EVIDENCE-BASED PRACTICE

ACROSS THE HEALTH PROFESSIONS

2ND EDITION

Tammy Hoffmann • Sally Bennett • Chris Del Mar

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Evidence-based practice across the health professions 2nd edition

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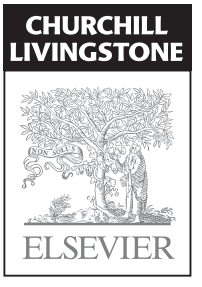

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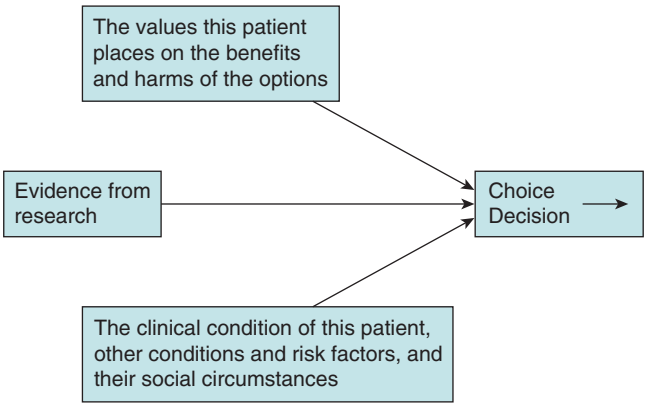
Foreword

Paradigms change over time. The development of a new paradigm does not do away with the old one, but adapts and changes it. In the last three years we have seen increasing interest in fitting the evidence to the individual patient. Of course evidence-based practice, in addition to its focus on the evidence, also emphasises the need to relate the evidence to the unique condition and values of the individual patient. This emphasises two important aspects: the clinical condition of each patient and their values.

Wittgenstein said that every idea is a picture, and it may be, if we had used the picture below, that evidence-based medicine would not have been described and criticised as 'cookbook medicine' in its early years.



Throughout the new edition of this book the need to take all three of these factors, as well as a fourth, the practice context, into account when making decisions is emphasised and very clearly explained. One of the ways in which this has been achieved is by expanding the number of discipline-specific worked examples. The importance of this lies in making the practice of evidence—essential to getting the right information to the decision-making point—clearly relevant and achievable to *all* health professionals, whatever their unique role is in providing healthcare.

The editors have done a terrific job of clearing away the mystique of the subject matter to make the concepts and processes clear and accessible. Throughout it, this book keeps the focus on what it is that clinicians and patients really need to know to make decisions. This book should contribute to making sure we are all able to get the best available evidence to every patient choice and every clinical decision.

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Chris was educated in science and medicine and worked as a general practitioner until commencing in an academic position at the University of Queensland in 1988, where he was Professor of General Practice from 1995 to 2004. He was Dean of Health Sciences and Medicine and also Pro-Vice-Chancellor of Research at Bond University from 2004 to 2009. He is an internationally-known evidence-based practice researcher, has led evidence-based practice workshops for over 20 years and has also conducted health services and clinical research. Chris has published four books and more than 300 research articles and book chapters. He has been Editor of the research section of the *Australian Family Physician*; Chair of the Royal Australian College of General Practitioners National Research Committee; President of the Australian Association for Academic General Practice, Visiting Professor of General Practice at Oxford University and Chair of the editorial committee of the Australian Government's health web portal, HealthInsite. He is a Coordinating Editor of the Cochrane Collaboration, and has been a member of the Editorial Board of the *BMJ* and a deputy editor of the *Medical Journal of Australia.*

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Jenny has worked and trained as a general practitioner, clinical epidemiologist and economist. Since graduating in medicine, she has worked in positions that combine her interests in these three areas. Her main research areas of interest are diagnosis, screening and evidence-based practice in clinical practice. She is a member of the Cochrane Systematic Reviews of Diagnostic Accuracy Methods Working Group.

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Sue has worked as an occupational therapist for over three decades in a variety of practice settings in Australia and the USA. She has worked in clinical, management and program development roles. Sue was also Assistant Professor in the Occupational Therapy Department at Ithaca College, NY where she was involved with incorporating evidence-based practice into the curriculum and also taught the Research Methods and Thesis courses. Sue is an author for the Cochrane Stroke Group and has been invited to present on the Cochrane Colloquium, systematic reviews and evidence-based practice for the American Occupational Therapy Association Educational Program Director's meetings and various college clinical educator programs. Sue's post-professional master's degree research was in clinical reasoning and her PhD research includes exploring how therapists define and incorporate evidence into their reasoning process when working with people who have had a stroke.

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Professor Ernst is an academic doctor and researcher who specialises in the study of complementary and alternative medicine. He was appointed as Professor of Complementary Medicine at the University of Exeter, the first such academic position in the world. His work has been awarded with 13 scientific prizes/awards and he served on the Medicines Commission of the British Medicines and Healthcare Products Regulatory Agency from 1994 to 2005. He has published more than 1000 papers in the peer-reviewed literature and more than 40 books.

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Paul was the director of Oxford University's Centre for Evidence-Based Medicine from 2003 to 2010 and is an international leader in evidence-based medicine. He is the author of seven books related to evidence-based practice and more than 190 peer-reviewed journal articles, and has led more than 100 evidence-based practice workshops in dozens of countries. Now at Bond University in Australia, his research focuses on improving the clinical impact of publications by reducing the more than $85 billion annual loss from unpublished and unusable research (see, for example, Chalmers I, Glasziou P. Avoidable waste in the production and reporting of research evidence. *Lancet* 2009; 374(9863):86–9). As a general practitioner, this work has particularly focused on the applicability and usability of published trials and reviews.

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Preface

When the publishers asked us to prepare a second edition, they asked us to respond to feedback that was in the form of popular demand: more examples for more health professionals, please. We are delighted to oblige. This edition of the book contains new material that is relevant to exercise physiologists and human movement specialists, pharmacists, paramedics, and complementary and alternative medicine practitioners, in addition to the 10 disciplines that were included in the first edition.

We have expanded our contributor team and as well as adding discipline experts, we have been joined by a host of international and national experts in numerous fields of evidence-based practice. We welcome our new contributors to the book and thank all of the authors for their valuable contributions.

The overwhelmingly positive reaction to the first edition, and the developments that evolved from it, delighted us. The field of evidence-based practice is sometimes naïvely and incorrectly viewed as a relatively slow-changing area. Yet, as we updated each of the chapters even we were surprised by the number of developments and progress since we prepared the first edition four years ago. For example, into Chapter 12 we have added information about qualitative evidence synthesis. We have also added a new chapter (Chapter 17—*Embedding evidence-based practice into routine clinical care*) which reflects on the importance of an organisational environment which promotes evidence-based practice and describes specific supportive strategies.

Finally, we hope that this book helps bring together health team members from different disciplines for a common purpose, in the same way that we have done so in producing this book—so that, quite apart from enjoying each other's company, we can deliver seamless, integrated and up-to-date evidence-based care to our patients.

Tammy Hoffmann, **Sally Bennett** and **Chris Del Mar**

Chapter 1

Introduction to evidence-based practice

Tammy Hoffmann, Sally Bennett and Chris Del Mar

LEARNING OBJECTIVES

After reading this chapter, you should be able to:

- Explain what is meant by the term evidence-based practice
- Understand the origins of evidence-based practice
- Explain why evidence-based practice is important
- Describe the scope of evidence-based health care
- List and briefly explain each of the five steps that make up the evidence-based practice process

WHAT IS EVIDENCE-BASED PRACTICE?

There is a famous definition by Professor David Sackett and some of his colleagues which declares evidence-based medicine to be explicit and conscientious attempts to find the best available research evidence to assist health professionals to make the best decisions for their patients.[1] Even though this definition was originally given with respect to evidence-based medicine, it is often extended beyond the medical profession and used as the definition of evidence-based practice as well. The definition may sound rather ambiguous, so let us pick its elements apart so that you can fully appreciate what is meant by the term *evidence-based practice*.

The purpose of evidence-based practice is to assist in clinical decision making. To make informed clinical decisions, we need to integrate lots of pieces of information. As health professionals, we are typically very good at seeking information from our patients and their families and from the settings in which we work; but, traditionally, we have not been as aware of the information that we can gain from research. When Sackett and his colleagues refer to 'evidence', they clarify it by specifying 'evidence from research'. So, although we need information from many sources, evidence-based practice shows how research can also play a role in informing clinical decisions. Let us sidetrack for a moment to look briefly at what research can offer us to enhance our clinical decision making.

We are familiar with the importance of research for testing theories and for providing us with the background information that forms part of our clinical knowledge. Knowledge about subjects such as anatomy, pathology, psychology and social structures that is essential to our work has been refined over many years through research. Our science-based training gives us models on which to base our clinical management of patients. Of course, having an understanding of the mechanisms is important—for example, we could never have made sense of heart failure or diabetes without understanding the basic mechanisms of these illnesses. Yet, focusing only on the mechanisms of illness can be misleading. Evidence-based practice encourages us to concentrate instead on testing the information directly. This is actually difficult for health professionals to do, because we have been trained to consider primarily the underlying mechanisms. Table 1.1 gives some clinical examples to illustrate how the two approaches differ.

Returning to exploring the elements of the definition of evidence-based practice, the definition very deliberately states that attempts to find evidence should be 'explicit' and 'conscientious'. There is a good

TABLE 1.1:
EXAMPLES OF HOW FOCUSING ONLY ON THE MECHANISMS OF ILLNESS CAN BE MISLEADING

Previous recommendation (based on a mechanism approach)	Rationale based on a mechanism approach	The empirical research that showed it was wrong
Put babies onto their fronts when they go to sleep	If they should vomit in their sleep, they might swallow the vomit into their lungs and develop pneumonia (Dr Spock in the 1950s)[2]	Observational data have shown that babies are more likely to die of sudden infant death syndrome (SIDS) if they lie on their fronts, rather than on their backs, when sleeping[3]
Bed rest after a heart attack (myocardial infarction)	The heart needs resting after an insult in which some of the heart muscle dies	Randomised controlled trials showed that bed rest makes thromboembolism (a dangerous condition in which a clot blocks the flow of blood through a blood vessel) much more likely[4]
Covering skin wounds after removal of skin cancer	To prevent bacteria gaining access and therefore causing infection	A randomised controlled trial showed that leaving the skin wounds open does not increase the infection rate[5]

reason for this. Prior to the advent of evidence-based practice, the way in which many health professionals accessed research was somewhat haphazard and their understanding of how to accurately interpret research results was often superficial. In other words, we may not have been making the best use of research to inform our clinical decision making. For example, simply using whatever research evidence you happen to obtain from reading the few journals that you subscribe to is not going to sufficiently meet your clinical information needs or keep you updated with new research.[6] Hence, the definition of evidence-based practice encourages us to be 'explicit' and 'conscientious' in our attempts at locating the best evidence from research.

That leads us to explore what is meant by the term *best* evidence from research. Understanding what the different study designs can and cannot help you with and, if you like, what their pros and cons are is important. Part of the skill of evidence-based practice is being able to locate the type of study design that is best suited to the particular type of information that you need in order to make a clinical decision. Further, as we explain in more detail later in this chapter, some studies have not been designed very well and this reduces the confidence that we have in their conclusions. We therefore need to attempt to find the best quality research that is available.

The beginning of the definition of evidence-based medicine according to Sackett and colleagues,[1] introduced at the beginning of this chapter, is well known and often quoted. However, the section that follows it is also important. It reads:

> The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research. By individual clinical expertise we mean the proficiency and judgement that individual clinicians acquire through clinical experiences and clinical practice. Increased expertise is reflected in many ways, but especially in more effective and efficient diagnosis and in the more thoughtful identification and compassionate use of individual patients' predicaments, rights, and preferences in making clinical decisions about their care.[1]

This definition makes it clear that evidence-based practice also requires clinical expertise, which includes thoughtfulness and compassion as well as knowledge of effectiveness and efficiency. As this is a key aspect of evidence-based practice, we consider the concept of clinical expertise in more depth in Chapter 15.

A simple definition of evidence-based practice

Over time, the definition of evidence-based practice has been expanded upon and refined. Nowadays one of the most frequently used and widely known definitions of evidence-based practice acknowledges that it involves the integration of the best research evidence with clinical expertise and the patient's unique values and circumstances.[7] It also requires the health professional to take into account characteristics of the practice context in which they work. This is illustrated in Figure 1.1. As you read this book, keep this definition in mind. Evidence-based practice is *not* just about using research evidence, as some critics of it may suggest. It is also about valuing and using the education, skills and experience that you have as a health professional. Furthermore, it is also about considering the patient's situation and values when making a decision, as well as considering characteristics of the practice context (for example, the resources available) in which you are interacting with your patient. This requires judgment and artistry, as well as science and logic. The *process* that health professionals use to integrate all of this information is *clinical reasoning* (in Chapter 15, this process is discussed in more detail). When you take these four elements and combine them in a way that enables you to make decisions about the care of a patient, then you are engaging in evidence-based practice.

Before we continue, just a note about the language used throughout the book: we have chosen to use the word 'patient', although we acknowledge that different terms (such as 'client' or 'consumer') are used in different disciplines.

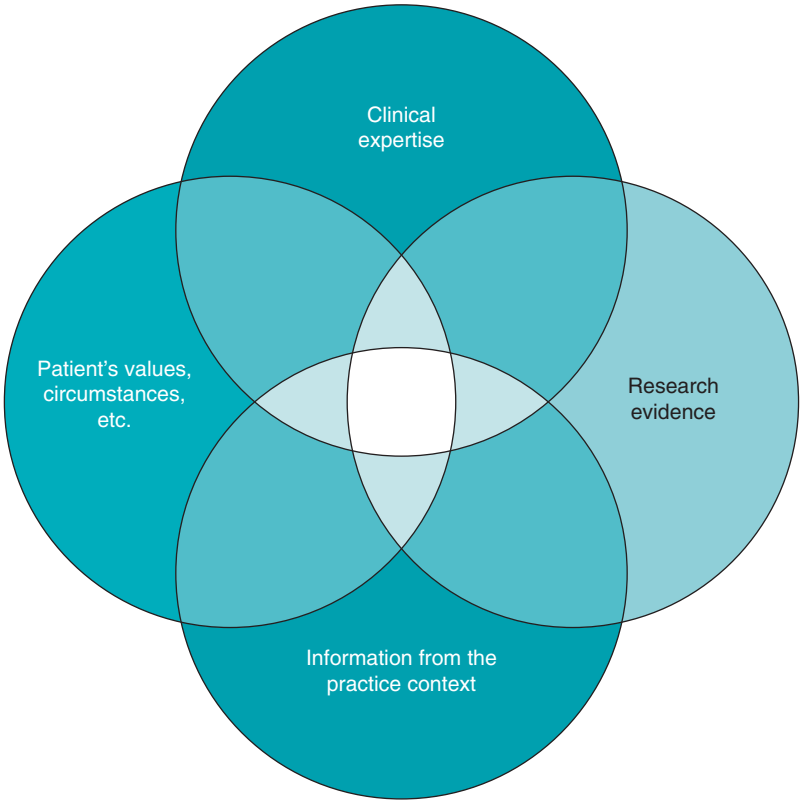

Figure 1.1

Evidence-based practice involves using clinical reasoning to integrate information from four sources: research evidence, clinical expertise, the patient's values and circumstances, and the practice context.

Where did evidence-based practice come from?

It came from a new medical school that started in the 1970s at McMaster University in Canada. The new medical program was unusual in several respects. One difference was that it was very short (only three years). This meant that its teachers realised that the notion of teaching medical students everything they needed to know was clearly impossible. All they could hope for was to teach them how to find for themselves what they needed to know. How could they do that? The answer was the birth of evidence-based medicine, and hence evidence-based practice.

What happened before evidence-based practice?

This is a good question, and one that patients often ask whenever we explain to them what evidence-based practice is all about. We often relied just on 'experience', on the expertise of colleagues who were older and 'better' and on what we were taught as students. Each of these sources of information can be flawed and there are good data to show this.[8] Experience is very subject to flaws of bias. We over-emphasise the mistakes of the recent past, and underestimate the rare mistakes. What we were taught as students is often woefully out of date.[9–11] The health professions are, by their nature, very

conservative, and so relying on colleagues who are older and better (so-called 'eminence-based practice'[12]) as an information source will often provide us with information that is out of date, biased and, quite simply, often wrong.

This is not to say that clinical experience is not important. In fact, it is so important that it is a key feature in the definition of evidence-based practice. Clinical experience (discussed further in Chapter 15) is knowledge that is generated from practical experience and involves thoughtfulness and compassion as well as knowledge about the practices and activities that are specific to a discipline. However, rather than simply relying on clinical experience alone for decision making, we need to use our clinical experience *together* with other types of information. To help us make sense of all of the information that we have—from research, from clinical settings, from our patients and from clinical experience—we use clinical reasoning processes.

Is evidence-based practice the same as 'guidelines'?

No. As you will see in Chapter 13, guidelines are one way that evidence-based practice can help to get the best available evidence into clinical practice, but they are by no means the only way. Unfortunately, some documents that call themselves 'guidelines' are *not* evidence-based guidelines (for example, they may contain recommendations that are derived from a mixture of research evidence and expert opinion). When this is the case, they are worse than any evidence-based practice alternatives, because health professionals may mistakenly believe that the 'recommendations' are evidence-based when in fact they are opinion-based, with all the biases that accompany opinion.

Is evidence-based practice the same as randomised controlled trials?

No. As you will see in Chapter 4, it is certainly true that randomised controlled trials are the cornerstone of research investigating whether *interventions* ('treatments') work. However, questions about the effectiveness of interventions are not the only type of question that health professionals need good research information about. For example, health professionals also need good information about questions of: *aetiology* (what causes disease or makes it more likely); *frequency* (how common it is); *diagnosis* (how we know if the patient has the disease or condition of interest); *prognosis* (what happens to the condition over time); and what *patients' experiences and concerns* are in particular situations. In this book, we will primarily focus on how to answer four main types of questions—concerning the effects of interventions, diagnosis, prognosis and patients' experiences and concerns—as these questions are relevant to a range of health professionals and are asked commonly by them. Each question type requires a different type of research design (of which randomised controlled trials are just one example) to address it. Other research designs include *qualitative research*, *case-control studies, cross-sectional studies* and *cohort studies*. There are many others. They can all be examples of the best evidence for some research questions. This is explored in more depth in Chapter 2.

Can anyone practise evidence-based practice?

Yes. With the right training, practice and experience, any of us can learn how to do evidence-based practice competently. You do not have to be an expert in anything. Having access to the internet and databases (such as PubMed and the Cochrane Library) is good. And having some trustworthy colleagues to check your more surprising findings is also good.

Do health professionals have time for an activity like evidence-based practice?

Health professionals do not have to commit more time to evidence-based practice than they are comfortable with. Actually, if you are a practising health professional, you will probably find that you

can replace a lot of what you currently do, such as (for example) reading journals, attending in-service training or other continuing professional development activities, with evidence-based practice. Simply reading a journal or attending a conference or in-service training session is not evidence-based practice—although, of course, these activities often form part of evidence-based practice. When they do, the process which is followed, and the way in which the 'answers' to the clinical questions are subsequently used, is different (as described in Chapter 17).

WHY IS EVIDENCE-BASED PRACTICE IMPORTANT?

Put simply, the main reason why evidence-based practice is important is because it aims to provide the most effective care that is available, with the aim of improving patient outcomes. However, there are many other reasons why it is important. When you seek health care for yourself from a health professional, do you expect that you will receive care that is based on the best available evidence? Of course you do. Likewise, our patients expect that we will provide them with the most effective care and the most accurate healthcare information that is available. As the internet plays such a large role in today's society, patients are now more aware of and educated about health conditions and issues such as intervention options and available tests. For example, it is not uncommon for patients to show their health professional information about a new intervention that they read about on the internet and ask to receive that intervention. As their treating health professional, we need to be able to assess the accuracy of this information, determine the suitability of the intervention for our patient and work with them to decide if this intervention is an appropriate and effective option for them.

Evidence-based practice promotes an attitude of inquiry in health professionals and gets us thinking about questions such as: Why am I doing this in this way? Is there evidence that can guide me to do this in a more effective way? As such, evidence-based practice has an important role in facilitating our professional accountability. By definition, we are *professionals* whose job is to provide health care to people who need it (hence the term 'health professionals'). As part of providing a professional service it is our responsibility, when it is possible, to ensure that our practice is informed by the best available evidence. When we integrate the best available evidence with information from our clinical knowledge, patients and practice context, the reasoning behind our clinical decisions becomes more apparent and this serves to reinforce both our professional accountability and our claim of being a health professional.

Evidence-based practice also has an important role to play in ensuring that health resources are used wisely and that relevant evidence is considered when decisions are made about funding health services. There are finite resources available to provide health care to people. As such, we need to be responsible in our use of healthcare resources. For example, if there is good quality evidence that a particular intervention is harmful or not effective and will not produce clinically meaningful improvement in our patients, we should not waste precious resources providing this intervention—even if it is one that has been provided for years. That is not to say, however, that if no research exists that clearly supports what we do, the interventions that we provide should not be funded. As discussed later in this book, absence of evidence and evidence of ineffectiveness (or evidence of harm) are quite different things.

SCOPE OF EVIDENCE-BASED HEALTH CARE

As mentioned earlier, evidence-based practice is a concept that emerged out of evidence-based medicine. Although this book will concentrate largely on the use of evidence-based practice in clinical settings, evidence-based concepts now permeate all of health care (and beyond). That is why you will hear, from time to time, terms such as 'evidence-based purchasing' (where purchasers are informed by research to make purchases of health and social care services and resources that are useful and safe), 'evidence-based policy' (where policy makers integrate research evidence into the formation of policy documents and decisions to address the needs of the population) or 'evidence-based management' (where managers integrate research findings into a range of management tasks). Evidence-based practice has had a

significant impact in more than just the clinical domain, and its influence can be seen in many of the major health systems and government health policies across the world. In fact, if you are interested, you might like to do a quick internet search that will show that 'evidence-based' principles are now being applied in social care, criminology, education, conservation, engineering, sport and many other disciplines.

COMMON CRITICISMS OF EVIDENCE-BASED PRACTICE

Once you start reading widely in this area you will notice that many have criticised evidence-based practice.[13] Criticisms that have been raised are often due to lack of knowledge or misinformation, so we will have a look at some of them here.

Some authors criticise evidence-based practice for relying too heavily on quantitative research. Qualitative research is very important in helping us to understand more about how individuals and communities perceive health, manage their own health and make decisions related to health-service usage. There is growing appreciation of the value and contribution of qualitative research to evidence-based practice. This is partially reflected in the growth of mixed-methods research papers (those that use a combination of qualitative and quantitative approaches); both primary studies, such as those that are answering questions about intervention effectiveness, and systematic reviews that critically review the quality and synthesise the findings of individual studies.

Authors from a range of health professions have also highlighted the limitations of relying on research to provide the evidence on which to base practice. They point to limited available research, particularly in some areas of allied health. Similarly, questions have been raised as to whether it is possible to develop sufficient and appropriate research to support the complexity and rapidly changing nature of professional practice.[14] While we agree that there will never be enough research to provide answers to every possible clinical question, evidence-based practice emphasises using the best research evidence *available* and acknowledges the need to draw on expert opinion where research does not exist. Further, clinical experience, which is one of the key components of evidence-based practice, must be relied on even more where there is a lack of evidence or uncertainty.

Many authors have debated the nature of 'evidence', arguing that evidence comes from many sources other than research. While it is vital to incorporate information from many different sources, the term 'evidence' in evidence-based practice serves a specific purpose. Its purpose is to highlight the value of information from research which has so often been ignored. In fact, some have suggested that, instead of the term *evidence-based practice*, 'knowledge-based practice' or 'information-based practice' should be used. While these alternatives avoid the contentiousness about what evidence is and what it is not, it would be impossible to find a health professional who does not base their practice on knowledge or information. In other words, use of the term 'evidence' (where evidence is taken to mean evidence from research) helps to highlight a source of information that has been under-utilised. Use of the term 'evidence' to highlight the role of research in clinical decision making by no means discounts the importance of information and knowledge from patients and health professionals themselves, and this is something we hope to demonstrate throughout this book.

THE PROCESS OF EVIDENCE-BASED PRACTICE

Rather than being just a vague concept that is difficult to incorporate into everyday clinical practice, the process of evidence-based practice is actually quite structured. The process can be viewed as a number of steps that health professionals need to perform when an information need (that can be answered by research evidence) arises:[7]

1. Convert your information needs into an answerable clinical question.
2. Find the best evidence to answer your clinical question.

3. Critically appraise the evidence for its validity, impact and applicability.
4. Integrate the evidence with clinical expertise, the patient's values and circumstances, and information from the practice context.
5. Evaluate the effectiveness and efficiency with which steps 1–4 were carried out and think about ways to improve your performance of them next time.

Some people may prefer to remember these steps as the five **A**s:[15]

- **A**sk a question
- **A**ccess the information
- **A**ppraise the articles found
- **A**pply the information
- **A**udit.

Regardless of which list you prefer to use to remember the process of evidence-based practice, the basic steps are the same and they are explained in more detail below.

Step 1. Convert your information needs into an answerable clinical question

The process of evidence-based practice begins with the recognition that you, as a health professional, have a clinical information need. Some types of clinical information needs can be answered with the assistance of research evidence. Chapter 2 describes the different types of clinical information needs and which ones research evidence can help you to answer. An important step in the evidence-based practice process is turning this information need into an answerable clinical question, and there are some easy ways to do this which are demonstrated in Chapter 2.

You may have a question about:

- **intervention** (that is, treatment)—for example, in adults with rheumatoid arthritis, is education about joint protection techniques effective in reducing hand pain and improving function?
- **diagnosis**—for example, in adults admitted to a chest pain unit, which elements of serial diagnostic testing are the most sensitive and specific predictors of cardiac involvement?
- **prognosis**—for example, in people undergoing total knee replacement for osteoarthritis, what improvement in walking ability is expected after six weeks?
- **patients' experiences and concerns**—for example, what does the lived experience of older adults transitioning to residential aged-care facilities mean for their ability to integrate and find a sense of identity?

The type of question will determine the type of research that you need to look for in order to answer your question. This is explained further in Chapter 2.

Step 2. Find the best evidence to answer your clinical question

Once you have structured your clinical question appropriately and know what type of question you are asking and, therefore, what sort of research you need to look for, the next step is to find the research evidence to answer your question. It is important that you are aware of the many online evidence-based resources and which will be most appropriate for you to use to search for the evidence to answer your question. Being able to *efficiently* search the online evidence-based resources is a crucial skill for anyone who practises evidence-based practice. Chapter 3 contains information about the key online evidence-based resources and how to look for evidence efficiently.

Step 3. Critically appraise the evidence for its validity, impact and applicability

Upon finding the evidence, you will need to critically appraise it. That is, you need to examine the evidence closely to determine whether it is worthy of being used to inform your clinical practice.

Why do I need to critically appraise the evidence? Is not all published research of good quality?

Unfortunately, not all published research is of good quality. In fact, there are a number of studies that suggest that much of it is of poor quality (see, for example, references 16–25). There is a range of reasons why this is the case. Conducting a well-designed research study is hard work—there are many issues to consider during the design phase. Sometimes, even when researchers have designed a great study, things that they have no control over can happen—such as losing many of the participants to follow-up (despite their best attempts to avoid this happening), or an unexpected change in the type or number of patients who are eligible for recruitment into the study. There are many practical and ethical considerations that can also make it difficult to conduct a study that uses methods to avoid introducing bias into a trial. For example, as you will see in Chapters 2 and 4, lack of blinding can introduce bias in a study. However, in the overwhelming majority of randomised controlled trials that evaluate an allied health intervention, it is not possible to blind either the participants or the therapists who are providing the intervention as to whether the participants are in the intervention group or the control group. Too often, research is conducted by people who do not have a full awareness of the issues surrounding research design and, as a result, the studies that they conduct are flawed. The way in which some researchers report their studies also can be incomplete and, as readers, we are often left wondering about the details of some aspects of the study and unsure whether the researchers did or did not consider particular aspects of study design. Sadly, the people who peer-review the studies for journals are sometimes no more informed about all of the latest issues in study design than the researchers who conducted the studies are.

Fortunately, it appears that this situation is changing, with some emerging data showing that the quality of studies is improving over time as researchers increase their use of methods to minimise the risk of bias.[23,26–29] This is most likely because there is now a growing awareness of the importance of strong study design (thanks in part to the proliferation of evidence-based practice) on the part of authors of studies, reviewers of studies and journal editors. As you will see in various chapters throughout the book, guides for how certain types of studies should be reported have been developed (for example, in Chapter 4, you will learn about the CONSORT statement for randomised controlled trials). A list of the reporting guidelines for various study types is available at the website of the EQUATOR Network (www.equator-network.org). A growing number of journals now require authors of studies to carefully follow these guides if they wish their article to be considered for publication. All of this is good news for us (health professionals who wish to use evidence to inform their clinical decision making), as it has the potential to make interpreting research reports easier, but there is still a very long way to go to remedy the multitude of ways in which bias can creep in to the design and reporting of research studies.

Because of this, before you can use the results of a research study to assist you in making a clinical decision, you need to determine whether the study methods are sound enough to provide you with potentially useful information or, alternatively, whether the methods are so flawed that they might potentially provide misleading results. Studies that are poorly designed may produce results that are distorted by bias (and, often, more than one type of bias). Some of the common types of bias are introduced in Chapter 2. The main types of bias that are relevant to each of the question types are explained in detail in the corresponding chapter that discusses how to appraise the evidence for each question type.

What is involved in critically appraising evidence?

There are three main aspects of the evidence (that is, each study) that you need to appraise (in the following order):

1. **Internal validity.** This refers to whether the evidence is trustworthy. That is, can you believe the results of the study? You evaluate the validity of the study by determining whether the study was carried out in a way that was methodologically sound. In this step, we are concerned with the study's *internal validity*—this is explained more fully in Chapter 2.
2. **Impact.** If you decide that the validity of the study is sufficient that you can believe the results, you then need to look closely at the results of the study. The main thing that you need to determine is the impact (that is, the clinical importance) of the evidence. For example, in a study that compared the effectiveness of a new intervention with an existing intervention, did the new intervention have a *large enough effect* on the clinical outcome(s) of interest that you would consider altering your practice and using the new intervention with your patient?
3. **Applicability.** If you have decided that the validity of the study is adequate and that the results are clinically important, the final step of critical appraisal is to evaluate whether you can apply the results of the study to your patient. Essentially you need to assess whether your patient is so different from the participants in the study that you cannot apply the results of the study to your patient. This step is concerned with assessing the *external validity* (or the 'generalisability' or 'applicability') of the study—this is explained more fully in Chapter 2.

Many chapters in this book (Chapters 4–12) are devoted to helping you learn how to critically appraise various types of evidence. There are plenty of appraisal checklists that you can use to help you critically appraise the evidence. Many of the checklists are freely available on the internet. Most of them contain more or less the same key items. The checklists that we have used in this book as a general guide for the appraisal of research are based on those developed by the UK National Health Service Public Health Resource Unit as part of the Critical Appraisal Skills Programme (CASP). In turn, these checklists were derived from the well-known *Journal of the American Medical Association (JAMA)* Users' Guides.[29] The CASP checklists are freely available at www.casp-uk.net. For the appraisal of qualitative research, we have also used the Qualitative Assessment and Review Instrument (QARI) developed by the Joanna Briggs Institute. The QARI can be accessed as part of a software package which you can download for free (once you have registered) at www.joannabriggs.edu.au. In addition, the CASP checklist for appraising qualitative studies is also described and the two approaches are compared in Chapter 10.

Each of the CASP checklists begins by asking two screening questions. These questions are designed to filter out studies of low methodological quality. This is so that you do not waste your time proceeding to appraise the validity, impact and applicability of a study that is going to be of too poor a quality for you to use in clinical decision making. In the worked examples in Chapters 5, 7, 9 and 11, you will notice that these screening questions are not included in the examples. This is because, prior to appraising their chosen article, the authors of each of the worked examples had already conducted a screening process when they decided which article was the best available evidence to use to answer their clinical question. When you are critically appraising research articles, keep in mind that no research is perfect and that it is important not to be overly critical of research articles. It just needs to be *good enough* to assist you to make a clinical decision.

Step 4. Integrate the evidence with clinical expertise, the patient's values and circumstances, and information from the practice context

The fourth step in the evidence-based practice process involves integrating the findings from the critical appraisal step with your clinical expertise, your patient's needs and the practice (clinical) context. As

discussed earlier in this chapter and illustrated in Figure 1.1, these four elements form the definition of evidence-based practice. 'Clinical expertise' refers to a health professional's cumulative experience, education and clinical skills. As evidence-based practice is a problem-solving approach that initially stems from a patient's needs, any clinical decision that is made in relation to the patient should involve consideration of the unique needs, values, preferences, concerns and experiences that each patient brings to the situation. Many of the chapters of this book discuss the need for and process of integrating research evidence with clinical expertise and the patient's needs, with appropriate consideration also given to the practice context.

Step 5. Evaluate the effectiveness and efficiency with which steps 1–4 were carried out and think about ways to improve your performance of them next time

As evidence-based practice is a process that is intended for health professionals to incorporate into their routine clinical practice, it is important that you learn to do it as efficiently as possible so that it does not become a time-consuming or onerous task. Asking yourself self-reflection questions after you have completed steps 1 to 4 of the evidence-based practice process can be a useful way to identify which steps you are doing well and areas where you could improve. Box 1.1 contains some examples of self-reflection questions that you could ask when evaluating how well you performed steps 1 to 4 of the evidence-based practice process.

HOW THIS BOOK IS STRUCTURED

The process of evidence-based practice that was just described has been used as a structure for this book. In addition to the key steps that form the evidence-based practice process, there are other topics that are important for health professionals who wish to practise evidence-based practice to know. Topics such as how to implement evidence into practice and how to communicate with patients about evidence are also addressed in chapters of this book.

BOX 1.1

Examples of self-reflection questions when evaluating your performance of steps 1 to 4 of the evidence-based practice process

- Am I asking well-formulated clinical questions? (See Chapter 2)
- Am I aware of the best sources of evidence for the different types of clinical question? (See Chapter 3)
- Am I searching the databases efficiently? (See Chapter 3)
- Am I using the hierarchy of evidence for each type of clinical question as my guide for the type of evidence that I should be searching for? (See Chapter 2)
- Where possible, am I searching for and using information that is higher up in the pyramid of levels of organisation of evidence (for example, syntheses, synopses, summaries and pre-appraised original studies)? (See Chapter 3)
- Am I integrating the critical appraisal into my clinical practice? (See Chapters 4–13)
- Can I clearly explain what the evidence means to my patients and involve them in shared decision making where appropriate? (See Chapter 14)
- Am I proactively monitoring for newly emerging evidence in my field of practice?[30] (See Chapter 3)

Chapter 1—Introduction to evidence-based practice	This chapter addresses some of the background information about evidence-based practice, such as what it is, why it was developed, why it is important and the five key steps that underlie the process of evidence-based practice.
Chapter 2—Information needs, asking questions and some basics of research studies	Chapter 2 provides details about clinical information needs, how to convert them into an answerable question and how the type of research that you look for differs according to the type of question you are asking. This chapter also contains some of the background statistical information that you need to understand before being able to critically appraise the research evidence.
Chapter 3—Finding the evidence	Chapter 3 contains information about how to undertake the second step of the evidence-based practice process, which is searching for the evidence to answer your clinical question.
Chapter 4—Evidence about effects of interventions	This chapter explains what to do when you have a clinical question about the effects of an intervention, with the focus on how to perform the third and fourth steps of the evidence-based practice process. It gives details about how to assess the validity of the evidence, understand the results and use the evidence to inform clinical practice.
Chapter 5—Questions about the effects of interventions: examples of appraisals from different health professions	As the steps of evidence-based practice become easier with practice, this chapter provides you with a number of worked examples of questions about interventions so that you can see, step-by-step, for various clinical scenarios how questions are formulated and evidence is found, appraised and applied. In keeping with the multidisciplinary nature of this book, examples from a range of health professions are provided.
Chapter 6—Evidence about diagnosis	This chapter follows the same structure as Chapter 4, but the content is focused on how to appraise the evidence when your clinical question is about diagnosis.
Chapter 7—Questions about diagnosis: examples of appraisals from different health professions	Chapter 7 contains a number of worked examples of questions about diagnosis from a range of health professions that commonly have diagnostic/assessment informational needs.
Chapter 8—Evidence about prognosis	This chapter follows the same structure as Chapters 4 and 6, but the content is focused on how to appraise the evidence when your clinical question is about prognosis.
Chapter 9—Questions about prognosis: examples of appraisals from different health professions	Chapter 9 contains a number of worked examples of questions about prognosis from a range of health professions that commonly consider prognostic issues.

Chapter 10—Evidence about patients' experiences and concerns	This chapter follows the same structure as Chapters 4, 6 and 8, but the content is focused on how to appraise the evidence when your question is about patients' experiences and concerns and you are using qualitative research to answer the question.
Chapter 11—Questions about patients' experiences and concerns: examples of appraisals from different health professions	Chapter 11 contains a number of worked examples of questions about patients' experiences and concerns from a range of health professions.
Chapter 12—Appraising and understanding systematic reviews and meta-analyses	As discussed in Chapter 2, systematic reviews and meta-analyses are a very important research study type. They are so important that we have devoted an entire chapter to explaining how to appraise and make sense of them.
Chapter 13—Clinical guidelines	Clinical practice guidelines can be a useful tool in evidence-based practice. Chapter 13 provides you with information about what they are, how they are developed, where to find them and how to assess their quality to determine if you should use them in clinical practice.
Chapter 14—Talking with patients about evidence	Knowing how to talk with patients and explain, in a way that they can understand, what the evidence you have found means for them is an important skill for health professionals. Chapter 14 describes how to do this and how to involve your patients in the decision-making process.
Chapter 15—Clinical reasoning and evidence-based practice	Clinical reasoning is the process by which health professionals integrate information from many different sources. Having an understanding of clinical reasoning can clarify, and hopefully improve, our clinical decision making.
Chapter 16—Implementing evidence into practice	After finding and appraising the evidence, patient outcomes will only be altered if the evidence is then implemented into clinical practice. Chapter 16 describes the process for doing this, along with some of the barriers that may be encountered during the process, and strategies for overcoming them.
Chapter 17—Embedding evidence-based practice into routine clinical care	While individual health professionals will always be key in advancing evidence-based practice, an organisational environment which recognises the value of, and encourages, evidence-based practice is also important. Chapter 17 describes why organisations should promote evidence-based practice, characteristics of organisations that do this and specific strategies which organisations can use to support evidence-based practice.

SUMMARY POINTS OF THIS CHAPTER

- Evidence-based practice is a problem-based approach where research evidence is used to inform clinical decision making. It involves the integration of the best available research evidence with clinical expertise, each patient's values and circumstances, and consideration of the clinical (practice) context.
- Evidence-based practice is important because it aims to improve patient outcomes and it is what our patients expect. However, it also has a role in facilitating professional accountability and guiding decisions about the funding of health services.
- Evidence-based practice has extended to all areas of health care and is now used in areas such as policy formulation and implementation, purchasing and management.
- There are five main steps in the evidence-based practice process: (1) asking a question; (2) searching for evidence to answer it; (3) critically appraising the evidence; (4) integrating the evidence with your clinical expertise, the patient's values and information from the practice context; and (5) evaluating how well you performed steps 1–4 and how you can improve your performance the next time you complete this process.
- Not all research evidence is of sufficient quality that you can confidently use it to inform your clinical decision making. Therefore, you need to critically appraise it before deciding whether to use it. The three main aspects of the evidence that you need to critically appraise are its: (1) validity—can you trust it?, (2) impact—are the results clinically important? and (3) applicability—can you apply it to your patient?.

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