Better informed health care through better clinical guidelines

An NHMRC Draft Discussion Paper
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WORKING TO BUILD A HEALTHY AUSTRALIA
Vision
For Australia to have a world-leading, priority-driven program for the production, publication and implementation of trustworthy, accessible clinical practice guidelines

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Executive Summary

Evidence based clinical practice guidelines are key to establishing effective, high quality and safe health care practices and policies. They are one of the most common mechanisms for translating the results of research into practice and policy in countries with well organised health systems, and can bridge the gap between original research and clinical practice. They make recommendations about what clinicians should do, and developed after taking into consideration the entire body of relevant research evidence on a topic, rather than pieces of research selected to support preconceived beliefs. They have the potential to both improve health and save costs.

Australia needs a more rational, national framework that can efficiently produce relevant, accessible and reliable clinical practice guidelines. In the absence of such a framework the guideline enterprise will remain fragmented, inefficient, not strategic and susceptible to the influence of vested interests.

The key challenges facing clinical guidelines in Australia are:

1. Inefficiency: a strategic, priority-driven approach is needed
2. Poor quality: problems with conflicts of interest not being declared of managed, guideline recommendations not informed by the body of the best available evidence, and processes that are not transparent
3. Lack of capacity: lack of the necessary critical mass of expertise and experience in the design and conduct of systematic reviews resulting in an inability to be responsive
4. Lack of investment in information technology: most guidelines are developed using manual systems and published in paper or as pdf files
5. Inaccessibility: clinicians have problems finding guidelines, and then finding the information they need within a guideline, making them difficult to use.
6. Obsolescence: how to keep up with newly available research and keep guideline recommendations up-to-date

The National Health and Medical Research Council has been working with the Department of Health and the Australian Commission on Safety and Quality on Health Care towards a national, priority-driven framework for producing trustworthy clinical practice guidelines. If accepted and successfully implemented, the framework would underpin the efficient and effective delivery of quality clinical care that makes the most of the investment made in guidelines by Australian governments. It would expedite the translation of health and medical research into practice and policy and form the basis of clinical care standards. It includes:

- A priority driven national clinical guideline agenda
- Guideline development and approval processes focused on quality and transparency
- Capacity building in the methods applied in guideline development including systematic reviews
- Investment in information technology to enable the modernisation and streamlining of the guideline development, approval and publication processes, and making the final guideline product more accessible.
Introduction

The purpose of health and medical research (HMR) is to achieve better health for all Australians. Better health encompasses increased life expectancy, as well as social goals such as equity, affordability and quality of life. HMR investment supports innovation in Australia’s $135bn p.a. health sector and is vital for delivering health outcomes, creating national wealth and ensuring the efficiency and sustainability of the health system.

Better Health Through Better Research, 2013

The journey from early discovery to the practical application of new research is rarely straightforward. It can take decades for the results of research to inform clinical practice or health policy. One of the most common mechanisms for translating the results of research into practice and policy in countries with well organised health systems is through the development and implementation of evidence-based clinical practice guidelines. We know from the experience of the UK’s National Institute of Health and Clinical Excellence (NICE) that guidelines have the potential to both improve health and be cost saving.

In Australia the system for developing and implementing clinical practice guidelines is fragmented, non-strategic and inefficient. This lack of cohesion is not serving the best interests of the Australian population and is having a direct, negative impact on the quality and cost of health care decisions being made by and for them.

At the heart of the issue is the absence of a national, integrated, priority-driven, strategic framework for developing clinical guidelines. There is no alignment of funding for new guidelines with national, state or territory health priorities, and as a result guidelines produced are more likely to address ad hoc issues reflecting the interests of individual groups than areas of high priority or need. There is no coordinated approach to the actual funding, development and implementation of guidelines, in contrast to other agencies internationally such as the UK’s National Institute for Health and Care Excellence (NICE) or the Agency for Health Care Research and Quality (AHRQ) in the US. In many instances there is little engagement between the developers of clinical practice guidelines and those responsible for the delivery of health care and policy development resulting in recommendations that are out of alignment with practice.

Another issue underpinning the need for change is the need for guidelines to be relevant and useful to clinicians, helping them keep up to date with current thinking and the ever-increasing body of knowledge. This can be difficult when, for example, it has been estimated that one research paper is published every minute, and 75 trials and 11 systematic reviews are published every day. The advent of open access publishing, the increased attention being paid to research transparency, and the obligation researchers have to make the results of their research public (particularly clinical trials) has further accelerated the unprecedented growth in health information. Engulfed by information, individual clinicians may be tempted to pay greater attention to the most recently published piece of research, rather than the entire body of evidence published on a topic. Compounding this situation are the many, conflicting health messages received through the general media and the internet. These messages may be prejudiced by vested interests, influenced by poorly conducted or poorly reported research, and misinformed by distorted or incorrect interpretations of research findings. This leads to poor, and potentially harmful, health care decisions. Clinical guidelines are necessary to provide clarity and aid decision making in an environment where the volume of new information can be overwhelming.

Why Guidelines?

Clinical guidelines are key to establishing effective, high quality and safe health care practices and policies. They are accepted worldwide as a mechanism for translating the results of research into practice and policy in countries with well organised health systems, and can bridge the gap between original research and clinical practice. They make recommendations about what clinicians should do that are developed after taking into consideration the body of research evidence on a topic, rather than pieces of research selected to support preconceived beliefs. They have the potential to both improve health and save costs.
Clinical guidelines should provide balanced information on both the beneficial and harmful consequences of a decision. Guidelines should enable those who are ultimately responsible for applying judgement and making health care decisions to do so with a degree of confidence.

**What is a clinical guideline?**

A widely used definition of a clinical guideline was established in 1990 by the Institute of Medicine. That is, “systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances.”\(^\text{10}\) The World Health Organization defines guidelines as any document containing “recommendations for clinical practice or public health policy.”\(^\text{11}\) A recommendation “tells the intended end-user of the guideline what he or she can or should do in specific situations to achieve the best health outcomes possible, individually or collectively”.

Traditionally clinical guidelines have been voluminous, text-book-like documents making multiple recommendations and providing other advice for all aspects of the diagnosis and management a particular health condition. These comprehensive guidelines have generally been published in printed form as books, or online as large pdf files.

Comprehensive clinical practice guidelines are time and resource consuming to produce. Like text books, they can be difficult to access and quickly become out of date. Agencies engaged in the process of producing guidelines are struggling with burden of trying to keep their guidelines easy to use and up to date. It is time to consider innovative new ways to provide evidence-informed advice to decision-makers. This may necessitate shifting away from comprehensive all-of-issue text books to shorter, focused advice made accessible electronically.

One way to do this is to think about a comprehensive clinical practice guideline as being a collection of short form guidelines, each of which may contain one or more evidence-based recommendations. Thinking about guidelines as collections of recommendations allows developers to prioritize topics within a guideline: that is, issues that should be addressed first when new guidelines are developed, and when existing guidelines are updated. Maintaining a guideline program with limited resources then becomes more manageable. It also opens the way to adopting a “living guideline” model (discussed further on page 18), and provides an avenue through which we can build on the work of others. For example, taking advantage of existing, high quality systematic reviews, particularly Cochrane reviews.

**Quality guidelines take time**

Trustworthy guidelines are based on rigorous systematic reviews of the best available evidence, have transparent processes and manage conflicts of interest.\(^\text{12}\) Producing high quality, reliable, relevant, evidence-based clinical practice guidelines is time and resource consuming. The broader the scope of the guideline, and the more complex the questions the guideline needs to address, the longer the process will take. This can sometimes be at odds with the need to respond to requests for advice quickly. With forward planning, adequate resources and sufficient on-the-ground capacity to do the necessary work it is possible to minimise delays and provide evidence-informed advice within reasonable timeframes and without compromising integrity.

The provision of high quality, evidence-informed clinical practice guidelines requires:

- An advisory group comprised of individuals with an appropriate mix of content expertise relevant to the subject area, including health care practitioners and consumers. This group needs to determine the scope of a guideline including the problems and specific questions that need to be addressed. Importantly, these experts need to interpret the body of evidence once it has been compiled, and apply judgement in order to come up with specific recommendations on what the eventual users of the guideline (health care practitioners, patients, carers or policy makers) should do.
The advisory group to have transparent processes and procedures. Interests will be declared and conflicts of interest will be appropriately managed.

Skilled groups of professionals with expertise in the methodology of evidence synthesis, experience in the application of these methods and the design, conduct and interpretation of systematic reviews who can guide the advisory group through the process of formulating recommendations based on that evidence.

Public consultation: required by the NHMRC Act\textsuperscript{13} and ensures key stakeholders have the opportunity to contribute.

**Clinical trials and clinical guidelines**

The NIH Research Translation Framework is a commonly used model that describes the “traditional” linear pathway from bench to bedside typical in clinical medicine, and particularly drug development. The earliest phases of translation occur when basic science moves to clinical research through Phase I and II clinical trials. If efficacy is demonstrated then Phase III (randomised clinical trials) can follow to determine effectiveness. As with all good science, some replication is necessary, and multiple randomised trials addressing the same question can be synthesised (systematic reviews and meta-analyses) and used to inform recommendations made in clinical practice guidelines. Randomised clinical trials, and systematic reviews of such trials, are the best study designs for evaluating the effectiveness of an intervention and are the foundation of high quality clinical practice guidelines. (See Figure 1)

In the process of developing a guideline, gaps in the evidence will be identified which should in turn generate new ideas for future clinical trials addressing questions of direct relevance to decision making; research informing policy and policy informing research.

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Figure 1: NIH Research Translation Framework\textsuperscript{1}
Australia’s investment in clinical guidelines

Of the 1046 guidelines published in Australia between 2005 and 2013 at least 235 received government funding: 171 from federal government and 76 from State or Territory governments. If the “average” guideline costs $1 - $1.5 million to produce, then it is possible that Australian governments are collectively spending tens of millions of dollars each year on the production of clinical practice guidelines, most of which are of poor quality. Only 1 in 5 guidelines funded or developed by government make any reference to the evidence underpinning the recommendations made, and only 1 in 10 are informed by systematic reviews of the evidence. Only 16% of guidelines associated with government describe the processes used to develop them, and most lack transparency around who authored them, and if and how interests were declared and conflicts of interest were managed. A relatively small investment in a strategic and efficient framework for producing guidelines would make better use of existing resources, result in guidelines that are of better quality, lead to better decisions untainted by vested interests and to better health outcomes.

In addition to improving health, trustworthy guidelines can lead to significant savings to the health care and welfare systems (see Box 1). In 2006, for example, a London School of Economics report concluded that implementation of the UK’s National Institute of Health and Clinical Excellence guideline on cognitive behaviour therapy for depression would be cost saving by getting people off incapacity benefits and back into the workforce.

Only one in four of those who suffer from depression or chronic anxiety is receiving any kind of treatment. The rest continue to suffer, even though at least half of them could be cured at a cost of no more than £750. This is a waste of people’s lives. It is also costing a lot of money. For depression and anxiety make it difficult or impossible to work, and drive people onto Incapacity Benefits. We now have a million people on Incapacity Benefits because of mental illness – more than the total number of unemployed people receiving unemployment benefits. ...... But can we afford the £750 it costs to treat someone? The money which the government spends will pay for itself. For someone on Incapacity Benefit costs us £750 a month in extra benefits and lost taxes. If the person works just a month more as a result of the treatment, the treatment pays for itself. 6

Box 1: The difference a national clinical guideline can make. Antenatal Magnesium Sulphate

Cerebral palsy and cognitive dysfunction are the most frequently occurring neurologic impairments associated with preterm birth (before 37 weeks gestation). In 2008, the cost to the Australian community of cerebral palsy, including financial cost and lost wellbeing, was estimated to be AUD$3.87 billion per annum. In per capita terms, including the value of lost wellbeing, the estimate cost per person with cerebral palsy is over $115,000 per person per annum.15

In 2009 it was established that magnesium sulphate given to women prior to preterm birth reduces the risk of cerebral palsy. The number of women needed to be treated to benefit one baby by avoiding cerebral palsy is 63.16 The babies of more than 4000 pregnant Australian women are at risk.

The Antenatal Magnesium Sulphate guidelines were published in 2010, recommending that women at risk of early preterm imminent birth, use magnesium sulphate for neuroprotection of the fetus, infant and child. The guidelines met the standards required by NHMRC and were approved in November 2010.

The estimated rate of uptake of this guideline in Australian and New Zealand tertiary maternity hospitals is up to 90%. They have therefore had a significant impact on the health and well-being of preterm infants and their families, and resulted in significant financial savings.
Who is responsible for guidelines in Australia?

The key government players in clinical guidelines are:

- The COAG Health Council and the Australian Health Ministers’ Advisory Council (AHMAC): important funders of guideline development mainly on a State or Territory basis
- The National Health and Medical Research Council (NHMRC): legislated responsibility for issuing guidelines, approving guidelines prepared by third parties, and setting standards for guideline development.
- The Australian Commission for the Safety and Quality of Health Care (ACSQHC): which among its legislated functions may formulate guidelines relating to health care safety and quality matters and consult and co-operate with other persons, organisations and governments on health care safety and quality matters. It is also charged with responsibility for advising AHMAC on guideline priorities.
- The Commonwealth Department of Health: this agency has provided significant funding for guideline development over the last decade.
- State and Territory Governments who contribute to the development of guidelines and, importantly, their implementation. Over one third of guidelines receiving government funding receive State or Territory Government funding.
- Other Commonwealth agencies with remits that include the production of clinical guidelines, including the National Blood Authority and Cancer Australia.

NHMRC Responsibilities and Standards for Guidelines

The NHMRC Act (1992, amended 2006) sets out NHMRC’s responsibilities for issuing and approving guidelines. The CEO is required “in the name of the NHMRC, to inquire into, issue guidelines on, and advise the community on” matters relating to health, and health and medical research. Issuing guidelines is, however, an unfunded mandate that the agency is able to realise in only a very limited way.

The guidelines NHMRC produces are usually initiated at the request of, and funded on a case-by-case basis by, the Commonwealth Department of Health. The impromptu, ad hoc nature of many of these requests makes it difficult to anticipate the work and plan its delivery. This leads to inefficiencies and a failure to build a critical mass of expertise. The inability to forward plan means that Australia has limited capacity to respond knowledgeably, efficiently and in a timely fashion.

NHMRC can also approve guidelines prepared by government and non-government agencies outside of the NHMRC. Guidelines that seek NHMRC approval have been demonstrated to be of consistently higher quality, however the majority of third party developers do not seek NHMRC approval. This is possibly due to the higher standard required in order to obtain approval, or concerns about the time it takes to do so.

NHMRC 2015 Standards for Guidelines

Guidelines issued or approved by NHMRC need to be reliable and of the highest quality. Achieving this requires a clearly defined set of standards, and appropriate mechanisms to ensure compliance with these standards.

The NHMRC Act gives the agency a legislated responsibility to set norms and standards for the conduct, reporting and use of health and medical research in Australia. This includes standards for clinical practice guidelines which were first published by the agency in 1999, their aim being to establish a minimum level of quality that is considered acceptable for clinical practice guidelines in Australia.

The Standards for Guidelines have not been changed since they were originally published and they, and the associated handbook series, are now out of date. NHMRC has recently revised the Standards for Guidelines to bring them more into line with standards developed and implemented by similar agencies internationally. The revised standards have been included in this discussion paper (see Appendix 2) and will underpin the process of transformation that will ultimately improve the quality of Australia’s clinical practice guidelines.
The challenges facing Australian clinical guidelines

“Clinical guidelines are often too complex, out of date, lacking in credibility or poorly implemented”

Productivity Commission: Efficiency in Health, 2015

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<td>1. Inefficiency</td>
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<td>2. Poor quality</td>
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<td>3. Lack of capacity</td>
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Inefficiency
The system for developing and implementing clinical practice guidelines in Australia is fragmented, non-strategic and inefficient. There is no cohesive, strategic national approach to identifying priorities for clinical practice guidelines and clinical care standards. Commonwealth, state and territory governments do not coordinate the way in which they invest in guidelines, leading to gaps in areas of priority and unnecessary replication in others. The current situation is not serving the best interests of the Australian population and is likely to be having a direct, negative impact on the quality and cost of health care.

In the UK the National Institute for Health and Care Excellence (NICE) has the remit, the resources and the infrastructure to support the development and implementation of clinical guidelines nationwide. Such a framework does not exist in Australia. Although the NHMRC Act 1992 assigns responsibility to the CEO “to inquire into, issue guidelines on, and advise the community” and governments on various matters relating to health, it is largely an unfunded mandate that the agency is able to realise in only a very limited way.

Poor quality
Clinical guidelines are only able to facilitate good decision making if they have been developed in such a way that ensures that the recommendations they make can be trusted. In order to be trustworthy, clinical guidelines must (among other requirements) establish transparent processes, manage conflicts of interest, and establish the evidence foundations for each recommendation. Unfortunately, very few clinical guidelines in Australia meet these requirements and most are unable to reliably support informed decision making. A review conducted by NHMRC of 1046 Australian guidelines published over a 9 year period demonstrated that:
- Only one in three guidelines describe the processes used to develop them
- Fewer than one in five guidelines make any reference to the evidence underpinning the recommendations made
- A mere 7% of guidelines clearly document the way in which conflicts of interest are identified and managed

Most of the guidelines approved by NHMRC Council are produced by third parties, many of which receive government funding. Although guidelines submitted to this approval process have been demonstrated to be of consistently higher quality, only 4% of guidelines produced in Australia seek and receive NHMRC approval.
Lack of capacity

In Australia the availability of groups with the necessary critical mass of expertise and experience in the design and conduct of systematic reviews (the foundation of high quality guidelines) and other methods frequently applied in guidelines (such as modelling) is limited. This is a problem experienced not only by guideline developers but also those involved in health technology assessment and comparative effectiveness research who often need high quality work delivered within quite tight timeframes. This lack of capacity is the result of inadequate investment in relevant infrastructure and training.

Lack of investment in information technology

Most of the processes involved in developing, approving, publishing and updating clinical guidelines are achieved using outdated, time consuming manual systems. Investment in information technology solutions to guideline development has been minimal, with the possible exception of tools to support some of the components of the systematic review process. Recent developments have seen some early investment internationally in tools to support some aspects of guideline production and publication, although many are untested and have not been developed with interoperability or longevity in mind.

Inaccessibility

If guidelines are to have any impact on clinical practice then clinicians need to be able to identify a guideline if it exists, obtain the guideline, and then locate and understand the required information within the guideline. Inability to access guidelines has been identified as a key barrier to their implementation, particularly in rural and regional areas.19,20 The old fashioned, printed text book approach to guideline publication, and the lack of a standard structure used across guidelines, makes many of them dense and difficult to navigate. Even if guidelines are made available online they tend to be large pdf files that can be slow to download and not feasible for use by the bedside.

Obsolescence

“...even if a guideline is produced after an optimally diligent process and published so rapidly that it is up to date at its launch, it still freezes current best practice. Inevitably, today’s best practice will be obsolete tomorrow.”

Dietz and Stokes, 2012

Clinical practice guidelines can quickly become out of date, particularly in areas with an active research program. Keeping the evidence in guidelines up-to-date, and ensuring that the recommendations derived from that evidence are current, is important to ensure ongoing relevance and reliability. The process of monitoring the evidence and managing updates is time and resource consuming. Arbitrary cut-offs (eg rendering a guideline out-of-date after a predefined time period has elapsed) do not take into account the nature of the recommendations a guideline may contain and current research activity. Such cut-offs may be appealing on a practical level but are not useful on an applied level. If a key piece of research is published tomorrow, we can’t afford to wait 3-5 years before the impact of that research is considered. Keeping guidelines up to date is significant challenge with which guideline producing agencies around the world continue to struggle.
The National Health and Medical Research Council has been working with the Department of Health and the Australian Commission on Safety and Quality on Health Care to develop a national, priority-driven framework to produce trustworthy clinical practice guidelines. If accepted and implemented successfully, the framework would underpin the efficient and effective delivery of quality clinical care that makes the most of the investment made in guidelines by Australian governments. It would expedite the translation of health and medical research into practice and policy and form the basis of clinical care standards. It consists of:

- A priority driven national clinical guideline agenda
- Guideline development and approval processes focused on quality and transparency
- Capacity building in the methods applied in guideline development including systematic reviews
- Investment in information technology to enable the modernisation and streamlining of the guideline development, approval and publication processes
- A model for engagement and collaboration with government and non-government agencies responsible for guideline development or implementation

The proposed framework considers the potential roles of, and interaction between, the key government (described on page 9) and non-government players. The Department of Health will play an integral role in the guideline transformation process. It leads and shapes Australia’s health system outcomes through evidence based policy, well targeted programmes, and best practice regulation. The department is committed to: working across all tiers of Australia’s federal structure of government to provide funding, policy, regulation and guidance on the management of the whole health system; working with external stakeholders to understand issues within the health system and how they can be addressed and focusing on better, more cost-effective patient care through innovation and technology.

Figure 2. A national framework for clinical guideline production in Australia
Improving efficiency

The intention of the framework is to make better use of the resources already invested by governments in clinical guidelines. It assigns responsibility for each aspect of the guideline development process in a strategic and coordinated fashion, specifically:

i. Identification of priority topics
ii. Funding of prioritised guidelines
iii. Development, approval and publication
iv. Implementation

i) Identification of priority topics
The Australian Commission on Safety and Quality in Health Care (ACSQHC) has finalised criteria to establish national priorities for clinical practice guidelines which were approved by the Australian Health Ministers’ Advisory Council (AHMAC) in November 2014. A call for Expressions of Interest in adding topics to the list is currently in progress. (See Appendix 1) This will inform the development of the initial list of priorities which is expected to be considered by AHMAC in November 2015.

ii) Funding of prioritised guidelines
The exact mechanism for funding individual guidelines has yet to be determined. Ideally, governments would only fund the development of guidelines on prioritised topics. It is proposed that it be a requirement that all guidelines developed under the framework seek and obtain NHMRC approval. This will ensure that minimum quality standards are met and that there is a central agency that is aware of all guideline development activity and can monitor progress.

iii) Development, approval and publication
The process of developing and approving guidelines will be facilitated by the office of NHMRC. The focus will be on ensuring that guidelines are of high quality and meet NHMRC Standards. This will be achieved by either commissioning an appropriate guideline developer to undertake the entire process of guideline development, or by commissioning appropriate groups to undertake parts of the guideline development process (such as the conduct of systematic reviews) but retaining responsibility for establishing and managing the expert committees who will ultimately make the recommendations.

All guidelines issued or approved by NHMRC are considered by NHMRC Council. The process of seeking this approval will be streamlined to minimise the time taken to obtain approval but without compromising integrity. Potential avenues for simplifying the public consultation process will also be explored particularly in relation to the production of living guidelines.

iv) Implementation
A mechanism for keeping all key stakeholders (particularly AHMAC, the relevant colleges and professional societies and ACSQHC) informed of progress in the development of funded guidelines will be introduced. This will facilitate the transition from guideline development and approval into the development of health care standards and eventual implementation into clinical practice.
Improving Quality and Building Capacity

Improving the quality of Australia’s clinical guidelines is intrinsically linked to increasing the availability of teams of people with the appropriate mix of expertise who are capable of delivering guidelines that meet the newly revised NHMRC 2015 Standards for Guidelines (See Appendix 2).

Various, complementary initiatives would be introduced, all of which target capacity building and quality improvement.

i) Centres of Research Excellence
Centres of Research Excellence (CRE) is an established NHMRC competitive funding scheme that provides support for teams of researchers to pursue collaborative research and develop capacity in clinical, population health and health services research. It is proposed to expand the scheme to create CREs in Evidence Synthesis (CRE-ES). Existing and new CREs could be encouraged to build the capacity to efficiently perform high-quality systematic reviews, be on top of cutting edge methods for evidence synthesis, and able to cope with complex decision making scenarios. Once established, it would be possible to commission these CREs to perform systematic reviews to inform the guideline production process. CRE-ESs would be required to have access to the relevant expertise however each piece of commissioned work will need to be funded appropriately. If guideline priorities are identified in advance it should be possible to plan ahead, allocate the work, and ensure delivery of completed guidelines within agreed timeframes.

ii) Recognition of Guideline Developers
The feasibility of introducing a recognition scheme for guideline developers will be explored. In order to be recognised, developers will need to demonstrate their ability to deliver guidelines that meet the 2015 Standards. Recognised guideline developers would be eligible to receive government funding to develop guidelines.

iii) Establishing a Clinical Guidelines Network (CGN)
Guideline developers in receipt of government funding to develop guidelines would be invited to join the Clinical Guidelines Network. The Network would give its members the opportunity to engage with each other, share experiences and collaborate on projects, particularly in relation to the development and implementation of shared information technology solutions, and the application of new methods. Incentives to become a member organisation of the Network could include access to resources (including the potential to access library resources) and training opportunities relevant to NHMRC’s 2015 Standards for Guidelines. This could include training in systematic reviews and the use of GRADE.

iv) Training in the methods of guideline development
Access to systematic review training through the Australasian Cochrane Centre (ACC) is currently restricted to individuals who are actively undertaking a Cochrane review. The ACC and NHMRC would negotiate to offer Cochrane training to members (and potential members) of the NCGA.

NHMRC will also explore the potential to offer webinars to Network members, as well as access to other online resources to support guideline developers. This could be achieved through the development of an online platform, similar to Australian Clinical Trials (https://www.australianclinicaltrials.gov.au/) and the Human Research Ethics Portal (https://hrep.nhmrc.gov.au/). An online platform will make it easier to support guideline developers wanting to meet the standards, including guidelines issued or approved by NHMRC.
Investing in information technology

“…each systematic review is described as a computer program that automatically retrieves relevant trials, appraises them, extracts and synthesizes data, evaluates the risk of bias, performs meta-analysis calculations, and produces a report in real time”

Tsafnat et al 2014

Until recently, the process of developing a guideline has primarily been achieved manually. Over the past 2-3 years some guideline developers nationally and internationally have started to explore the potential for information technology to automate at least some (and in some cases all) of the component processes. This includes software to aid in the conduct of systematic reviews, the use of social media to consult with clinicians, consumers, policy makers and other end users, and ultimately online publication of the final guideline products.

In August 2015, NHMRC with the Department of Health commissioned a report to describe the ways in which specific information technology tools might be used to facilitate the development and publication of clinical practice guidelines in Australia (see Appendix 2). The report was informed by three forums for guideline developers (held in Canberra, Sydney and Melbourne) during which developers were asked to indicate factors (ideas, needs and preferences) that might influence their choice of electronic tools. As a result, the report proposes criteria to support selection of software for individual steps of the guideline production process.

The next step is to apply the criteria to tools that are currently available, or as new tools become available, to determine their suitability to support one or more aspects of the guideline development process. A standard way of structuring a guideline will need to be developed, and individual data fields defined, in order to ensure interoperability across pieces of software. For some processes there may not be tools available so investment in their creation may be necessary.

When it is sensible to do so, collaboration with appropriate organisations (including other guideline development groups) that are also in the business of synthesizing evidence and creating guidelines and developing software to support that endeavour should be encouraged. One such organisation is the international Cochrane Collaboration which, through its Project Transform, is exploring ways “to improve the way people, processes, and technologies come together to produce Cochrane content”. Another is MAGIC, “a non-profit initiative working to improve the creation, dissemination and dynamic updating of guidelines, evidence summaries and decision aids” (http://magicproject.org/about/).

For guidelines issued or approved by NHMRC a limited number of software options for each task in the process need to be agreed to. These would need to be linked together under an overarching information technology framework (The NHMRC Guideline Development Platform) that would support the entire process from the original scoping and registration a new guideline, monitoring the progress of its development, seeing it through NHMRC’s approval process, and through to publication. Although most processes will be similar across guidelines, the framework will need to be adaptable to different types of guideline (See Figure 3). It will need a secure audit trail so changes made to a guideline, or the underpinning body of evidence, are clearly and transparently documented.

The Guideline Platform would likely require the development of bespoke software, and an online web platform, to support the unique set of tasks related to the process of overseeing and approving guidelines.
Figure 3: Example - Process followed for developing clinical practice guidelines on diagnostic tests

1. Choose Guideline Panel Members
2. Choose Panel Chair(s)
3. Agree on the methods used and the process
4. Declare and manage potential conflicts of interest
5. Generate clinical questions
6. Identify outcomes critical to the recommendation
7. Systematically gather current evidence addressing each of the questions
8. Estimate pretest probabilities (based on literature review) as well as test and treatment thresholds
9. Prepare summaries of evidence informing guideline panel's decisions about each question asked
10. Formulate suggested recommendations
11. Discuss each recommendation during a guideline panel meeting
12. Finalize recommendations

Ensure representation of all stakeholders:
- allergists
- pediatricians
- gastroenterologists
- dermatologists
- epidemiologists
- metrologists
- dieticians
- food chemists
- patients or their proxies

Ensure representation of all stakeholders:
- Identify clinical problems requiring guidance
- Generate focused questions (PICO)
- Reach consensus among panel members on the final questions (define them if necessary)

Ensure representation of all stakeholders:
- Identify all patient important outcomes
- Define the consequences of being classified in each of the categories (TP FP FN TN)
- Explicitly rate importance of outcomes

Ensure representation of all stakeholders:
- Perform a systematic review
- Use existing high-quality up-to-date systematic review
- Perform as systematically a search as possible and transparently summarise identified evidence

Ensure representation of all stakeholders:
- If justified and necessary define distinct sub-populations with a different baseline risk of the disease (pre-test probability)

Ensure representation of all stakeholders:
- For each critical outcome:
  - Assess the quality of the supporting evidence
  - Summarise the expected effects
Making guidelines more accessible and dealing with obsolescence

The Guideline Development and Publication Platforms will allow NHMRC, and guideline developers seeking NHMRC approval, to develop and publish using a “living guideline” (or “dynamic updating”) model. Living guidelines make it possible to prioritise recommendations for updating, facilitate the rapid updating of the evidence underpinning those recommendations, and then make modifications to the recommendations if necessary, as and when new evidence becomes available. A dynamic updating model is being tested by a small number of agencies globally, including Kaiser Permanente and MAGICorg.24, 25

The Guideline Development Platform will need to directly link to an automated online Guideline Publication Platform. The resulting published product/s need to be easily and quickly accessible in the format preferred by the end user (including tablets and phones), taking into account the way in which particular users access information, what information they access and when. In addition, the information needs to be published in a manner that is easy to keep up-to-date (see Figure 4).23 It therefore needs to be able to interact dynamically with the underlying Guideline Development Platform, and also with other online resources (eg the Australian and New Zealand Clinical Trial Registry).

Figure 4: The updating process of Clinical Practice Guidelines23

<table>
<thead>
<tr>
<th>1: Identify new relevant evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different methods for identifying new relevant evidence; Literature search, restrictive or exhaustive; collecting opinions of experts; external review; or alerts. The time frame for assessing the need of an update differs and ranges from 6 months to 5 years.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2: Assessment of the need for an update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different methods for assessing the need for an update; Assessment of importance and relevance of new evidence, whether new evidence alters current CPG, whether new evidence is not yet included; group meetings; expert judgement; or producing continuously evidence summaries.</td>
</tr>
<tr>
<td>No effect: validity remains No update required</td>
</tr>
<tr>
<td>Obsolete CPG Update required</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3: Updating process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature search, evidence selection, evidence synthesis, evidence assessment. Methods might be similar to step 1 and 2, consequently, the results might be used whenever this has been done rigorously.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4: External review</th>
</tr>
</thead>
<tbody>
<tr>
<td>A broad-ranging external review with a multidisciplinary sample, not involved in developing or updating the CPG, should be conducted, including experts in the clinical area and methodological experts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5: Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication: The publication includes an overview of updated recommendations in each chapter, additionally, de novo recommendations or new fields should be indicated.</td>
</tr>
</tbody>
</table>
References


2. Cresswell A. Medical discoveries going to waste. The Australia 5 July 2012.

3. Mackey DA. Your time starts now – translation time lines for major ophthalmic discoveries. MJA 18 June 2012.


Appendix 1: NHMRC’s 2015 Standards for Guidelines

The NHMRC Act calls on the CEO to issue guidelines (Section 7), and approve guidelines developed by third parties (Section 14A). The NHMRC Standards for Externally Developed Guidelines were first published in 1999 as an appendix in “A guide to the development, implementation and evaluation of clinical practice guidelines”. In 2007 “NHMRC standards and procedures for externally developed guidelines” was published to inform third party guideline developers of the procedures to be following if their intention was to seek NHMRC approval. In 2011 this document was updated to become “Procedures and requirements for meeting the 2011 NHMRC standard for clinical practice guidelines”. A summary of the NHMRC standard was referred to in the 2011 document, and key principles were described in the 2007 document, but the Standards themselves have not been updated since they were originally published in 1999.

NHMRC’s 2015 Standards for Guidelines have been developed in order to bring Australia’s standards for guidelines up to date and into line with similar standards internationally (see Table 1). They have been compiled with a view to being applicable to all guidelines containing recommendations1 for clinical practice or public health (including environmental health). They were developed by NHMRC’s Advisory Group on the Synthesis and Translation of Research Evidence (STORE; see page 23).

A series of handbook “modules” will be developed to provide practical advice and guidance on how to meet each of the standards. Once complete, the new handbook will replace “A guide to the development implementation and evaluation of clinical practice guidelines”, all of the associated handbooks, and the NHMRC additional levels of evidence and grades for recommendations for developers of guidelines.

Guideline Principles

The 2015 Standards for Guidelines are underpinned by nine guiding principles. Clinical practice and public health guidelines will:

1. Be relevant and useful for decision making
2. Be transparent
3. Be overseen by a guideline development group
4. Identify and manage conflicts of interest
5. Be focused on health and related outcomes
6. Be evidence informed
7. Make actionable recommendations
8. Be up to date
9. Be accessible

---

1 The World Health Organization defines guidelines as any document containing “recommendations for clinical practice or public health policy”. A recommendation “tells the intended end-user of the guideline what he or she can or should do in specific situations to achieve the best health outcomes possible, individually or collectively”. WHO 2014.
NHMRC’s 2015 Standards for Guidelines

1. To be relevant and useful for decision making guidelines will:
   1.1. Address a health care issue of importance
   1.2. Clearly state the purpose of the guideline and the context in which it will be applied
   1.3. Be informed by public consultation
   1.4. Be feasible to implement

2. To be transparent guidelines will make publicly available:
   2.1. The details of all processes and procedures used to develop the guideline,
   2.2. The source evidence
   2.3. The declarations of interest of members of the GDG and information on how any
       conflicts of interest were managed
   2.4. All sources of funding for the guideline

3. The Guideline Development Group (GDG) will:
   3.1. Be composed of an appropriate mix of expertise and experience, including
       representatives of relevant end users
   3.2. Have clearly defined, documented processes for reaching consensus

4. To identify and manage conflicts of interest guideline developers will:
   4.1. Require all interests of all GDG members to be declared.
   4.2. Establish a process for determining if a declared interest represents a conflict of
       interest, and how a conflict of interest will be managed.

5. To be focused on health and related outcomes guidelines will:
   5.1. Be developed around explicitly defined clinical or public health questions
   5.2. Address outcomes that are relevant to the guideline’s expected end users
   5.3. Clearly define the outcomes considered to be important to the person/s who will be
       affected by the decision, and prioritise these outcomes.

6. To be evidence informed guidelines will:
   6.1. Be informed by well conducted systematic reviews
   6.2. Consider the body of evidence for each outcome (including the quality of that
       evidence) and other factors that influence the process of making recommendations
       including benefits and harms, values and preferences, resource use and
       acceptability.
   6.3. Be subjected to appropriate peer review

7. To make actionable recommendations guidelines will:
   7.1. Discuss the options for action
   7.2. Clearly articulate what the recommended course of action is, and when it should be
       taken
   7.3. Clearly articulate what the intervention is so it can be implemented
   7.4. Clearly link each recommendation to the evidence that supports it
   7.5. Grade the strength of each recommendation to help guide end users as to whether
       or not the majority of people would benefit from implementation of the
       recommendation

8. To be up-to-date guidelines will:
   8.1. Ensure that the body of evidence on which the recommendation is based is up-to-
       date
   8.2. Propose a date by which the evidence and the guideline should be updated. This
       may be specific to each recommendation.

9. To be accessible guidelines will:
   9.1. Be easy to find
   9.2. Ideally be free of charge to the end user
   9.3. Be clearly structured, easy to navigate and in plain English
   9.4. Be accompanied by a dissemination plan
Table 1: NHMRC guideline principles mapped to standards internationally

<table>
<thead>
<tr>
<th>Principle</th>
<th>IOM</th>
<th>AGREE</th>
<th>NHMRC 2011</th>
<th>GIN 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Be relevant and useful for decision making</td>
<td>Domain 1: scope and purpose</td>
<td>A. Governance and stakeholder involvement</td>
<td>Scope of a guideline Peer review and stakeholder consultation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Domain 2: Stakeholder involvement</td>
<td>B. Scope and purpose</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>F. Public consultation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Be transparent</td>
<td>Standard 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Be overseen by a guideline development group</td>
<td>Standard 3</td>
<td>Domain 6: Editorial independence</td>
<td>A. Governance and stakeholder involvement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard 6: Editorial independence</td>
<td>Composition of guideline development group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Identify and manage conflicts of interest</td>
<td>Standard 2</td>
<td></td>
<td>Conflicts of interest Financial support and sponsoring organization</td>
<td></td>
</tr>
<tr>
<td>5. Be focused on health and related outcomes</td>
<td>Standard 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard 7</td>
<td>Domain 3: rigour of development</td>
<td>Methods Evidence reviews</td>
<td></td>
</tr>
<tr>
<td>7. Make actionable recommendations</td>
<td>Standard 6</td>
<td>Domain 4: clarity of presentation</td>
<td>D. Guideline Recommendations</td>
<td></td>
</tr>
<tr>
<td>8. Be up to date</td>
<td>Standard 8</td>
<td></td>
<td>Guideline recommendations</td>
<td></td>
</tr>
<tr>
<td>9. Be accessible</td>
<td>Domain 5: applicability</td>
<td>E. Guideline Structure and Style G. Dissemination and implementation of guidelines</td>
<td>Guideline expiration and updating</td>
<td></td>
</tr>
</tbody>
</table>
NHMRC Advisory Group on the Synthesis and Translation of Research Evidence

Terms of Reference
NHMRC aims to improve Australian practices in the development and implementation of clinical practice guidelines, public health guidelines, systematic reviews and decision making. The Advisory Group on the Synthesis and Translation of Research Evidence (STORE) provides advice to NHMRC Council and the CEO on the standards and resources needed to achieve this aim.

Initial work plan
• Establish a set of core standards for clinical practice guidelines in Australia
• Establish a set of core standards for environmental and public health guidelines in Australia
• Develop a handbook for developing, implementing and evaluating clinical practice guidelines
• Develop a handbook for developing, implementing and evaluating guidelines in environmental and public health
• Identify relevant methodological guidance that may exist elsewhere (e.g. NICE, AHRQ, IOM) and determine if it is relevant, or could be adapted to suit, the Australian context
• Advise on the appropriateness of new methods and tools that could assist those engaged in developing guidelines in Australia. For example, the use of analytic frameworks and statistical modelling in guidelines
• Advise on difficult or complex methodological issues arising from NHMRC guidelines currently in development
• Advise on new approaches being considered for evidence synthesis and guideline development and publication, including short form guidelines, rapid response guidance and position papers

The Advisory Group may form sub-groups to address specialist areas and co-opt individuals with additional expertise if and as required.

Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Philip Alderson</td>
<td>Centre for Clinical Practice, National Institute for Health and Clinical Excellence, UK</td>
</tr>
<tr>
<td>Professor Paul Glasziou</td>
<td>Director, Centre for Research in Evidence-Based Practice (CREBP), Bond University</td>
</tr>
<tr>
<td>Professor Sally Green</td>
<td>Director, Australasian Cochrane Centre</td>
</tr>
<tr>
<td>Ms Philippa Middleton</td>
<td>Executive Director, Australian Research for Health of Women and Babies (ARCH)</td>
</tr>
<tr>
<td>Professor Dianne O’Connell</td>
<td>Cancer Research Division, Cancer Council NSW</td>
</tr>
<tr>
<td>Professor Elizabeth Waters</td>
<td>Director, Public Health Insight, Centre for Health Equity, The Melbourne School of Population &amp; Global Health</td>
</tr>
</tbody>
</table>

SToRE members serve as individuals on the basis of their expertise, knowledge and experience, and not as representatives of their employer, organization or affiliated group.
Appendix 2: Information technology for guideline development

The potential for information technology tools to facilitate the development of clinical practice guidelines

Prepared for NHMRC
August 2015
What is a clinical practice guideline and how is it developed?

It is apparent that our definition of a guideline has evolved in recent years with the advent of digital technology. Typically, guidelines have been large, printed ‘static’ documents that included within them a number of research questions and resulting recommendations, accompanied by one or more comprehensive systematic reviews. These guidelines were fixed in time, and updating them to meet NHMRC requirements required re-doing the entire volume of work within a pre-determined time period (5 years from initial date of publication). Issues related to the feasibility of implementing the resulting guidelines were explicitly considered, but usually only during drafting of the recommendations. Similarly, consideration of the best way to evaluate the impact of a guideline often occurred towards the end of the guideline development process.

More recently, our definition of guidelines has shifted towards the recommendations themselves: each recommendation can now be viewed as a ‘guideline’. And individual recommendations can now be accessed in a layered format with the supporting, systematically reviewed evidence available to those who want it. There is now greater recognition of the importance of early consideration of how the guidelines will be used and by whom, in order to facilitate guideline implementation and evaluation. And with a focus on individual recommendations, there is the opportunity to vary the time-frame over which recommendations are updated according to the level of research activity by question. Together these changes are allowing the development of ‘living’ guidelines: clinical practice guidelines that retain their evidentiary rigor but are more responsive to changes in evidence, and are better designed to meet the needs of their users. There is also earlier focus on measuring the uptake and impact of guidelines.

What is the Potential Role for IT?

The NHMRC is leading a program of work to update the way in which clinical practice guidelines are developed in Australia. The over-arching aim of this work is to improve the quality, currency and accessibility of Australian clinical guidelines. It is recognised that the time and resources required to produce guidelines are significant. Advances in information technology (IT) have the potential to transform the development of clinical practice guidelines in two keys ways: (1) automation of many of the labour-intensive activities that are fundamental to the development of evidence-based guidelines, (2) digital methods of dissemination to enhance uptake and implementation.

The current report describes the ways in which specific IT tools might be used to facilitate the development and publication of clinical practice guidelines in Australia. This report presents a list of candidate IT tools and proposes criteria for the evaluation of these tools. The list of candidate tools is based on feedback from NHMRC guideline developers in Australia and searches of the published and grey literature. The evaluation criteria are based on an understanding of the activities involved in the development of clinical practice guidelines (see Table 2) and feedback from government and non-government organisations with experience in guideline development (see below).

<p>| Table 2  Activities within each phase of the guideline development process |</p>
<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project preparation</td>
<td>• Prioritising topics and agreeing scope</td>
</tr>
<tr>
<td></td>
<td>• Organising resourcing (staff and budget)</td>
</tr>
<tr>
<td></td>
<td>• Establishing project governance ( guideline steering/reference group and processes)</td>
</tr>
<tr>
<td>2. Evidence Identification</td>
<td>• Defining clinical questions with PICO</td>
</tr>
<tr>
<td></td>
<td>• Defining search strategy and search terms</td>
</tr>
<tr>
<td></td>
<td>• Running search(es)</td>
</tr>
<tr>
<td></td>
<td>• Managing full library of candidate articles</td>
</tr>
<tr>
<td></td>
<td>• Removing duplicates</td>
</tr>
<tr>
<td></td>
<td>• Screening abstracts (applying criteria for exclusion)</td>
</tr>
<tr>
<td></td>
<td>• Retrieving full text articles</td>
</tr>
<tr>
<td></td>
<td>• Screening full text articles (re-applying criteria for exclusion)</td>
</tr>
<tr>
<td>3. Evidence Appraisal and Synthesis</td>
<td>• Sorting studies by type</td>
</tr>
<tr>
<td></td>
<td>• Applying quality assessment/risk of bias criteria</td>
</tr>
<tr>
<td></td>
<td>• Extracting study characteristics data</td>
</tr>
<tr>
<td></td>
<td>• Extracting outcomes data</td>
</tr>
<tr>
<td></td>
<td>• Converting data (as required)</td>
</tr>
<tr>
<td></td>
<td>• Statistically combining data (as appropriate)</td>
</tr>
<tr>
<td></td>
<td>• Empirically combining data</td>
</tr>
<tr>
<td>4. Recommendation development</td>
<td>• Applying considered judgment based on strength and applicability of the body of evidence, with regard to likely implementation issues</td>
</tr>
<tr>
<td></td>
<td>• Agreeing wording for recommendation</td>
</tr>
<tr>
<td></td>
<td>• Agreeing strength of recommendation</td>
</tr>
<tr>
<td></td>
<td>• Undertaking peer review/public consultation</td>
</tr>
<tr>
<td>5. Dissemination and Implementation</td>
<td>• Publishing recommendations and accompanying evidence base</td>
</tr>
<tr>
<td></td>
<td>• Developing secondary products to facilitate implementation (eg, mobile applications for clinicians, patient information materials, hospital protocols etc)</td>
</tr>
<tr>
<td></td>
<td>• Monitoring uptake and use of guideline in clinical practice</td>
</tr>
</tbody>
</table>

Initial feedback from NHMRC guidelines developers

The NHMRC has hosted a series of three workshops from April to June 2015, in Canberra, Sydney and Melbourne. The workshops covered the broader range of activities being undertaken by the NHMRC around ‘guidelines improvement’. One part of those workshops was to discuss ways in which the use of IT could improve the process of guidelines development.

Attendees were invited to discuss IT tools they had used or considered for use, and the advantages and disadvantages of these. A summary of the key themes from all three workshops is presented below, by participant. A detailed description of the feedback from the workshops, arranged by theme, is provided in Appendix 1.

**Government**
From the perspective of government the following principles are important for the development of national guidelines:

- national and jurisdictional endorsement
- prioritisation of topics across jurisdictions
- considerations of safety
• authentic consumer involvement
• national co-ordination of effort
• adherence to legislative requirements
• upholding principles of privacy
• mechanisms to manage conflicts of interest
• use of trusted methodology
• overall budget and achieving value for money

Developers
For guideline developers, the key issues were around developing guidelines using efficient, flexible processes. Particular attributes that they would like to see are:
• reduced duplication of effort and efficient use of clinicians’ time
• reduced costs associated with development
• a modular approach to recommendation development, with varying timeframes for ‘active’ vs ‘stable’ recommendations
• ownership of the IP associated with the guideline
• multi-layered functionality according by user type (ie, guidelines development group administrator vs systematic reviewer vs member of clinical steering group)
• Incorporation of NHMRC standards to facilitate reporting and subsequent approval process by Council.

Users
There was much discussion regarding the users of guidelines, and the importance of recognising that different modes of dissemination and implementation are needed for different users and settings. Whilst clinicians, consumers and carers are most often cited as the target audiences for clinical practice guidelines, guidelines are also used by Commonwealth and State policy makers, researchers, research funders, educators, and producers of secondary/derivative products.

Overall
All attendees agreed some over-arching principles. In particular, there was agreement with the overall approach being taken by the NHMRC: to evaluate IT tools that are currently available and use or adapt those tools that best suit the needs of developers, and not to develop new tools de novo. A recurring theme from the third party developers was that if the NHMRC is considering developing an ‘IT platform’ to improve the quality of guideline development, it needs to facilitate guideline development, not hinder it. In other words, whilst the platform could provide direction regarding which tools meet NHMRC criteria for use, developers would require flexibility around the specific tools they each use.

There was universal agreement that an understanding of how and when guidelines will be used is an absolute requirement prior to beginning guideline development. It was also agreed by all participants that recommendations need to actionable and that measurable effects should be defined at the outset, and tracked prospectively.

And finally, it is recognised that the needs of different guideline developers are overlapping, but different. For example, the governance requirements for guidelines developed by government agencies may be quite different to those of a non-
government organisation. To maximise use, it would be ideal for the NHMRC IT platform to meet the needs of all types of guideline developers.

**IT tools for possible evaluation by NHMRC**

As mentioned above, a list of IT tools that might facilitate the development of guidelines has been drafted and is presented (in alphabetical order) in Table 3. This list has been collated using information from the literature and from participants at the NHMRC workshops. For each IT tool the table lists a reference (usually a website) for the tool, and a brief description of the stated functionality of the tool.

The list is limited to tools that are publically available (either free or paid), and does not include ‘in house’ tools or platforms (eg, wikis) produced by developers for their own use.

It can be seen that some tools have a very narrow focus performing only one or two of the activities listed in Table 2 (eg, Abstrackr) whereas other tools perform multiple activities of systematic review preparation (eg, SRDB.Pro) or recommendation development (eg, MAGIC app). Some tools currently support the automation of systematic review tasks, while others don’t. But it is certainly possible to imagine a system where each systematic review is described as a computer programme that automatically performs all the functions of a systematic review (Tsafnat et al, 2014), allowing the clinical steering group of a guideline to focus on applying their considered judgement to the determination of recommendations.
### Table 3  IT tools that may facilitate the NHMRC guideline development process

<table>
<thead>
<tr>
<th>Name</th>
<th>Source and Brief Description</th>
</tr>
</thead>
</table>
| Abstrackr     | • [http://www.abstrackr.cebm.brown.edu/](http://www.abstrackr.cebm.brown.edu/)  
• Machine learning-based abstract screening                                                                |
| Aigaion       | • [http://sourceforge.net/projects/aigaion/](http://sourceforge.net/projects/aigaion/)  
• Reference management system                                                                |
• Reference management system                                                                |
| CitNetExplorer| • [http://www.citnetexplorer.nl/Features](http://www.citnetexplorer.nl/Features)  
• Tool for visualising citation networks                                                                |
| Covidence     | • [http://www.covidence.org/](http://www.covidence.org/)  
• Preparation of systematic reviews                                                                |
| CREBP         | • [http://crebp-sra.com/](http://crebp-sra.com/)  
• Systematic review assistant                                                                |
| Distiller-SR  | • [https://distillercer.com/products/distillersr-systematic-review-software/](https://distillercer.com/products/distillersr-systematic-review-software/)  
• Preparation of systematic reviews                                                                |
| Dr Evidence   | • drevidence.com/  
• Evidence table generation and meta-analysis                                                                |
| EndNote       | • [http://endnote.com/](http://endnote.com/)  
• Bibliographic software                                                                |
• Searchable database of related health evidence                                                                |
| EPPI reviewer | • [eppi.ioe.ac.uk/cms/er4/](http://www.citnetexplorer.nl/Features)  
• Preparation of systematic reviews                                                                |
| EROS          | • [www.eros-systematic-review.org/](http://www.eros-systematic-review.org/)  
• Preparation of systematic reviews                                                                |
| ExaCT         | • Kiritchenko S et al. 2010  
• PICO element extraction                                                                |
| GATE          | • [https://gate.ac.uk/overview.html](https://gate.ac.uk/overview.html)  
• Open-source software for analyzing text                                                                |
| GDT & GRADE pro| • See [http://www.guidelinedevelopment.org/](http://www.guidelinedevelopment.org/)  
• Systematic review preparation and GRADE decision-making                                                                |
• Ontology based search tool for PubMed that categorises hits                                                                |
| Import.io     | • [https://import.io/](https://import.io/)  
• Data extraction from websites                                                                |
| MAGIC         | • See [http://www.magicproject.org/](http://www.magicproject.org/)  
• and [http://www.magicapp.org/](http://www.magicapp.org/)  
• Guideline authoring and publication                                                                |
| Mendeley      | • [www.mendeley.com/](http://www.mendeley.com/)  
• Bibliographic software                                                                |
| Meta-analyst  | • Wallace et al 2009  
• Creates meta-analysis from extracted data                                                                |
| Metafor package | • [http://www.metafor-project.org/doku.php](http://www.metafor-project.org/doku.php)  
• Meta-analysis add-on for R                                                                |

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metta</td>
<td>Smalheiser et al 2014 • Meta-search engine for systematic reviews</td>
</tr>
<tr>
<td>PACES</td>
<td>• <a href="http://paces.jbiconnectplus.org/">http://paces.jbiconnectplus.org/</a> • Online tool for conducting clinical practice audits in health settings</td>
</tr>
<tr>
<td>ParsCit</td>
<td>• <a href="http://wing.comp.nus.edu.sg/parsCit/">http://wing.comp.nus.edu.sg/parsCit/</a> • Reference string extraction from published papers</td>
</tr>
<tr>
<td>PRISMA generator</td>
<td>• <a href="http://prisma.thetacollaborative.ca/">http://prisma.thetacollaborative.ca/</a> • Automatic generation of PRISMA flow diagrams</td>
</tr>
<tr>
<td>Quick Clinical</td>
<td>• Coiera et al 2005 • Meta-search engine</td>
</tr>
<tr>
<td>Reference Manager</td>
<td>• refman.com/ • Bibliographic software</td>
</tr>
<tr>
<td>RefDB</td>
<td>• <a href="http://refdb.sourceforge.net/index.html">http://refdb.sourceforge.net/index.html</a> • Reference database and bibliography</td>
</tr>
<tr>
<td>RefWorks</td>
<td>• <a href="http://www.refworks.com/">http://www.refworks.com/</a> • Online citation management</td>
</tr>
<tr>
<td>RevMan</td>
<td>• tech.cochrane.org/revman • Meta-analysis software from Cochrane Collaboration</td>
</tr>
<tr>
<td>RevMan-HAL</td>
<td>• ccdan.cochrane.org/revman-hal • Automatic write-up from extracted data, extension of RevMan</td>
</tr>
<tr>
<td>RobotReviewer</td>
<td>• Marshall et al 2015 • Machine-learning assessment of bias in clinical trials</td>
</tr>
<tr>
<td>Sherlock</td>
<td>• Cepeda et al 2013 • Search engine for clinicaltrials.gov trial register</td>
</tr>
<tr>
<td>SRDB.PRO</td>
<td>• <a href="https://www.srdb.pro/">https://www.srdb.pro/</a> • Citation searching, de-duplication, data extraction, report writing</td>
</tr>
<tr>
<td>stArt</td>
<td>• Hernandes et al 2012 • Support for all stages of systematic review preparation</td>
</tr>
<tr>
<td>Spa</td>
<td>• Kuiper et al 2014 • Web based data extraction tool for PDF documents</td>
</tr>
<tr>
<td>SUMARI</td>
<td>• joannabriggs.org/sumari.html • Systematic review preparation and meta-analysis</td>
</tr>
<tr>
<td>WebPlotDigitizer</td>
<td>• arohatgi.info/WebPlotDigitizer • Digitisation of data from graphs and plots</td>
</tr>
<tr>
<td>Weka</td>
<td>• <a href="http://www.cs.waikato.ac.nz/ml/weka/index.html">http://www.cs.waikato.ac.nz/ml/weka/index.html</a> • Data mining based on machine learning</td>
</tr>
</tbody>
</table>
Proposed criteria for assessing IT tools

A set of criteria for evaluating the usefulness of different IT tools for guideline development is presented in Table 4. The criteria are based on the phases and activities of guideline development listed in Table 2 and key principles identified by participants in the NHMRC workshops. The key principles include aspects such as system requirements, ownership of data, ease of use, availability of support, the interoperability of the different tools, cost and likelihood of ongoing availability.

It is proposed that each candidate IT tool be assessed against all of the criteria listed in Table 4. The assessment allows one of four responses to each criteria:

1. the tool has no functionality for the specified function
2. the tool has the ability to support this function when performed manually
3. the tool has the ability to semi-automate this function, or
4. the tool has the ability to fully automate this function

The technical performance of each tool (ie, the extent to which it does what it is designed to do) will be paramount. The specific measures used to determine technical performance will be different for each activity: eg, the ability of text mining to appropriately screen abstracts for inclusions can be measured in many ways such as ‘recall’ or ‘precision’ (both defined as sensitivity), ‘work saved over sampling’, time taken, specificity, or classification error.

Obviously, efficiencies that might be achieved as a consequence of automation or semi-automation of systematic review processes should not result in a significant loss of relevant studies or data. A recent review by O’Mara-Eves et al 2015 concluded that current approaches to text mining for systematic reviews result in workload reductions of 30% to 70% and are associated with the loss of approximately 5% of relevant studies.

The assessment criteria recognise the importance to developers of using tools that facilitate guideline development. Key aspects of such facilitation are certainty that a tool will continue to be available (once an investment in its use has been made) and between-tool operability (within and across the different phases of guideline development).

Based on the information in each evaluation sheet, it is envisaged that the NHMRC could create a shortlist of IT tools that are considered most useful for guideline development.
<table>
<thead>
<tr>
<th>Details of tool</th>
<th>Name</th>
<th>Version/Date of release</th>
<th>Reference (eg, website)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
<td>Specific guideline development function</td>
<td>No function</td>
<td>Supports manual</td>
</tr>
<tr>
<td>2. Evidence Identification</td>
<td>Defining research question PICO</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Running saved search in relevant databases</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Exporting search results</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Managing library (incl duplicate removal)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Screening abstracts and full text articles for inclusion</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Evidence Appraisal &amp; Synthesis</td>
<td>Extracting study characteristics (study type, blinding, treatment allocation etc)</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Extracting PICO information</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td></td>
<td>Determining study quality/risk of bias</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td></td>
<td>Extracting outcomes data</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td></td>
<td>Converting data</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td></td>
<td>Statistically combining data</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Empirically combining data</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Recommendation Development</td>
<td>Applying considered judgement to body of evidence</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Identifying implementation or resource use issues</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Developing wording and strength of Recommendations</td>
<td>☐</td>
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<tr>
<td></td>
<td>Developing Good Practice Points</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td></td>
<td>Managing public consultation and peer review</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Disseminate &amp; Implement</td>
<td>Publishing recommendations with supporting evidence</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td></td>
<td>Development of secondary products to facilitate uptake</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Evaluation and monitoring of uptake and use of guidelines</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Performance</td>
<td>[Notes for assessors]</td>
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<tr>
<td></td>
<td>[How well does it do what it is designed to do? cf different measures]</td>
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<tr>
<td></td>
<td>[Operating system/PC/Mac; computer vs mobile device]</td>
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<td>[Local vs remote server; license terms; cyber security]</td>
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<td></td>
<td>[Ease of use of interface; capacity to link with other tools across phases]</td>
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<td></td>
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<td></td>
<td>[What is current/future support? Proprietary/Open source; Extensible?]</td>
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<td></td>
<td>[Will it continue to be available? What is current payment model?]</td>
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</tr>
<tr>
<td></td>
<td>[Highlight additional functionality or issues not captured above]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References


Hernandes, E, Zamboni, A., Fabbri, S. and Di Thommazo, A. CLEI Electronic Journal 2012, 15: 1. Using GQM and TAM to evaluate StArt – a tool that supports systematic review

Kiritchenko, S., de Bruijn, B., Carini, S., and Sim, I. BMC Medical Informatics & Decision Making 2010, 10: 56. ExaCT: automatic extraction of clinical trial characteristics from journal publications.


Appendix 1: Details of feedback from NHMRC developer workshops

This Appendix details the feedback received at three workshops convened by the NHMRC and held in Canberra on 21 April, in Sydney on 20 May, and in Melbourne on 17 June 2015. Attendees at the first workshop predominantly represented government and government agencies involved in guidelines development: the Australian Commission on Safety and Quality in Healthcare (ACSQHC), The Commonwealth Department of Health, the National Blood Authority, Cancer Australia, and non-government organisations including the Cochrane Collaboration. Attendees at the second and third workshops were predominantly from non-government organisations that have previously sought or that plan to seek NHMRC endorsement for guidelines developed by them (so called ‘third-party developers’).

The feedback across the three workshops is grouped by the following themes: priority setting; system requirements; systematic review and guideline development functionality; ownership, security and privacy; accessibility; cost; governance; and project management. Although there was a difference in the emphasis placed on each theme according to participant types (ie, government versus non-government), there was agreement across all participants of the importance of all themes.

The current document is focused on the specific functionality and evaluation of IT tools. Priority setting and project management were acknowledged by all participants as important aspects of guideline development. However, both of these aspects were considered to be outside the scope of the current project.

Priority Setting

- The process being undertaken by the ACSQHC applies to government-funded, NHMRC-developed guideline
- Questions were asked regarding what would happen if blood or cancer topics were prioritised, given that the NBA and cancer Australia are government agencies with guidelines responsibilities in these therapeutic areas
- Guidelines developed outside this framework are encouraged to have their own autonomous processes for prioritising topics, taking account of their own strategic considerations and funding
- Opportunities for third-party developers to learn from each other and government re prioritisation methods and criteria
- Third party developers could benefit from using or adapting the ACSQHC priority-setting criteria, without being bound by them (recognizing that funding, resourcing, operational and strategic priorities are organization-dependent)

System Requirements

- Robust and sustainable architecture – use of mirror servers, and availability of ongoing maintenance and/or support
- Must be able to handle expected volume of traffic without crashing
- Needs to be able to support teams spread across different locations – including the ability to support international collaborators
• Needs to meet government IT requirements, including web accessibility where relevant
• Needs to be compatible with IT systems of users
• Needs to be sufficiently flexible to allow development of fit-for-purpose guidelines where needed – especially when published guideline needs to reflect the look and feel of different third party developers
• Although one integrated system for the entire guidelines enterprise is appealing, it was noted that development of IT solutions is rapid, and it would not be sensible for the NHMRC platform to lock into specific tools – better to identify ‘approved’ tools, and update/add to the list as new tools are developed
• Ideally developers don’t want to be driven the technology: rather, developers should define their needs and then identify or develop technology to meet those needs.

Systematic review and guideline development functionality
• Government is supportive of building national guidelines capacity
• Needs to allow updates of existing guidelines as well as development of new guidelines – given that many existing guidelines will be in a paper format, there will need to be a practical method of transitions over to a digital platform
• Need to be able to build database and meta-analyses over time, so that process becomes incremental, not de novo each time
• Needs to allow version control and documentation of rationale for all decisions made (methodological and recommendation-related)
• Consideration of breadth of guideline: whole condition vs topic-specific
• Ability to have a ‘modular’ approach to guideline development, and update each according to level of activity in specific research areas
• Ability to ‘date stamp’ individual questions (or groups of questions)
• Opportunity to facilitate transition from FORM to GRADE (given the international adoption of the latter), recognising the similarities and differences between the two approaches
• Being able to respond quickly to new clinical evidence is very important (even simply citing a new study alongside a relevant recommendation, without having updated that recommendation)
• Being able to use or adapt guidelines from other countries
• Some participants have successfully used Survey Monkey used to agree/vote on wording of recommendations
• Being able to facilitate communication with the clinical group would be very useful
• Participants were interested in the potential for new opportunities to engage with the Cochrane Collaboration, and linking to the Transform project would be very useful
• Third party developers would value links to tools that have been considered by the NHMRC as suitable for use in guidelines development
• Increasingly important that guidelines consider co-morbidities, genomic and the advent of personalised medicine

Ownership, security and privacy
• Ownership and copyright needs to clearly articulated up front
• The need to control their own Intellectual Property was a key concern of third party developers
• Need to store data on a local server was an issue for all, but particularly for government developers (as current legislations prevents the storage of government information in the cloud)
• Important for third-party developers to have control of their own database and outputs
• Need restricted, secure access for developers during development phase, and the ability to control access for different types of users (eg, NHMRC vs developer administrator vs member of clinical steering group)
• Important that private details of developers (eg, contact details of clinical steering group) are kept confidential

Accessibility for developers
• System must be intuitive, and easy to use for all – especially busy clinicians on the steering group who might only dip in and out of it. If users have to ‘fight’ the system, they won’t use it
• If there is insufficient evidence to support the development of full recommendations, then there must be scope for developers to produce evidence-informed guidance instead (eg, Good Practice Points, or ‘guidance’ documents)

Accessibility for users
• We need to produce outputs that will be of real use in improving patient health: guidelines need to be implantable and measurable
• Need to understand how users access guidelines - who uses the guideline and when? Important to note that clinicians don’t necessarily use the guidelines directly, but may use products derived from them
• Scope of guidelines important to users too – eg, Diabetes vs diabetic foot
• Important to measure impact of guidelines – could be via improved health outcomes, decreased variation in practice, number of downloads
• Important that we have our ‘end goal’ in mind when we start: designing ‘secondary products’ should not be an after-thought
• Important that outputs have connectivity with point of care decision support systems, and are mobile friendly – ie, can be used on smart phones and tablets
• Consider using registry data to measure guideline impact

Cost
• Cost is an issue for all developers, but many have invested significantly in IT solutions (eg, development of ‘in house’ wiki platforms by the Cancer Council Australia, and Cancer Australia; or use of MAGIC app)
• It was acknowledged that many guidelines tools were initially provided for free, but have become commercialised. So there can be risk in locking in to using a ‘free’ tool that might become expensive in the future
Governance

- The NHMRC is very focused on improving the transparency of guideline development, especially regarding the process of COI declaration and reporting of funding sources
- Participants agreed with principles of new NMHRC standards for guidelines development on the condition that meeting the requirements of the NHMRC is not an ‘onerous, additional activity’, but is an activity embedded in development process
- Important that governance processes are in place before guidelines development starts, and that sufficient time is spent at start of a guideline development process to agree scope
- Suggestion that NHMRC portal could be used more actively to support public consultation of draft guidelines
- Consider the value of public consultation at the time of drafting the research protocol
- Developers would value discussion around the possibility of targeted vs ‘full’ public consultation: full public consultation can be an intensive exercise which some organisations find difficult to resource.

Project Management

- Guidelines are large projects that require high-level resource management (people and money)
- The time and costs required to develop guidelines under existing models are frustrating for government and developers alike
- For third party developers, guideline teams are usually scattered across different locations working on different sections of the guideline and communication is via email, teleconference calls and face-to-face meetings
- All of these present issues with cost and version control
- Participants suggested that a budgeting tool would be very helpful
- The provision of NHMRC-approved templates that can be used by developers would be well received
- There was discussion regarding the use of reliable systematic reviewers, with the acknowledgment that these can be difficult to identify.
Appendix 3: AHMAC Criteria for Prioritisation

In November 2014, AHMAC endorsed the following criteria for national clinical practice guidelines to be considered for public funding. It was agreed that:

1. The clinical area has the potential to significantly benefit the quality of patient/consumer care and health outcomes.

AND

2. The clinical area is:
   a) high prevalence or represents a significant burden of disease (especially for high health needs or vulnerable populations) and/or
   b) imposes high costs on health service funders, users (consumers/patients/carers), service providers, insurers and any opportunity costs incurred (i.e. consider the trade-off between the benefits achieved from assigning resources to the development of one particular guideline and the potential consequences for not supporting another) and/or
   c) is a Government health priority topic.

AND

3. There is potential to:
   a) reduce risks and harms to consumers/patients/health service users, and/or
   b) reduce unwarranted variation in prevention, diagnosis or treatment, and/or
   c) derive better quality and value care by reviewing treatments that may be over-utilised, under-utilised or of low value and/or
   d) provide evidence-based advice in areas where there is new care, rapid change, uncertainty about clinically-effective and cost-effective care, inappropriate practice or contested evidence.

AND

4. There are no other current, valid or relevant guidelines available or applicable to the Australian context.