ACC/AHA SPECIAL REPORT

ACC/AHA Special Report: Clinical Practice Guideline Implementation Strategies: A Summary of Systematic Reviews by the NHLBI Implementation Science Work Group

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

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Key Words: AHA Scientific Statements • cost • detailing • effectiveness • evidence-based • incentives • interventions • reminders • systematic review

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BACKGROUND: In 2008, the National Heart, Lung, and Blood Institute convened an Implementation Science Work Group to assess evidence-based strategies for effectively implementing clinical practice guidelines. This was part of a larger effort to update existing clinical practice guidelines on cholesterol, blood pressure, and overweight/obesity.

OBJECTIVES: Review evidence from the published implementation science literature and identify effective or promising strategies to enhance the adoption and implementation of clinical practice guidelines.

METHODS: This systematic review was conducted on 4 critical questions, each focusing on the adoption and effectiveness of 4 intervention strategies: (1) reminders, (2) educational outreach visits, (3) audit and feedback, and (4) provider incentives. A scoping review of the Rx for Change database of systematic reviews was used to identify promising guideline implementation interventions aimed at providers. Inclusion and exclusion criteria were developed a priori for each question, and the published literature was initially searched up to 2012, and then updated with a supplemental search to 2015. Two independent reviewers screened the returned citations to identify relevant reviews and rated the quality of each included review.

RESULTS: Audit and feedback and educational outreach visits were generally effective in improving both process of care (15 of 21 reviews and 12 of 13 reviews, respectively) and clinical outcomes (7 of 12 reviews and 3 of 5 reviews, respectively). Provider incentives showed mixed effectiveness for improving both process of care (3 of 4 reviews) and clinical outcomes (3 reviews equally distributed between generally effective, mixed, and generally ineffective). Reminders showed mixed effectiveness for improving process of care outcomes (27 reviews with 11 mixed and 3 generally ineffective results) and were generally ineffective for clinical outcomes (18 reviews with 6 mixed and 9 generally ineffective results). Educational outreach visits (2 of 2 reviews), reminders (3 of 4 reviews), and provider incentives (1 of 1 review) were generally effective for cost reduction. Educational outreach visits (1 of 1 review) and provider incentives (1 of 1 review) were also generally effective for cost-effectiveness outcomes. Barriers to clinician adoption or adherence to guidelines included time constraints (8 reviews/overviews); limited staffing resources (2 overviews); timing (5 reviews/overviews); clinician skepticism (5 reviews/overviews); clinician knowledge of guidelines (4 reviews/overviews); and higher age of the clinician (1 overview). Facilitating factors included guideline characteristics such as format, resources, and end-user involvement (6 reviews/overviews); involving stakeholders (5 reviews/overviews); leadership support (5 reviews/overviews); scope of implementation (5 reviews/overviews); organizational culture such as multidisciplinary teams and low-baseline adherence (9 reviews/overviews); and electronic guidelines systems (3 reviews).

CONCLUSION: The strategies of audit and feedback and educational outreach visits were generally effective in improving both process of care and clinical outcomes. Reminders and provider incentives showed mixed effectiveness, or were generally ineffective. No general conclusion could be reached about cost effectiveness, because of limitations in the evidence. Important gaps exist in the evidence on effectiveness of implementation interventions, especially regarding clinical outcomes, cost effectiveness and contextual issues affecting successful implementation.

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2. METHODS

The ISWG developed a conceptual framework—based on the Multilevel Approaches Toward Community Health (MATCH) model—to define 4 levels where guideline implementation strategies can be initiated: the policy level, clinical institution level, provider level, and patient level. This conceptual framework is illustrated in Figure 1. Superimposed onto the strategies derived from the MATCH model is the current taxonomy of interventions aimed at achieving practice change used by the Cochrane Effective Practice and Organisation of Care (EPOC) Group: Professional Interventions, Financial Interventions, Organizational Interventions (with subcategories for Provider-oriented, Patient-oriented, and Structural interventions), and Regulatory Interventions. In Figure 1, this taxonomy is denoted in parentheses next to extant elements of the model.

The ISWG used the existing Rx for Change database of systematic reviews on healthcare intervention strategies, compiled by the Canadian Agency for Drugs and Technologies in Health for its initial scoping review to identify promising guideline implementation interventions aimed at providers. The results clearly identified 3 intervention strategies aimed at providers with some evidence of effectiveness: academic detailing, audit and feedback, and provider reminders. A fourth intervention strategy—provider incentives—was also selected because of evidence of effectiveness in Europe and its increasing use in US healthcare systems. Evaluation was limited to these 4 interventions because, beyond the intervention strategies themselves, ISWG was keenly interested in cost effectiveness, effect on clinical outcomes, and contextual issues affecting the success of the interventions. Additionally, given the practical considerations (eg, cost, time, training) associated with implementation interventions, the 4 strategies also likely vary in the resources and infrastructure required to make them both viable and successful in applied settings. Such considerations are likely to be of interest to stakeholders interested in supporting widespread adoption of the guidelines. The 4 strategies were mapped to their EPOC equivalent as defined in Table 1. Hereafter, the EPOC terminology will be used.

As shown in Figure 1, beyond the clinical institution, the clinician, and the patient, policy-level factors and the social, cultural, and physical environment influence guideline implementation. Three of the interventions that are the focus of this report are strategies classified by EPOC as Professional Interventions (ie, educational outreach visits, audit and feedback, and reminders), all falling into the “clinical institution” box of the MATCH model. The fourth intervention—provider incentives—represents an EPOC Financial Intervention, but it too falls into the clinical institution box of the MATCH model. Thus, the scope of this report is

1. INTORODUCTION

The National Heart, Lung, and Blood Institute (NHLBI) began to sponsor development of clinical practice guidelines (CPGs) in the 1970s to promote application of research findings for prevention, detection, and treatment of cardiovascular, lung, and blood diseases. In 2008, the NHLBI established expert panels to update the guidelines for high blood cholesterol, high blood pressure, and overweight/obesity using rigorous, systematic evidence reviews. Concurrently, 3 cutting work groups were formed to address risk assessment, lifestyle, and implementation. In 2013, the NHLBI initiated collaboration with the American College of Cardiology (ACC) and American Heart Association (AHA) to work with other organizations to complete, publish, and widely disseminate these guidelines. Beginning in 2014, the ACC/AHA Task Force on Clinical Practice Guidelines began updating these guidelines with collaborating organizations as an ongoing process to incorporate emerging evidence.

The uneven implementation of evidence-based CPGs is widely recognized as a continuing challenge to improving public health. Consistent with the new collaborative partnership model for developing guidelines based on NHLBI-sponsored systematic evidence reviews, the Implementation Science Work Group (ISWG) systematically reviewed the evidence from translation research to identify strategies shown to be effective or promising for improving the delivery of evidence-based care. The ISWG focused on healthcare delivery at both clinician and systems levels, while considering various intervention approaches, settings, contexts, and barriers commonly seen in healthcare systems. Although patient adherence to guideline recommendations is essential to achieve meaningful clinical outcomes, in this report, the NHLBI focused on the critical first steps of provider adoption and adherence. The NHLBI commissioned this report to advance the field of implementation science and inform the knowledge translation process.
limited to a subset of interventions intended to affect providers through the clinical institution. Most of the evidence assessed the impact of the interventions on “Clinician Intermediate Outcomes” (Figure 1), although several reviews reported “Patient Intermediate Outcomes” (particularly patient risk factors) and some “Patient Hard Outcomes” (eg, mortality).

In early 2012, with the adult cardiovascular disease (CVD) risk reduction guidelines in the final stages and over budget, the NHLBI decided to use systematic reviews (SRs) instead of primary studies for the implementation science systematic report. Accordingly, the NHLBI contracted with the American Institutes for Research to conduct the initial SR, which included 48 reviews published through 2012. A supplemental search to 2015 identified 7 additional reviews. This evaluation of SRs and overviews of synthesized evidence incorporated information that focused primarily on 3 distinct outcome categories: process-of-care; clinical effectiveness; and cost effectiveness. Although less-frequently reported, patient satisfaction and clinician satisfaction also were explored. The report focused on the 4 intervention strategies selected by the ISWG.

See the Online Data Supplement for additional details on the process and methods.

### 2.1. Critical Questions

Directed by the NHLBI, and with support from the SR contractor, the ISWG constructed critical questions (CQs) most relevant to identifying effective strategies to improve the delivery of evidence-based care. The 4 critical questions were:

**CQ1.** Does the evidence support the effectiveness of the selected intervention strategies (ie, educational outreach visits, reminders, audit and feedback, and provider incentives) in particular practice settings or for specific categories of health professionals?

**CQ2.** What are the cost considerations of implementing the selected intervention strategies (ie, educational outreach visits, reminders, audit and feedback, and provider incentives)?

**CQ3.** What are the contextual barriers—financial, organizational, and regulatory—that hinder or limit clinician adherence to and the adoption of CPGs, as encouraged by the selected intervention strategies?

**CQ4.** What policy or regulatory, organizational, and financial characteristics or factors influence the success of the selected clinical-institution level intervention strategies (ie, educational outreach visits, reminders, audit and feedback, and provider incentives) in achieving the implementation of guidelines and affecting professional practice behaviors?

### 2.2. Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were developed (a priori) for each CQ. Reviews were excluded if they did not focus on CPGs or on the implementation of a clinical practice that directly affected patient care. Reviews were also excluded if they did not include interventions aimed at clinicians or focused on the implementation of administrative practices.

For CQs 1 and 2, the ISWG selected SRs that focused on the implementation of CPGs or a clinical practice directly affecting patient care and aimed at clinicians. For CQs 3 and 4, we selected both SRs and overviews of SRs that focused on contextual issues affecting guideline implementation.

The ISWG included any health condition or disease, setting, outcome, or population. Studies could include process-of-care (eg, medication ordering, lab ordering), clinical effectiveness (eg, blood pressure reduction), or other types of outcomes (eg, cost and utilization and clinician satisfaction). Studies that focused solely on interventions targeting patients, such as those examining patient education or patient reminders, were excluded.

The search was limited to English-language resources.

### 2.3. The Process

The ISWG maintained a separation of the collection and compilation of the evidence and the final conclusions. The NHLBI contractor conducted the initial systematic search of the published literature up to 2012 from relevant bibliographic databases (ie, the Cochrane Library, PubMed, and other National Library of Medicine sources, such as the Health Services and Technology Assessment Texts and research summaries, reviews, and reports from the Agency for Healthcare Research and Quality evidence-based practice centers) for each critical question. Two independent reviewers (G.C., J.S.) screened the returned citations to identify relevant SRs and overviews, and the rigorous validation procedures were applied to ensure that the selected articles met the preestablished inclusion and exclusion criteria. Pairs of independent raters (G.C., J.S., J.J.V., and S.H.) determined the quality of each included SR, using the Assessment of Multiple Systematic Reviews (AMSTAR) tool. With oversight from a paired senior researcher (G.C. or J.J.V.), 2 research analysts abstracted relevant information from the included SRs. A second senior researcher (JS) examined 20% of the abstractions to ensure consistency and quality. A senior researcher (G.C.) constructed summary evidence tables with review by a principal researcher (S.H.) for quality control. The tables display the evidence in a manageable format to answer specific parts of the CQ. The contractor also prepared a draft analytic report.
The supplemental search (2012–2015), study selection, and study quality rating was conducted by an independent contractor procured by the ACC and the AHA. The lead NHLBI staff (G.C.B.) extracted relevant information from the included SRs and constructed summary evidence tables.

Using the draft report and summary evidence tables, the ISWG reviewed the consistency of the findings with the strength of the evidence and finalized the report.

2.4. Data Analysis

For CQs 1 and 2, the ISWG used an approach that determined the effectiveness of interventions in each SR based on a count of studies with positive outcomes regardless of statistical significance. They used these following 3 categories to characterize the effectiveness of the interventions on each outcome in each review:

1. **Generally effective**: More than two thirds of the reviewed studies had positive intervention effects.
2. **Mixed effectiveness**: One third to two thirds of the reviewed studies showed positive intervention effects.
3. **Generally ineffective**: Less than one third of the reviewed studies showed positive intervention effects.

The assessment of overall effectiveness was derived from the preponderance of effectiveness estimates in the individual reviews. Statistical significance of the effect is not implied in this categorization. This classification scheme is used to provide a sense of the proportion of studies showing a positive effect.

For CQs 3 and 4, conclusions are drawn from the contractor’s qualitative coding of included reviews during article abstraction for a variety of categories of contextual factors identified a priori. Themes were identified and summarized in post hoc analyses to develop general observations about the contextual factors that might support or hinder the implementation of guidelines.

3. RESULTS

Two independent reviewers screened 826 articles and 55 were selected and were abstracted for this report. Included were 39 SRs, and 16 overviews of SRs. The SRs were rated using the 11-point AMSTAR tool—23 received a score of ≥8 and were considered good-quality and 16 received a score of 7 to 4 and were consider fair-quality. Seven other SRs were rated “poor” with scores ≤3 and were excluded and not used for answering the critical questions. Figure 2 illustrates the selection process.

3.1. Critical Question 1

Does the evidence support the effectiveness of the selected intervention strategies (ie, educational outreach visits, reminders, audit and feedback, and provider incentives) in particular practice settings or for specific categories of health professionals?

SRs rated “good” and “fair” were used to answer CQ 1. Table 2 shows the classification of the overall effectiveness of each intervention for process-of-care outcomes and clinical effectiveness outcomes across the full set of included reviews. Table 3 provides expanded detail, summarized from available information by study quality of the effectiveness of each intervention for process-of-care outcomes and clinical effectiveness outcomes.

In summary, educational outreach visits showed general effectiveness in 12 of 13 SRs for process-of-care outcomes, particularly in prescribing behaviors. Five SRs reported clinical effectiveness outcomes for educational outreach visits. Three of 5 SRs and 14 of the 19 included studies showed clinical effectiveness. A good-quality SR on hypertension found that educational outreach visits improved both process of care and clinical outcomes (reductions in median systolic and diastolic blood pressure). When only the included CVD risk reduction studies were considered, 1 fair-quality SR showed general effectiveness, and 1 fair-quality SR showed mixed effectiveness for process of care outcomes.

Audit and feedback interventions were considered in 23 SRs (9 good quality) and showed general effectiveness for both process-of-care outcomes, particularly in clinician adherence to guidelines, and for clinical outcomes. Audit and feedback showed improved process of care and clinical outcomes for the management of hypertension. Four fair-quality SRs also included some studies on CVD risk reduction and 3 of these reviews showed general effectiveness for process of care. Conversely, the fourth fair-quality SR showed general ineffectiveness in improving CVD process of care outcomes.

Reminders were considered in 27 SRs—15 were good quality. These SRs showed mixed effectiveness for process-of-care outcomes overall but general effectiveness for prescribing behaviors. However, reminders were generally ineffective for clinical outcomes. The results were similar when only the CVD risk reduction studies were considered in 8 SRs. However, reminders were generally effective in improving clinical outcomes for hypertension.

Provider incentive interventions were included in 5 good-quality SRs and showed mixed effectiveness for both process-of-care and clinical outcomes—most of the positive outcomes were related to diabetes mellitus and asthma. When CVD risk reduction studies were analyzed separately, 1 good-quality SR found general effectiveness for both process of care and clinical outcomes. However, provider incentives were generally ineffective for improving clinical outcomes for hypertension in another good-quality SR.
3.2. Critical Question 2
What are the cost considerations of implementing the selected intervention strategies (ie, educational outreach visits, reminders, audit and feedback, and provider incentives)?

SRs rated “good” and “fair” were also used to answer CQ 2. Cost considerations refer to cost reduction and cost-effectiveness outcomes based on utilization measures resulting from implementing the selected intervention strategies. The studies in the SRs differ in the way they examined cost. Some calculated the amount saved per physician, cost per prescription, prescribing costs, per-patient cost avoidance, patient out-of-pocket costs, and hospitals’ return on investment. The SRs also differed in the utilization measures they examined. Some measured length of stay, the use of preventive services, or visits to health professionals. Most of the cost-effectiveness assessments consisted of >1 intervention versus a nonintervention control, or they compared interventions. In combination, all these factors made it difficult to reach conclusions about the cost effectiveness of different interventions.

Five good-quality SRs18–22 and 3 fair-quality SRs23–25 provided information about intervention costs or cost reductions. Four good-quality SRs19–22 included studies that reported cost-effectiveness outcomes but none conducted a cost-effectiveness study as a main component of the review (often because of a lack of data).

Educational outreach visits were generally effective in reducing costs in 2 reviews21,25 and showed cost effectiveness in 1 good-quality review.21 Two fair-quality reviews23,25 reported cost-reduction findings (length of stay and lab costs) for audit and feedback interventions and the results showed mixed effectiveness. Reminders were generally effective in reducing cost in 3 reviews18,24,25 and showed mixed effectiveness in another.20 Reminders were also cost effective in 1 review22 and the results showed mixed effectiveness in another.20 Although based only on 1 good-quality review19 provider incentive interventions reduced costs and were cost effective.

3.3. Critical Question 3
What are the contextual barriers—financial, organizational, and regulatory—that hinder or limit clinician adherence to and the adoption of CPGs, as encouraged by the selected intervention strategies?

Table 4 summarizes several barriers that were reported to influence clinician adoption or adherence to CPGs.

3.4. Critical Question 4
What policy or regulatory, organizational, and financial characteristics or factors influence the success of the selected clinical-institution level intervention strategies (ie, educational outreach visits, reminders, audit and feedback, and provider incentives) in achieving the implementation of guidelines and affecting professional practice behaviors?

Table 5 presents the evidence for several factors that appear to facilitate the success of the intervention strategies. Three reviews21,24,26 assessed the effect of various interventions alone compared with combinations of interventions. These reviews concluded that multifaceted interventions are more likely to be effective than single interventions in influencing process of care outcomes.

3.5. Summary
This summary of SRs and overview of reviews found general effectiveness for 2 of the 4 selected implementation interventions (educational outreach visits and audit and feedback) for improving process of care and clinical outcomes. Regarding the impact of characteristics of the interventions, multifaceted interventions appeared to be more effective. However, the paucity of controlled head-to-head comparisons and limitations in the evidence allowed only an estimate of general effectiveness, without the ability to determine whether the overall effects of the interventions were statistically significant, or more importantly, clinically meaningful.

No conclusions can be drawn regarding the effectiveness of the intervention strategies to improve process of care and clinical outcomes related to the treatment of CVD risk factors since most reviews did not focus on or include studies on these conditions. However, 1 good-quality review focused on hypertension and 4 fair-quality reviews included some studies on hypertension and dyslipidemia. The results from these few reviews suggest that implementation interventions are potentially as effective in CVD risk reductions as in other areas.

No general conclusion could be reached about the cost of implementing the selected intervention strategies. Although good-quality reviews generally reported cost-savings associated with an intervention, many of the interventions were multifaceted in nature; thus, the total cost associated with any component of an intervention was difficult to discern. Furthermore, cost effectiveness was not explicitly evaluated.

4. DISCUSSION
4.1. Common Themes in the Evidence and Practice Implications
The evidence generally showed greater increase in CPG adherence in practices with low-baseline adherence. Given the success of multifaceted interventions, and the beneficial impact of stakeholder involvement in developing the intervention and a priori assessment of local needs, implementation efforts should emphasize the need for implementers to understand their current...
practices and how their organizations’ practices may vary from forthcoming CPG recommendations. A self-assessment toolkit could be an important aid to practices when determining which of several implementation strategies might best suit their particular needs, context, and goals.

4.2. Report Limitations

Data used in this report were not retrieved from the primary studies, thus limiting information on the details of the interventions and results to that reported by the review authors. Second, this report used a qualitative synthesis of the evidence, which does not allow an assessment of the size of any expected benefits from the implementation of an implementation strategy. The report also relied heavily on the judgments of the authors of the SRs and the quality of the reviews. Third, analysis in this report is limited to 4 interventions aimed at providers and did not explore systems-level implementation. Other interventions might have shown effectiveness if they had been included. Fourth, the implementation of the 4 intervention strategies varied within reviews. Some reviews assessed single interventions, whereas others assessed multifaceted interventions. Fifth, many evaluations did not report sufficient contextual information to assess their potential influence on implementation efforts (eg, patient demographics, comorbid conditions, insurance coverage). Another major concern is that only a small number of the included studies provided information about clinical effectiveness and cost outcomes, and only a few provided comparisons of cost effectiveness.

Finally, in reviews of SRs, there is always the risk that an included study may appear in multiple reviews and the overlap presents the potential for double counting the results from individual studies. The ISWG addressed this potential risk in answering CQ 1 (process and clinical outcomes) and CQ 2 (cost) primarily by using only SRs where the included studies were clearly referenced and could be checked across reviews and did not include SRs that were updated by more recent reviews. For reviews with overlapping studies, the ISWG first considered whether counting or not counting the overlap would change the assessment of effectiveness of the interventions in this report. If it would not change the effectiveness, we counted the study in both reviews. However, if counting the overlap would change the effectiveness, we first considered the quality of the reviews, and if the overlapping reviews were of equal quality, counted the study in the most recent review. For example, if a study appeared in a good-quality review and a fair-quality review, we counted the study in the good-quality review and not in the fair-quality review. Finally, in SRs that updated a component (ie, interventions aimed at people with diabetes mellitus) of an SR, we counted the studies from the latest review and the studies minus the updated component from the older SR. The overlap was substantial for CQ 3 (barriers) and CQ 4 (facilitators), where SRs were combined with overviews of SRs. However, this overlap was inconsequential because the findings for CQs 3 and 4 were not based on study counts.

4.3. Research Gaps

Future research in CPG implementation interventions should address important design limitations in current studies and key gaps in the evidence base (Table 6). An important design limitation is the lack of explicit declaration or standardized terminology for the implementer and target of the interventions. Evidence is sorely needed on more tangible outcomes, such as clinical outcomes and cost effectiveness, in addition to intermediate or process outcomes. Simply demonstrating an effective implementation in one setting is not a guarantee that the same results will be found in other settings. Thus, additional SRs and empirical research are needed to better understand the effectiveness of implementation strategies with differing characteristics, in a variety of settings, with different types of clinicians, and targeting specific types of diseases or conditions—especially the control of CVD risk factors. Although multifaceted interventions rather than single interventions appear to be effective strategies for increasing CPG implementation, identifying the combinations of strategies that are most effective and in which contexts is important.

Innovative research methods and study designs are needed to leverage electronic health records (EHRs) as they might bolster implementation science in many ways. Specifically, electronic clinical data may improve the ability to target patients (eg, by diagnosis) for appropriate CPGs. Clinic and health system EHRs may have the ability to efficiently provide feedback on progress in achieving relevant CPG measures (eg, biomarkers) for an entire clinic or healthcare system, not strictly at the patient or clinician level. And for implementation research, EHRs may streamline planning and conducting other aspects of implementation trials (eg, more accurately determine event rates, eligible patients). EHRs might also be able to follow patient health outcomes on a long-term basis, beyond the typical length of clinical trials. The evolution of EHRs will likely include the development and embedding of risk models capable to enable targeting people with specific risk profiles. The use of networks of EHRs, such as those in the PCORI (Patient-Centered Outcomes Research Institute) Clinical Data Research Networks, could provide remarkable opportunities to study implementation strategies or even exploit the natural variation in strategies across centers. With many large and diverse patient populations now receiving care that is documented in EHRs, large population-based studies are becoming increasingly practical. Such pragmatic studies have the advantage of including the general population of patients and not just a carefully selected set
of participants in a randomized controlled trial. Although such studies may not have the precision of measurement commonly seen in rigorous trials, their benefit comes in the assessment of important clinical outcomes for entire populations of patients.

Finally, the good-quality reviews in this report are largely based on evidence from randomized controlled-trial study designs. Traditional randomized controlled trials are quite different from the context in which real-world implementation and behavior change occur. An observational, more qualitative approach may be needed to better understand how the preceding contextual issues and other drivers affect the success of an implementation intervention. An example of a qualitative approach is The Dartmouth Institute for Health Policy and Clinical Practice benchmarking study of how “best-in-class” health systems use clinical decision support.27 Such an outcomes-oriented approach would allow better evaluation of provider incentives, audit and feedback, educational outreach visits, reminders, and other interventions chosen to advance the implementation of CPGs.

In summary, there is some evidence that guideline implementation interventions are effective for both process of care and clinical outcomes. Limited evidence suggests that implementation interventions are generally effective at reducing costs, and in even more-limited evidence, that they are cost effective. Qualitative analysis suggests recurring themes regarding barriers and facilitators of success. Given the mixed results seen in many implementation studies, additional research focused on intervention effectiveness is needed, with special emphasis on improving methods and study designs, increasing the use of pragmatic trials, and determining how to enhance the utility of electronic clinical data. Also, more studies are needed on clinical outcomes, cost effectiveness and the influence of contextual factors on effectiveness of interventions. Studies done in real-world healthcare delivery systems and qualitative research may help address some of these important gaps in current evidence.

5. PERSPECTIVES

5.1. Translation Outlook 1
Audit and feedback and educational outreach visits were generally effective for improving both process of care and clinical outcomes while provider incentives showed mixed effectiveness. Reminders showed mixed effectiveness for process of care and were generally ineffective for improving clinical outcomes.

5.2. Translation Outlook 2
Multifaceted interventions were more effective than a single intervention strategy.

5.3. Translation Outlook 3
Additional research is needed on intervention effectiveness, with special emphasis on improving methods and study designs, increasing the use pragmatic trials, leveraging electronic clinical data, and evaluating cost effectiveness of interventions.

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Figure 1. Multilevel Model of CPG Implementation Strategies.
Figure 1 presents strategies to implement guidelines recommendations at 4 levels—policy, clinical institution, provider, and patient—to improve patient health.

CPG indicates clinical practice guidelines; FI-P, financial intervention-provider; OI-P, organizational intervention-provider; OI-Pt, organizational intervention-patient; OI-S, organizational intervention-structural; PI, professional intervention; and RI, regulatory intervention.

Table 1. Definition of Intervention Strategies

<table>
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<tr>
<th>Intervention</th>
<th>EPOC Equivalent</th>
<th>EPOC Definition</th>
</tr>
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<tbody>
<tr>
<td>Provider Reminders</td>
<td>Reminders</td>
<td>Patient or encounter specific information, provided verbally, on paper or on a computer screen, which is designed or intended to prompt a health professional to recall information. This would usually be encountered through their general education; in the medical records or through interactions with peers, and so remind them to perform or avoid some action to aid individual patient care. Computer-aided decision support and drugs dosage are included.</td>
</tr>
<tr>
<td>Academic Detailing</td>
<td>Educational Outreach Visits</td>
<td>Use of a trained person who met with providers in their practice settings to give information with the intent of changing the provider’s practice. The information given may have included feedback on the performance of the provider(s).</td>
</tr>
<tr>
<td>Audit and Feedback</td>
<td>Audit and Feedback</td>
<td>Any summary of clinical performance of health care over a specified period of time. The summary may also have included recommendations for clinical action. The information may have been obtained from medical records, computerized databases, or observations from patients.</td>
</tr>
<tr>
<td>Pay for Performance</td>
<td>Provider Incentives</td>
<td>Provider received direct or indirect financial reward or benefit for doing specific action. (Provider here means an individual. This is distinct from the EPOC term “institution incentives,” which is defined as: institution or group of providers received direct or indirect financial rewards or benefits for doing specific action.)</td>
</tr>
</tbody>
</table>

EPOC indicates Effective Practice and Organisation of Care.
Figure 2. Selection of Articles for Inclusion in the Report.

Figure 2 presents the study selection process from the initial search returns through title and abstract review and full-text review to select the 55 systematic reviews and overviews used in this report. ISWG indicates Implementation Science Work Group.

Table 2. Overall Effectiveness Across All Included Studies by Intervention, Type, and Outcome

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Process-of-Care Outcomes</th>
<th>Clinical Effectiveness Outcomes</th>
</tr>
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<tbody>
<tr>
<td>Educational outreach visits</td>
<td>Generally effective</td>
<td>Generally effective</td>
</tr>
<tr>
<td>Audit and feedback</td>
<td>Generally effective</td>
<td>Generally effective</td>
</tr>
<tr>
<td>Reminders</td>
<td>Mixed effectiveness</td>
<td>Generally ineffective</td>
</tr>
<tr>
<td>Provider incentives</td>
<td>Mixed effectiveness</td>
<td>Mixed effectiveness</td>
</tr>
</tbody>
</table>

Table 3. CQ 1: Summary of Systematic Reviews by Intervention, Effectiveness Rating, and Quality

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Process of Care</th>
<th>Clinical Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Outreach Visits</td>
<td>Good1, 2, 21, 28, 29</td>
<td>Good9, 10, 12, 25, 30, 33</td>
</tr>
<tr>
<td>Audit and Feedback</td>
<td>Good9, 23, 24, 26, 30, 33, 37</td>
<td>Good29, 30, 31, 33, 35, 37</td>
</tr>
<tr>
<td>Reminders</td>
<td>Good10, 17, 24, 26, 30, 32, 33, 37</td>
<td>Good16, 18, 22, 35, 38, 43, 45</td>
</tr>
<tr>
<td>Provider Incentives</td>
<td>Good19</td>
<td>Good19, 28, 46</td>
</tr>
</tbody>
</table>

CQ indicates clinical question; and N/A, not applicable.
Table 4. CQ 3: Contextual Factors That Appear to Hinder the Success of the Intervention Strategies

<table>
<thead>
<tr>
<th>Context</th>
<th>Key Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational</td>
<td>Time\textsuperscript{16,17,30,47–51}</td>
</tr>
<tr>
<td></td>
<td>Human resources\textsuperscript{48,49}</td>
</tr>
<tr>
<td>Clinician Knowledge, Attitudes, and Beliefs</td>
<td>Skepticism—concern about evidence base of guidelines, lack of universal acceptance of recommendations, implied rationing of services, fear of litigation\textsuperscript{24,47,49–51}</td>
</tr>
<tr>
<td></td>
<td>Lack of knowledge of guidelines\textsuperscript{24,32,49,50}</td>
</tr>
<tr>
<td></td>
<td>Age—older or more experienced clinicians less inclined to use\textsuperscript{48}</td>
</tr>
<tr>
<td>Workflow and Timing</td>
<td>Timing and effectiveness—barrier to effectiveness if further away from point of decision making\textsuperscript{42,52–55}</td>
</tr>
</tbody>
</table>

CQ indicates clinical question.

Table 5. CQ 4: Contextual Factors That Appear to Facilitate the Success of the Intervention Strategies

<table>
<thead>
<tr>
<th>Context</th>
<th>Key Facilitators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of Guidelines</td>
<td>Short and simple format\textsuperscript{47}</td>
</tr>
<tr>
<td></td>
<td>Provide patient pamphlets\textsuperscript{47}</td>
</tr>
<tr>
<td></td>
<td>Easy to understand and use\textsuperscript{48}</td>
</tr>
<tr>
<td></td>
<td>Minimal resources needed to implement\textsuperscript{48}</td>
</tr>
<tr>
<td></td>
<td>Involving end-users in guidelines development, implementation, and testing\textsuperscript{15,46,50,52}</td>
</tr>
<tr>
<td></td>
<td>Use of computerized guidelines in practice settings\textsuperscript{15,16}</td>
</tr>
<tr>
<td>Involving Stakeholders</td>
<td>Involvement in planning, developing, or leading interventions designed to influence practice patterns and clinical outcomes\textsuperscript{19,30,34,40,56}</td>
</tr>
<tr>
<td>Leadership</td>
<td>Leader’s social influence is recognized\textsuperscript{30}</td>
</tr>
<tr>
<td></td>
<td>Formal leadership\textsuperscript{40}</td>
</tr>
<tr>
<td></td>
<td>Local management support and enthusiasm\textsuperscript{24,51}</td>
</tr>
<tr>
<td></td>
<td>Adequate time to promote new practice\textsuperscript{44}</td>
</tr>
<tr>
<td>Scope of Implementation</td>
<td>Provider incentives—more broadly implemented in the United Kingdom with more consistent results than in the United States\textsuperscript{19}</td>
</tr>
<tr>
<td></td>
<td>Multifaceted interventions are more likely to be effective than single interventions\textsuperscript{21,26,35,54}</td>
</tr>
<tr>
<td>Organizational Culture</td>
<td>Multidisciplinary teams, coordination of care, pace of change, a blame-free culture, and a history of quality improvement\textsuperscript{19,28,38}</td>
</tr>
<tr>
<td></td>
<td>Low-baseline adherence\textsuperscript{19,29,34,36,40,46,55}</td>
</tr>
<tr>
<td>Workflow and Timing</td>
<td>Electronic guidelines systems</td>
</tr>
<tr>
<td></td>
<td>Integration with computers used in practice\textsuperscript{16,17}</td>
</tr>
<tr>
<td></td>
<td>Reminders automatic—clinicians not required to seek information\textsuperscript{42}</td>
</tr>
</tbody>
</table>

CQ indicates clinical question.

Table 6. Suggested Actions to Address Key Research Needs

<table>
<thead>
<tr>
<th>Suggested Actions</th>
<th>Research Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Study Design Issues</td>
<td>Clear descriptions of study methods and the interventions</td>
</tr>
<tr>
<td></td>
<td>Explicit implementer and target of intervention</td>
</tr>
<tr>
<td></td>
<td>Standardized measures of outcomes and descriptions of practice settings</td>
</tr>
<tr>
<td>Conduct New Research to Test the Effectiveness of Interventions</td>
<td>Effect on clinical outcomes, rather than intermediate outcomes</td>
</tr>
<tr>
<td></td>
<td>Cost effectiveness</td>
</tr>
<tr>
<td></td>
<td>Effect of multicomponent interventions, including specific combinations of interventions</td>
</tr>
<tr>
<td></td>
<td>Effect of policy-level interventions, for example:</td>
</tr>
<tr>
<td></td>
<td>Reimbursement</td>
</tr>
<tr>
<td></td>
<td>Accreditation</td>
</tr>
<tr>
<td></td>
<td>Publicly reported quality metrics</td>
</tr>
<tr>
<td></td>
<td>Effect of interventions targeting varieties of:</td>
</tr>
<tr>
<td></td>
<td>Settings, including baseline workflows</td>
</tr>
<tr>
<td></td>
<td>Clinician types</td>
</tr>
<tr>
<td></td>
<td>Types of diseases and conditions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Focus Evaluations on Contextual Factors</th>
<th>Organizational and practice context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Involvement of stakeholders and leadership</td>
</tr>
<tr>
<td></td>
<td>Integration with workflow</td>
</tr>
<tr>
<td></td>
<td>Implementation scope</td>
</tr>
<tr>
<td></td>
<td>Duration</td>
</tr>
<tr>
<td></td>
<td>Timing</td>
</tr>
</tbody>
</table>

| Leverage EHR Data and Tools | Mine data for observational studies                                    |
|                            | Platform for pragmatic prospective studies                              |
|                            | Access longer-term data than RCTs                                       |
|                            | Aggregate data and/or interventions by key factors, for example:        |
|                            | Patient characteristics                                                 |
|                            | Clinician characteristics                                                |
|                            | Clinic                                                                  |
|                            | Healthcare delivery system                                              |

| Conduct Qualitative and Observational Research | Effectiveness in diverse populations                                  |
|                                               | Drivers of success in real-world implementations                      |
|                                               | Contextual issues not amenable to RCTs                                |

EHR indicates electronic health record; and RCTs, randomized controlled trials.

<table>
<thead>
<tr>
<th>Committee Member</th>
<th>Employment</th>
<th>Consultant</th>
<th>Speakers Bureau</th>
<th>Ownership/Partnership/Principal</th>
<th>Personal Research</th>
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<td>Southern California Permanente Medical Group—Staff Physician</td>
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<td>Susan K.R. Heil</td>
<td>American Institutes for Research—Health and Social Development</td>
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(Continued)
### Appendix 1. Continued

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<tbody>
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<td>NINDS</td>
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<td>NIH</td>
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</tbody>
</table>

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AHA indicates American Heart Association; AHRQ, Agency for Healthcare Research and Quality; DSMB, data safety monitoring board; NCATS, National Center for Advancing Translational Sciences; NHLBI, National Heart, Lung, and Blood Institute; NIA, National Institute on Aging; NIH, National Institutes of Health; NINDS, National Institute of Neurological Disorders and Stroke; PCORI, Patient-Centered Outcomes Research Institute; and UCSF, University of California, San Francisco.

<table>
<thead>
<tr>
<th>Reviewer</th>
<th>Representation</th>
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</tr>
</thead>
<tbody>
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*Significant relationship.
†No financial benefit.

ACC indicates American College of Cardiology; AHA, American Heart Association; CV, cardiovascular; FDA, US Food and Drug Administration; KCCQ, Kansas City Cardiomyopathy Questionnaire; NHLBI, National Heart, Lung, and Blood Institute; NIH, National Institutes of Health; OSHPD, Office of Statewide Health Planning and Development; PAQ, Peripheral Artery Questionnaire; PCORI, Patient-Centered Outcomes Research Institute; SAQ, Seattle Angina Questionnaire.


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ACC/AHA Special Report: Clinical Practice Guideline Implementation Strategies: A Summary of Systematic Reviews by the NHLBI Implementation Science Work Group

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1. Overview of the Process

Directed by National Heart, Lung, and Blood Institute (NHLBI) and with support from the methodology team, the Implementation Science Work Group (ISWG):

- Developed a conceptual framework
- Constructed critical questions (CQ) most relevant to clinical practice.
- Identified (a priori) Inclusion/exclusion criteria for each CQ

Directed by the NHLBI, with input from the ISWG, the methodology team:

- Developed a search strategy, based on inclusion/exclusion criteria and CQ.
- Executed a systematic electronic search of the published literature from relevant bibliographic databases.
- Screened, by 2 independent reviewers, abstracts/full text returned from the search to identify relevant systematic reviews (SRs) and overviews of SRs.

Determined, by 2 independent raters, the quality of each included study.

- Abstracted relevant information from the included studies into an electronic database.
- Constructed detailed evidence tables, which organized the data from the abstraction database.
- The ACC/AHA commissioned an independent methodology team to update the relevant SRs and overviews from 2012 to 2015.

2. Search Strategy

The methodology team searched for relevant SRs in the Cochrane Library, PubMed, and other National Library of Medicine sources, such as the Health Services/Technology Assessment Texts and research summaries, reviews, and reports from the Agency for Healthcare Research and Quality evidence-based practice centers. The topics for research include 4 types of interventions: (1) academic detailing (educational outreach visits), (2) reminders, (3) audit and feedback, and (4) pay for performance (provider incentives) as well as guidelines or evidence-based care. The following search terms were used: ((“Education, Continuing”[majr] OR Reminder Systems[majr]) OR “academic detailing” OR Reminders OR “educational outreach” OR Decision Support Systems, Clinical[mh] OR “Reimbursement, Incentive”[mh] OR “financial interventions” OR “Pay for Performance” OR “provider incentives” OR “audit and feedback” OR medical audit[mh] OR “medical records” OR “electronic medical record” OR “electronic medical records” OR ehr[ti] OR ehrs[ti] OR emr[ti] OR emrs[ti]) AND (Guidelines as Topic[mh] OR Benchmarking OR Comparative Effectiveness Research OR Evidence-Based Practice[mh] OR Evidence-Based Medicine[mh] OR Standard of Care[mh] OR “standard of care” OR “standards of care” OR “Best practice” OR “best practices” OR “evidence based medicine” OR “evidence based intervention” OR “evidence based interventions” OR “evidence based practices” OR...
Another search was conducted to identify any additional overviews of SRs using the preceding search terms and replacing the last term “AND (systematic[sb])” with the following terms for a total of three additional searches:

1. AND “complex systematic reviews”.
3. (review [ti] OR overview [ti] OR overviews [ti]) AND systematic reviews [ti].

Additional resources were obtained from ISWG experts’ referrals and by examining reference lists of reviews obtained through the preceding search strategy.

3. Selection Criteria

SRs and overviews of SRs were included that: (1) had a significant focus on clinical practice guidelines or evidence-based medicine; (2) focused on the implementation of a clinical practice directly affecting patient care; (3) was a provider intervention (versus a patient intervention); (4) included any of the 4 specified interventions (defined below); and (5) assessed knowledge, attitudes, or behaviors related to evidence-based practices.

The following reviews were excluded: reviews that did not focus on clinical practice guidelines; that focused on the implementation of an administrative practice, such as billing or scheduling, or on clinical support services, including lab services, radiology, pharmacy, or access to health records; and that did not focus on the implementation of a clinical practice that directly affects patient care. Reviews were also excluded if they did not include interventions aimed at providers. Also excluded were letters to the editor, editorials, commentaries, testimonies, posters (with the exception of conference poster presentations), brochures, and flyers. The search was limited to English-language resources but not limited to a specific time period.

3.1. Study Design Inclusion Criteria

Only SRs or overviews of SRs were selected for inclusion. Overviews of SRs are systematic searches for SRs that meet the inclusion criteria; thus, SRs provide the source data on which a review is based. Henceforth “overviews of SRs” are referred to “as “overviews” to better distinguish them from: (a) the subset of SRs based on individual trials, and (b) the full set of included resources referred to as “reviews”.
3.2. Types of Interventions

Four types of interventions were selected for the literature review: provider reminders, audit and feedback, academic detailing or educational outreach, and pay for performance or provider incentives. Following is a summary of how each intervention was defined.

3.2.1. Provider Reminders or Clinical Decision Support Systems

Provider reminders are tools that may help providers identify patients or members in a population who are in need of some type of intervention and prompt the providers to initiate the intervention. These reminders may be received through:

- Stickers on charts; for example, in one clinic, the placement of a yellow circle sticker on a chart may mean that a patient needs an influenza vaccination
- Vital sign stamps: a reminder that vital signs need to be taken
- Medical or health record flow sheets: a sheet that requires a provider to document each intervention or assessment in the document
- Checklists: a list that enables providers to check off each activity completed, such as taking a blood pressure
- Computerized reminders or alerts: a pop-up reminder to ask about something or check on something; this might be associated with a specific diagnosis or a general reminder to ask, for example, about whether or not a patient feels any pain
- Computer algorithms that require providers to complete a task or fill in information for a task or assessment

Clinical decision–support tools are similar to provider reminders; however, they are often defined in diverse ways. Simply described, they are tools that are intended to help healthcare professionals make optimal decisions at the point of care. They may include computerized alerts and reminders and computerized order sets that help providers select options. Some computerized clinical decision support tools use “hard stops” within an electronic health record, flagging a quality indicator that requires a clinician action or decision. The system will not advance to the next step until the clinician has responded to the prompt.

3.2.2. Audit and Feedback

Audit and feedback may be referred to as “assessment and feedback” or “monitoring and feedback” by some organizations. Audit and feedback involves monitoring outcomes or compliance with a specific intervention or process. Hard copy or electronic health records are frequently used for audit and feedback because these records are expected to reflect the assessments, interventions, and outcomes associated with care delivery. Such “auditing” involves collecting data or information at the individual clinician or practice level. The “feedback” portion of audit and feedback generally involves the use of reports that are provided to individual clinicians to
let them know how they are doing in relation to others. This may include the use of “control charts” or reports that show how an individual clinician is performing relative to others in the practice or a larger system, such as other providers in the Medicaid program.

For example, a State Medicaid program may review the electronic or hard copy health records of every pediatric patient with a diagnosis of asthma that is enrolled in Medicaid. The record abstractors may have a checklist that is used to see whether a clinician has ordered the appropriate tests at the recommended frequency, has ordered the recommended medications, and has followed other recommended practices.

The percentage of compliance for each measure would then be computed for each clinician. And, the results for a specific clinician are summarized and compared against other anonymous providers.

3.2.3. Academic Detailing

Academic detailing is a method that involves service-oriented educational outreach. This practice is similar to the “detailing” approach used by pharmaceutical sales representatives to convince physicians to prescribe the medications that they are selling. Academic detailing often involves the following actions or attributes:

- A skilled or similarly educated health professional meets individually with practice clinicians and/or staff to talk about the evidence-based practice.
- The educational outreach may involve working with the practice or unit to help them brainstorm how to implement the innovation in a way that does not disrupt efficiency.
- Academic detailing may support improved clinical decision making by fostering one-on-one interaction between physicians and health professionals trained to communicate the latest evidence-based clinical data.
- The goal is to provide accurate, up-to-date synthesis of relevant clinical information in a balanced and engaging format.
- Academic detailing goes beyond providing continuing education.

3.2.4. Pay for Performance or Provider Incentives

Pay for performance is a strategy aimed at improving health care delivery that relies on the use of market or purchaser power. “Pay for performance” may refer to “financial incentives that reward providers for the achievement of a range of payer objectives, including delivery efficiencies, submission of data and measures to payer, and improved quality and patient safety” (1). However, in some settings pay for performance may also take the form of penalties.

3.3. Types of Participants, Populations, Settings, or Outcomes

The selection of reviews was not limited to those covering any particular setting, outcome, or population. As a result, the settings and type of clinicians included in the reviews and assessed outcomes vary. Studies could
include process of care, clinical effectiveness (i.e., patient outcomes), or other types of outcomes such as cost and utilization and provider satisfaction. Studies that focused solely on patient-mediated interventions, such as those examining patient education or patient reminders, were excluded.

4. Reliability Process

SRs are a type of research study. Therefore, procedures for preventing bias are as important as for other kinds of studies. When conducting this SR, methods were implemented to minimize the introduction of bias at several points in the process:

- Study selection
- Assessment of quality
- Data abstraction
- Synthesis of findings
- Reporting

4.1. Study Selection

Two members of the methodology team independently reviewed and selected citations based on the inclusion and exclusion criteria using the following process:

- Review titles and abstracts to eliminate only those studies that both reviewers agree are clearly not relevant.

- Review the full text of the remaining studies to select studies for inclusion in the SR. The review is included or excluded if both reviewers agree. When the reviewers disagree, they discuss and try to reach consensus. If the reviewers cannot reach a consensus, each gives the rationale for their determination to a third reviewer who makes the decision after reviewing the paper and reviewers comments.

- Each reviewer provides a rationale for each citation that they voted to exclude.

4.2. Quality Rating

The methodology team, in consultation with the NHLBI staff and ISWG, selected the Assessment of Multiple SRs (AMSTAR) tool to assess the methodological quality of SR (2). The scoring of the 11-item AMSTAR tool was scored using ratings established for the NHLBI Adult CVD Risk Reduction Guidelines project:

- Good quality = 11–8
- Fair quality = 7–4
- Poor quality = 3–0

Two members of the methodology team independently scored and rated the quality of each citation selected for inclusion. When the raters disagreed on the rating, they discussed the issue and tried to reach a
consensus. If they could not reach a consensus, a third staff member made the decision after reviewing the paper and raters comments.

Only studies rated “good” and “fair” were included in this report. Studies rated “poor” are excluded.

4.3. Data Abstraction

The methodology team developed an electronic abstraction form with data elements pertinent to the inclusion criteria to capture relevant information from the SRs rated “good” and “fair”. Abstractors were trained on the tool using a set of sample articles. Training and abstraction procedures were supported by written abstraction instructions that included: operational definitions for each field; training and practice; opportunities to ask questions; and double abstraction of a subset of items with opportunities for retraining.

An independent reviewer abstracted data from studies rated “good” and “fair”. A second abstractor reviewed 20% of the abstraction for quality control. Discrepancies were handled by discussion and agreement between both abstractor and the reviewer of a revised abstract. Any updates needed were made by the initial reviewer.

4.4. Synthesis

Summary evidence tables were developed to characterize the body of evidence for each review in terms of the types of studies included, the quality of included SRs as defined by the AMSTAR score, the range of settings where interventions took place, providers and behaviors targeted by the interventions, types of outcomes measured, and findings of overall effectiveness for all included interventions. Summary tables were constructed separately for SRs and overviews of SRs; descriptive characteristics and main findings were captured in separate summary tables.

5. Data Analysis

Similar to Cheung et al. (2012), the results of each SR were reviewed to determine the proportion of studies with positive outcomes regardless of statistical significance (3). As Cheung and colleagues discovered, many of the studies do not reliably estimate the statistical significance of the interventions because of unit of analysis errors. To help simplify the discussion of findings, Cheung’s strategy was adopted, and 3 categories were used to describe the outcomes of the studies included in each review:

1. **Generally effective**: more than two thirds of the studies in a review had positive effects for the intervention
2. **Mixed effects**: one third to two thirds of the studies in a given review showed positive effects for the intervention
3. **Generally ineffective**: less than one third of the studies in a given review showed positive effects for the intervention.
The statistical significance of the effect is not implied in this categorization, given limitations in the underlying data that could be culled from each review. The classification scheme is used simply to provide a sense of the abundance of included studies that showed a positive effect of the included interventions.

5.1. Overlap in Reviews

In reviews of SRs, there is always the risk that an included study may appear in multiple reviews and the overlap presents the potential for “double counting” the results from individual studies. The methodology team addressed this potential risk by:

- Answering CQ 1 (process and clinical outcomes) and CQ 2 (cost) primarily by using only SRs where the included studies were clearly referenced and could be checked across reviews and excluding SRs that were updated by more recent reviews.
- For reviews with overlapping studies, we first considered whether counting or not counting the overlap would change the assessment of effectiveness of the interventions in the review.
  - If counting the overlap would not change the effectiveness, we counted the study in both reviews.
  - If counting the overlap would change the effectiveness, we first considered the quality of the reviews, and if the overlapping reviews were of equal quality, counted the study in the most recent review. For example, if a study appeared in a good-quality review and a fair-quality review, we counted the study in the good-quality review and not in the fair-quality review.
  - In SRs that updated a component (i.e., interventions aimed at people with diabetes) of a SR, we counted the studies from the latest review and the studies minus the updated component from the older SR.
  - The overlap was substantial for CQ 3 (barriers) and CQ 4 (facilitators), where SRs were combined with overviews of SRs. However, this overlap was inconsequential since the findings for CQs 3 and 4 were not based on study counts.

References