul style="list-style-type: none"> ○ Small to moderate effect of multifaceted interventions that promote the use of evidence in policy. |
| Printed Educational Materials, Reminders, Computer-generated reminders delivered on paper (one review) | <ul style="list-style-type: none"> • Effective in one review. • Effective (one review)¹¹: <ul style="list-style-type: none"> ○ In 13 comparisons in 32 trials with baseline data, there was a 4.5% median improvement (IQR 0.5% to 7%). ○ In 37 comparisons from 32 trials, processes of care improved (median improvement 7%, IQR 3.6% to 12.9%), which was a moderate improvement in professional practice. <ul style="list-style-type: none"> ▪ Compared to no co-intervention (median improvement 11.2%, IQR 6.5% to 19.6%). ▪ As part of multifaceted interventions versus the same additional intervention alone (median improvement 4%, IQR 3.0% to 6.0%). ○ The following features positively impacted processes of care: <ul style="list-style-type: none"> ▪ Availability of space for healthcare professionals to enter a response (median effect size 13.7% vs 4.3% for no space, P=0.01.) ▪ Including an explanation of their content or advice (median effect size 12.0% vs. 4.2% for no explanation, P=0.02). ○ The largest improvement was seen in: <ul style="list-style-type: none"> ▪ Vaccination (median improvement 13.1%, IQR 12.2% to 20.7%) ▪ The smallest in professional-patient communication (median reduction 0.2%, IQR -2% to 9.2%). ▪ No impact as a result of number of behaviours targeted. |

Cognitive Outcomes (awareness of evidence, knowledge of evidence, discussions about evidence, self-efficacy to use evidence, intent to use or apply evidence)

| Intervention | Outcome |
|---|---|
| <p>Printed Educational Materials, Reminders, Computer-generated reminders delivered on paper (one review)</p> | <ul style="list-style-type: none"> • Ineffective in one review. • Ineffective (one review)¹⁰: <ul style="list-style-type: none"> ○ Six studies found PEMs compared to no interventions, single or multicomponent interventions had no impact. |
| <p>How information is delivered (Tailoring the message, Targeting the message to audience segments, Framing the message (one review)</p> | <p>One review⁵:</p> <ul style="list-style-type: none"> -In one study, loss framed messages (emphasizing what is lost by taking action or making a choice) in conjunction with narratives (in the form a story, testimonial, or entertainment education) were more persuasive than either loss framed messages in conjunction with statistical information alone or gain framed messages in conjunction with either narratives or statistical information (insufficient strength of evidence). -Two studies found loss-framed messages used in combination with non-targeting (i.e. a broader appeal culturally or societally) was more persuasive in the short-term than any other combination of framing and targeting (insufficient strength of evidence). -Two studies found no difference in outcomes between those receiving targeted or tailored (communication designed for an individual based on information from the individual) version of the intervention (insufficient strength of evidence). -In a third study, the targeted version was associated with greater chance of self-reported screening relative to the tailored version (insufficient strength of evidence). -One study found no difference between targeting an intervention and personally tailoring it to each participant compared to only targeting (low strength of evidence). |

Appendix D: Data Extraction Tables

| Items Reviewed | Systematic Review - Chhina et al, 2013 |
|--|---|
| General Information & Quality Rating for Review | |
| 1. Title | Effectiveness of academic detailing to optimize medication prescribing behaviour of family physicians. Chhina H, Bhole VM, Goldsmith C, Hall W, Kaczorowski J, Lacaille D, 2013 |
| 2. Quality Rating | Strong quality (8/10) |
| 3. Objectives of Review | <ul style="list-style-type: none"> To synthesize the current knowledge about the effectiveness and the magnitude of the effect, of academic detailing, as a stand-alone intervention, at modifying drug prescription behaviour of Family Physicians in primary care settings. |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> 15; Randomized controlled trials, Observational studies with controls Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> January 1983 – July 2010 |
| 6. Databases searched | <ul style="list-style-type: none"> MEDLINE, EMBASE, CENTRAL, Web of Science databases |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> <u>Inclusion:</u> <ul style="list-style-type: none"> Full-length articles describing original research RCT or observational studies with a control group Studies of AD delivered to FPs AD as the sole intervention Drug prescription as the target behaviour of AD <u>Exclusion:</u> <ul style="list-style-type: none"> Observational study without a control group Specialist physicians; other healthcare professionals Other CME, educational intervention, multifaceted interventions Other physician practice pattern |
| Details of Interventions | |
| 8. Description of interventions | <ul style="list-style-type: none"> Academic Detailing |
| 9. Intervention settings | <ul style="list-style-type: none"> Primary Care Setting |
| 10. Target groups | <ul style="list-style-type: none"> Family Physicians |
| 11. Outcome Measures | <ul style="list-style-type: none"> Drug prescription changes |

| Results of Review | |
|----------------------------|--|
| 12. Main Results of Review | <ul style="list-style-type: none"> • In 11 RCTs and four observational studies, AD was effective at changing prescribing practice in 60% of studies. • The median difference in relative change of prescription rate among studies was 21% (IQR 43.75%) for randomized control trials, and 9% (IQR 8.5%) for observational studies. • The magnitude of the effect size was moderate. • RCTs – Mixed results <ul style="list-style-type: none"> ○ AD was effective in achieving a change in the direction recommended by the AD intervention (five studies). ○ AD had a positive effect on some but not all target drugs (two studies). ○ In three studies, AD had a statistically significant effect in decreasing all or some of the target medications. ○ In three studies, AD had statistically significant effects for increasing the prescription of some medications while decreasing others for all or some of the target medications. ○ AD did not have a statistically significant effect at increasing prescription of the target medication (two studies). ○ AD had no effect (four studies). • Observational Studies – Mixed results <ul style="list-style-type: none"> ○ AD was effective at decreasing prescription of a target drug (two studies). ○ AD was not effective at decreasing prescription of a target drug (two studies). |
| 13. Comments/Limitations | <ul style="list-style-type: none"> • Expressing effects as relative changes can be difficult to interpret, or even misleading, especially when baseline rates are small. Small absolute changes can lead to large relative changes. Conversely, when baseline rates are fairly large, clinically meaningful absolute changes can appear as small relative changes. |

| Items Reviewed | Systematic Overview - Mostofian et al., 2015 |
|--|--|
| General Information & Quality Rating for Review | |
| 1. Title | Changing Physician Behavior: What Works? Mostofian F, Ruban C, Simunovic N, et. al., 2015. |
| 2. Quality Rating | Strong quality (9/10) |
| 3. Objectives of Review | <ul style="list-style-type: none"> • Primary Objective: In surgical and general practice, through what methods are clinical research results, as well as guidelines, best implemented to change physician practice patterns? |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> • 14; Systematic review of systematic reviews, systematic reviews, Randomized controlled trials (RCTs), controlled clinical trials, controlled before-and-after study and interrupted time series analysis, trials with objective measures. • Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> • Articles published between 1970 and October 6, 2012. |
| 6. Databases searched | <ul style="list-style-type: none"> • MEDLINE, EMBASE and PubMed. |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> • <u>Inclusion</u> (1-4 and either condition 5 or 6): <ul style="list-style-type: none"> ○ 1) topic linking research/guideline to practice, 2) education or other implementation method of guidelines, 3) systematic reviews, 4) English language, 5) all surgery types and postoperative care, and 6) general practice (hospital and private). • <u>Exclusion</u>: <ul style="list-style-type: none"> ○ 1) Published before 1970, 2) guidelines publication, 3) conference and letter reviews, 4) review focused on non-surgical topics (i.e. those that are too specialized to be considered general practice, as they only focus on a specific condition [e.g. stroke/cardiology, urology, gynecology, pathology/bacterial infection, dentistry, rehab, nursing, palliative care, pharmaceuticals/analgesics, psychiatric, vaccination, and diabetes]); and 5) literature reviews. |
| Details of Interventions | |
| 8. Description of interventions | <ul style="list-style-type: none"> • Academic Detailing: active information transfer through presentation by a trained person that occur inside the physician's office. • Audit and feedback: summary of clinical performance on patient care over a specified period based on medical records, computerized database, patient surveys, or observation. • Continuing Medical Education: Information transfer through participation in educational conferences, lectures, workshops, or meetings that occur outside the physician's office. Active forms include learning tailored specifically to the clinical specialty, smaller workshops, outreach, and academic detailing. |

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| | <ul style="list-style-type: none"> • Decision support systems: Information systems designed to improve clinical decision making through the analysis of patient-specific clinical variables (Ex., diagnosis, preventive care, disease management, drug dosing, and prescribing). • Economic incentives: Financial rewards or penalties to physicians or institutions. • Local opinion leaders: Healthcare providers who are nominated or considered by their colleagues to be “educationally influential.” • Multifaceted: Combination of 2 or more of the above intervention methods. • Patient-mediated intervention: Any intervention aimed at changing the performance of healthcare providers for which specific information was sought from or given to patients. • Printed education materials (passive dissemination method): Passive information transfer through the distribution of printed recommendations for clinical care (e.g. clinical practice guidelines, electronic publications, audio-visual materials). • Reminders: Manual or computerized prompts directed to physicians to perform a specific clinical action. |
| 9. Intervention settings | <ul style="list-style-type: none"> • Settings were not described; healthcare setting is described in one of the 14 articles included in this review. |
| 10. Target groups | <ul style="list-style-type: none"> • General physicians, physician assistants, nurse practitioners, healthcare professionals, internists, medical students/interns, gynecologists, pediatricians, Emergency physicians, Surgeons, Dentists, Nurses, Allied healthcare professionals (physical therapists, speech therapists). |
| 11. Outcome Measures | <ul style="list-style-type: none"> • Physician behaviour change. • Patient/healthcare outcome. |
| Results of Review | |
| 12. Main Results of Review | <ul style="list-style-type: none"> • Multifaceted interventions and active forms of CME were rated the most effective implementation methods to change physician behaviour for a desired outcome. <p>The results were grouped by intervention:</p> <ul style="list-style-type: none"> • Audit and Feedback (four reviews) <ul style="list-style-type: none"> ○ The results are inconclusive. <ul style="list-style-type: none"> ▪ Audit and feedback was more effective compared with no intervention or audit alone or feedback alone (two reviews). Adjusted relative risk for physician compliance ranged from 0.99 to 1.30. ▪ The adjusted risk difference of audit and feedback versus no intervention varied from -0.16, a 16% decrease in compliance to 0.70, a 70% increase in compliance (one review). • Feedback alone is most effective when presented close to the time of decision making in clinical practice (one review). |

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| | <ul style="list-style-type: none"> • Continuing Medical Education (four reviews) <ul style="list-style-type: none"> ○ In one review, 58% of 99 studies found active forms of CME improved physician performance by the physician meeting practice objectives over a period of 30 days to 1 year or longer. ○ In the same review, 77% of 99 studies found internet-based CME, such as webinars or online teaching modules and Internet, improved or maintained physician performance. ○ In two reviews, including 64 studies, 70% of multifaceted interventions (which included active interventions such as reminders, patient-mediated intervention, outreach visits, and the use of opinion leaders) were effective. ○ Formal didactic conferences and passive forms of CME, such as brochures or PEMS are the least effective methods for change and, at best, create small changes within practice (two reviews). ○ Mailing PEMS to clinicians (passive dissemination) were ineffective in changing physician behaviour when used alone (one review). ○ Based on physician outcomes of smoking cessation activities for patients, PEMS have a small effect, and in comparison to education workshops, the risk difference was +0.5% in favor of PEMS (one review). • Other Interventions (two reviews) <ul style="list-style-type: none"> ○ In one review, 68% of the 88 studies found decision-support systems improved patient results if they were activated automatically as part of the clinician work flow. They significantly improved clinical practice (one review). • Comparison of Multiple Interventions (five reviews) <ul style="list-style-type: none"> ○ Multiple intervention methods (audit and feedback, reminder, and CME) were most effective in changing physician practice patterns. These multifaceted interventions included a combination of active interventions: audit and feedback, reminders, local consensus or marketing, academic outreach, and interactive education (four reviews). ○ Multifaceted interventions are more likely to be effective compared to single interventions (one review). ○ Interactive compared to passive educational methods were highly effective methods for changing physician practice patterns (three reviews). ○ Reminders (concurrent and automatic) were recommended due to consistent positive results. ○ Didactic lecture-based CME and passive dissemination of PEMS were identified as weak interventions to change physician practice patterns. |
| 13. Comments/Limitations | <ul style="list-style-type: none"> • The reviews included were highly heterogeneous, meaning that the interventions and outcomes differed considerably. <ul style="list-style-type: none"> ○ Ex. High, moderate, and low effectiveness were defined by different parameters in each review. ○ Some studies did not report these parameters and made only qualitative judgement on the effectiveness of interventions. |

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| | <ul style="list-style-type: none">• Many of the included reviews identified heterogeneity as a limitation to making conclusive recommendations when comparing all techniques that attempt to change physician behaviour.• Risk of publication bias as only reviews published in English language were included. |
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| Items Reviewed | Systematic Overview - Boaz et al, 2011 |
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| General Information & Quality Rating for Review | |
| 1. Title | Effective implementation of research into practice: An overview of systematic reviews of the health literature. Boaz A, Baeza J, Fraser A and the European Implementation Score Collaborative Group. |
| 2. Quality Rating | Moderate quality (6/10) |
| 3. Objectives of Review | <ul style="list-style-type: none"> • Which methods are effective in implementing research evidence? • The effectiveness of implementation methods in translating evidence-based findings into practice as opposed to other non-evidenced-based changes. |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> • 13; Systematic Reviews. • Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> • 1998-2009 |
| 6. Databases searched | <ul style="list-style-type: none"> • Medline, Cochrane Database of Reviews. |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> • <u>Inclusion:</u> <ul style="list-style-type: none"> ○ Systematic Reviews. ○ Focus on the implementation of research evidence into practice. ○ Study population included healthcare providers and patients. ○ Interventions included were as follows: <ul style="list-style-type: none"> ▪ Clinical guidelines ▪ Audit and feedback ▪ Continuing professional education ▪ Financial incentives ▪ Use of opinion leaders ▪ Multifaceted interventions • <u>Exclusion:</u> <ul style="list-style-type: none"> ○ Systematic reviews that did not explicitly look at interventions designed to get research evidence into practice. ○ Systematic reviews that explored changes in provider behaviours but did not state that the changes were research based. ○ No mention of research evidence. ○ Papers that was unclear about the use of research evidence. ○ Studies that focused on evidence-based interventions but failed to report on the evidence base. |
| Details of Interventions | |

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| 8. Description of interventions | <ul style="list-style-type: none"> • Audit and feedback. • Computerized decision support. • Use of opinion leaders. • Multifaceted interventions. |
| 9. Intervention settings | <p>Not explicitly stated (information obtained from Table 1):</p> <ul style="list-style-type: none"> • Hospitals, Ambulatory care, Obstetrics, Primary Care. |
| 10. Target groups | <p>Not explicitly stated in the paper (information obtained from Table 1):</p> <ul style="list-style-type: none"> • Prescribers, Allied health professional, Obstetricians, Primary Care Professionals. |
| 11. Outcome Measures | <ul style="list-style-type: none"> • Outcomes related to improvements in process or patient well-being. |
| Results of Review | |
| 12. Main Results of Review | <ul style="list-style-type: none"> • Active interventions, such as opinion leaders, and reminders and feedback are more effective than passive approaches, such as information campaigns. <p>The results were grouped into key themes:</p> <ul style="list-style-type: none"> • Audit and feedback (one review) <ul style="list-style-type: none"> ○ Audit and feedback is most likely to change prescribing and preventative care (small effect) compared to complex areas such as disease management, adherence to guidelines and diagnosis appear less effected by audit and feedback. • Computerized decision support (two studies) <ul style="list-style-type: none"> ○ Computer guidance may give clinicians greater confidence in prescribing and lead to more effective prescribing practice (one study). • Use of opinion leaders (one review) <ul style="list-style-type: none"> ○ Opinion leaders can successfully promote evidence-based practice, however, the difficulty of identifying opinion leaders and the labour intensive nature of assessing their impact may limit their use as a knowledge transfer intervention. • Multifaceted interventions (number of studies not stated) <ul style="list-style-type: none"> ○ Interventions designed to promote the use of evidence in policy are more effective when delivered as part of multifaceted intervention that combine different approaches, though the effect is small to moderate. |
| 13. Comments/Limitations | <ul style="list-style-type: none"> • Double counting individual studies included in different reviews. • Included studies in reviews are not likely to include the very latest research; this has particular implications for interventions based on new technologies such as electronic reminders for clinicians. • Reviewers are situated at some distance from the original studies and rely on summaries produced by others of existing primary studies. • Selection of systematic reviews looked explicitly at interventions designed to get research evidence into practice |

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| | <p>which may have led to reporting bias.</p> <ul style="list-style-type: none">○ Some systematic reviews were excluded because they were not explicit in their inclusion criteria or main body of the text that the studies selected were focused on promoting the use of evidence in practice.○ Others were excluded because they were not explicit in the main body of the text that the systematic review was focused on promoting the use of evidence in practice. <ul style="list-style-type: none">● The lack of high-quality primary studies demonstrating improvements in patient outcomes and the poor descriptive value of many studies make learning lessons for implementation of computerized decision support difficult (one review). |
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| Items Reviewed | Systematic Review - McCormack L et al., 2013 |
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| General Information & Quality Rating for Review | |
| 1. Title | Communication and Dissemination Strategies To Facilitate the Use of Health-Related Evidence. McCormack L, Sheridan S, Lewis M, Boudewyns V, Melvin CL, Kistler C, Lux LJ, Cullen K, Lohr KN, 2013. |
| 2. Quality Rating | Strong quality (10/10) |
| 3. Objectives of Review | <p>This review examined how to best communicate and disseminate evidence, including uncertain evidence, to inform health care decisions. There were three primary objectives – comparing effectiveness of</p> <ol style="list-style-type: none"> 1. KQ 1: Communicating evidence in various contents and formats that increase the likelihood that target audiences will both understand and use the information. <ol style="list-style-type: none"> a. What is the comparative effectiveness of communication strategies to promote the use of health and health care evidence by patients and clinicians? b. How does the comparative effectiveness of communication strategies vary by patients and clinicians? 2. KQ 2: A variety of approaches for disseminating evidence from those who develop it to those who are expected to use it. <ol style="list-style-type: none"> a. What is the comparative effectiveness of dissemination strategies to promote the use of health and health care evidence for patients and clinicians? b. How does the comparative effectiveness of dissemination strategies vary between patients and clinicians? 3. KQ 3: Various ways of communicating uncertainty-associated health-related evidence to different target audiences. <ol style="list-style-type: none"> a. What is the comparative effectiveness of different ways of explaining uncertain health and health care evidence to patients and clinicians? <p>A secondary objective was to examine how the effectiveness of communication and dissemination strategies varies across target audiences, including evidence translators, health educators, patients, and clinicians.</p> <p>Results were only extracted for questions one and two because the results for question three reported on communicating patients only, not physicians.</p> |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> • 61; Individual RCTs, Cluster RCTs, Quasi-experimental trials (KQ3 only), Non-randomized trials (KQ3 only) • Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> • 2000 to March 15, 2013 |

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| 6. Databases searched | <ul style="list-style-type: none"> • MEDLINE, The Cochrane Library, Cochrane Central Trials Registry, Psyc INFO, Web of Science. |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> • <u>General Inclusion Criteria for all Key Questions:</u> <ul style="list-style-type: none"> ○ Study Populations: Adults (≥ 19 years): general public and patients, Clinicians. ○ Interventions: Techniques and strategies as specified for individual Key Questions, For KQ 1 and 2 must be based on systematic review or guideline evidence. ○ Comparators: Alternate presentations of specified interventions for individual Key Questions. ○ Outcomes: Prevention and treatment. ○ Settings: Inpatient and outpatient settings and clinics of all types, Academic health care institutions, Community-based settings such as churches, fraternal organizations, professional or social clubs, pharmacies, homes. ○ Geographic locations: Austria, Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Luxembourg, Netherlands, Norway, Poland, Portugal, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States. ○ Sample sizes: $N \geq 100$ total individuals in the study, No limits on size of clusters. ○ Other: Access to entire article. • <u>General Exclusion Criteria for all Key Questions:</u> <ul style="list-style-type: none"> ○ Study Populations: Children (< 19 years), Incarcerated populations, Federal and State policymakers. ○ Comparators: Comparisons with usual practice (except for KQ 3 when the evidence is sparse). ○ Outcomes: End of life. ○ Settings: Primary and secondary schools, Prisons and jails. ○ Geographic locations: Any other country not specified for inclusion. ○ Sample sizes: $N < 100$ total individuals in the study. ○ Other: Inability to retrieve full article. • <u>Inclusion criteria for research evidence to be communicated or disseminated</u> <ul style="list-style-type: none"> ○ Systematic review evidence or guidelines generated by governmental organizations or agencies, such as: United States Preventive Services Task Force (USPSTF); the Community Preventive Services Task Force; Cochrane Collaboration; National Institute for Health and Clinical Evidence (NICE); National Institutes for Health (NIH) agencies (such as National Health Lung and Blood Institute (NHLBI), National Institute of Diabetes and Digestive and Kidney Disorders (NIDDK), National Cancer Institute (NCI); AHRQ-funded Evidence-based Practice Centers (EPCs). ○ Systematic review evidence or guidelines from a professional organization or society, such as American Medical Association (AMA) or the American Cancer Society (ACS) if information in the article indicated an attempt to base on evidence (literature review and not just consensus). |

- Evidence from guidelines in the National Guideline Clearinghouse (NGC) because the NGC expects recommendations to be based on authoritative sources using systematic review techniques.
- Evidence from government-supported (e.g., NCI) research consortiums (such as the NCI Breast Cancer Research Consortium) that is compiled using acceptable methods such as systematic reviews and/or meta-analyses and that presents guidelines or recommendations to inform practice or behavior change (or both).
- Exclusion criteria for research evidence to be communicated or disseminated
 - Evidence based solely on a consensus process.
 - Evidence based on a single intervention trial or on prior work by the “evidence” authors.
 - Evidence for which a specific guideline or systematic review from a recognized body was not cited as the source.
 - Evidence based on conference proceedings.
 - Evidence based on a compilation or combination of multiple sources and heavily adapted. These combinations of multiple sources were often compiled using consensus-based decisions and non-systematic procedures.
- Included communication strategies and approaches for Key Question 1
 - Tailoring the message:
 1. Using a computerized database of messages that can be combined in response to answers to pre-programmed questions asked of an individual.
 2. Applying an electronic algorithm to design messages based on individual input regarding a limited number of questions.
 3. Trying to direct messages to individuals’ status on key theoretical determinants (knowledge, outcome expectations, normative beliefs, efficacy, or skills) of the behavior of interest.
 4. Incorporating recognizable aspects of participants to convey (implicitly or explicitly) that the messages are designed specifically for them. This is more than a personalized letter (e.g., “Dear Jane”).
 5. Providing messages to participants about their psychological or behavioral states. Individualized feedback may be provided synchronously (e.g., by a chat function, telephone, or face-to-face) or asynchronously (e.g., by email or discussion board, or mail).
 - Targeting the message:
 1. Manipulating language, visuals, music, or choice of behavior topic in ways that make the message more interesting, relevant, or appealing to specific subgroups.
 - Using narratives:
 1. Invoking personal stories, case studies, anecdotes, testimonials, experiential sharing (e.g., personal account of an individual’s experience in donating an organ to a sibling).

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| | <ul style="list-style-type: none"> 2. Using entertainment education (e.g., talking about issue in a soap opera storyline) or photo novellas or graphic novels. ○ Framing the message: <ul style="list-style-type: none"> 1. Creating messages that emphasize the positive consequences of compliance are referred to as positive (gain) frame, whereas those that stress the negative consequence of noncompliance are denoted as negative (loss) frame. Studies should explicitly state that the stimuli differed in terms of gain or loss frame. For example, <ul style="list-style-type: none"> • Positive (gain) frame: “Get active! Enhance your health!” vs. “A lack of activity increases risk for diabetes.” 2. Negative (loss) frame: “With drug X, you have a 5% chance of dying” vs. “With drug X, you have a 95% chance of surviving.” ○ More than one of the above strategies: <ul style="list-style-type: none"> 1. A multicomponent approach uses several communication strategies in concurrent combination or in sequence to increase understanding of the evidence or information. 2. Multicomponent interventions are important to this review only to the extent that they are compared with another intervention that is different by only 1 or more aspects. ● <u>Inclusion criteria specific to Key Question 1</u> <ul style="list-style-type: none"> ○ Strategies of interest included tailored communication, communication targeted at audience segments; use of narratives; and message formatting. ○ Studies that compared two or more of the included communication strategies head to head (e.g. tailoring vs. targeting). ○ Studies that used a multicomponent approach that had a combination of two or more communication strategies (e.g. tailoring and targeting) compared with a single strategy. ○ Studies of decision aids only when they were based on evidence-based guidelines. Studies must have used a decision aid as a communication strategy or dissemination technique. ● <u>Exclusion criteria specific to Key Question 1</u> <ul style="list-style-type: none"> ○ Studies that compared one of these communication strategies with “usual practice” (i.e. steps that are essentially standard procedures and do not represent any included strategies that serve as interventions of interest). ○ Studies that compared permutations of the included communication strategies, for example, comparison of two different ways of using narratives. ○ Studies that examined interpersonal communication techniques given that our focus was on examining the comparative effectiveness of techniques that evidence developers might use in developing evidence summaries for end-users. |
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- Inclusion criteria specific to Key Question 2
 - Active dissemination strategies included designed to:
 1. Increase the reach of information (e.g. postal and electronic mail; electronic/digital, social, and mass media);
 2. Increase people’s motivation to use and apply evidence (e.g., using champions, opinion/thought leaders, peer and social networks);
 3. Increase people’s ability to use and apply evidence (e.g. by packaging information so that the factors likely to affect adoption are easy to find or provided “how to” information; or by skills-building efforts).
 - Head-to-head comparisons between these broad categories (e.g. increasing reach vs. increasing motivation), within comparisons of different strategies with the same broad aims (e.g., increasing reach using social media vs. increasing reach using digital media).
 - Multicomponent strategies with several dissemination strategies in concurrent combination or in sequence to increase the reach of evidence, to enhance end users’ motivation to adopt evidence or to enhance their ability to apply the evidence were included.
 - Included Dissemination Strategies and Their Approaches to Dissemination:
 1. Improve reach of evidence: Distributing evidence widely to many audiences and across many settings extends the numbers and types of recipients.
 - Postal: Any information delivered to a new destination by a human carrier employed by a government-affiliated postal service or a for-profit mail or parcel delivery service such as FedEx™ or UPS®.
 - Electronic and digital media: Any information delivered by telephone or web-based email, text messages, or electronic programs such as personal digital assistant (PDA) resources or phone apps.
 - Social media: Any information delivered by Internet-based social networking sites such as Facebook, Twitter, YouTube, myspace, foursquare, and LinkedIn. Sometimes problem- or group-specific social networks exist for professional organizations or patient subgroups; these would fall into social media as long as they have a “social” network component as described above.
 - Mass media: Any information delivered by television, radio, print newspapers, print magazines, or billboards.
 - Interpersonal verbal group or individual outreach: Information delivered by telephone,

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| | <p>webinar, or in-person visits, including purposeful delivery of brochures or pamphlets, but without any motivational component. The audiences can include: pharmacists, nurses, doctors, counselors, or other clinicians.</p> <ol style="list-style-type: none"> 2. Motivate recipients to use and apply evidence: Using a variety of authoritative experts or spokespersons to increasing interest in or acceptability of the evidence or related recommendations may promote enthusiasm or action on the part of clinicians or patients. <ul style="list-style-type: none"> • Champions (cheerleaders): People who take ownership of the evidence and visibly promotes it within their own organization or across other settings. Champions help overcome social and political pressures imposed by an organization, provide a role model for personal commitment to the program, and involve others in its use. <ul style="list-style-type: none"> ○ For example, an evidence developer might train or enlist the help of a local champion to promote evidence within his or her organization. • Opinion or thought leaders (frequently has an endorsing or persuasive element): Recognized experts who lend their name to dissemination efforts to endorse the idea being disseminated and to establish credibility. They may or may not actually participate in the work and do not necessarily have any relationship with the organization to which evidence is to be disseminated. They could endorse the intervention, have a role in its development, or advise on strategies. <ul style="list-style-type: none"> ○ For example, an opinion leader might be the CEO or the head of a department, an external expert in a particular field applicable to the evidence, or a well-recognized figure such as the U.S. Surgeon General. • Social networks: A network of individuals who have a common perspective, relationships, or similar connection. The relationships can be informal (friends, peers, family) or formal (patient provider, nurses), but network members have defined role obligations. Peer networks provide a central and trusted source for information and might use multiple other dissemination strategies themselves (such as newsletters, journals, phone- and internet-based distribution, face-to-face conferences, peer-to-peer conversations, etc.). 3. Enhance recipients' ability to use and apply evidence (regardless of delivery mode) providing additional resources about evidence or recommendations based on evidence, such as how they can be incorporated into current practice, or giving specific suggestions for change enhances a traditional dissemination strategy. <ul style="list-style-type: none"> • Provision of supporting "how-to" materials: Includes physical materials that a health care practice might use to apply evidence in their activities. These might include giving tracking sheets to patients or giving risk calculators to clinicians. These might also include tailored |
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| | <p>toolkits that explain how to implement evidence-based recommendations from in specific settings.</p> <ul style="list-style-type: none"> • Supporting materials do not include brochures, counseling resources, or resources that originate from the practice. They must originate from the evidence developer and be given to the end user. • Skill training, capacity building, and problem solving: training in any skill that would allow appropriate use of evidence (to overcome barriers); might include training in recognizing the quality of evidence or the circumstances under which it can be reasonably used; also includes training in various counseling techniques that would facilitate evidence implementation and interactive seminars. <p>4. More than one of the above strategies: combining multiple dissemination strategies, including ways to increase reach, motivation, or ability, may be more effective than single strategies.</p> <ul style="list-style-type: none"> • A multicomponent approach uses several dissemination strategies in concurrent combination or in sequence to increase the reach of evidence, enhance the end users' motivation to adopt and use or apply evidence. Multicomponent interventions are important to this review only to the extent that they are compared with another intervention that is different by at least one other aspect. <ul style="list-style-type: none"> • <u>Exclusion criteria specific to Key Question 2</u> <ul style="list-style-type: none"> ○ excluded studies that compared the above strategies to “usual practice.” In this case, this means passive, uncontrolled spread of information of evidence or no direct effort to spread information such as posting information to an evidence developer’s website or posting scientific publications in a searchable database. ○ excluded studies that compared enhanced versions of the same strategy (e.g., monthly telephone calls vs. weekly telephone calls). ○ excluded studies in which the primary purpose of the intervention was implementation (see definition in the Introduction), even when the intervention seemingly raised awareness or educated patients or clinicians (such as reminders at the point of care or audit-and-feedback). |
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| Details of Interventions | |
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| 8. Description of interventions | <p>Specific clinical interventions include:</p> <ul style="list-style-type: none"> • Strategies to communicate evidence: <ul style="list-style-type: none"> ○ Tailoring the message—Communication designed for an individual based on information from the individual. ○ Targeting the message to audience segments—Communication designed for subgroups based on group membership or characteristics such as age, sex, race, cultural background, language, and other |

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| | <p>“psychographic” characteristics (e.g., a person’s attitudes about a particular subject matter).</p> <ul style="list-style-type: none"> ○ Using narratives—Communication delivered in the form of a story, testimonial, or entertainment education. ○ Framing the message—Communication that conveys the same messages in alternative ways (e.g., emphasizing either what is gained or what is lost by taking an action or making a choice). ○ Using a multipronged approach with any of the communication techniques described above (e.g., tailoring and targeting). <ul style="list-style-type: none"> ● Strategies to disseminate evidence, such as those that: <ul style="list-style-type: none"> ○ Increase reach of the evidence (e.g., telephone; postal mail/email; electronic/digital media, social media, mass media, interpersonal outreach). ○ Increase people’s motivation to use and apply the evidence (e.g., opinion leaders, champions, social networks). ○ Increase people’s ability to use and apply the evidence (e.g., additional resources, skillsbuilding). ○ Use a multipronged approach with any of the dissemination strategies described above (e.g., social marketing, academic detailing). |
| 9. Intervention settings | Clinical or community settings in the United States, such as Inpatient and outpatient settings and clinics of all types, Academic health care institutions, Churches, settings for fraternal organizations, professional or social clubs, pharmacies, Homes. |
| 10. Target groups | Recipients of health and health care evidence, also called “target audiences,” which include Adult patients and the adult public at large, Clinicians, including physicians, nurses, mid-level providers, and/or pharmacists. |
| 11. Outcome Measures | <p>Specific outcomes, which include:</p> <p>Intermediate outcomes for all target audiences</p> <ul style="list-style-type: none"> ● Awareness of the evidence ● Knowledge about the evidence ● Discussions about the evidence ● Self-efficacy to use the evidence ● Behavioral intentions to use or apply the evidence <p>Ultimate outcomes for patients</p> <ul style="list-style-type: none"> ● Health-related decisions or behaviors ● Clinical outcomes <p>Ultimate outcomes for clinicians</p> <ul style="list-style-type: none"> ● Behaviors |
| Results of Review | |
| 12. Main Results of Review | The results were grouped into key questions: <u>Key Question #1</u> |

- Framing [communication that conveys the same messages in alternative ways (e.g., emphasizing either what is gained or what is lost by taking an action or making a choice)] versus narratives (communication delivered in the form of a story, testimonial, or entertainment education) (one study; insufficient strength of evidence [SOE]).
 - Loss framed messages used in conjunction with narratives were more persuasive (i.e., convincing) than either loss framed messages in conjunction with statistical information alone or gain framed messages in conjunction with either narratives or statistical information.
- Framing (gain/loss) versus targeting [communication designed for subgroups based on group membership or characteristics such as age, sex, race, cultural background, language, and other “psychographic” characteristics (e.g., a person’s attitudes about a particular subject matter).] (Two studies; insufficient SOE).
 - The loss-framed message used in combination with non-targeting (i.e., a more broad appeal either culturally or societally, such as a collectivist appeal) was more persuasive relative to any other combination of framing and targeting, but the results held only in the short-term for one of the trials and the targeting was done on different factors across the trials.
- Targeting (yes/no) versus tailoring (communication designed for an individual based on information from the individual) (three studies; insufficient SOE).
 - No significant differences in outcomes between those receiving the targeted or tailored version of the intervention in two studies. In a third study, the targeted version was associated with greater likelihood of self-reported screening relative to the tailored version. The authors attributed this unexpected finding to a possible ‘boomerang effect’ (i.e., because the tailored letter may have been too alarming) and/or insufficient customization of tailored version. Across the three studies, investigators targeted and tailored the interventions based on different factors.
- Targeting (yes/no) and tailoring (yes/no) versus targeting only (one study; low SOE).
 - Investigators found no statistically significant differences when they targeted an intervention to the subpopulation and personally tailored it to each study participant compared to a version of the intervention that was only targeted. They attributed the lack of differential impact to a possible ‘ceiling effect’ in the study population given the fairly high baseline screening rates (of about 80 percent).

Key Question #2: Disseminating Evidence to Clinicians

- No difference between ability strategies [increase peoples’ ability to use and apply the evidence such as how it can be incorporated into current practice or specific suggestions for change, to enhance a traditional dissemination strategy (e.g., additional resources or information; skills-building efforts)] and reach strategies [increase reach to a variety of audiences; distributing evidence widely to many audiences and across many settings (e.g., telephone; postal mail/email; electronic/digital media, social media, mass media, interpersonal outreach) to increase the reach of information] related to clinician behavior (4 studies, low SOE).

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| | <ul style="list-style-type: none"> • Multicomponent strategies that address a combination of reach, ability, or motivation [increase motivation to use and apply such information ; increasing interest in the evidence through champions (also known as “cheerleaders”), opinion/though leaders, or social networks) appear to be more effective than one strategy alone for affecting clinicians’ behaviors, particularly guideline adherence (7 studies; moderate SOE) and for clinical outcomes although many comparisons examining clinical outcomes were not significant (6 studies, low SOE). |
| 13. Comments/Limitations | <p>Key Question #1</p> <p>Challenges in interpreting the current body of literature include:</p> <ul style="list-style-type: none"> • Use of multiple communication strategies simultaneously. <ul style="list-style-type: none"> ○ In several cases, investigators used some combination of the four communication strategies when developing their interventions instead of comparing only a single strategy with another single strategy. Because comparisons were not one-to-one, it was more challenging to isolate the effects of each strategy. • Combining communication strategies with channel variation. <ul style="list-style-type: none"> ○ In one trial, investigators enhanced the communication strategy by also varying the communication channel for the intervention (i.e., using a lay health worker). While this tactic creates the potential for a more powerful effect, it is also complicates determining the effect of each strategy relative to the other. • Variation in use of strategies for patients versus clinicians. <ul style="list-style-type: none"> ○ None of the trials that met our review addressed using the four communication strategies with clinicians; therefore, we were unable to address KQ 1b. • The evidence base for addressing comparisons of communication strategies of interest was extremely sparse (i.e., only seven trials of direct comparisons). • There was disproportionate use of convenience samples. While randomizing a convenience sample increases the likelihood of equal distribution of characteristics, unmeasured confounding may exist because of selection bias with the sample. All of these trials studies used self-reported data, which can be subject to social desirability bias. For behaviors such as screening or dietary intake, this may pose another limitation. • Investigators did not control for a variety of potentially confounding variables, such as mode of communication (e.g., use of mailed materials), amount of content (e.g., one-page letter versus multicomponent intervention), or apply modeling techniques that might have clarified the impact (or lack of it) of such factors. <p>Key Question #2</p> <ul style="list-style-type: none"> • The strength of evidence is low or insufficient for most comparisons related to clinical outcomes and knowledge for clinicians because we had only single trials in each case. • Several conceptual and methodological limitations emerged from the literature about dissemination strategies, and some clouded the evidence base about communication as well. First, the significant heterogeneity in how |

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| | <p>the field references and classifies dissemination strategies continues to confound dissemination and implementation approaches.⁴ Authors of other recent reviews have also acknowledged the difficulty in identifying patterns across heterogeneous dissemination studies or data.</p> <ul style="list-style-type: none"> • The lack of consistency across investigator teams and studies hampered our efforts to classifying a strategy into one of our domain groupings • Many studies, particularly clinically oriented trials, provided little theoretical or conceptual justification for the dissemination strategy employed or a hypothesis for why particular strategy was expected to be more effective than another. With no underlying framework, the investigators, and we, found null findings difficult to interpret and explain. • Studies often confounded the mode of distribution with other variables related to communication. Therefore, we could not tease apart the effect of mode, channel, and content of the intervention on the outcome of interest. • This body of evidence was quite heterogeneous. Across the included studies the health conditions examined included cardiovascular disease, cancer, pain, hypertension, among others. • The types of behaviors targeted for change included adherence, smoking cessation, surgery, preventive screening, among others. • Even when investigators studied a similar issue, physical activity or quality of life for example, different measures were used. Moreover, the trials were also diverse with respect to target audience (clinicians, patients, or both). For clinicians, trials may have targeted primary care physicians, residents or nurses. • To address this heterogeneous and complicated body of work, we classified the trials in broad terms. Nonetheless, this effort still left too few studies in some categories with which to make meaningful conclusions about the relative impact of a particular dissemination strategy. • We could not pursue any quantitative (pooling) analyses, and we summarized results with text, rather than numbers in our summary tables as other investigators have done. • Further, many times the mode of communication was confounded with other variables we examined which made it impossible to disentangle if a particular strategy was effective above and beyond the mode or channel used to send the information. Synthesis examining mode or agent did not change the pattern or results, likely due to the extensive non-significant findings across included studies. • Many studies did not consistently compare strategies directly to each other, but instead compared to a usual care or control condition or at times made direct comparisons for only some outcomes. This factor, which limited our ability to draw conclusions about the comparative effectiveness of one approach versus another, may be partially an artifact of the conceptual confusion. |
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| Items Reviewed | Systematic Overview - Squires et al, 2014 |
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| General Information & Quality Rating for Review | |
| 1. Title | Are multifaceted interventions more effective than single-component interventions in changing health-care professionals' behaviours? An overview of systematic reviews. Squires JE, Sullivan K, Eccles MP, Worswick J, Grimshaw JM, 2014 |
| 2. Quality Rating | Moderate quality (7/10) |
| 3. Objectives of Review | <ul style="list-style-type: none"> To evaluate the effectiveness of multifaceted interventions in comparison to single-component interventions in changing health-care professionals' behaviour in clinical settings. |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> 25; Dose-response/Effect-Based Statistical Analyses, Direct Comparison, In-Direct Comparison Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> Inception to May 1, 2013 |
| 6. Databases searched | <ul style="list-style-type: none"> Rx for Change |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> <u>Inclusion:</u> <ul style="list-style-type: none"> Studies had to report a comparison of the effectiveness of multifaceted to single-component interventions to change the behaviour of health care professionals. Reviews had to be rated as moderate or high methodological quality (AMSTAR rating of 4 or higher). A minimum of three primary studies per review comparing multifaceted interventions to a control and single interventions to a control. Only the latest version of a review was included. <u>Exclusion:</u> <ul style="list-style-type: none"> None stated. |
| Details of Interventions | |
| 8. Description of interventions | <ul style="list-style-type: none"> Multifaceted interventions (any intervention including two or more components) vs single-component interventions. |
| 9. Intervention settings | <ul style="list-style-type: none"> Primary care practices, Hospitals, Outpatient clinics, Communities, Nursing homes, Ambulatory care settings, Medical centres, Long-term care facilities, Pharmacies, schools. |
| 10. Target groups | <ul style="list-style-type: none"> Physicians, nurses, pharmacists, mental health clinicians, medical assistants, medical and surgical residents, youth workers, counsellors, orthopaedic surgeons, psychiatrists, nurse practitioners. |
| 11. Outcome Measures | <ul style="list-style-type: none"> Behaviour change (reducing the number of prescriptions written for antibiotics, use of guidelines, and improving hand hygiene). |
| Results of Review | |
| 12. Main Results of Review | Results were grouped as follows for effectiveness of multifaceted interventions: |

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| | <ul style="list-style-type: none"> • Effect size/dose-response statistical analyses (three reviews) <ul style="list-style-type: none"> ○ There is no relationship between the effect size and the number of components in the interventions (two reviews). ○ Single interventions statistically improved processes and outcomes of care compared to usual care (median improvement 5.7%) (one review). ○ Multifaceted interventions statistically improved processes and outcomes of care compared to single interventions (median improvement 1.9%) (one review). • Direct comparisons (Eight reviews) <ul style="list-style-type: none"> ○ Four out of eight reviews showed multifaceted interventions were more effective than single component interventions. ○ The remaining four found mixed or no effect. • Indirect comparisons (23 reviews) <ul style="list-style-type: none"> ○ Nine out of 23 reviews found both single-component and multifaceted interventions effective compared to usual care. ○ Six out of 23 reviews found mixed or no effect. ○ Seven out of 23 reviews found single interventions to be effective and multifaceted interventions to have mixed effectiveness. ○ The last review found single interventions to have mixed effectiveness and multifaceted interventions to be effective. |
| 13. Comments/Limitations | <ul style="list-style-type: none"> • Only included reviews published in Rx for Change database; grey literature was not searched, therefore not all work in this field may have been included. • Authors did not retrieve data from primary studies; therefore limited to information reported by the review authors. • Small number of review reporting effect size/dose-response statistical analyses of effectiveness, the authors also included non-statistical assessments of effectiveness to answer their research question. This necessitated the use of vote counting which has several weaknesses. |

| Items Reviewed | Systematic Review - Ferguson et al, 2014 |
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| General Information & Quality Rating for Review | |
| 1. Title | Factors influencing the effectiveness of multisource feedback in improving the professional practice of medical doctors: A systematic review. Ferguson J, Wakeling J, and Bowie P, 2014. |
| 2. Quality Rating | High quality (8/10) |
| 3. Objectives of Review | <ul style="list-style-type: none"> To identify key factors that influences the effectiveness of multisource feedback (MSF) in improving the professional practice of medical doctors. |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> 16; Randomized controlled trials, Cross sectional survey questionnaires, Mixed methods, Qualitative methods Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> Inception to 2012 |
| 6. Databases searched | <ul style="list-style-type: none"> MEDLINE, EMBASE, CINAHL, PsycINFO, Psychological and Behavioral Sciences Collection, Cochrane CENTRAL Database, Applied Social Sciences Index and Abstracts (ASSIA). |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> <u>Inclusion:</u> <ul style="list-style-type: none"> Published empirical studies with a focus on the development and application of MSF methods by all healthcare professional groups. <u>Exclusion:</u> <ul style="list-style-type: none"> Not explicitly stated. |
| Details of Interventions | |
| 8. Description of interventions | <ul style="list-style-type: none"> Multisource feedback (questionnaire-based process, which allows for feedback form colleagues to be collected in a systematic way. The intent of the feedback is to guide behaviour change and improve performance. The participant usually receives a copy of their own data, presented as aggregate scores for each element of perceived professional's performance being assessed by colleagues along with comparison data for their group.) |
| 9. Intervention settings | <ul style="list-style-type: none"> Not explicitly stated |
| 10. Target groups | <ul style="list-style-type: none"> Paediatricians, Foundation nurses, Family Physicians, Surgeons, Medical specialists, General practitioners (trainees and doctors) |
| 11. Outcome Measures | <ul style="list-style-type: none"> Changes in professional behaviours <ul style="list-style-type: none"> Measured by self-reported change in behaviour Measured by change in performance |
| Results of Review | |
| 12. Main Results of Review | <p>The results were grouped into the following categories:</p> <ul style="list-style-type: none"> Impact of MSF on medical professionals' professional practice (16 studies). <ul style="list-style-type: none"> Groups that took part in a tailored coaching session to identify strengths and weaknesses and in setting |

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| | <p>specific behaviour goals in addition to MSF showed significant changes in (one study):</p> <ul style="list-style-type: none"> ▪ Communicating effectively with patients and family, 35% improvement (35%; 95% CI, 11.0%-58%) ▪ Timeliness of completing task, 30% improvement (30%; 95% CI 7.9%-53%) ▪ Demonstrating responsibility and accountability, 26% improvement (26%; 95% CI, 2.9%-49.0%) <ul style="list-style-type: none"> ○ The most common type of change was related to communication, either with colleagues or patients (eight studies). <ul style="list-style-type: none"> ▪ Other changes include better follow-up of patients (one study), maintaining medical records (one study), improving information provided to patients (two studies) and managing stress (one study). ○ Participants taking part in MSF were more likely to contemplate and intend to change their behaviours rather than actually implementing changes (two studies). <ul style="list-style-type: none"> ● Main factors of MSF that influence its impact on medical professionals' professional practice <ul style="list-style-type: none"> ○ Source of feedback (three studies) <ul style="list-style-type: none"> ▪ Feedback was only perceived as useful when physicians considered the raters to be familiar with their work and had experience either working with them or observing their practice (one study). <ul style="list-style-type: none"> ● If raters were familiar with their work, they were perceived as credible. ▪ Usage and acceptance of feedback was influenced by whether physicians felt the rater had sufficient knowledge of their work (one study) ▪ Raters need to be unbiased in their feedback and honest if physicians were to use their feedback (one study). ▪ Feedback from patients had a positive influence on physicians' acceptance and use of feedback and had a greater impact on physician behaviour than feedback from colleagues. The main behaviour change concerned communication with patients (two studies). ○ Format of the feedback (17 studies) <ul style="list-style-type: none"> ▪ The need for facilitated feedback was identified as a factor that would positively influence the acceptance of the feedback (six studies). ▪ Facilitation from an appraiser, mentor, facilitator, supervisor or coach enabled acceptance of feedback and setting achievable goals (six studies). ▪ Participants preferred to receive written feedback rather than a numerical score (two studies). ▪ Significant preference for free-text comments from raters (one study). ▪ Written comments from raters were essential to physicians' satisfaction with and acceptance of the feedback (one study). ○ Content of the feedback (five studies) <ul style="list-style-type: none"> ▪ Physicians that received negative ratings in the feedback report contemplated or initiated more behavioural changes than physicians who did not receive as many negative ratings (one study). |
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| | <ul style="list-style-type: none"> ▪ Physicians that received positive feedback that confirmed good professional practice, they saw no need for change (three studies). ▪ Receiving several comments from different sources about the same behaviour was found to facilitate the use of feedback received (one study). ○ Response to feedback (six studies) <ul style="list-style-type: none"> ▪ Reflecting on the MSF feedback was an important factor in its use. For the feedback to be accepted and used, reflection needed to be facilitated, with the facilitator supporting and guiding the reflective process (two studies). ▪ Unclear whether this reflection would have been as effective had it not been facilitated (two studies). ▪ Physicians who received feedback that was negative and/or inconsistent with their self-perceptions were more likely to respond with emotional distress and question the feedback process (two studies). ▪ When physicians disagreed with the feedback, they questioned its credibility and would not make any practices changes until they carried out their own independent reviews of their practice (two studies). |
| 13. Comments/Limitations | <ul style="list-style-type: none"> • Literature search was restricted to English, publication bias cannot be ruled out. • Methodological quality varied between the articles and most of the studies were conducted on small volunteer-based samples. • This review focussed on published empirical studies; some relevant unpublished studies may have been missed. • Two studies in this review have been reported in multiple articles which could lead to over-reporting of the findings. • 15/16 included studies were descriptive therefore the strength of the findings may be limited by the uncontrolled nature of the studies. • 15/16 studies had self-reported rather than measured changes in behaviour; healthcare systems are not concerned with changing health professionals self-reported behaviours, rather they want to change actual behaviour in the belief that this should lead to improved patient care. • Some studies reported intention to change rather than actual change in behaviour. |

| Items Reviewed | Systematic Review - Ivers N et al, 2012 |
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| General Information & Quality Rating for Review | |
| 1. Title | Audit and feedback: Effects on professional practice and healthcare outcomes. Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'Brien MA, Johansen M, Grimshaw J, Oxman A, 2012. |
| 2. Quality Rating | Strong quality (10/10) |
| 3. Objectives of Review | <ul style="list-style-type: none"> • To assess the effects of audit and feedback on the practice of healthcare professionals and patient outcomes and to examine factors that may explain variation in the effectiveness of audit and feedback. <ol style="list-style-type: none"> 1. Is audit and feedback effective for improving health provider performance and healthcare outcomes? 2. What are the key factors that explain variation in the effectiveness of audit and feedback? 3. How does the effectiveness of audit and feedback compare to other interventions? |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> • 49; Randomised control trials • Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> • Inception-2010 |
| 6. Databases searched | <ul style="list-style-type: none"> • Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL, Science Citation Index and Social Sciences Citation Index. |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> • <u>Inclusion:</u> <ul style="list-style-type: none"> ○ Only included intervention where audit and feedback were a core or essential element. <ul style="list-style-type: none"> ▪ Audit and feedback alone. ▪ Audit and feedback as a core, essential component of a multifaceted intervention. ▪ Audit and feedback as a component of a multifaceted intervention but not considered “core and essential”. • <u>Exclusion:</u> <ul style="list-style-type: none"> ○ Studies that provided data only on cost. ○ Studies that measured knowledge or performance in a test situation only. |
| Details of Interventions | |
| 8. Description of interventions | <ul style="list-style-type: none"> • Audit and feedback: any summary of clinical performance of health care over a specified period of time. • It can also be described as clinical performance feedback. • The feedback can include recommendations for clinical action and may be delivered in a written, electronic or verbal format. |
| 9. Intervention settings | <ul style="list-style-type: none"> • Outpatient settings (majority), In patient settings. |
| 10. Target groups | <ul style="list-style-type: none"> • Healthcare professionals responsible for patient care, Healthcare professionals in postgraduate training were |

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| | included, Physicians (majority), Pharmacists, Nurses. |
| 11. Outcome Measures | <ul style="list-style-type: none"> • Appropriate prescribing. • Laboratory or radiology test utilisation. • Management of patients with either cardiovascular disease or diabetes. • Objectively measured provider performance (prescribing, use of laboratory tests) in a healthcare setting or patient health outcomes (smoking status or blood pressure). • Dichotomous outcomes: Proportion compliance with guidelines or the proportion of patients with appropriate management. • Continuous outcome measures: Costs, number of laboratory tests, number of prescriptions. |
| Results of Review | |
| 12. Main Results of Review | <p>Overall results:</p> <ul style="list-style-type: none"> • Audit and feedback leads to small, potentially important improvements in professional practice (1.3% to 4.3% increase in compliance with desired practice). • The effectiveness of audit and feedback seems to depend on healthcare professional baseline performance and how the feedback is provided (see below for further details). <p>The results were grouped as follows:</p> <p>Comparison A: Any intervention in which audit and feedback is the single intervention or is the core, essential feature of a multifaceted intervention, compared to usual care</p> <ul style="list-style-type: none"> • When audit and feedback is the single intervention or is the core, essential feature of a multifaceted intervention, it increases compliance with desired practice compared to usual care: <ul style="list-style-type: none"> ○ For dichotomous measures: <ul style="list-style-type: none"> ▪ There was 4.3% increase in compliance with desired practice compared to usual care [Weighted median adjusted RD was 4.3% increase in compliance with desired practice (IQR 0.5% to 16%)] (49 studies). ▪ The range in adjusted RD for compliance with desired practice was wide: a 9% absolute decrease to a 70% increase in compliance. ○ For continuous measures: <ul style="list-style-type: none"> ▪ There was a 1.3% increase in compliance with desired practice compared to usual care. [Weighted median adjusted change relative to baseline control was a 1.3% increase in compliance with desired practice (IQR 1.3% to 23.2%)] (21 studies). ▪ Adjusted change relative to baseline control varied widely, from a 50% decrease in desired practice to a 139% increase in desired. • When audit and feedback is the single intervention or is the core, essential feature of a multifaceted intervention, it |

decreases desired patient outcomes for dichotomous measures and increases desired patient outcomes for continuous measures:

- There was a 0.4% decrease in desired dichotomous patient outcomes compared to usual care [the weighted median adjusted RD was a 0.4% decrease in desired outcomes (IQR -1.3% to 1.6%)] (15 studies).
- There was a 17% increase in continuous patient outcomes compared to usual care [the weighted median adjusted change relative to baseline control was a 17% improvement (IQR 1.5% to 17%)] (15 studies).

Investigation of heterogeneity of factors affecting effect sizes (80 comparisons)

- Format, source, frequency, instructions for improvement and the direction of change required were all identified as significant characteristics for when audit and feedback is used as a single intervention or is the core, essential feature of a multifaceted intervention.
 - Format: When feedback is presented in both verbal and written format there was an 8% increase in desired outcome versus verbal feedback alone (expected difference in adjusted RD = 8%).
 - Source: When feedback is delivered by a supervisor or senior colleague there was an 11% increase in desired outcome versus when feedback is provided by the investigators (expected difference in adjusted RD = 11%).
 - When feedback is provided monthly there was a 7% increase in desired outcome versus when the feedback is only presented once (expected difference in adjusted RD = 7%).
 - When the feedback contained both an explicit, measurable target and a specific action plan there was a 5% increase in desired outcome versus when the feedback contained neither (expected difference in adjusted RD = 5%).
 - When the feedback aimed at decreasing a current behaviour there was a 6% increase compared to feedback that was intended to increase a current behaviour (expected difference in adjusted RD = 6%)
- Study quality and profession (physician versus non-physician) were not associated with variation in effect size.
- When comparing the mean estimate of effect for audit and feedback alone versus audit and feedback in a multifaceted intervention using a univariate analysis, results were mixed for dichotomous and continuous outcomes
 - Not statistically significant for dichotomous outcomes.
 - Significant for continuous outcomes.

Exploratory analyses of context and complexity

- For audit and feedback, the clinical setting (outpatients vs inpatient vs mixed, other or unclear) was marginally statistically significant in the multivariate meta-regression model (P=0.037).
 - The estimated effects were similar across inpatient and outpatient settings (inpatient estimated RD = 7.7%; outpatient estimated RD = 7.1%; mixed, other or unclear estimated RD = 3.0%).
- Use of audit and feedback has a larger effect on prescribing behaviour (RD = 11.1%) compared to diabetes or

cardiovascular disease (5.9%), laboratory or radiology testing (4.2%), or other (4.7 %).

- Meta-analysis on subgroups showed that for prescribing, the weighted median adjusted RD was 13.1% (IQR 3% to 17%) (26 comparisons) compared to laboratory or radiology test utilisation, the weighted median adjusted RD was 0.1% (IQR -0.1% to 6.5%) (three comparisons), management of diabetes or cardiovascular disease, the weighted adjusted RD was 0.5% (IQR -0.5% to 3.4%) (14 comparisons).

Comparison B. Audit and feedback alone compared to no intervention

- The use of audit and feedback alone compared to no intervention increased targeted professional practice outcomes compared to no intervention:
 - For dichotomous outcomes there was a 3% increase in desired outcome [weighted median adjusted RD was 3.0% (IQR 1.8% to 7.7%)] (48 studies).
 - For continuous outcomes, there was a 1.3% increase in desired outcome [weighted median adjusted change relative to baseline control was 1.3% (IQR 1.3% to 11.0%)] (48 studies).

Comparison C. Audit and feedback as the core feature of a multifaceted intervention compared to no intervention

- The use of audit and feedback as part of a multifaceted intervention increased targeted professional practice outcomes compared to no intervention:
 - For dichotomous outcomes, a 5.5% increase in desired outcome [weighted median adjusted RD was 5.5% (IQR 0.4% to 16%)] (50 studies).
 - For continuous outcomes, a 26.1% increase in desired outcome [weighted median adjusted change relative to baseline control was 26.1% (IQR 12.7% to 26.1%)] (50 studies).

Comparison D. Different ways of providing audit and feedback (head-to-head comparisons)

Peer comparison

- When peer comparison is added to audit and feedback compared to no use of peer comparison, statistically significant increases were observed for:
 - Asthma management (RD = 2%) (two studies)
 - Inpatient laboratory test utilisation (5%) (two studies)
 - Improved quality of care for diabetic patients (RD= 3%, IQR = 2% to 4%) (two studies).
 - Influenza vaccination (OR 1.54, 95% CI 1.26 to 1.96)] (one study).
 - Foot examination (OR 1.33, 95% CI 1.05 to 1.69)] (one study).
 - Haemoglobin A1C measurement (OR 1.33, 95% CI 1.04 to 1.69)] (one study).
- No improvements in cholesterol measurement (OR 1.20, 95% CI 0.95 to 1.51) and triglyceride measurement (OR 1.15, 95% CI 0.92 to 1.44) or management of asthma (adjusted RD = -5%, high risk of bias) were found between the

groups that utilized peer comparisons and those that did not (one study).

Presentation of feedback and inclusion of additional information

- Inclusion of additional information about patient risk increased the effectiveness of audit and feedback for control of blood pressure (adjusted RD = 2%; OR 1.72, 95% CI 1.09 to 2.70) (one study).
- Inclusion of brief advice increased the effectiveness of audit and feedback for pap smear quality (adjusted RD = 1%) (one study).
- The use of Pareto and cause and effect charts with audit and feedback did not cause differences in rates of methicillin-resistant *Staphylococcus aureus* infections in hospital wards (adjusted change = 5%, high risk of bias, patient outcome; P=0.46) (one study).
- No differences were observed with the inclusion of the type and amount of data used for feedback for blood pressure control or adequate glucose control (two studies).

Source and Delivery

- One of four studies looking at feedback delivered by mail versus in-person (verbally) found a significant effect for the use of verbal feedback versus written feedback for benzodiazepine prescriptions in-hospital (adjusted RD = 24%, high risk of bias).
- Three studies found that verbal feedback as part of staff meetings, in large group settings, and in large groups as part of CME had no effect.
- Mixed results for source of feedback:
 - One study comparing physician-peer with nurse feedback found no difference.
 - One study found mutual feedback from physician peers improved practice management outcomes compared with unidirectional feedback from a non-physician (median adjusted RD = 5%).

Recipient participation

- Mixed results found when recipients participated in the feedback:
 - One study found worse management of anaemia in hospital patients (adjusted RD = -21%, high risk of bias; OR = -3.36, P=0.002).
 - One study found when resident physicians conducted a self-audit at baseline, it led to improvements compared with simply receiving the data for mammographic screening rates (adjusted RD = 8%, no OR reported, P value <0.05) but not for improvement in influenza vaccination rates (adjusted RD = 1.5%; no OR reported, P=0.17).

Comparison E. Audit and feedback combined with complementary interventions compared to audit and feedback alone.

Audit and feedback with reminders compared to audit and feedback alone (eight studies)

- Outpatient Test Ordering
 - Reduced x-ray utilisation by 46% relative to baseline (no P value reported) (one study).
 - Reduced blood test utilisation (one study):
 - Audit and feedback with educational messages OR = 0.87 (95% CI 0.81 to 0.94).
 - Audit and feedback with educational messages and reminders OR = 0.78 (95% CI 0.71 to 0.85).
 - Audit and feedback alone, -2%.
- Management of Diabetes
 - No differences in haemoglobin A1C, systolic blood pressure, and low-density lipoprotein cholesterol levels (median adjusted change relative to baseline performance in the audit and feedback alone arm = 2%, no P value reported) (one study).
 - Feedback with reminders intensified diabetes treatment versus feedback alone (adjusted RD = 7.25%; no P value reported) (one study).
- Increased provision of preventive services by internal medicine trainees (unadjusted RD = 8.0%; no P value reported) (one study).
- Improved management of benzodiazepine prescriptions (median adjusted RD = 1.7%, high risk of bias, no statistical test reported) (one study).
- No effect on improving the management of impacted molars or the quality of cholesterol management in hospitals (two studies).

Audit and feedback with educational outreach compared to audit and feedback alone

- The use of educational outreach with audit and feedback increased desired practice (24 various practices including unsafe prescribing practices, beta-blocker use in asthmatics, inappropriate antibiotic prescribing, etc.):
 - For dichotomous outcomes, the weighted median adjusted RD for audit and feedback with outreach versus feedback alone was 0.7% increase in desired practice (IQR -1.1% to 5.1%) (15 studies).
 - For continuous outcomes, there was 27% increase in desired practice compared to feedback alone [median adjusted change relative to baseline control was 27% (IQR 0% to 40.5%)] (four studies).

Audit and feedback plus other educational interventions compared to audit and feedback alone

- Mixed results for the use of other educational interventions with audit and feedback:
 - Mixed results for small group education with audit and feedback compared to audit and feedback alone in

four studies; two studies found that the combination was more effective than audit and feedback alone, and two studies found that there was no effect.

- Mixed results for adding a seminar to audit and feedback in two studies:
 - Reduced inappropriate prescribing of antibiotics (adjusted RD = 7.1%; pre-post change for seminar + feedback: 11.6, 95% CI 6.6 to 16.7 versus pre-post change for feedback alone: 3.8, 95% CI -1.2 to 8.8 and adjusted change relative to baseline control = 26%; P<0.001).
 - Minimally increased compliance with guidelines for MRI of the lumbar spine or knee (unadjusted RD = 4%, high risk of bias; no P value reported).
- Mixed results for written educational materials in combination with audit and feedback in three studies:
 - Two decreased test utilisation compared to audit and feedback alone (unadjusted difference = 22.3%, high risk of bias, no P value reported and adjusted change relative to baseline performance in the audit and feedback alone arm = 33%; no P value reported) and one found no significant effect on prescription rates (adjusted change relative to baseline performance in the audit and feedback alone arm = 8%; no P value reported) (three studies).
- No effect for multifaceted interventions involving educational interventions and audit and feedback on the quality of care for venous thrombosis and heart failure (two studies).

Audit and feedback with case management or organizational interventions compared to audit and feedback alone

- No difference in desired outcomes in four studies.

Audit and feedback with patient-mediated interventions compared to audit and feedback alone

- One study out of five showed a positive effect in improving control of diabetes (median adjusted RD = 4.4%; OR 2.4, P<0.01).
- No difference was found for antibiotic prescribing, management of low back pain, influenza vaccination rates or control of haemoglobin A1C (four studies).

Comparison F. Other interventions compared to audit and feedback

Reminders compared to audit and feedback (eight studies)

- Mixed results in eight studies:
 - Two studies found reminders to be more effective than audit and feedback in reducing overall radiology requests (median adjusted change relative to baseline performance in audit and feedback arm 15%; pre-post difference in rate for reminders =1.57, 95% CI 0.6 to 2.5 and pre-post difference for feedback = 0, no P value) and improving delivery of a variety of preventative services (unadjusted RD 4.5%, no P value).
 - Two studies found audit and feedback to be more effective than reminders on reducing clinical inertia in

diabetes, (adjusted RD = 6%, $P < 0.01$) and managing inpatient cholesterol (median adjusted RD = 15%, high risk of bias; no P value).

- Four studies found little or no difference between reminders and audit and feedback in reducing the number of laboratory tests ordered, rate of mammography referral, diabetes management, or improving the management of impacted molars.

Educational outreach compared to audit and feedback

- Mixed results in two studies:
 - Educational outreach by a local opinion leader increased the proportion of women with a previous C-section offered a trial of labour (unadjusted RD = 17.9%, $P = 0.002$) (one study).
 - Educational outreach by a nurse had no effect on the management of urinary incontinence (one study).

Other educational interventions compared to audit and feedback

- Mixed results for seminars in two studies:
 - One study, no difference in appropriateness of MRI requests of the lumbar spine or knee.
 - One study, seminars were more effective than audit and feedback for reducing benzodiazepine prescriptions (adjusted change relative to baseline performance in the audit and feedback arm = 22%; $P = 0.03$).
- Similar effects for practice-based small group learning and postal audit and feedback for increasing appropriate use of antihypertensives (adjusted RD = 0.8%; no P value reported) (one study).
- Mixed results for printed educational materials compared to audit and feedback in two studies:
 - One study, audit and feedback increased laboratory test utilisation and printed educational materials had no change (unadjusted RD = -12.9%, high risk of bias; no P value) (one study).
 - No effect for either intervention in second study.

Case management or organizational interventions compared to audit and feedback

- Mixed effects in two studies:
 - One study, no effect on systolic blood pressure.
 - One study, similar effects of feedback and either point-of-care testing or rapid clinical decision support from the laboratory for keeping patients within target INR (International Normalized Ratio) for their oral anticoagulation (adjusted change relative to baseline performance in the audit and feedback arm = 4% for both comparisons, $P = 0.13$ for difference across all arms).

Patient-mediated interventions compared to audit and feedback

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| | <ul style="list-style-type: none"> • There was no difference between patient-mediated interventions compared to provider-directed audit and feedback (three studies). |
| 13. Comments/Limitations | <ul style="list-style-type: none"> • In most of the included studies, the method of allocation was not clearly indicated which may result in overestimates of effect. • Only 32% of included studies were judged to have a low risk of bias, 18% to have a high risk of bias; no association between overall risk of bias and the estimate of effect. • Trials that had audit and feedback as the core in one arm were included; this avoided including trials of multifaceted interventions where feedback was included but where the main effects of the intervention were unlikely to be due to feedback. This leads to potential for conservative bias if some effective multifaceted interventions were excluded. • Earlier reviews considered printed educational materials to have little or no effect on changing professional practice, however recent reviews have found that printed educational materials have a small (but potentially important) effect. This leads to potential conservative bias for studies comparing feedback to printed materials, but an overestimation of the effect attributed to audit and feedback in studies where feedback plus printed materials are compared to no intervention. • Potentially neglected to abstract design factors related to feedback design, especially organizational and contextual characteristics. • Chose to focus on comparisons where it was possible to calculate an adjusted risk difference and adjusted change relative to the baseline control; studies without baseline data were excluded. • They weighted the analyses by number of health professionals involved in each trial; if the number of health professionals were not reported, they were weighted by the number of practices/hospitals/communities involved in the trials which may have led to some larger studies with many participants but few clusters being assigned a weight that did not reflect the actual size of the trials. |

| Items Reviewed | Systematic Review - Giguere A et al, 2012 |
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| General Information & Quality Rating for Review | |
| 1. Title | Printed education materials: effect on professional practice and healthcare outcomes. Giguere A, Legare F, Grimshaw J, Turcotte S, Fiander M, Grudniewicz A, Makosso-Kallyth S, Wolf F, Farmer A, Gagnon M, 2012. |
| 2. Quality Rating | Strong quality (10/10) |
| 3. Objectives of Review | <ol style="list-style-type: none"> 1. To assess the effect of PEMs on the practice of healthcare professionals and patient health outcomes. 2. To explore the influence of some of the characteristics of the PEMs (e.g. mode of delivery, source of information, format) on their effect on professional practice and patient outcomes. |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> • 45; Randomized controlled trials, Interrupted time series. • Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> • Inception to June 2011 |
| 6. Databases searched | <ul style="list-style-type: none"> • MEDLINE (OVID), EMBASE (OVID), The Cochrane Central Register of Controlled Trials (CENTRAL), Cumulative Index to Nursing and Allied Health Literature, CINAHL, EbscoHost, The EPOC Specialised Register, Reference Manager, CAB Abstracts, EbscoHost, ERICL Educational Resources Information Center, Wilton, Global Health, CAB Direct, HealthStar, OVID. |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> • <u>Inclusion:</u> For the first objective, the following comparisons were included: <ul style="list-style-type: none"> ○ PEM only compared to no intervention. ○ PEM only versus single intervention. ○ Multifaceted intervention where PEM is included versus multifaceted intervention without PEM. For controlled before and after studies: <ul style="list-style-type: none"> ○ Only the trials that used contemporaneous data collection (i.e. pre- and post-intervention periods for study and control sites are the same). ○ That selected appropriate control site for studies using second site as controls (i.e. study and control sites are comparable with respect to dominant reimbursement system, level of care, setting of care, and academic status). ○ That used a minimum number of site (i.e. there was a minimum of two intervention sites and two control sites). For ITS design: <ul style="list-style-type: none"> ○ A clearly defined point in time when the intervention occurred. ○ At least three data points before and three after the intervention. For all studies: |

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| | <ul style="list-style-type: none"> ○ Studies published in all languages. ○ Any healthcare provider provided with PEMS to improve their practice or patient outcomes or both. ○ Studies in which participants were student and healthcare professionals were included only if they could separate outcomes from students and qualified healthcare professionals. ○ Studies included distribution of published or printed recommendation for clinical care and evidence to inform practice, (clinical practice guidelines, journal articles, and monographs). ○ PEMs delivered personally (i.e. addressed to a specific individual), through mass mailings, or passively delivered through broader communication channels (e.g. printable documents available on the Internet, mass media). ○ Multifaceted interventions that comprised PEM only were included if they were compared to the same multifaceted intervention without the studied PEM. ● <u>Exclusion:</u> <ul style="list-style-type: none"> ○ Interventions to provide increased access to electronically retrievable information were considered to be outside of the scope of this review. ○ Studies that only reported the impact of PEMs on healthcare professionals' attitudes, awareness, knowledge, or opinions. |
| Details of Interventions | |
| 8. Description of interventions | <ul style="list-style-type: none"> ● Printed educational materials. |
| 9. Intervention settings | <ul style="list-style-type: none"> ● Not reported. |
| 10. Target groups | <ul style="list-style-type: none"> ● Any healthcare provider (90% physicians, 6% mix of health professionals, 4% unclear) |
| 11. Outcome Measures | <ul style="list-style-type: none"> ● Impact of PEMs on healthcare professionals' practice or patient outcomes, or both ● any objective measure either of professional practice (e.g. the number of tests ordered, prescriptions for a particular drug) or of patient health outcomes (e.g. blood pressure, complications after surgery) |
| Results of Review | |
| 12. Main Results of Review | <ul style="list-style-type: none"> ● PEMS led to a 2% absolute improvement in professional practice in groups that received PEMs compared to groups that received no intervention (nine RCTs, data analysis from seven). ● Statistically significant improvement in professional practice outcomes after the introduction of PEMs. <ul style="list-style-type: none"> ○ Increase in the number of procedures of 0.13 per 1000 (31 ITS studies, data analysis from 25). ● Patient health outcomes: mixed results overall. <ul style="list-style-type: none"> ○ In one study, PEMs led to a 13% increase in clinical depression remission patient outcomes compared to no intervention. |

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| | <ul style="list-style-type: none"> ○ In three other studies, PEMs led to a mix of increase and decrease of different patient health outcomes. ● PEM only versus single intervention <ul style="list-style-type: none"> ○ One study found no effect of PEMs compared to a single intervention. ● Effect modifiers (22 studies) <ul style="list-style-type: none"> ○ Characteristics that may have more potential to influence effectiveness of PEMs are source of information, tailoring, clinical areas, type of targeted behaviour, purpose, level of evidence and format. ○ Characteristics that do not influence the effectiveness of PEMS are mode, frequency, or duration of delivery. |
| 13. Comments/Limitations | <ul style="list-style-type: none"> ● Participants in this review were generally physicians (90%), therefore findings in this review need to be confirmed for other types of professionals. ● Included studies were performed in developed countries, primarily in outpatient practices and in some hospitals; therefore applicability of observed results to other settings is unknown. ● More studies are required to draw conclusions on many of the potential effect modifiers (most PEMs were not explicit about their educational intent so it is difficult from the set of included studies to evaluate whether an intervention developed specifically ad educational would be more efficient. ● Only a small number of studies looked at patient outcomes. ● The level and slop estimates were evaluated with time series analyses from a limited number of data points; thus pooling of level difference is prone to imprecision. ● Missing information from primary studies (e.g. frequency of PEM delivery, message and format of PEM). |

| Items Reviewed | Systematic Review - Grudniewicz et al, 2015 |
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| General Information & Quality Rating for Review | |
| 1. Title | What is the effectiveness of printed educational materials on primary care physician knowledge, behaviour, and patient outcomes: a systematic review and meta-analyses. Grudniewicz A, Kealy R, Rodseth R, Hamid J, Rudoler D and Straus S. 2015. |
| 2. Quality Rating | Moderate quality (6/10) |
| 3. Objectives of Review | <ul style="list-style-type: none"> • To examine what effect printed educational materials have on Primary care physicians' knowledge, behaviour, and patient outcomes, in comparison to no intervention or to other single- or multi-component educational interventions. |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> • 40; Randomized control trials, quasi randomized trials, controlled before and after studies, and interrupted time series analyses. • Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> • Search conducted on November 25, 2014, <10 years. |
| 6. Databases searched | <ul style="list-style-type: none"> • Medline, EMBASE, ERIC, and the Cochrane Central Register of Controlled Trials. |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> • Studies reporting the effectiveness of PEMs for PCPs (family physicians as well as specialists practicing primary care such as pediatricians). • Any method of delivery of the intervention (e.g. email, mail, fax) or level of intensity (i.e. how often the intervention was delivered) was included. • Comparisons had to allow for the isolation of the effect of PEMs on outcomes, meaning that studies comparing two PEMs with no control group or studies comparing two interventions where both groups included PEMS were excluded. • No restrictions were placed on publication status or date of publication. • Physician attitudes were not included. • Studies examining interactive online educational materials (such as online courses) or patient-specific materials were excluded. • Studies not published in English were excluded. |
| Details of Interventions | |
| 8. Description of interventions | <ul style="list-style-type: none"> • Printed educational materials, defined for the purpose of the review as guidelines, summaries of guidelines, the dissemination of published or non-published information, recommendations, or evidence presented in print or electronic form. <ul style="list-style-type: none"> ○ Electronic materials included PDFs, other document files (e.g. Microsoft Word documents), and non- |

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| | interactive web pages. |
| 9. Intervention settings | <ul style="list-style-type: none"> • Primary care practice environment. |
| 10. Target groups | <ul style="list-style-type: none"> • Family physicians and specialists practising primary care such as pediatricians. |
| 11. Outcome Measures | <ul style="list-style-type: none"> • PCP knowledge, behaviour and patient outcomes. |
| Results of Review | |
| 12. Main Results of Review | <ul style="list-style-type: none"> • In meta-analyses, printed educational materials compared to no interventions or single interventions had no impact on patient outcomes (five studies) (RR = 1.00, 95% CI = 1.00, 1.00, I² = 0), physician behaviour outcomes (five meta-analyses) or physician cognition outcomes (three studies). • In studies that could not be statistically combined, printed educational materials compared to no intervention or to other single- or multi-component educational interventions had a significant effect on one of four patient outcomes (one study). • Printed educational materials compared to no intervention or to other single- or multi-component educational interventions had mixed effects on physician behaviour (nine studies). • Printed educational materials compared to no intervention or to other single- or multi-component educational interventions did not improve physician cognition (three studies). |
| 13. Comments/Limitations | <ul style="list-style-type: none"> • Differences in outcome measurement and limited reporting resulted in the inability to pool results for a number of studies. • The ability to conduct a meta-regression to explore effect modifiers was limited by the small number of trials eligible for meta-analysis. • It is possible that the meta-analyses had too few included outcomes to detect the small differences that may be expected from PEMs. • The physician cognition meta-analyses may be limited in their usefulness due to high statistical heterogeneity. • The review may have been limited by only including English-language studies. |

| Items Reviewed | Systematic Review - Arditi C et al, 2012 |
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| General Information & Quality Rating for Review | |
| 1. Title | Computer-generated reminders delivered on paper to healthcare professionals; effects on professional practice and health care outcomes. Arditi C, Rege-Walther M, Wyatt J, Durieux P, Burnand B, 2012. |
| 2. Quality Rating | Strong quality (10/10) |
| 3. Objectives of Review | <ol style="list-style-type: none"> 1. To evaluate the effects of reminders automatically generated through a computerized system and delivered on paper to healthcare professionals on processes of care (related to healthcare professionals' practice) and outcomes of care (related to patients' health condition). 2. Primary Question: <ul style="list-style-type: none"> ○ Are computer-generated reminders delivered on paper effective in improving processes and outcomes of care? <ul style="list-style-type: none"> ● Are computer-generated reminders delivered on paper alone (single intervention) more effective than usual care? ● Are computer-generated reminders delivered on paper combined with other interventions (multifaceted intervention) more effective than the other interventions alone (without reminders)? 3. Secondary Questions: <ul style="list-style-type: none"> Content of reminder <ul style="list-style-type: none"> ○ Are reminders that include some individual patient-specific information more effective than generic reminders (i.e. same message for all patients)? ○ Are reminders that include space for response from clinician more effective than reminders that do not include this? ○ Are reminders that offer specific advice on patient management (i.e. recommendation for care) more effective than reminders that offer general information only (e.g. prevalence of a disease)? ○ Are reminders that include an explanation of their content or advice (e.g. background information, risk definition) more effective than reminders that do not include this? ○ Are reminders that are explicitly from or justified by reference to an influential source more effective than anonymous reminders or those from another source? An influential source can be a systematic review, a practice guideline, a bibliographic citation, or a person or body likely to be perceived as credible by the target clinician. Delivery of reminder <ul style="list-style-type: none"> ○ Are reminders available at point-of-care (i.e. at patient's visit) more effective than reminders available at another time (e.g. mailed reminders received after patient's visit)? Behaviour targeted by reminder |

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| | <ul style="list-style-type: none"> ○ Do reminders vary in effectiveness according to the targeted behaviour (e.g. test ordering, prescription)? |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> ● 32; Controlled trials (Random allocation or non-random method of allocation) ● Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> ● Inception-2012 |
| 6. Databases searched | <ul style="list-style-type: none"> ● Cochrane Central Register of Controlled Trials, MEDLINE, OvidSP, EMBASE, EPOC Group, Specialised Register, Reference Manager, CINAHL, INSPEC. |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> ● <u>Inclusion:</u> <ul style="list-style-type: none"> ○ Computer-generated reminders delivered on paper. ○ A computer had to be involved in producing the reminder for eligible patients or in selecting the patients about whom the clinician received a reminder, or both. ○ Applications of computerized algorithms to identify eligible patients, for whom the prompt is printed out and placed in the chart. ○ Once generated, the reminder was delivered on paper (fax included), and not on a computer screen or by email or text message. ○ Reminder had to target a healthcare professional who delivered the care directly to patients, not an intermediary (e.g. clinic receptionist, clinician manager). ● <u>Exclusion:</u> <ul style="list-style-type: none"> ○ If a computer was merely used as a medium to print the reminder without any other function, the reminder was not considered as computer-generated. ○ Expert systems for facilitating diagnosis or estimating prognosis were not considered as reminders, even if their output was printed out. ○ A document listing all the drugs a patient was currently taking (e.g. drug profile) or a document summarizing the medical records, with no rules applied in the computer, were not considered as reminders, but as an organization intervention (i.e. changes in the medical records systems). ○ New information collected directly from patients on a computer and given to the provider as a prompt was not considered as a reminder intervention, but as a patient-medicated intervention. |
| Details of Interventions | |
| 8. Description of interventions | <ul style="list-style-type: none"> ● Computer-generated reminders delivered on paper. ● A computer had to be involved in producing the reminder for eligible patients or in selecting the patients about whom the clinician received a reminder, or both. ● Once generated, the reminder was delivered on paper (fax included), and not on a computer screen or by email or text message. |

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| 9. Intervention settings | <ul style="list-style-type: none"> • Most took place in an outpatient setting, Inpatient setting. |
| 10. Target groups | <ul style="list-style-type: none"> • Any qualified healthcare professional, primarily physicians. |
| 11. Outcome Measures | <ul style="list-style-type: none"> • Dichotomous processes of care (related to healthcare professionals' practice). • Continuous processes of care. • Dichotomous outcomes of care (related to patients' health condition). • Continuous outcomes of care. |
| Results of Review | |
| 12. Main Results of Review | <ul style="list-style-type: none"> • The use of computer-generated reminders delivered on paper to healthcare professionals led to improved processes of care. <ul style="list-style-type: none"> ○ In 13 comparisons with baseline data, the median marginal improvement was 4.5% (IQR 0.5% to 7%). ○ Across 37 comparisons, the median improvement in processes of care associated with the reminder intervention was 7% (IQR 3.6% to 12.9%), which was a moderate improvement in professional practice. ○ Comparisons involving no co-interventions (i.e. reminders alone versus usual care) showed a median improvement in process of care of 11.2% (IQR 6.5% to 19.6%). ○ Multifaceted interventions (i.e. reminders plus additional intervention(s) versus the same additional intervention(s) alone) showed a lower median improvement in processes of care of 4.0% (IQR 3.0% to 6.0%). ○ Effective on a range of interventions; prescribing, vaccination, test ordering, professional-patient communication. • The following reminder features impacted processes of care: <ul style="list-style-type: none"> ○ Availability of space for healthcare professionals to enter a response significantly impacted the processes of care effect size (median 13.7% versus 4.3% for no space, P=0.01). ○ Including an explanation of their content or advice significantly impacted the processes of care effect size (median 12.0% versus 4.2% for no explanation, P=0.02). ○ Largest improvement seen was in vaccination, median improvement of 13.1% (IQR 12.2% to 20.7%) ○ Smallest improvement seen was for professional-patient communication, with a median reduction of 0.2% (IQR -2% to 9.2%). ○ No impact on processes of care as a result of number of behaviours targeted. • Effectiveness of computer-generated reminders delivered on paper in improving outcomes of care <ul style="list-style-type: none"> ○ Reminders were not associated with improved outcomes of care (one study). • In sensitivity analyses, none of the results substantially changed when removing high, low, or moderate quality |

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| | studies (32 studies). |
| 13. Comments/Limitations | <ul style="list-style-type: none"> • This review did not consider the effectiveness of reminders as part of a multifaceted intervention, although many interventions are multifaceted in nature. • The effectiveness of reminder in improving patient outcomes could not be assessed either, due to lack of data. • All studies were in U.S. and in Canada and based in university hospitals, university-affiliated clinics or large healthcare organizations which often developed their own electronic medical records system and embedded reminder system which limits the applicability of the evidence to other types of healthcare delivery systems. • Quality of the evidence is moderate, as assessed with the GRADE approach. • Publication bias for smaller studies showing greater effect size than larger studies. It is possible that smaller studies with negative or insignificant results were not published, reducing the true overall effect size. • No significant association was found between effect size and study features, except for patient sample size. <ul style="list-style-type: none"> ○ Studies with a small patient sample size achieved larger improvements than studies with large patient sample size (median 12.4% vs. 4.4%, P=0.01) (37 comparisons). |

| Items Reviewed | Systematic Review - Goyder C et al, 2015 |
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| General Information & Quality Rating for Review | |
| 1. Title | Email for clinical communication between healthcare professionals. Goyder C, Atherton H, Car M, Heneghan C, Car J, 2015 |
| 2. Quality Rating | Strong quality (10/10) |
| 3. Objectives of Review | <ul style="list-style-type: none"> • To assess the effects of email for clinical communications between healthcare professionals on healthcare professional outcomes, patient outcomes, health service performance, and service efficiency and acceptability, when compared to other forms of communicating clinical information. |
| Details of Review | |
| 4. Type and Quality of Included Studies | <ul style="list-style-type: none"> • 1; Meta-analysis. • Quality assessed. |
| 5. Search Period | <ul style="list-style-type: none"> • Inception to 2013 |
| 6. Databases searched | <ul style="list-style-type: none"> • Cochrane Consumers and Communication Review Group Specialised Register, Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, PsycINFO, CINAHL, ERIC, Australasian Digital Theses Program, Index to Theses, Networked Digital Library of Theses and Dissertations, ProQuest Dissertations & Theses A&I: Health & Medicine, Clinic trials register, WHO Clinical Trial Search Portal, Current Controlled Trials, Google Scholar. |
| 7. Inclusion and Exclusion Criteria | <ul style="list-style-type: none"> • <u>Inclusion:</u> <ul style="list-style-type: none"> ○ RCTs and quasi-randomised trials, trials with individual and cluster randomisation. ○ Controlled before and after (CBA) studies with the following criteria: <ul style="list-style-type: none"> ▪ There were at least two intervention sites and two control sites; ▪ The pre- and post-intervention periods of measurement for the control and intervention groups were the same; ▪ The intervention and control groups were comparable on key characteristics. ○ Interrupted time series (ITS) studies that met the following criteria: <ul style="list-style-type: none"> ▪ The intervention occurred at a clearly defined point in time, and this was specified by the researchers; ▪ There were at least three data points before and three data points after the intervention was introduced. ○ Relevant trials with economic evaluations. ○ Studies where email was one part of a multifaceted intervention were included where the effects of the email component were individually reported, even if they did not represent the primary outcome, only if they achieved the appropriate statistical power. ○ Studies comparing email communication to no intervention, as well as comparing it to other modes of |

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| | <p>communications such as face-to-face, postal letters, calls to a landline or mobile telephone, text messaging using a mobile telephone and if applicable, automated versus personal emails.</p> <ul style="list-style-type: none"> • <u>Exclusion:</u> <ul style="list-style-type: none"> ○ Email between professionals solely for educational purposes. ○ Studies which considered the general use of email for communication between healthcare professionals for multiple purposes but did not separately consider clinical communication between healthcare professionals |
| Details of Interventions | |
| 8. Description of interventions | <ul style="list-style-type: none"> • Email that was used for two-way clinical communication between healthcare professionals to facilitate inter-service consultation. • Email that allowed healthcare professionals to contact each other (e.g. to send information about a patient, to provide notifications for public health purposes, or to facilitate the sharing of relevant information about the healthcare institution. • Interventions that used email in the any of the following forms for communication between healthcare professionals: <ul style="list-style-type: none"> ○ Unsecured standard email to or from a standard email account; ○ Secure email which is encrypted in transit and sent to or from a standard email account with the appropriate encryption decoding software; ○ Web messaging, whereby the message is entered into a pro-forma which is sent to a specific email account, the address of which is not available to the sender. |
| 9. Intervention settings | <ul style="list-style-type: none"> • Primary care settings (services of primary health care), outpatient settings (outpatient clinics), community settings (public health settings), hospital settings. |
| 10. Target groups | <ul style="list-style-type: none"> • Healthcare professionals |
| 11. Outcome Measures | <ul style="list-style-type: none"> • Whether email had been understood and acted upon correctly by the recipient as intended by the sender, and secondary outcomes focused on whether email was an appropriate mode of communication. • Health professional outcomes <ul style="list-style-type: none"> ○ Resulting from whether the email had been understood and acted upon correctly by the recipient as intended by the sender, e.g. professional knowledge and understanding, inter-professionals communication and relationships, professional behaviour, actions or performance. • Patient outcomes <ul style="list-style-type: none"> ○ Associated with whether the email had been understood and acted upon correctly by the recipient as intended by the sender, such as patient understanding, patient health status and well-being, treatment |

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| | <p>outcomes, skills acquisition, support, patient behaviours or actions.</p> <ul style="list-style-type: none"> • Health service outcomes <ul style="list-style-type: none"> ○ Associated with whether email had been understood and acted upon correctly by the recipient as intended by the sender, e.g. service use, management or coordination of a health problem. • Harms <ul style="list-style-type: none"> ○ E.g. effects on safety or quality of care, breaches in privacy, technology failures. |
| Results of Review | |
| 12. Main Results of Review | <ul style="list-style-type: none"> • Healthcare professional actions or performance (one study) <ul style="list-style-type: none"> ○ Patients whose physicians received an EMR message were more likely to receive the recommended care than those in the usual care group; specifically, a bone mineral density (BMD) measurement (OR 31.17; 95% CI 4.13 to 235.51); a BMD measurement or osteoporosis medication (OR 16.80; CI 6.75 to 41.85); or osteoporosis medication only (OR 3.27; 95% CI 1.02 to 10.51). ○ Patients in the usual care group were more likely to receive neither a BMD measurement, nor osteoporosis medication (OR 0.06; 95% CI 0.02 to 0.15). • Patient behaviour (one study) <ul style="list-style-type: none"> ○ Women whose physicians received an EMR message had significantly higher calcium intake compared to the usual care group (P=0.02) ○ There was no significant difference between groups for reporting regular activity and calorific expenditure. • Health service outcomes (one study) <ul style="list-style-type: none"> ○ No primary outcomes relating to health services were assessed. • Harms (one study) <ul style="list-style-type: none"> ○ No primary outcomes relating to harms were assessed. • Patient evaluation of care (one study) <ul style="list-style-type: none"> ○ There no significant difference between the group whose physicians received an EMR message compared to usual care in patient satisfaction with care and services received for bone health. |
| 13. Comments/Limitations | <ul style="list-style-type: none"> • Terminology is a problem when searching for evidence on new technologies, especially those for communication; different terms can be used to describe email, including electronic mail, electronic messaging, web messaging, and web consultation. Some relevant terms may have been missed. • Trials with negative results may not have been published • Review only looked at two-way communication led to the exclusion of several studies where email was used in a one-way fashion. |

