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Optimizing the language and format of guidelines to improve guideline uptake

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Organizations around the world produce clinical practice guidelines at an astonishing pace, with great effort and at substantial cost.[1] Unfortunately, despite broad dissemination efforts, large gaps remain between guideline recommendations and real-world practice across health systems, practitioner and patient types, and diseases.[2] Conventional approaches to guideline implementation use the guideline as a starting point and manipulate factors external to the guideline (e.g., provider knowledge and practice workflow) to optimize its uptake.[1] However, it is becoming increasingly clear that certain features of the guideline itself may also influence its uptake. We explore how the language and format used in a guideline may affect how likely it is to be followed in real-world practice. We offer practical tips to optimize these features in an effort to increase a guideline's uptake.

Why don't clinicians use guidelines?

Clinicians complain that guidelines are too lengthy, ambiguous and complex[3–5] and that they are presented in too rigid a fashion for practical application in individual cases.[6–9] In a review of 41 qualitative studies, incomprehensible structure, poor usability and poor local applicability of guidelines were identified as the key barriers to their implementation.[10] In particular, primary care physicians perceive barriers and facilitators to guideline uptake almost exclusively according to their format, language and usability.[11] Accordingly, the style in which a guideline is written (e.g., providing suggested actions rather than prohibitive rules) influences how it is received and whether it will be followed.[12] In an observational study involving general practitioners in the Netherlands, vague and imprecisely defined recommendations were followed in 36% of clinical decisions, whereas clear recommendations were followed in 67% of decisions.[13]

The influence of these "intrinsic" guideline characteristics[14] on clinicians' intention to practise and their actual practise of recommended behaviours has been recognized for more than a decade.[13,15–17] Recently, an extensive review of these characteristics[18] has enabled the development and validation of a set of key principles to optimize the implementability of guidelines — the Guideline Implementability for Decision Excellence Model (GUIDE-M) (Appendix 1, available at www.cmaj.ca/lookup/suppl/doi:10.1503/cmaj.151102/-/DC1). These principles include (a) credible and representative developers of guideline content, (b) high-quality synthesis and contextualization of evidence for creating guideline content and (c) optimal use of language and format to convey recommendations.[19]

Why are the language and format of guidelines so important?

A growing body of literature suggests that the language of recommendations has to be simple, clear and persuasive to reduce cognitive load, increase understanding and retention, and render convincing and salient arguments.[18] The level of complexity is inversely proportional to overall guideline adoption[20,21] and adherence to recommendations.[22,23]

At the same time, a number of formatting aspects of guidelines can help to promote their use in practice.[12,24] These include presentation aspects such as a user-friendly layout (e.g., considering document length and the placement of visual elements), structure (e.g., bundling information and matching the order and flow of recommendations to that of real-world practice) and how information is best visualized (e.g., conveying complex recommendations through tables, graphs and flowcharts). Some of these common design principles for scientific communication have an empirical foundation, whereas many others are derived from best practices and user preferences. However, because most formatting principles are based on cognitive processes, they are likely to be generalizable across disciplines and contexts.[18]

Studies have shown that efforts to improve language and format according to best evidence

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can improve the uptake of recommendations. In a randomized controlled trial (RCT) of guideline writing styles, a more specific and actionable recommendation increased appropriate ordering of tests and decreased inappropriate ordering.[25] Furthermore, compared with no guideline at all, the nonspecific guideline led to a *decrease* in appropriate ordering,[25] which suggests that a poorly written guideline may be harmful. In another RCT, evidence-based improvements to language style and specificity of recommendations in a guideline led to users having stronger intentions to implement the recommendations, greater perceived control over their ability to implement guideline-recommended behaviours and more positive attitudes toward the guideline, compared with the original version.[17]

Examples from recent guidelines

To illustrate some of these concepts, we have chosen examples from the latest guidelines for three of the most common chronic conditions in Canada: diabetes, asthma and ischemic heart disease.[26] In each example, we display a recommendation from a published guideline and highlight problem areas related to the corresponding language or format "construct" (where relevant, we also highlight issues related to the creation of content). We then present a suggested revision of the recommendation that attempts to address these problems. (More detailed descriptions of the constructs are presented in Appendix 2, available at www.cmaj.ca/lookup/suppl/doi:10.1503/cmaj.151102/-/DC1.) A member of each original guideline committee was asked to comment on these issues and to provide content expertise in crafting the revised recommendations (A.Y.Y.C. for diabetes, K.A.C. for ischemic heart disease, and L.P.B. for asthma). Although format is no less important than language, each example raised multiple language-related issues, but only a few format-related ones; therefore, most of the highlighted issues relate to language.

Example 1

Figure 1 features several examples of ambiguous language in a recommendation from the Canadian Diabetes Association 2013 clinical practice guidelines for the prevention and management of diabetes in Canada.[27] Ambiguity arises when guidelines do not clearly and consistently specify recommended actions and parameters on which decisions should be based.[23,28] This can lead to vague recommendations that are unlikely to guide practice in a meaningful way.[29] The first bullet point in the recommendation in Figure 1 is conditional on a situation in which "glycemic control is not being achieved." Failure to provide a definition of suboptimal glycemic control introduces *semantic ambiguity*, whereby different users of the guideline may reasonably interpret this condition in different ways. The same bullet point recommends "training of healthcare providers and patients." However, both the nature of this training and how this task should be operationalized are unclear[23] (e.g., should health care providers receive the training first and then train their patients, or should both health care providers and patients undergo the same training simultaneously?), which introduces *task ambiguity.*

The recommendation in Figure 1 also fails to identify which of the several possible health care providers typically involved in diabetes care should undergo the training or assume responsibility for subsequent patient training (e.g., primary care physicians might think that the recommendation is aimed exclusively at specialists, and vice versa). This introduces *responsibility ambiguity*.[23]

Ambiguity can be overcome by using propositional and semantic analysis techniques (which systematically identify ambiguous areas in the text that lead to misunderstandings)[30] and subsequent disambiguation (establishment of a single semantic interpretation for a recommended statement).[28] Ultimately, each recommendation should specify what action is required, by whom and when (under what specific conditions).[16,31]

Similarly, recommendations for "periodic pre- and postprandial measurements" (first bullet point in Figure 1) and "infrequent [self-monitoring of blood glucose]" (second bullet point) represent a failure to use *specific* language. Use of "periodic" and "infrequent" leaves the recommendation open to broad interpretation. In turn, this can lead to reduced adherence or increased practice variation, or both.[32] When guideline developers intend to establish "ceilings and floors" around specific actions, use of concrete statements to clarify frequencies and quantities increases the extent to which information is understood and remembered.[16]

Example 2

Figure 2 has several examples of implementability problems related to how guideline content was created. The sample recommendations are from the Canadian Thoracic Society 2012 guideline on the diagnosis and management of asthma.[33] The recommendation for clinicians to change their patient's inhaler device challenges *compatibility* with existing prescribing habits. Because many clinicians may have a preferred product in each class of inhalers that they are most familiar with, implementation could be limited by both resistance to this change[34] and the cognitive load associated with adopting this change.[35] Also, this represents a new norm, and changes in practice that are incom-

patible with existing norms are less likely to be adopted.[13,36–38] In situations where such recommendations are unavoidable, implementability can be improved by clearly laying out exactly what changes are required[39] and how the innovation will improve the provider's performance.[40]

The recommendation also raises concerns about *patient preferences*. Patients may be reluctant to change their inhaler device because of personal preference and concerns about adverse effects.[41,42] The guideline developers themselves acknowledged that a switch to budesonide–formoterol has been associated with a twofold increase in discontinuation due to adverse effects.[33,43] Pressure on physicians to accommodate patient preference plays an important role in guideline adherence.[44] Accordingly, avoiding blanket recommendations in favour of a menu of options allowing clinicians to consider potentially divergent patient choices and values would be expected to improve adherence.[31,45,46] This not only reflects users' clinical reality, but it also presents an opportunity for shared decision-making.[47] Understanding of the breadth of patient preferences can be improved further through direct patient input during guideline development.[48,49] Guideline developers can also include metrics such as the number needed to treat or harm, which clinicians can use to empower patients to apply their personal values in the shared decision-making process.[50]

We also noted that a different section of the same guideline represented in Figure 2 offered a contradictory recommendation (initiation of a leukotriene receptor antagonist) for the same clinical scenario (patients whose asthma is not controlled with the combination of an inhaled corticosteroid and long-acting β-agonist). This contradiction represents a case of *pragmatic ambiguity*, leaving readers confused as to which of the two recommendations should be applied.[51] The guideline developers could instead have presented both possible courses of action with use of the boolean operator "or"[20] and a list of conditions indicating

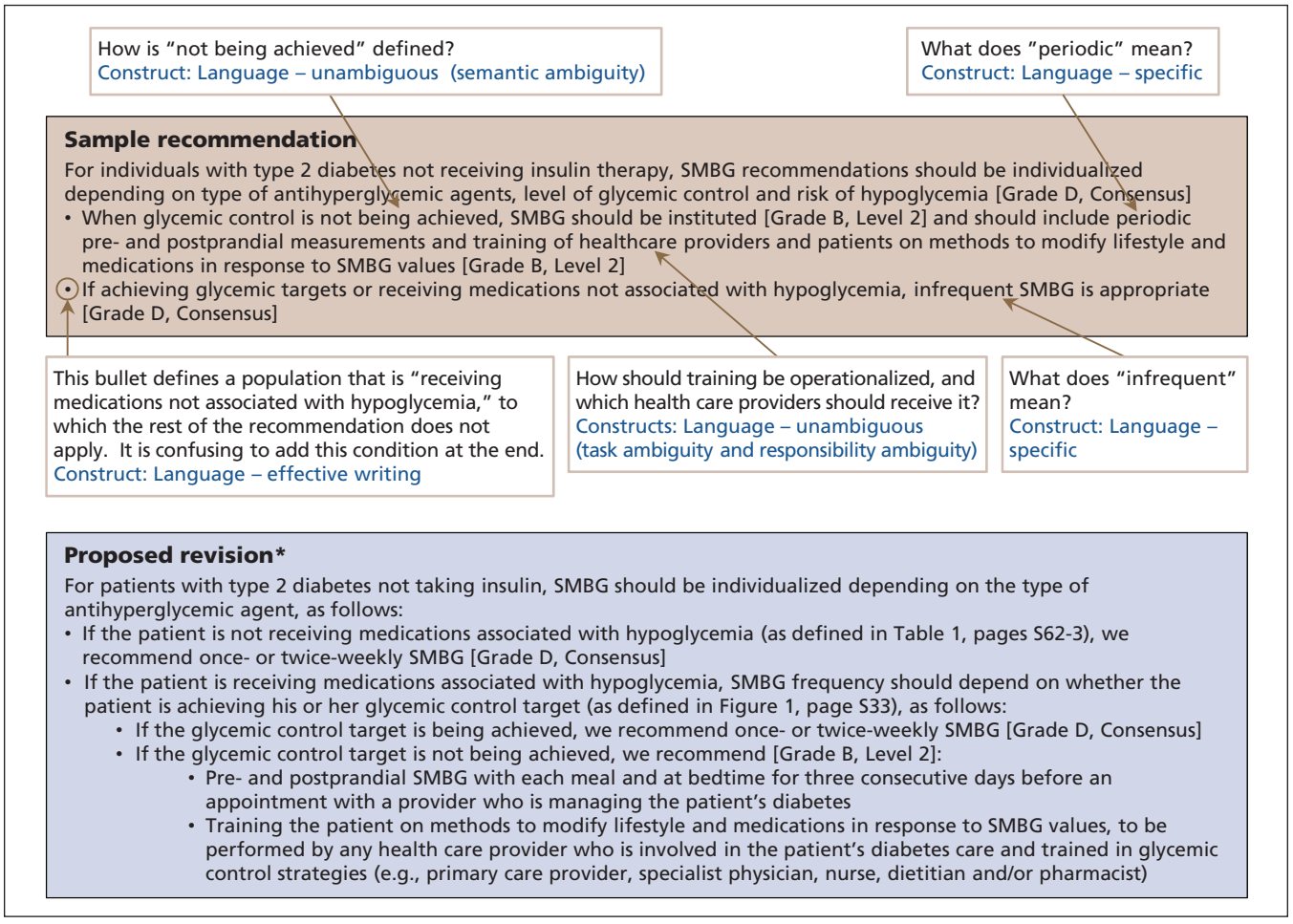

Figure 1: Recommendation for monitoring glycemic control in patients with diabetes, taken from the 2013 clinical practice guidelines for the prevention and management of diabetes in Canada (page S37).[27] Beige box: original recommendation with identified problems and corresponding constructs. Blue box: proposed revision. *The proposed revision is for explanatory purposes only and should not be interpreted as an actual guideline recommendation. SMBG = self-monitoring of blood glucose. (See Appendix 2 for definitions of the constructs, available at www.cmaj.ca/lookup/suppl/doi:10.1503/cmaj.151102/-/DC1.)

when one option should be favoured over the other. The contradictory recommendation was also presented without any level of evidence, thereby failing to meet criteria for *completeness of reporting the evidence base*. The omission leaves readers unsure about both the quality of underlying evidence and the strength of the corresponding recommendation and lessens the likelihood they will follow the recommendation.[31,52]

Example 3

Appendix 3 (available at www.cmaj.ca/lookup/suppl/doi:10.1503/cmaj.151102/-/DC1) contains several examples of both language and format concerns. The sample recommendations are from the 2014 Canadian Cardiovascular Society guidelines for the diagnosis and management of stable ischemic heart disease.[53] In terms of language, one recommendation suggests the addition of a nitrate

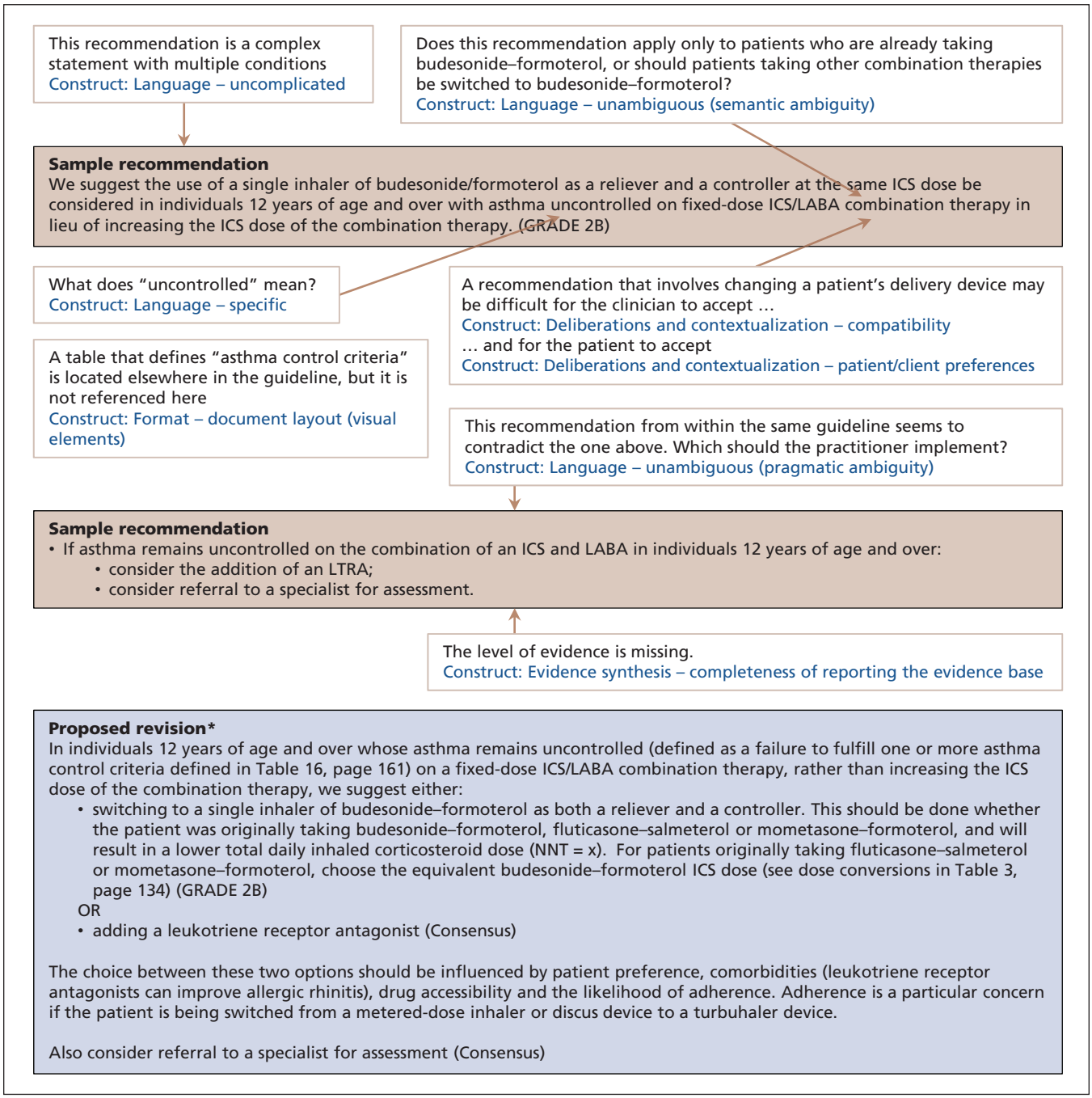

Figure 2: Recommendations for the management of patients with asthma uncontrolled on fixed-dose combination ICS/LABA therapy, taken from the Canadian Thoracic Society 2012 guideline on the diagnosis and management of asthma (p. 144 and 158).[33] Beige boxes: original recommendations with identified problems and corresponding constructs. Blue box: proposed revision. *The proposed revision is for explanatory purposes only and should not be interpreted as an actual guideline recommendation. ICS = inhaled corticosteroid, LABA = long-acting β_2-agonist, LTRA = leukotriene receptor agonist.

when treatment with a β-blocker and/or a long-acting calcium-channel blocker "is not tolerated or contraindicated." Failure to provide a definition or example of intolerance or contraindication constitutes *exception ambiguity*, whereby the circumstances in which clinicians should make an "exception" to this recommendation (because the risk of the medication outweighs its benefits) are not clearly defined.[54]

In another example, a negative recommendation (describing what treatments *not* to use for angina management) is interspersed with positive recommendations. The word "not" in front of a recommendation is considered a "killer" term, because it is both easy and dangerous to overlook.[55] At best, this creates confusion, slows down the reader[56] and reduces guideline acceptance[57,58] and compliance.[59] At worst, it leads to an erroneous interpretation of the recommendations. Accordingly, *effective writing* requires negative recommendations to be clearly separated from positive ones.[55]

In another recommendation regarding implementation and optimization of medical therapy, the timelines, patient population and assessment criteria to determine adequacy of therapy are all described in a single sentence (Appendix 3). This recommendation includes multiple steps[37,57] in a complex decision tree[13,36,60] as well as different conditional factors that should influence the clinician's approach.[13,61] This type of complexity hinders understanding and persuasiveness and may render recommendations more difficult to accept[22,62] and thus less likely to be implemented.[37,63] Managing this complexity to produce *uncomplicated* recommendations requires "atomization" — the process of extracting and presenting individual concepts from the complex recommendation.[64]

The same recommendation refers to "high-risk features." Although not referenced specifically, a table located elsewhere in the guideline clearly defines such features. This is a format issue, whereby *visual elements* (e.g., a table) that is required to understand a recommendation should be easily and quickly accessible to readers.[65,66] This promotes simplicity and ease of use,[12,24,67] both of which influence real-world guideline uptake.[68,69]

Finally, the individual recommendations presented in Appendix 3 are a complex set of interrelated conditional statements and options that must be considered together in order to manage an individual patient's angina. This amount and complexity of information can easily result in "information overload," whereby users become so saturated that important information is lost and the person's interest in the information is diminished.[70] Best *information display* practices attempt to shift cognitive load to the human perceptual system by presenting information in a visual form that facilitates exploration and understanding and leads to better, faster and more confident decisions.[71] In this case, a flowchart of the clinical decision pathway, such as the one we have created (Appendix 4, available at www.cmaj.ca/lookup/suppl/doi:10.1503/cmaj.151102/-/DC1), would enable an understanding of how individual recommendations relate to one another.[72] It could be structured in a sequence that mimics a real patient encounter, enabling users to follow a more natural mapping process and to assimilate information better.[73] When the decision logic is complex and the temporal sequence of activities is unclear,[31] use of such strategies can improve guideline utilization.[74]

Where do guideline developers go from here?

Improving the intrinsic characteristics of guidelines will require effort by professional societies that produce guidelines, guideline writers themselves and guideline scientists. The first steps are to create awareness among guideline societies and to convince guideline writers of the importance of these issues. Practically, these stakeholders will need to allocate additional time and resources for application of language and format principles in the guideline process. Ideally, end-users of a guideline should also be involved in this process. Recent work suggests that primary care physicians can be successfully engaged in objectively assessing language and format attributes of recommendations and improving these according to their preferences[11] (a worksheet from this process is included in Appendix 5, available at www.cmaj.ca/lookup/suppl/doi:10.1503/cmaj.151102/-/DC1). Efforts could be initiated by individual guideline committees. Alternatively, medical societies that produce multiple guidelines may choose to build a team consisting of intended users (e.g., primary care providers), graphic designers and professional writers tasked with assessing and optimizing draft recommendations for multiple guidelines.[13] As a final validation step, optimized recommendations could be pilot tested by real-world users given clinical vignettes to gauge their understanding of the recommendations,[75] with a mechanism for structured feedback for further improvements.

Conclusion

Poor uptake of guidelines continues to be a major challenge across health systems, greatly limiting our ability to deliver the benefits of advancing research to patients. We believe that approaches that focus on factors external to the guideline as well as those that consider intrinsic guideline characteristics will be needed to tackle this challenge.

However, given that conventional external implementation strategies of varying cost and complexity have had only modest impacts on care, addressing *how* guidelines are written may be the simpler and more cost-effective intervention to augment their uptake. Furthermore, a basic set of such principles is likely to be applicable across content areas and thus easier to implement widely than conventional implementation approaches, which are context dependent. Guideline scientists and guideline developers need to collaborate to establish and refine methods to operationalize these concepts easily, and to measure the impact objectively on both guideline uptake and patient-relevant outcomes.

References

1. Grimshaw JM, Thomas RE, MacLennan G, et al. Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technol Assess* 2004;8:iii-iv, 1-72.
2. McGlynn EA, Asch SM, Adams J, et al. The quality of health care delivered to adults in the United States. *N Engl J Med* 2003; 348:2635-45.
3. Mazza D, Russell SJ. Are GPs using clinical practice guidelines? *Aust Fam Physician* 2001;30:817-21.
4. Lugtenberg M, Zegers-van Schaick JM, Westert GP, et al. Why don't physicians adhere to guideline recommendations in practice? An analysis of barriers among Dutch general practitioners. *Implement Sci* 2009;4:54.
5. Francke AL, Smit MC, de Veer AJ, et al. Factors influencing the implementation of clinical guidelines for health care professionals: a systematic meta-review. *BMC Med Inform Decis Mak* 2008;8:38.
6. Farquhar CM, Kofa EW, Slutsky JR. Clinicians' attitudes to clinical practice guidelines: a systematic review. *Med J Aust* 2002;177: 502-6.
7. Smith L, Walker A, Gilhooly K. Clinical guidelines of depression: a qualitative study of GPs' views. *J Fam Pract* 2004;53:556-61.
8. Veldhuijzen W, Ram PM, van der Weijden T, et al. Characteristics of communication guidelines that facilitate or impede guideline use: a focus group study. *BMC Fam Pract* 2007;8:31.
9. Lugtenberg M, Burgers JS, Besters CF, et al. Perceived barriers to guideline adherence: a survey among general practitioners. *BMC Fam Pract* 2011;12:98.
10. Cochrane LJ, Olson CA, Murray S, et al. Gaps between knowing and doing: understanding and assessing the barriers to optimal health care. *J Contin Educ Health Prof* 2007;27:94-102.
11. Kastner M, Estey E, Hayden L, et al. The development of a guideline implementability tool (GUIDE-IT): a qualitative study of family physician perspectives. *BMC Fam Pract* 2014;15:19.
12. Carlsen B, Glenton C, Pope C. Thou shalt versus thou shalt not: a meta-synthesis of GPs' attitudes to clinical practice guidelines. *Br J Gen Pract* 2007;57:971-8.
13. Grol R, Dalhuijsen J, Thomas S, et al. Attributes of clinical guidelines that influence use of guidelines in general practice: observational study. *BMJ* 1998;317:858-61.
14. Gagliardi AR, Brouwers MC, Bhattacharyya OK. The Guideline Implementability Research and Application Network (GIRAnet): an international collaborative to support knowledge exchange: study protocol. *Implement Sci* 2012;7:26.
15. Shiffman RN, Dixon J, Brandt C, et al. The GuideLine Implementability Appraisal (GLIA): development of an instrument to identify obstacles to guideline implementation. *BMC Med Inform Decis Mak* 2005;5:23.
16. Michie S, Johnston M. Changing clinical behaviour by making guidelines specific. *BMJ* 2004;328:343-5.
17. Michie S, Lester K. Words matter: increasing the implementation of clinical guidelines. *Qual Saf Health Care* 2005;14:367-70.
18. Kastner M, Bhattacharyya O, Hayden L, et al. Guideline uptake is influenced by six implementability domains for creating and communicating guidelines: a realist review. *J Clin Epidemiol* 2015; 68:498-509.
19. Brouwers MC, Makarski J, Kastner M, et al.; GUIDE-M Research Team. The Guideline Implementability Decision Excellence Model (GUIDE-M): a mixed methods approach to create an international resource to advance the practice guideline field. *Implement Sci* 2015;10:36.
20. Scott SD, Plotnikoff RC, Karunamuni N, et al. Factors influencing the adoption of an innovation: an examination of the uptake of the Canadian Heart Health Kit (HHK). *Implement Sci* 2008;3:41.
21. Tornatzky LG, Klein KJ. Innovation characteristics and innovation adoption-implementation: a meta-analysis of findings. *IEEE Trans Eng Manage* 1982;29:28-43.
22. Rashidian A, Eccles MP, Russell I. Falling on stony ground? A qualitative study of implementation of clinical guidelines' prescribing recommendations in primary care. *Health Policy* 2008; 85:148-61.
23. Gurses AP, Marsteller JA, Ozok AA, et al. Using an interdisciplinary approach to identify factors that affect clinicians' compliance with evidence-based guidelines. *Crit Care Med* 2010;38(Suppl): S282-91.
24. Gagliardi AR, Brouwers MC, Palda VA, et al. How can we improve guideline use? A conceptual framework of implementability. *Implement Sci* 2011;6:26.
25. Shekelle PG, Kravitz RL, Beart J, et al. Are nonspecific practice guidelines potentially harmful? A randomized comparison of the effect of nonspecific versus specific guidelines on physician decision making. *Health Serv Res* 2000;34:1429-48.
26. Chronic disease facts and figures. Ottawa: Public Health Agency of Canada; 2015. Available: www.phac-aspc.gc.ca/cd-mc/facts_figures-faits_chiffres-eng.php (accessed 2015 Aug. 29).
27. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2013 clinical practice guidelines for the prevention and management of diabetes in Canada. *Can J Diabetes* 2013;37(Suppl 1):S1-212.
28. Shiffman RN, Michel G, Essaihi A, et al. Bridging the guideline implementation gap: a systematic, document-centered approach to guideline implementation. *J Am Med Inform Assoc* 2004;11: 418-26.
29. Flanders SA, Halm EA. Guidelines for community-acquired pneumonia: Are they reflected in practice? *Treat Respir Med* 2004;3:67-77.
30. Patel VL, Arocha JF, Diermeier M, et al. Methods of cognitive analysis to support the design and evaluation of biomedical systems: the case of clinical practice guidelines. *J Biomed Inform* 2001;34:52-66.
31. Rosenfeld RM, Shiffman RN. Clinical practice guideline development manual: a quality-driven approach for translating evidence into action. *Otolaryngol Head Neck Surg* 2009;140(Suppl 1):S1-43.
32. Codish S, Shiffman RN. A model of ambiguity and vagueness in clinical practice guideline recommendations. *AMIA Annu Symp Proc* 2005:146-50.
33. Lougheed MD, Lemiere C, Ducharme FM, et al.; Canadian Thoracic Society Asthma Clinical Assembly. Canadian Thoracic Society 2012 guideline update: diagnosis and management of asthma in preschoolers, children and adults. *Can Respir J* 2012;19:127-64.
34. Redelmeier DA, Ferris LE, Tu JV, et al. Problems for clinical judgement: introducting cognitive psychology as one more basic science. *CMAJ* 2001;164:358-60.
35. Farrington J. From the research: myths worth dispelling seven plus or minus two. *Performance Improvement Quarterly* 2011;23:113-6.
36. Burgers JS, Grol RP, Zaat JO, et al. Characteristics of effective clinical guidelines for general practice. *Br J Gen Pract* 2003;53:15-9.
37. Foy R, MacLennan G, Grimshaw J, et al. Attributes of clinical recommendations that influence change in practice following audit and feedback. *J Clin Epidemiol* 2002;55:717-22.
38. Lugtenberg M, Burgers JS, Zegers-van Schaick JM, et al. Guidelines on uncomplicated urinary tract infections are difficult to follow: perceived barriers and suggested interventions. *BMC Fam Pract* 2010;11:51.
39. McAlister FA, van Diepen S, Padwal RS, et al. How evidence-based are the recommendations in evidence-based guidelines? *PLoS Med* 2007;4:e250.
40. Thompson RL, Higgins CA, Howell JM. Personal computing: toward a conceptual model of utilization. *Manage Inf Syst Q* 1991;15:125-43.
41. Rau JL. Determinants of patient adherence to an aerosol regimen. *Respir Care* 2005;50:1346-56, discussion 57-9.
42. Björnsdóttir US, Gizurarson S, Sabale U. Potential negative consequences of non-consented switch of inhaled medications and devices in asthma patients. *Int J Clin Pract* 2013;67:904-10.
43. Cates CJ, Lasserson TJ. Combination formoterol and budesonide as maintenance and reliever therapy versus inhaled steroid maintenance for chronic asthma in adults and children. *Cochrane Database Syst Rev* 2009;(2):CD007313.
44. Tan KB. Clinical practice guidelines: a critical review. *Int J Health Care Qual Assur Inc Leadersh Health Serv* 2006;19:195-220.
45. Shaneyfelt TM, Mayo-Smith MF, Rothwangl J. Are guidelines following guidelines? The methodological quality of clinical practice guidelines in the peer-reviewed medical literature. *JAMA* 1999;281:1900-5.

46. Tudiver F, Guibert R, Haggerty J, et al. What influences family physicians' cancer screening decisions when practice guidelines are unclear or conflicting? *J Fam Pract* 2002;51:760.
47. Shapiro DW, Lasker RD, Bindman AB, et al. Containing costs while improving quality of care: the role of profiling and practice guidelines. *Annu Rev Public Health* 1993;14:219-41.
48. Verkerk K, Van Veenendaal H, Severens JL, et al. Considered judgement in evidence-based guideline development. *Int J Qual Health Care* 2006;18:365-9.
49. *SIGN 50: a guideline developer's handbook*. Edinburgh: Scottish Intercollegiate Guidelines Network; 2015. Available: www.sign.ac.uk/pdf/sign50.pdf (accessed 2015 Dec. 3).
50. Hahn DL. Importance of evidence grading for guideline implementation: the example of asthma. *Ann Fam Med* 2009;7:364-9.
51. Goud R, van Engen-Verheul M, de Keizer NF, et al. The effect of computerized decision support on barriers to guideline implementation: a qualitative study in outpatient cardiac rehabilitation. *Int J Med Inform* 2010;79:430-7.
52. Brouwers MC, Kho ME, Browman GP, et al. AGREE II: advancing guideline development, reporting and evaluation in health care. *CMAJ* 2010;182:E839-42.
53. Mancini GB, Gosselin G, Chow B, et al.; Canadian Cardiovascular Society. Canadian Cardiovascular Society guidelines for the diagnosis and management of stable ischemic heart disease. *Can J Cardiol* 2014;30:837-49.
54. Gurses AP, Seidl KL, Vaidya V, et al. Systems ambiguity and guideline compliance: a qualitative study of how intensive care units follow evidence-based guidelines to reduce healthcare-associated infections. *Qual Saf Health Care* 2008;17:351-9.
55. Gawande A. *The checklist manifesto: how to get things right*. New York: Metropolitan Books; 2010.
56. Gaetner-Johnston L. *Best practices for bullet points*. Seattle: Syntax Training; 2005. Available: www.businesswritingblog.com/business_writing/2005/12/the_best_of_bul.html (accessed 2016 Jan. 27).
57. Milner KK, Valenstein M. A comparison of guidelines for the treatment of schizophrenia. *Psychiatr Serv* 2002;53:888-90.
58. Watine J, Friedberg B, Nagy E, et al. Conflict between guideline methodologic quality and recommendation validity: a potential problem for practitioners. *Clin Chem* 2006;52:65-72.
59. Gagliardi AR, Brouwers MC, Palda VA, et al. An exploration of how guideline developer capacity and guideline implementability influence implementation and adoption: study protocol. *Implement Sci* 2009;4:36.
60. van der Weijden T, Grol RP, Knottnerus JA. Feasibility of a national cholesterol guideline in daily practice. A randomized controlled trial in 20 general practices. *Int J Qual Health Care* 1999;11:131-7.
61. Garfield FB, Garfield JM. Clinical judgment and clinical practice guidelines. *Int J Technol Assess Health Care* 2000;16:1050-60.
62. Ball K. Surgical smoke evacuation guidelines: compliance among perioperative nurses. *AORN J* 2010;92:e1-23.
63. Parry G, Cape J, Pilling S. Clinical practice guidelines in clinical psychology and psychotherapy. *Clin Psychol Psychother* 2003;10:337-51.
64. Shiffman RN, Michel G, Essaihi A, et al. Using a guideline-centered approach for the design of a clinical decision support system to promote smoking cessation. *Stud Health Technol Inform* 2004;101:152-6.
65. Conroy M, Shannon W. Clinical guidelines: their implementation in general practice. *Br J Gen Pract* 1995;45:371-5.
66. Silayoi P, Speece M. The importance of packaging attributes: a conjoint analysis approach. *Eur J Mark* 2007;41:1495-517.
67. Stone TT, Schweikhart SB, Mantese A, et al. Guideline attribute and implementation preferences among physicians in multiple health systems. *Qual Manag Health Care* 2005;14:177-87.
68. Tong A. Clinical guidelines: Can they be effective? *Nurs Times* 2001;97:III-IV.
69. Grimshaw JM, Russell IT. Effect of clinical guidelines on medical practice: a systematic review of rigorous evaluations. *Lancet* 1993;342:1317-22.
70. Lehtonen J. The Information Society and the new competence. *Am Behav Sci* 1988;32:104-11.
71. Lurie NH. Visual representation: implications for decision making. *J Mark* 2007;71:160-77.
72. Tu SW, Campbell J, Musen MA. The structure of guideline recommendations: a synthesis. *AMIA Annu Symp Proc* 2003:679-83.
73. Kushniruk AW, Patel VL. Cognitive and usability engineering methods for the evaluation of clinical information systems. *J Biomed Inform* 2004;37:56-76.
74. Turner T, Misso M, Harris C, et al. Development of evidence-based clinical practice guidelines (CPGs): comparing approaches. *Implement Sci* 2008;3:45.
75. Chatterjee A, Bhattacharyya O, Persaud N. How can Canadian guideline recommendations be tested? *CMAJ* 2013;185:465-7.

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