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The evidence base for diabetes care

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Evidence-based medicine

A complex set of decisions by individuals and organizations determine how health care is delivered to people with diabetes. Historically, such decisions have been made in the absence of evidence or without strict regard to it. This has led to the persistence of practices for which there is little evidence, the slow adoption of new practices that have been demonstrated to be effective and wide variation in clinical practice and the quality of care. In recent years, there has been increasing appreciation that treatment decisions should be based on sound evidence. For patients, care providers and health systems alike, this awareness represents an opportunity to shape the delivery of care on the basis of evidence of effectiveness. This book is devoted to providing the evidence base on which treatment decisions in diabetes care may be made.

Sackett *et al.* defined evidence-based medicine as 'the conscientious, explicit and judicious use of clinically relevant research in making decisions about the care of individual patients'.¹ The strength of evidence-based medicine is that it moves clinical practice from anecdotal experience and expert opinion to a refutable scientific foundation of basic and clinical research from which we can systematically progress. Evidence-based medicine advocates that experimental methods, especially randomized, controlled clinical trials (RCTs), provide the basis for clinical practice. The strength of RCTs lies in their internal validity. The use of randomization is the strongest insurance that treatment groups will differ

only in their exposure to the intervention and, hence, differences in observed outcomes can be attributed to differences in the intervention.

Perhaps not surprisingly, the major limitation of RCTs lies in their external validity, that is, the extent to which they are generalizable to particular population groups, individuals, practitioners and settings. 'Efficacy' is defined by Last as the extent to which a specific intervention produces a beneficial result under ideal conditions.² 'Effectiveness', on the other hand, is the extent to which the intervention does what it is intended to do 'in the real world'.² When individuals who participate in RCTs are atypical, the health care professionals who participate are unrepresentative or the settings deviate from a usual clinical environment, the external validity or generalizability of the results of the RCT may be low. Indeed, in most instances, an RCT offers an indication of the efficacy of an intervention, what can be achieved in the most favourable circumstances, rather than its effectiveness, what can be achieved in every day clinical practice.

Another limitation of evidence-based medicine is that the evidence that we need is not always available. In some instances, lack of evidence is a result of the necessary studies not having been carried out or not having been carried out for long enough to evaluate health endpoints. The task of conducting all of the required RCTs is overwhelming. There are a huge number of health care interventions which, when added together, have many components. It is simply impossible to subject all of these interventions and their components to experimental evaluation.

Some interventions are studied and some are not. Indeed, some types of interventions are more likely to be studied than others. For example, pharmacological interventions are studied more extensively than non-pharmacological interventions, because of regulatory requirements and industry support and because of the technical and methodological difficulties in designing RCTs to evaluate non-drug interventions. As a result, the literature often fails to provide convincing evidence for complex behavioural interventions such as education, diet and lifestyle modification. In other instances, RCTs may be impossible to conduct if, for example, there are ethical or legal obstacles, if some interventions cannot be allocated on a random basis or if potential participants, practitioners or investigators refuse to take part.

Another limitation of evidence-based medicine derives from an understanding of the limits of the scientific method in clinical practice. Clinical decisions involve people and the application of results from research to clinical practice must take account of people in their social context.³ Clinical judgement is central to clinical practice and involves weighing the benefits and risks of any medical choice in consultation with individual patients. Clinical trials explicitly focus on hard endpoints such as physiological measures and disease incidence or mortality. They often fail to focus on soft endpoints such as patient preferences or quality of life. To the extent that the latter influence clinical decision making, non-scientific mechanisms may guide decisions.³ Indeed, as stated by Sackett *et al.*, 'External clinical evidence can inform, but can never replace, individual clinical expertise. It is this expertise that decides whether the external evidence applies to the individual patient at all and, if so, how it should be integrated into a clinical decision. Any external guideline must be integrated with individual clinical expertise in deciding whether and how it matches the patient's clinical state, predicament and preferences and thus whether it should be applied.'¹

One of the 'credibility gaps' developing between the advocates of evidence-based medicine and the practitioners engaged in day-to-day patient care is that studies which faithfully reflect the clinical and behavioural complexities of individual patients not only have not yet been done but are unlikely ever to be done. Many clinicians 'struggle to apply the results of studies that do not seem that relevant to their daily practice'.⁴ RCTs have a number of strong points but the ready generalization of their results to 'real life' clinical situations is not one of them. Too strong an emphasis on the need for evidence to support practice can easily be translated into an unwillingness to do anything which is not based on evidence. Thus the

positive message of evidence-based medicine can, if taken to extremes, become a form of 'evidence-based paralysis', which acts to the detriment of the patient and the population.

Evidence-based practice

For these reasons, we prefer the term 'evidence-based practice' to the narrower, but more widely used term, 'evidence-based medicine'. Evidence-based practice emphasizes the importance of practitioners other than doctors and the importance of health-related activities other than those most obviously associated with physicians. In defining evidence-based practice, three components are essential:

- the determination, whenever possible, to base decisions on evidence accumulated through research
- use of the best possible evidence available at the time the decision needs to be made and
- use of the evidence most appropriate to a particular patient or population.

We would widen that definition of evidence-based practice to include people who are not yet patients and may never become patients, that is, to include prevention as well as care, cure and rehabilitation. In addition, although evidence-based practice uses the evidence from RCTs to provide evidence for clinical practice, it does not diminish the importance of human relationships or ignore the fact that clinical decisions in primary care involve consideration of the unique problems and concerns of individual patients.

We have chosen to call this book 'The Evidence Base for Diabetes Care' to emphasize, from the outset, that our focus is on the extent to which diabetes prevention and treatment can be based on high-quality evidence. It is not intended to be a comprehensive text book on how to care for people with diabetes. Although it refers to clinical guidelines, it is not a collection of evidence-based guidelines. This book sets out to examine critically the best evidence that is currently available in the field of diabetes prevention and care and to present it in an accessible form. The enormous potential of evidence-based practice to prevent illness, identify it early, treat it, reduce suffering and rehabilitate people to normal life presents a challenge which cannot be ignored.

Evidence-based diabetes practice

Diabetes is a particularly good example of the potential for evidence-based practice. There are at least four

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| 1 | The person with diabetes is central to the management of the condition |
| 2 | Diabetes care is multidisciplinary – evidence-based practice is important |
| 3 | The worldwide impact of diabetes is increasing at a dramatic rate |
| 4 | There is a considerable quantity of high-quality evidence available |

Figure 1.1 The potential of diabetes for evidence-based practice

reasons for this (Figure 1.1). First, most diabetes care is based on long-term behavioural change. Such change will not take place unless the affected person is willing to make these changes and is assisted in making these changes. What better way is there of encouraging evidence-based practice than to make both patients and practitioners aware of the evidence that exists and the benefits (and harms) of implementing it? Second, diabetes care is multidisciplinary. The person with diabetes and, in most instances, the family, are at the centre of all diabetes health care activities. To be successful, diabetes care needs to involve the cooperation and collaboration of many practitioners – nurses, dieticians, podiatrists, psychologists and doctors. Thus diabetes care is a particularly striking example of evidence-based practice as opposed to evidence-based medicine. Third, the increasing prevalence of diabetes and its public health importance, particularly in developing countries, are a major impetus for this book. Finally, there is a considerable quantity of high-quality evidence relevant to diabetes prevention and care that needs to be translated into practice. As with other fields, there is also evidence which is not of such high quality and areas for which little evidence exists at all.

A brief explanation of terms

Throughout this book, various epidemiological terms have been used to describe risk in the context of clinical trials. These can be summarized as follows in relation to a trial which randomizes participants to two groups – an intervention group and a control group. Imagine, for the sake of simplicity, two dichotomous outcomes – prevention and non-prevention, for example:

		Outcome		
		Prevention	Non-prevention	
Intervention group	A	B		A + B
Control group	C	D		C + D

The following rates can be defined:

- Experimental event rate (EER) = $A / (A + B)$
- Control event rate (CER) = $C / (C + D)$
- Absolute risk reduction (ARR) = $CER - EER$
- Relative risk reduction (RRR) = $(CER - EER) / CER$
- Number needed to treat (NNT) = $1 / ARR$

Analogous calculations can be performed in relation to adverse events:

		Adverse event		
		Present	Not present	
Intervention group	A	B		A + B
Control group	C	D		C + D

- Experimental (adverse) event rate (E(A)ER) = $A / (A + B)$
- Control (adverse) event rate (C(A)ER) = $C / (C + D)$
- Absolute risk of adverse events = $E(A)ER - C(A)ER$
- Relative risk of adverse events = $(E(A)ER - C(A)ER) / C(A)ER$
- Number treated for one adverse event = $1 / \text{absolute risk of adverse event}$

Both absolute and relative risk measures have their place in evidence-based practice, but in order to understand relative risk measures, knowledge of what they are relative to is needed. For example, a relative risk reduction of 50% could mean going from an absolute risk of 1% to 0.5% or from an absolute risk of 20% to 10%. However, the absolute risk reductions, which in this case would be 0.5% and 10%, respectively, demonstrate markedly different benefits. When available, authors have been encouraged to include absolute measures, with or without their relative equivalents.

The hierarchy of evidence

There are several suggested hierarchies for grading evidence. Examples of two of these are that used by the United States Preventive Services Task Force

<i>Strength of the recommendation:</i>	
A	There is good evidence to support the use of the procedure
B	There is fair evidence to support the use of the procedure
C	There is poor evidence to support the use of the procedure
D	There is fair evidence to reject the procedure
E	There is good evidence to support the rejection of the procedure
<i>Quality of the evidence:</i>	
(I)	Evidence obtained from at least one properly randomized controlled trial
(II-1)	Evidence obtained from well-designed controlled trials without randomization
(II-2)	Evidence obtained from well-designed cohort or case-control analytical studies, preferably from more than one centre or research group
(II-3)	Evidence obtained from multiple timed series with or without the intervention or from dramatic results in uncontrolled experiments
(III)	Opinions of respected authorities based on clinical experience, descriptive studies or reports of expert committees

Figure 1.2 USPSTF template for assessing recommendations and evidence⁵

(USPSTF)⁵ and that suggested by Chalmers *et al.*⁶ The USPSTF template distinguishes between strength of a recommendation and the quality of the evidence (Figure 1.2). Chalmers *et al.*'s hierarchy ranks the source of evidence in a similar fashion to the second component of the USPSTF's template (Figure 1.3).

In this book, the frameworks used to review the evidence change from time to time. We have been flexible if authors have chosen different ways to summarize the existing evidence.

This book and how to use it

Systematic reviews of the literature are a necessary component of evidence-based practice. Inaccessible evidence, even of the highest quality, is of no use to a practitioner. There are several current resources which make evidence more accessible and provide assessments of its quality. These include the Cochrane Collaboration, which prepares and maintains rigorous, systematic and up-to-date reviews and meta-analyses of the benefits and risks of health care interventions,^{7,8}

'Effective Healthcare Bulletins'⁹ and a clutch of new journals and evidence-based medicine reviews that enable searches of databases to be made for articles that meet criteria for evidence-based decision-making.¹⁰

In this book, we summarize these reviews. The chapters are arranged to reflect the chronology of diabetes. They start with considerations of definition and classification, proceed through prevention of the condition itself, the prevention of complications and then the organization of care. When necessary, there are separate chapters for type 1 diabetes and type 2 diabetes – the chapters on prevention, for example. When the same principles apply to both, as for the treatment of established complications, they are combined in a single chapter.

We have brought together potentially contrasting views of the evidence – those of clinicians on the one hand, and epidemiologists on the other. This is intended to bring out the different perspectives and requirements of these two areas of practice. In many cases, the authors have been able to organize their

Highest	–	Meta-analysis of randomized controlled trials
	–	Randomized controlled trials
	–	Non-randomized controlled trials
	–	Cohort studies
	–	Case-control studies
	–	Case series
Lowest	-	Case reports

Figure 1.3 Hierarchy of evidence advocated by Chalmers *et al.*⁶

literature searches according to Cochrane Collaboration principles⁷ and the results of these searches, for RCTs, are systematically presented in tables. In the chapters dealing with the prevention and treatment of established complications, we have asked teams to contribute since the span of topics is so wide. Throughout this book, authors have been asked to clarify and comment upon the evidence in each of their topic areas and to highlight what remains to be resolved by future research. We hope, therefore, that this book will be useful to patients and their representatives to allow them to establish whether their care includes all interventions known to be effective, to policy makers as a guide to what is already known and to those responsible for planning future research to identify major areas of uncertainty.

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