Knowledge Transfer to Clinicians and Consumers by the Cochrane Musculoskeletal Group

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ABSTRACT. The Cochrane Musculoskeletal Group (CMSG) is one of 50 groups of the Cochrane Collaboration that prepares, maintains, and disseminates systematic reviews of treatments for musculoskeletal diseases. Once systematic reviews are completed, the next challenge is presenting the results in useful formats to be integrated into the healthcare decisions of clinicians and consumers. The CMSG recommends 3 methods to aid knowledge translation and exchange between clinicians and patients: produce clinical relevance tables, create graphical displays using face figures, and write consumer summaries and patient decision aids. Accordingly, CMSG has developed specific guidelines to help researchers and authors convert the pooled estimates of metaanalyses in the systematic reviews to user-friendly numbers. First, clinical relevance tables are developed that include absolute and relative benefits or harms and the numbers needed to treat. Next, the numbers from the clinical relevance tables are presented graphically using faces. The faces represent a group of 100 people and are shaded according to how many people out of 100 benefited or were harmed by the interventions. The user-friendly numbers are also included in short summaries and decision aids written for patients. The different levels of detail in the summaries and decision aids provide patients with tools to prepare them to discuss treatment options with their clinicians. Methods to improve the effects and usability of systematic reviews by providing results in more clinically relevant formats are essential. Both clinicians and consumers can use these products to use evidence-based information in individual and shared decision-making. (J Rheumatol 2006;33:2312–8)

Key Indexing Terms:
ARTHRITIS EVIDENCE-BASED MEDICINE REVIEW LITERATURE
RISK ASSESSMENT DECISION MAKING DECISION SUPPORT TECHNIQUES

The Cochrane Musculoskeletal Group (CMSG) is one of 50 groups of the Cochrane Collaboration that prepares, maintains, and disseminates systematic reviews of treatments for musculoskeletal diseases. Since its establishment in 1993, the CMSG has developed an expertise in producing high quality, relevant systematic reviews in musculoskeletal diseases. Guidelines to produce CMSG reviews are described in the preceding article[1]. But once systematic reviews are completed the next challenge, not unique to the musculoskeletal field, is presenting the results of reviews in a useful format, ready to be integrated into healthcare decisions. Methods to clearly summarize the evidence from CMSG systematic reviews for a variety of audiences have therefore been developed and are included in the CMSG guidelines. The CMSG has, over the past 10 years, dedicated time and resources to develop user-friendly summaries of their reviews — summaries that are understandable, readable, and usable, and address the concerns of clinicians and consumers with musculoskeletal conditions. We show how the numbers from the metaanalysis forest plots (often called blobbograms) in Cochrane systematic reviews can be transformed into "friendly-front-ends" that clinicians and patients can understand (see Figure 1).

Summarizing the evidence for the end user. Cochrane reviews are intended to help a wide audience of people (including health policy makers, clinicians, and patients) make well informed decisions about healthcare. Systematic reviews provide the scientific evidence, but end users need it summarized in a format that is easy to understand and appropriate to their needs. We recommend 3 components to aid knowledge translation and exchange between the clinician and patient: (1) clinical relevance tables including numbers needed to treat (NNT), (2) face figures, and (3) consumer summaries and

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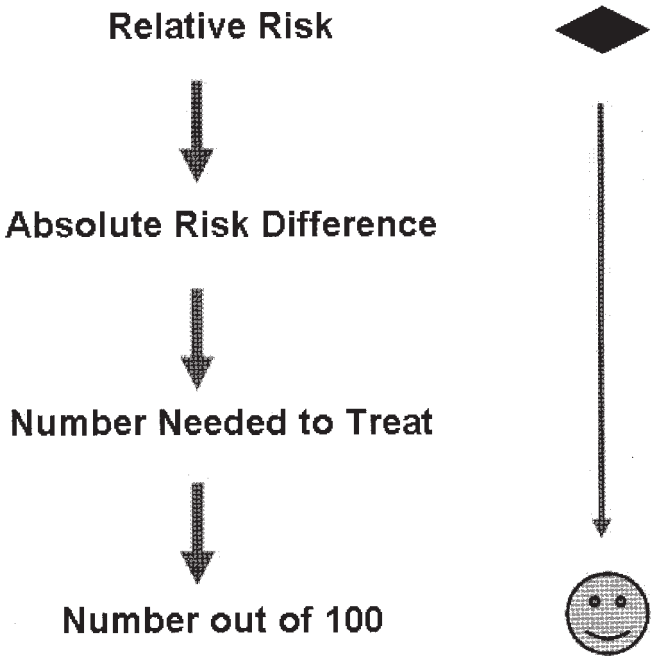

Figure 1. Translating numbers from systematic reviews into user-friendly numbers. The relative risk, represented as a diamond on a blobbogram, is converted to an absolute number needed to treat and then to the number of patients out of 100 who benefit from the intervention.

decision aids that the CMSG has specifically developed for people with musculoskeletal conditions. The guidelines explain to reviewers how to produce and use these components. The development of this methodology is outlined in more detail in the introduction chapter of BMJ Evidence-Based Rheumatology (http://www.evidbasedrheum.com).

Clinical relevance tables. The first step is to translate the numbers from the metaanalysis into a clinically useful format. These numbers are made more "usable" by presenting them as percentages and NNT in a clinical relevance table. Where possible, the following data are provided in a clinical relevance table: (1) if a scale, the range; (2) baseline rates; (3) relative effects; (4) absolute measures; (5) NNT for benefit or harm (when comparing a new treatment with a control treatment, the NNT is the number of patients who need to be treated with the new treatment rather than the control treatment in order for one additional patient to benefit or be harmed). If relative measures for major outcomes are statistically significant ($p < 0.05$), then it is recommended that the absolute risk difference and NNT are calculated (Table 1).

In moving towards these "friendly" numbers, it is important to recognize that several methodological/statistical challenges need to be addressed, including:

- the determination of the baseline risk
- the selection of the specific risk estimate
- the assessment of important changes in a continuous outcome
- the accommodation of varying scales for a continuous outcome
- the attribution of harms to the study groups.

Absolute measures are essential to making an informed decision[2], but they are very dependent on the baseline risk of patients included in the trials and on duration of followup. It can be a challenge to determine the best choice for the baseline risk. Incidence and prevalence rates may need to be researched to determine this information. If this information is not available, the combined event rate in the placebo group from the metaanalysis could be used (Table 1).

Calculation of NNT for benefits or harms is more complex from metaanalysis than from single trials. The method used to calculate NNT from metaanalysis should be clearly stated in the methods section of the review. An NNT calculated from risk reduction is unlikely to be a stable method unless event rates in placebo groups are very similar. Since event rates vary considerably (in practice), it is recommended that a relative measure such as odds ratio (OR) or relative risk (RR) is used. OR is advocated over RR since it is less dependent on whether data are entered as beneficial or adverse outcomes. The OR and RR can be applied to different levels of baseline risk to generate risk-specific NNT for the treatment. The NNT calculator developed by Cates (http://www.nntonline.net) is recommended to determine the NNT from the result of a metaanalysis. Review authors may also contact the CMSG for detailed instructions to calculate an NNT or read the CMSG guidelines available at http://www.cochranemsk.org/review/resources/.

Dichotomous outcomes. Results for dichotomous outcomes are presented in tables with event rates and relative risk (or OR), relative and absolute measures, and NNT (Table 1). Depending on the outcome (beneficial or adverse event), the event rate in the control group and RR or OR are used and entered into the Cates NNT calculator. The NNT calculator also calculates the numbers of people out of 100 who benefit or are harmed.

Continuous outcomes. Results for continuous outcomes are presented in tables with the absolute and relative changes from baseline. Absolute change describes the change in units of the continuous outcome, so people can judge the magnitude

Table 1. Clinical relevance table based on metaanalysis in the Cochrane systematic review for adalimumab for rheumatoid arthritis[3].

Outcome	No. Patients (no. Trials)	Event Rate in Control Group, %	Weighted Absolute Risk Difference, %	Weighted Relative Percentage Change (improvement)	No. Needed to Treat (Benefit)	Statistical Significance	Quality of Evidence[1]
ACR 50	1067 (3)	10.5	30 (30 more people out of 100)	273	4	Significant	Gold

of the effect on a scale. The relative change is used to provide clinically meaningful information about the expected change relative to the baseline mean in the control or untreated group. Absolute and relative changes are calculated using the weighted mean difference or standardized mean difference, the baseline mean, and standard deviation in the control group. Details about how to calculate these changes are provided in the CMSG guidelines at http://www.cochranemsk.org/review/resources/. The NNT for a continuous outcome can be calculated using the Wells calculator at the CMSG editorial office.

Table 2 is an example of a clinical relevance table using data from a Cochrane systematic review of corticosteroid injections for shoulder pain for pain as a continuous outcome[4]. In this example, the absolute change of 19% represents an improvement in pain of 0.95 units on a scale of 0 to 5 with corticosteroid injections. The relative change is 45%, which represents the improvement in pain with corticosteroid injections (0.95 units) relative to the baseline mean in the control (2.12 units). The NNT was calculated using the Wells calculator.

Face figures. As a second method to present results in a meaningful way, "face figures" that represent a group of people can be included in the review for a graphical representation of the outcomes (Figure 2). Presenting results from systematic reviews in graphical displays may help clinicians explain benefits and harms to their patients and may be better understood by consumers[5]. The graphical displays can be created by transforming relative risks and event rates to NNT and "face tables" by also using the Cates NNT calculator.

The graphical display consists of a face table showing good, bad, or better outcomes with treatment. Each face table represents a total of 100 faces that are divided into 3 categories: good outcome, bad outcome, and better with treatment. The dark faces are those patients who have a good outcome with no treatment. The white faces are those who suffer a bad outcome or no change in outcome with or without treatment. The shaded faces are those patients who are better with treatment; they change their category of outcome if they receive the active treatment. But since it is not possible to tell who those patients are, all 100 have to be given active treatment for this group to benefit.

Using the data from Table 1, the relative risk and control event rate have been used to create the face figures in Figure 2. This example shows the effect of adalimumab on achieving an American College of Rheumatology 50% response to treatment. The box illustrates that 11 out of 100 people will achieve a 50% improvement if treated or not treated (dark faces). An additional 30 out of 100 people will improve due to treatment with adalimumab (shaded faces). But 59 out of 100 people will not improve with adalimumab (white faces).

Consumer summaries and patient decision aids. A third method for translating the results of a systematic review into a user-friendly format is creating consumer summaries and decision aids. According to the *Cochrane Handbook*, Chapter 3.2, a "plain language summary" of a systematic review should be included in all Cochrane systematic reviews. It "aims to summarize the review in an easily understood style which would be understandable by consumers of healthcare."[6] Currently, the CMSG Knowledge Translation Specialist writes the plain language summaries, which are approved by review authors and consumers before publication of the systematic review. To reach a large audience, these summaries are freely available on the Website of the Cochrane Collaboration at http://www.cochrane.org/reviews. Because of a unique relationship with The Arthritis Society they are also freely available in English, and many in French, on their Website at http://www.arthritis.ca/look at research/cochrane reviews. Due to a recent collaboration with Arthritis Victoria in Australia, the summaries are posted on their Website as well (http://www.arthritisvic.org.au, under "Arthritis Explained, Research, Current Reviews").

Over the past 10 years, the CMSG has been developing a format for the plain language summary that meets the information needs of musculoskeletal consumers and is easily understandable[7]. Initially, the CMSG consulted guidelines and "how to" manuals, and reviewed recommendations for writing patient information. There is a plethora of advice that the CMSG distilled to 4 key elements: set the stage; use a question and answer format; use an active voice, and use short sentences and paragraphs; and present a balance of information. There is also a large field of study into the most effective methods of communicating benefits and risk. Much of the literature indicates that percentages can be confusing to the lay public and that statistics may be better understood using event rates (e.g., numbers of people out of 100 with condition X who improve or experience side effects in a specified timeframe compared to numbers out of 100 who do not improve)[8,9]. These numbers should also be based on absolute

Table 2. Clinical relevance for continuous outcome for subacromial corticosteroid injection versus placebo for shoulder pain[4].

Outcome	No. Patients (no. Trials)	Baseline Mean in Control Group*	Weighted Absolute Change*, %	Weighted Relative Percentage Change* (improvement), %	No. Needed to Treat (Benefit)	Statistical Significance	Quality of Evidence[1]
Improvement in pain at 4 weeks	90 (2)	2.12	19 (0.95 fewer points, scale of 0 to 5)	45	3	Significant	Silver

* Using most representative study.

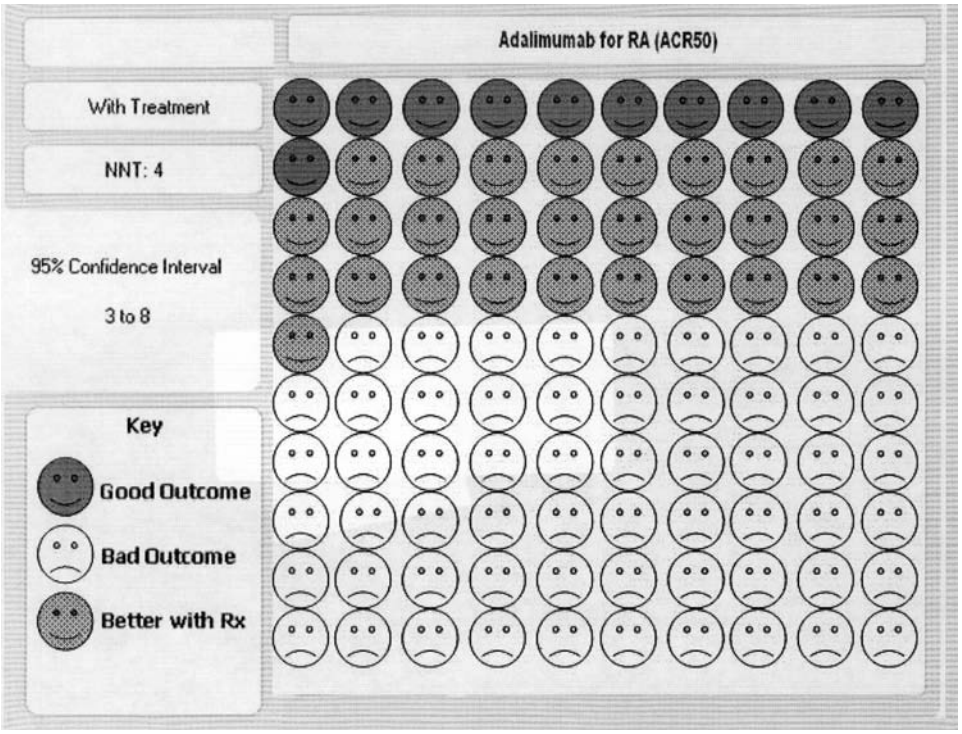

Figure 2. Face figures using the data from Table 1 to graphically display benefit of adalimumab for rheumatoid arthritis (see text for details). NNT= number needed to treat.

risks as opposed to relative risks; but presenting both absolute and relative risks is ideal[10].

The CMSG also reviewed other summaries based on Cochrane systematic reviews and research into knowledge transfer methods. The Cochrane Cancer Network has produced summaries of systematic reviews about cancer in the Cancer Library (http://www.update-software.com/publications/cancer/), which are written specifically with consumers in mind and presented in a question/answer format. Patient information using systematic reviews has also been made available through the National Electronic Library of Health and NHS Direct Online. Consumers accessing those sites could view a brief summary of evidence, choose to see more detailed information, and follow links to full-text articles and additional resources[11]. This concept of different levels of information is apparent in other knowledge transfer initiatives. Both the Program in Policy Decision Making[12] and the Canadian Health Services Research Foundation[13] promote multiple versions of summaries with increasing levels of detailed information. Other research indicates that incorporating evidence-based information into patient decision aids (tools to help people participate in decisions) can be an effective way to translate evidence to patients[14].

At the same time that the CMSG was reviewing the literature and examples of summaries, the CMSG was building a group of consumers with musculoskeletal diseases who were interested in developing easily understandable and relevant summaries of the reviews. This group indicated that many consumers prefer to read numbers to understand risks and benefits of a treatment, many want details about the study populations to determine if they are similar to themselves, and others want specific information about drug dosages and mode of delivery. Interestingly, the consumer group could not agree on the length of the summary or the level of detailed information in the summary that was most effective to translate the evidence. This disagreement confirmed the idea that people want different amounts of health information. Many are content with a brief summary of information, while others want more details.

Presenting evidence-based information at different levels of detail; the 1, 5, 15, 45 minute versions. Information from CMSG systematic reviews is presented in 4 versions of different levels of information: a 1 minute version; a 5 minute version; a 15 minute version; and a 45 minute version or decision aid. The different levels of detail address the needs of different patients who want varying amounts of detail about a treatment or want help with decision-making. Depending on the needs of the patient/consumer, one version or all versions may be helpful when making decisions about treatments.

The 1 minute version of the consumer summary consists of only a few sentences that provide the main conclusions of the systematic review. This summary should only take about 1 minute to read and is geared to the individual who is seeking a small amount of information, who may expect to follow it up with discussions with their healthcare practitioner or are seeking confirmation. This version includes brief statements

Table 3. Plain language summary for adalimumab for rheumatoid arthritis[3] (5 minute version including 1 minute summary).

How well does adalimumab (Humira) work to treat rheumatoid arthritis and how safe is it?

To answer this question, scientists analyzed six high quality studies. The studies tested over 2300 people who had rheumatoid arthritis for more than 10 years. People had either injections of adalimumab or fake injections. Some studies also tested people taking methotrexate in combination with adalimumab or the fake injections. This Cochrane Review provides the best evidence we have today.

What is rheumatoid arthritis and how can adalimumab help?
Rheumatoid arthritis is a disease in which the body's immune system attacks its own healthy tissues. The attack happens mostly in the joints of the feet and hands and causes redness, pain, swelling, and heat around the affected joints. Adalimumab is a "biologic" that is injected into the body to decrease pain and swelling and slow the progress of rheumatoid arthritis. Adalimumab is a new drug that was approved for injection at a dose of 40mg every other week. It is usually prescribed when other disease modifying anti-rheumatic drugs (DMARDs) do not work well.

How well did adalimumab work?
More people improved with all doses of adalimumab plus methotrexate than with fake injections plus methotrexate. After 24 weeks:

- 41 out of 100 people showed a 50% improvement with 40mg of adalimumab every other week plus methotrexate
- 11 out of 100 people showed a 50% improvement with fake injections plus methotrexate

This means that 30 more people out of 100 benefited from receiving adalimumab plus methotrexate than fake injections plus methotrexate.

More people had improved symptoms with adalimumab alone than with fake injections, but the improvement was not at much as when adalimumab was taken in combination with methotrexate.
After 52 weeks, x-rays showed that 20mg of adalimumab every week or 40mg every other week slowed joint damage more than fake injections.

Were there any side effects?
Minor side effects included reactions where the needle was injected, headaches, allergy-like symptoms, and colds. Some people went to hospital because of serious side effects. Most side effects occurred about the same amount for people taking adalimumab and people taking fake injections.

- 5 out of 100 people had serious side effects with 40mg of adalimumab every other week plus methotrexate
- 7 out of 100 people had serious side effects with fake injections plus methotrexate

This means that 2 more people out of 100 had a serious side effect from receiving fake injections plus methotrexate than adalimumab plus methotrexate.

One study showed that people who received adalimumab had more serious infections such as tuberculosis and cancer than people who took fake injections. Long-term side effects still need to be studied.

What is the bottom line?
There is **"gold"** level evidence that in people with long-standing rheumatoid arthritis who do not respond to DMARDs, adalimumab at 40 mg every other week plus methotrexate decreases pain and swelling better after 24 weeks than methotrexate alone or no DMARDs. Adalimumab in combination with methotrexate improves symptoms better than adalimumab alone.
Side effects in the short term are well-tolerated. Rare and long-term side effects are not yet known.

Based on Navarro-Sarabia F, Ariza-Ariza R, Hernandez-Cruz B, Villanueva I. Adalimumab for rheumatoid arthritis. In: The Cochrane Library, Issue 3, 2005. Chichester, UK: John Wiley & Sons, Ltd.

about the overall benefits and risks of the treatment, as well as general "precautions" such as the need for more research in a particular area or the lack of data about longterm benefits and risks. The 1 minute version is also the summary statement in both the 5 minute and 15 minute versions.

The 5 minute version is similar to the abstract of a systematic review but written for consumers. This one page summary, which may take 5 minutes to read, is the plain language summary now published in CMSG Cochrane reviews. But instead of consisting of a block of text in one paragraph (the traditional format of the Cochrane synopsis), it consists of a series of questions and answers: What and who were studied? What is the condition and why might this treatment work? Did it work? What were the side effects? What is the "bottom line"? Details are included about the number of studies in the review and duration, the number of people studied, the dosages and administration of the intervention, the results of the review (both efficacy and safety) and the summary.

Table 4. Weighing the pros and cons of steroid injections for shoulder pain (from Decision Aid).

What do I think of the pros and cons of steroid injections?
The information below is from 12 studies that tested steroid injections in people with rotator cuff disease. These studies lasted up to 1 year.

PROS AND CONS OF STEROID INJECTIONS

PROS	How much does it matter to you?	CONS	How much does it matter to you?
Pain and movement in the shoulder may improve with a subacromial injection	* * * * *	Pain may go away on its own	* * * * *
Ability to do daily routine may improve with a subacromial injection	* * * * *	Improved pain, movement and ability to do daily routine may not last long	* * * * *
Quicker relief compared to waiting	* * * * *	Temporary Side effects: *facial flushing, pain where injection occurs, rise in blood sugar in people with diabetes*	* * * * *
Avoid the risk of serious stomach side effects if NSAIDs are not taken	* * * * *	May not be better than non-steroidal anti-inflammatory drugs (NSAIDs)	* * * * *
Other pros:	* * * * *	Personal cost of injection	* * * * *
		Other cons:	* * * * *

Results are presented using both narrative and numerical descriptions. Using the information from the clinical relevance tables and from the face figures, the RRs, ORs, and NNTs are translated into the number of people out of 100 who benefit or are harmed with the intervention and without the intervention. Table 3 is a 5 minute summary of the systematic review for adalimumab to treat rheumatoid arthritis and includes the numbers out of 100 from Table 1 and Figure 2. This 5 minute consumer summary has been received and valued, since it can be printed easily on one page for easy distribution during consultations and is not overwhelming.

Many of the consumers in the CMSG Consumer Group, especially those who were generally well informed about their condition, wanted more information than the 5 minute summary provided. These consumers were actively involved in their care and sought as much information as possible about potential treatments before making their health decisions. The 15 minute summary caters to these individuals and their information needs. This summary is usually 2 to 3 pages long and takes approximately 15 minutes to read. While this version elaborates on the same information found in the shorter version by providing specifics about patient populations, sample sizes, and outcomes, it also explains more about the rigor of the systematic review process. In this summary, there is a section that describes how the review authors found and analyzed the studies, and it includes descriptions about the types of studies (primarily randomized controlled trials) and their quality.

The 45 minute patient decision aid version is unique in format, compared with the consumer summaries. This evidence-based tool prepares consumers to participate in decision-making in ways they prefer[15] by:

• providing evidence-based information about a health condition, options, benefits, harms, probabilities, and scientific uncertainties;

• helping people clarify the value they place on the benefits, harms, and scientific uncertainties by describing what it is like to experience the physical, emotional, and social effects of options and asking people which benefits and harms matter most to them (Table 4); and

• providing structured guidance in the steps of decision-making and communication of their informed values with others involved (e.g., clinician, family).

Patient decision aids supplement (but do not replace) clinician's counseling about options; they can be used before, during, or after a clinical consultation. A Cochrane systematic review of several randomized trials indicates that they are superior to standard counseling alone to improve the process

of decision-making and decision quality[8]. Decision aids corresponding to most CMSG systematic reviews will soon be available on The Arthritis Society Website. To access decision aids to some of the CMSG systematic reviews, visit http://decisionaid.ohri.ca/ decaids.html and see under "Bone/Muscle Conditions."

Plans are under way to evaluate the consumer summaries and decision aids. These include evaluation of the acceptability to users, optimal formats, and situations in which each version is most effective. For example, we are developing methods for tailoring these user-friendly products for different disadvantaged populations. It is expected that this work will provide ongoing opportunities for the CMSG, and other knowledge synthesizers, to improve the translation of evidence into formats that facilitate the integration of that evidence into healthcare decisions by consumers.

The CMSG is a strong proponent of improving the impact and usability of systematic reviews by providing results in more clinically relevant formats. We have provided explicit recommendations for doing so here. Review authors and producers of evidence-based information can use these methods to translate their results into usable formats. In addition, clinicians and consumers can use the "user-friendly products" when making their own healthcare decisions and sharing decision-making. We welcome further methodological research to improve the quality of systematic reviews and plan future updates of this report to incorporate the results of this research.

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