IMPROVING CLINICAL PRACTICE
Towards more effective use of decision support in clinical practice: what the guidelines for guidelines don’t tell you
I. A. SCOTT,1,2 C. P. DENARO,2,3 C. J. BENNETT3 and A. M. MUDGE3

1Department of Internal Medicine, Princess Alexandra Hospital, 2Department of Medicine, University of Queensland and 3Department of Internal Medicine, Royal Brisbane and Women’s Hospital, Brisbane, Queensland, Australia

Abstract
The Brisbane Cardiac Consortium Clinical Support Systems Program used multiple strategies in optimising quality of care of patients with either of two cardiac conditions. One of these strategies was the development and active implementation of decision support systems centred on evidence-based, locally agreed clinical practice guidelines. Our experience in undertaking this task highlighted numerous operational challenges for which solutions were difficult to extract from existing published literature. In the present article we provide a methodology grounded in both theory and real-world experience that may assist others in developing and implementing systems of guideline-based decision support. (Intern Med J 2004; 34: 492–500)

Key words: clinical practice guidelines, attributes, implementation, impact, evaluation.

INTRODUCTION
In recent times there has been considerable interest in providing support for clinical decision-making at the point of care. One form of support aims to ensure that recommendations derived from clinical practice guidelines (CPG) are readily accessible to practising clinicians.1 CPG have been defined as “systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific circumstances”.2 They aim to reduce undesirable variation in care and hence improve the quality of care.3 Many CPG are used to derive operational documents comprising protocols, pathways and process charts.

However, while CPG significantly improve both process and outcomes of care under trial conditions, there is uncertainty about their real-world effectiveness.5,6,7,8 Concerns have been voiced about excessive numbers of guidelines, many of which are poorly constructed or outdated, difficult to access or apply in individual cases, too rigid or complicated to be of help, or irrelevant to the needs of particular groups of practitioners. In response, the National Health and Medical Research Council of Australia9 and other agencies10,11 have produced detailed descriptions of methods for developing, disseminating and implementing CPG. A number of checklists and critical appraisal guides seek to ensure CPG remain valid and useful to the intended user.12–14

The use of guideline-based decision support was a key feature of the Brisbane Cardiac Consortium (BCC) Clinical Support Systems Program (CSSP) which targeted the in-patient and postdischarge care of patients hospitalised with either acute coronary syndromes (ACS) or congestive heart failure (CHF).15 This project was one of four CSSP projects which aimed to integrate evidence-based medicine with continuous practice improvement (Table 1). Although the previously mentioned published literature was consulted and found to be useful, we encountered several operational issues for which solutions were difficult to find in published reports. Based on this experience, we describe a pragmatic approach for translating guidelines into effective decision support which builds on previous work and imparts points of emphasis which we feel are critical to successful future endeavours. Moreover, we contend that the proper development and interpretation of guideline recommendations are critical to the formulation of any performance measures used in evaluating the effects of quality improvement interventions.

THE AIMS OF DEVELOPING GUIDELINES
In the first instance, guidelines should provide recommendations that are based on a systematic review of the available scientific evidence, are developed and endorsed by multidisciplinary panels of reputable experts, and are contextualised in regards to interpretation and strength of evidence.16 Unfortunately, many published CPG do

Correspondence to: Ian A. Scott, Princess Alexandra Hospital, Ipswich Road, Woolloongabba, Brisbane, Qld. 4102, Australia.
Email: ian_scott@health.qld.gov.au
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Table 1  Objectives of the Clinical Support Systems Program

- Provide evidence that when CPI\(^1\) and EBM\(^2\) methodologies are brought together into an integrated model, there is an improvement in the quality of patient care
- Involve multidisciplinary clinical teams, health managers and consumers in the design, development, implementation and evaluation of the study projects
- Develop organisational and management structures and tools necessary to develop and maintain the capacity for clinical practice improvement
- Identify which components of the CSS model are most effective
- Determine if the CSS model is replicable and transferable to other sites and clinical settings

\(^1\)Clinical Practice Improvement (CPI) involves approaches to continuously improving clinical practice, using tools such as clinical guidelines and pathways, outcome and performance indicators, and clinical measurement supported by appropriate information systems. \(^2\)Evidence-Based Medicine (EBM) involves the translation of best available evidence, based on scientific research, into clinical practice in ways that inform clinical decision making and system-of-care design and performance. CSS, clinical support system.

not adhere well to these basic methodological standards.\(^3\)\(^7\)\(^-\)\(^9\)

Second, recommendations contained within CPG must be able to yield best practice standards for deciding whether patients have received appropriate care.\(^20\)\(^-\)\(^22\)

Attempts to objectively evaluate quality of care will be hampered if robust and precise measures of appropriate-ness of care cannot be distilled from guidelines because of an inadequate review of extant evidence (validity problem) or because guideline recommendations are too non-specific, impractical or controversial (application problem).

STARTING OUT

We faced an early challenge in developing our guidelines for patients with ACS and CHF. This was to reconcile the demands of undertaking a thorough literature review and formulating cogent recommendations based on unanimous (or near-unanimous) stakeholder agreement with the constraints of limited time and resources. We undertook the following steps:

1 Carefully defined the subject of each guideline as relating to in-hospital management or posthospital care and provided a precise definition of diagnostic criteria used to identify the patient population to whom the guideline recommendations were to apply. This avoided making the scope of the guideline unmanageable and circumvented ongoing indecision about what to include or not include in the guideline.

2 Convened a small writing group of two individuals with demonstrated expertise in both clinical content and systematic review to develop the first draft of each guideline. We surmised that larger groups would prove unwieldy and inefficient at this early stage; wider consultation and review would come later.

3 Applied a pragmatic approach to reviewing published evidence by first reviewing all existing guidelines and systematic reviews related to our topics rather than conduct an extensive review of all published trials.\(^23\)

Retrieved articles were accepted for consideration if they satisfied certain quality criteria (Table 2).\(^24\)\(^,\)\(^25\)

We took notice of how frequently previously published systematic reviews were ignored by those developing new guidelines.\(^26\)

Consequently, our search started with Cochrane Library, Clinical Evidence and Best Evidence in identifying summary reports. Only when these sources were exhausted for specific questions did we move on to searching other sources for individual trials (e.g. Cochrane Controlled Trials Register and PubMed Clinical Queries).

4 Used, adapted and reformatted pre-existing valid guidelines within the bounds of copyright and acknowledging original sources.\(^27\)\(^,\)\(^28\)

While concerns have been expressed about bias and inconsistency that local adaptation may introduce into otherwise rigorous original guidelines, we contend that as long as explicit rules of evidence such as those previously listed are consistently applied, local adaptation does not appear to compromise validity.\(^29\)

5 Selected a representative sample of both experts and potential end-users in reviewing guideline recommendations. In choosing participants we asked two simple questions: (i) ‘Who are the experts or senior clinicians who could criticise, disagree with, or disendorse the finished guidelines if not consulted during the development process?’ and (ii) ‘Who are the end-user clinicians who will ignore the guidelines if the latter fail to meet their clinical needs?’ The published literature provides little guidance as to how many reviewers are needed and how they should be selected.\(^30\)\(^,\)\(^31\)

We relied on local knowledge of who needed to be invited on the basis of content expertise, strategic influence, and perceived willingness to participate. Our groups comprised consultant and junior medical representatives, general practitioners (GPs), clinical pharmacists and senior nurses.

6 Employed explicit formal group methods in obtaining group consensus in how the evidence and the recommendations were to be interpreted.\(^32\)\(^-\)\(^34\)

In the grey zones of practice where conclusive evidence is lacking,\(^15\) subjective judgement will be necessary in formulating recommendations. The challenge under such circumstances is to minimise susceptibility of...
expressed opinions to bias and self-interest.\textsuperscript{36,37} While there is no optimal method for doing this, three principal methods exist for synthesising judgements under states of uncertainty (Table 3). We chose a modified Delphi technique as the most practical method, although the choice of method will depend on local circumstances. While necessitating sustained effort and multiple guideline iterations, this consensus building allowed clinicians to exchange views and assumptions, to compare the guideline against their own practice standards, and to gain a sense of ownership of the guideline and the process of quality improvement.

7 Applied a simple ‘strength of evidence’ classification to our recommendations adapted from that used by the Scottish Intercollegiate Guideline Network (Table 4).\textsuperscript{38,39} Whatever classification scheme is used should reflect both the strength of evidence underpinning the recommendation and the level of agreement amongst experts, while avoiding multiple grading levels which engender confusion. In this way, the guideline recommendations can be prioritised in terms of levels of evidence and expert agreement. As an example, we placed a summary of all Grade A recommendations at the beginning of our full-text guidelines.

8 Specified the need for the guideline, and its method of development (how and who), style of presentation, and expiry or review date of the guideline. This allowed readers to quickly judge for themselves the need for a guideline and why they should use our guideline rather than another. Deciding just when to review our guidelines proved difficult,\textsuperscript{40,41} but we aimed for review within 2 years given the likelihood of new research and changes to cardiac practice.

**APPLYING GUIDELINES IN PRACTICE**

The ultimate value of CPG is determined by the impact they have on clinical decision-making and patient care. In our view, the probability that CPG would change care was directly related to the attributes of the guideline itself and the effectiveness of the implementation strategy.

**Guideline attributes**

Our experience in applying BCC guidelines suggested that several guideline attributes are critical to acceptance on the part of practising clinicians.

1 **Relevance.** Guidelines will have limited impact unless the target patient population is clearly defined, the associated burden of disease is significant, a strong evidence base exists to inform practice, and there are perceived evidence-practice gaps which oblige clinicians to acknowledge and adhere to guideline recommendations. Guidelines which do not exhibit these properties are less likely to attract clinician attention or ‘buy-in’.\textsuperscript{42}

2 **Applicability.** A guideline is more likely to be dismissed or misapplied if it is overly complex, ambiguous or difficult to apply in clinical practice.\textsuperscript{43} As an
Table 3  Methods for deriving group consensus†

**Nominal group technique**
This technique uses a highly structured meeting to gather information from guideline panelists (usually 9–12) about specific recommendations. Copies of the draft guidelines and associated literature reviews should be distributed as prereading to all panelists. The meeting consists of two rounds in which panelists rate, discuss, and then rerate a number of recommendations. The meeting is facilitated either by an expert on the topic or a credible nonexpert and is structured as follows:

- Panelists spend several minutes writing down their views about each recommendation.
- Each panelist, in turn, contributes one opinion to the facilitator who records it on a flip chart.
- Similar opinions are grouped together where appropriate, and panelists discuss to clarify and evaluate each opinion.
- Each panelist ranks each opinion (round 1) and the rankings are tabulated and presented.
- The overall ranking is discussed and reranked (round 2).
- The final rankings are tabulated and the results fed back to panelists.

The method can be adapted and conducted as a single meeting or with the first stage conducted by post followed by discussion and rerating at a face to face meeting.

**Delphi process**
The process takes its name from the Delphi oracle’s skills of interpretation and foresight and proceeds in a series of rounds as follows:

- Round 1: Either panelists are invited to provide opinions on a specific recommendation, or the panel as a whole expresses opinions in a face to face meeting.
- These opinions are grouped together under a limited number of headings and guideline recommendations, which include stated opinions, are circulated to all panelists.
- Round 2: Panelists rank their agreement with guideline recommendations after being made aware of the group’s responses and these rankings are summarised and included in a revised version of the guideline recommendations.
- Round 3: Panelists rerank their agreement with each recommendation and these rerankings are assessed for degree of consensus.

If an acceptable degree of consensus is obtained the process may cease with final results fed back to participants; if not the third round is repeated.

The process may be modified by having rounds after the first in which panelists meet to discuss and resolve uncertainties or disagreement and limit the number of further rounds. The Delphi process enables a large group of experts to be contacted cheaply, usually by mail or email, with few geographical limitations on the sample.

**Consensus conference**
The consensus conference method was first formally developed and used by the National Institutes of Health in the USA. This method is useful when the topic is limited to a small number of questions and where there is considerable controversy and limited evidence. This process is based on a meeting of panelists who review the evidence from the literature as presented by experts. There are three phases: A preliminary phase during which questions are well defined, and experts and panel are chosen by organisers. The panel comprises potential end-users who are informed about the methodology of a consensus conference and about the quality of scientific information available. The second phase is the plenary session of the consensus conference which lasts one or two days during which the experts’ texts and presentations are discussed at length by the panel. The third phase is the final meeting of the panel during which guideline recommendations are formulated and agreed to.

†Adapted from Jones and Hunter32, Black et al.33 and Shekelle and Schriger34

Table 4  Grading system for guideline recommendations†

**Grade A recommendations (mandatory or obligatory)**
Based on well designed randomised controlled trials or systematic reviews of such trials (for therapies) OR well designed cross-sectional studies (for diagnostic tests) OR well designed prospective cohort studies (for prognosis)

AND
Consistent clinical results which support the recommendation.

**Grade B recommendations (discretionary)**
Based on non-randomised experimental studies or retrospective cohort studies or case control studies

AND/OR
Less consistent results to support the recommendation.

**Grade C recommendations (highly discretionary)**
All other information sources including uncontrolled studies or expert statements

AND/OR
Considerable variation in results to support the recommendation.

†Adapted from Harbour38 and Guyatt et al.39
example in regards to management of ACS, one reported guideline for unstable angina invoked considerable disagreement amongst emergency physicians in the interpretation of its complicated risk stratification procedure.\textsuperscript{44} We chose to present our guidelines in simple formats such as clinical algorithms and flow charts wherein decision points were made as clear as possible,\textsuperscript{45,46} and avoided vague or controversial recommendations which were unlikely to be followed.\textsuperscript{47} These simple formats contained instructions on how to access the more detailed full-text guidelines for those who wanted more information. Road testing draft guidelines in small-scale pilots before large-scale implementation was undertaken in confirming applicability and we would highly recommend this process to others.

3 Flexibility. Guidelines are often criticised as being too insensitive to the many nuances of providing care to individual patients.\textsuperscript{48,49} In our full-text guidelines, we stated the specific exceptions to our recommendations and indicated alternative evidence-based courses of action. We also avoided making throwaway recommendations which, if religiously followed, might incur significant cost or resource burden. For example we did not mandate that all patients with suspected ACS be admitted to coronary care units (CCU) as we were aware that, in one study of a triage guideline for chest pain, literal interpretation of the guideline led to an inappropriately high usage of CCU beds by low-risk patients.\textsuperscript{50}

4 Measures of benefit and risk. Guideline recommendations can be prioritised and can exert more impact if the benefits and risks to patients of receiving recommended care are expressed in absolute terms.\textsuperscript{51} For as many of our recommendations as possible, we stated the absolute risk reduction (or increase) of an adverse outcome and number needed to treat or harm, a technique which engendered considerable positive feedback.

5 High quality evidence. Although it is still unclear whether evidence-based guidelines in general work any better than those based on narrative consensus,\textsuperscript{52} we were of the view that the latter approach ran a high risk of formalising unsound practice,\textsuperscript{53} and would alienate our clinician audience.

Implementation strategy

Many different strategies are potentially available to implement guidelines and change clinical practice. We accepted the published literature consensus that a multifaceted approach was required in the absence of a single effective strategy.\textsuperscript{54} Our choice of strategies was based on our perception of available resources, likely barriers to change, and evidence of effectiveness of different strategies.\textsuperscript{55}

We found the PRECEDE model of behaviour change very useful in guiding our efforts in its articulation of how such change occurs.\textsuperscript{56} The predisposing phase raises awareness of the need for guidelines by profiling evidence-practice gaps in current care (obtained from guideline-based clinical audits) and challenging existing clinical culture. The enabling phase ensures clinicians understand the guidelines and know how to access and apply them and the maintenance phase involves identifying and overcoming ongoing barriers to guideline uptake while providing feedback and rewarding changes in care resulting from such uptake.

Predisposing phase

As a predisposing strategy, we combined dissemination of our guidelines with presentations of past and recent audits in participating hospitals, as well as relevant studies from the published literature, which profiled problems with specific aspects of care.

Enabling phase

In the enabling phase we employed a toolkit of interventions aimed at maximising guideline use for which there was empirical evidence of effect and which addressed several of the perceived local barriers to use.

1 Ease of access. Bound, paper-based guidelines sitting on office shelves or stored, unindexed, in filing cabinets will not be used in busy clinical practice. No one is going to reach for a guideline that looks and feels like a textbook. Consequently, we invested heavily in producing small pocket cards, concise pamphlets, and guideline summaries which we anticipated would be preferred to more discursive formats,\textsuperscript{6,8} particularly by more junior or inexperienced clinicians. Guidelines presented as wall charts, laminated guides, or icons on desktop computers also served to keep recommendations in the eye of busy clinicians. We also customised guideline formats to suit the needs of the end-user. For example, brief, algorithmic formats were directed at interns and residents while more detailed, referenced guidelines were promoted to registrars and consultants.

2 Educational strategies. We were aware of the considerable published literature that shows that traditional educational strategies, such as mail-outs of printed guidelines and didactic methods of instruction, fail to produce sustained changes in practice.\textsuperscript{57} As a result, we used regularly scheduled interactive, case-based, small group seminars and workshops to provide opportunities for participants to discuss the practical interpretation and individualised application of guideline recommendations, and to embed discussion about guideline recommendations within an analysis of identified evidence-practice gaps at local level.\textsuperscript{58,59}

3 Use of opinion leaders. Clinicians with the ability to influence the views and behaviour of their colleagues were employed in the small groups mentioned above to promote guideline uptake by providing clear explanations and endorsement of the need for guidelines and the likely improvements.
in care that would result from their widespread adoption.\textsuperscript{60,61}

4 \textit{Academic detailing}. This refers to one-on-one education of clinicians\textsuperscript{62} by a content expert in the subject’s work environment. This task was performed by clinical pharmacists in BCC who accompanied consultants and registrars on ward rounds, undertook in-service training of senior nurses, liaised with individual members of staff, and presented at educational forums. We surmised that a humanised interactive approach to decision support was just as important as electronic or other forms of decision support. We were encouraged by reported evidence of effectiveness of pharmacist detailing in improving prescribing of key medications, particularly for patients with CHF.\textsuperscript{63}

5 \textit{Guideline-based prompts, reminders, and checklists}. Such tools when provided at the point of care help ensure consistent enactment of guideline recommendations.\textsuperscript{54,1} We employed both clinician-mediated tools (e.g. bedside prescribing checklists and chart stickers directed at clinicians by other members of the health care team such as pharmacists or nurses) and patient-mediated tools (e.g. a patient checklist which prompted patients to enquire whether they were receiving specific treatments and if not, why not).\textsuperscript{65}

Patient mediated tools empowered patients to educate and actively involve themselves in clinical decision-making, and, similar to experience elsewhere, was acceptable to clinicians in our program.\textsuperscript{65}

Computerised discharge summary formats were developed that served as guideline reminders to both hospital medical staff and GPs in that they mandated the former to prescribe, and the latter to actively consider, medication lists and rationales, therapeutic goals, and risk factor targets.\textsuperscript{66}

Finally, forms used to obtain feedback from GPs about whether specific processes of care were being provided to individual patients served as another means for reminding GPs of guideline recommendations.

6 \textit{Computerised clinical decision support}. Despite evidence that computerised aids can improve drug prescribing and preventive care,\textsuperscript{67} we lacked the sophisticated, mobile systems required to deliver such decision support. We suspect our experience in this regard is similar to most hospitals in Australasia. Results of the Austin Bowel Cancer CSSP which tested the feasibility of guideline-assisted decision-making using personal digital assistants\textsuperscript{68} are awaited with interest. Major advances are expected in this field now that a national framework for developing electronic decision support in health has been formulated.\textsuperscript{69}

The reinforcing phase

The reinforcing phase consisted primarily of cyclical feedback of results of clinical audits which compared observed practice with guideline-based best practice. Such audits, coupled with continuation of the enabling strategies mentioned above, served as a powerful motivation for change,\textsuperscript{70,71} enhanced by the inclusion of peer-referenced feedback comparing performance of different clinician groups at specialty or hospital level.\textsuperscript{72}

During the course of our project, our efforts were vindicated by the publication of controlled trials which confirmed the positive impact on clinical outcomes of multifaceted approaches to translating guidelines into practice.\textsuperscript{73}

**OVERCOMING BARRIERS TO GUIDELINE IMPLEMENTATION**

Despite best intentions on the part of clinicians, adherence to guidelines may be compromised by insufficient clinician knowledge and skills, patient non-adherence, or environmental barriers.\textsuperscript{74}

Educating clinicians and empowering patients in the ways already described help overcome the first two barriers.

As for environmental factors, these are often portrayed as structural problems outside the control of physicians such as inadequate levels of resources, staff, or time, or inappropriate system design or work practices. However, on closer examination, these constraints are not insurmountable. Raising awareness of guideline-discordant care can build motivation for multidisciplinary groups to redesign care processes, achieve interdisciplinary consensus as to the most appropriate forms of care, and align management objectives with clinical policies.\textsuperscript{75}

We demonstrated how this could work in optimising care of patients with ACS in our hospital emergency departments.

**EVALUATING SUCCESS OF GUIDELINE IMPLEMENTATION**

The success of our guideline implementation can be evaluated in two ways: (i) a utilisation evaluation of the achieved level of coverage of the target groups in terms of guideline awareness and use and (ii) an outcomes evaluation of the impact of guideline implementation in improving quality of care.

Utilisation evaluation

All cardiologists, general physicians, emergency physicians, and registrars and residents undertaking rotations in these respective disciplines in participating hospitals throughout the program period (approximately 200 clinicians in total) received guidelines in one form or another (full-text guidelines in the case of consultants and senior registrars; pocket guides for junior staff) and attended, in the case of junior staff, at least one guideline education session. Approximately 1100 general practitioners received laminated desk-top guides and 1 in 4 attended at least one case-based guideline awareness forum or practice-based detailing session. Over a 12-month period up to June 2002, the BCC website recorded 3355 hits for full-text guidelines, 1255 hits for 2-page summaries, and 505 hits for the pocket guides, while 500 hits were recorded for full-text guidelines on
the Queensland Health CPG website (David Harvey, personal communication, July 2003).

Although formal surveys were not conducted, focus group discussions and observations made by senior clinicians and clinical pharmacists indicated that the majority of the target group appeared to be aware of the guidelines and that many, including the majority of junior hospital staff and GPs, had used them in practice and found them to be useful.

There was no doubt that the interdisciplinary consensus about different aspects of disease management that came from formulating guideline recommendations using group processes was one of the sentinel achievements of our program. Areas of practice previously characterised by uncertainty or disagreement as a result of lack of group consensus were given greater clarity (e.g. the processing of patients for lysis in the emergency department vs transfer to the cardiac catheterisation laboratory for primary angioplasty; early request for coronary angiography; referral at discharge to cardiac rehabilitation).

Areas where, at project conclusion, there remained potential for improvement in our guideline program were: (i) dissemination to, and uptake by, non-medical health professionals (nurses and allied health professionals); (ii) integration of guideline recommendations into clinical pathways; (iii) conversion of paper formats into portable electronic versions and (iv) more timely revision of a minority of guideline recommendations as new research evidence came to hand (e.g. increased indications for percutaneous coronary interventions in ACS; use of β-blockers in severe grades of CHF).

Outcomes evaluation

It is impossible to gauge the outcome effects of CPG implementation alone in a program which featured the concurrent deployment of several other quality improvement interventions such as pharmacist detailing, patient self-management strategies, and repeated performance feedback. However, it is fair to say that the success of the total package of interventions was highly dependent on the intensity of dissemination and use of the guidelines as the initial intervention, and the resource and organisational constraints placed upon the successful enactment of specific guideline recommendations (such as access to fast-track lysis in emergency departments, invasive coronary procedures and echocardiography). As detailed results of our program are described elsewhere,15,76,77 only a brief summary of guideline-mandated changes in practice will be presented here.

In regards to in-hospital care, significantly more (P ≤ 0.05) eligible patients with ACS in the postintervention than in baseline period received:

• Referral to outpatient cardiac rehabilitation (100% increase)

However, there was no significant increase in the number of patients undergoing early coronary angiography or revascularisation (although baseline rates were already averaging 90% in highly eligible patients), and only a slightly upward trend in the numbers of patients who received lysis within 30 min of hospital arrival.

Compared to baseline, significantly more (P ≤ 0.05) patients with CHF in the postintervention period received:

• Assessment for potentially reversible precipitating factors (20% increase)
• Assessment for thyroid function status in the presence of atrial fibrillation (52% increase)
• Prophylaxis for deep venous thrombosis (140% increase)
• β-blockers at discharge (66% increase)
• Referral for follow-up at hospital clinics within 4 weeks of discharge (28% increase)

In contrast, the numbers of patients undergoing left ventricular function assessment remained unchanged (at approximately 65%) as did the proportion receiving either ACE inhibitors (75%) or alternative second-line vasodilators (20%).

CONCLUSION

Our experience within BCC reinforces the view that developing sound, evidence-based guidelines is not enough to improve care. If guidelines are to be translated into effective decision support, careful attention is needed in regards to guideline attributes, choice of implementation strategies, and methods for overcoming internal and external barriers. The methods described here have the benefit of being tested in a real-world quality improvement program and of having empirical support from recent published literature.

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