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EVIDENCE-BASED PRACTICE

In this chapter, we explore and provide an account of evidence-based practice (EBP) as a process and professional culture, including its origins, aims, and mission. A historical perspective is necessary to understand the evolution of EBP from a linear perception of the relationship between sources of scientific evidence to a dialectical model in which various components interact. Generic models of EBP are presented. The creation of EBP in the context of interaction among the best available scientific evidence; client characteristics such as values, traditions, and acceptance; and organizational and professional factors such as worker skills and values and organizational structures are explored. EBP is related to other concepts such as EBPs and interventions and evidence-informed practice.

As noted in Chapter 1, in this chapter we use *evidence-based medicine* and *evidence-based practice* interchangeably depending on the context being discussed. Both terms refer to similar principles, although the former is commonly used in health-related contexts and the latter in social contexts.

Let us start by defining EBP. At this stage of its evolution, the concept of EBP has two main components:

- First, EBP is an intervention supported by empirical evidence.
- Second, EBP is a process of applying an evidence-based intervention in a specific sociocultural context.

In this chapter, we examine various aspects of each of these components. However, at this point we would like to clarify that we view both of these components as important and indispensable aspects of EBP, which differs from most (but by no means all) literature on EBP. In many instances,

particularly in the everyday language of professionals and laypersons, EBP is conceptualized according to the first component. As outlined in this chapter, this component has been the primary historical focus of EBP. EBP as a process is a more contemporary concept, introduced first as a standalone process and later in the context of other human services professions, such as social work, education, and law enforcement.

The second component of the definition is as fundamental as the first. The idea of EBP as a process is a new and innovative attempt to develop a professional culture; if further advanced, it carries the promise of radically changing the work culture of professionals and others, as well as the context of client–patient treatment. In this sense, EBP is a professional mind-set or culture of professional practice, as indicated by the title of this book.

Origins of evidence-based practice

EBP doubtlessly has its background in evidence-based medicine (EBM). Perhaps the most-cited definition of EBM was coined by Sackett and his colleagues as follows:

Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research.

*(Sackett, Rosenberg, Muir Gray, Haynes,
& Richardson, 1996, para. 2)*

Most interpretations of this specific definition begin by emphasizing a process—the interaction between, and integration of, evidence, patient characteristics, and clinical (structural) circumstances in an intervention. Later in this chapter, we do the same. Similarly, in our view, EBM as a process is the translation of the best available scientific evidence to implementation and practice. However, we start with the concept of evidence itself as we seek a historical understanding of the origins of EBM and EBP.

The concept of scientific evidence in therapeutic interventions or in more general terms is related to the truth of a theoretical assertion or the validation of an assertion in real-life practice and experience. From a universal and historical perspective, it may be interpreted in the realm of the human inclination and desire to know the truth and explain phenomena in a valid fashion. In Western traditions, evidence is related to a great extent to experimental thinking. However, it would be false to assume that the experimental mind is exclusively a Western virtue, given the historical emphasis of Eastern traditions in China and India on wisdom and cosmology.

Although the modern concept of EBM is relatively very young, the concept and practice of medicine based on the best available evidence have

existed in some form for a very long time. Paradoxically, the experimental mind and the authoritative mind seem to have existed side by side both in the history of scientific progress and in terms of therapeutic intervention. As illustrated by the James Lind Library (www.jameslindlibrary.org), our knowledge has been successively progressing from the fallacy of making misleading claims toward the practice of making insightful, valid claims about the effects of therapeutic intervention. Seen in this perspective, the modern concept of EBM is a promising step in this very direction.

In his 1951 doctoral thesis, J. P. Bull (1959) provided numerous anecdotal as well as verified accounts of experimental thinking and practice in the known history of human societies. Claridge and Fabian (2005) described the historical development of EBM in four stages—the ancient, Renaissance, transitional, and modern eras—which in our view is a reasonable way of structuring historical events. In the following section, we briefly characterize these four developmental stages. These brief, chronological presentations highlight the work of various scientists and practitioners. However, our presentation is far from a comprehensive historical exposé and does not include numerous other figures that deserve mention as contributors to our collective heritage of the events leading to the modern understanding of EBM in the 21st century.

EBM during ancient times

For obvious reasons, knowledge of this period is limited to anecdotal studies. Nevertheless, as illustrated in Bull's 1959 article, there are many accounts of the existence of an experimental mind among ancient humans. We borrow two meritorious examples from Claridge and Fabian (2005), which they retrieved from the James Lind Library.

The first anecdote is an early sign of experimental thinking 2,000 years ago in one of the precursors to modern Western civilization; the second example is from China more than 1,000 years ago. Both anecdotes provide an indication of early awareness of the merits of comparative, experimental approaches in understanding the causes of differential effects.

Then Daniel said to the guard whom the master of the eunuchs had put in charge of Hananiah, Mishael and Azariah and himself. "Submit us to this test for ten days. Give us only vegetables to eat and water to drink; then compare our looks with those of the young men who have lived on the food assigned by the king and be guided in your treatment of us by what you see." The guard listened to what they said and tested them for ten days. At the end of ten days they looked healthier and were better nourished than all the young men who had lived on the food assigned them by the king.

(Claridge & Fabian, 2005, p. 548)

The second example of interest comes from the Song Dynasty. In 1061, Ben Cao Tu Jing reportedly said, “In order to evaluate the efficacy of ginseng, find two people and let one eat ginseng and run, the other run without ginseng. The one that did not eat ginseng will develop shortness of breath sooner” (Claridge & Fabian, 2005, p. 548).

Between ancient times and the Renaissance, around 1000 AD, an important series of books was published by an Iranian scientist, Ibn Sina, known as Avicenna in the West. Ibn Sina’s *Canon of Medicine* summarized and synthesized medical knowledge, albeit in a relatively crude fashion, into a comprehensive review of literature and experience. His approach to testing of medications became famous because of its experimental orientation. Ibn Sina suggested the substance being tested must be pure, it should be tested on an uncomplicated disease, the dosage must match the strength of the disease, and the outcome must be consistent. Furthermore, he argued that testing substances on animals may not be an accurate substitute for human tests (Bull, 1959). The *Canon of Medicine* remained the authoritative source of knowledge for many centuries, and many of the basic approaches advocated by Ibn Sina still stand today as components of controlled studies.

EBM during the naissance of modern science

From an evolutionary perspective, the 17th and 18th centuries constituted a period of significant advancement in the foundation of modern science. Especially in continental Europe and the British Isles, innovative methods in physics, statistics, and surgical sciences began emerging concurrently. This evolution included the emergence of modern social science methodology during the second half of the 18th century among a group of economists in Edinburgh, Scotland (Soydan, 1999).

James Lind, a surgeon with the British navy, is considered the pioneer of the first controlled clinical trial, which was conducted in 1747. Lind is the namesake of the James Lind Library, a depository of literature illustrating and explaining the development of treatment trials in health care. Lind published *A Treatise of the Scurvy* in Edinburgh, the current home of the James Lind Library, in 1753.

Characterized as a severe vitamin C deficiency, scurvy plagued populations that lacked adequate access to fruits and vegetables for centuries. Sailors were especially affected, given that perishable food could not be stored properly and consumed during lengthy naval expeditions.

The following is a key passage from Lind’s treatise (adopted and edited by Claridge & Fabian, 2005; some of the original language is not modernized):

On the 20th May, 1747, I took twelve patients in the scurvy on board the Salisbury at sea. Their cases were as similar as I could have them. They all in general had putrid gums, the spots and lassitude,

with weakness of their knees. They lay together in one place, being a proper apartment for the sick in the fore-hold; and had one diet in common to all.

Two of these were ordered each a quart of cyder a day. Two others took twenty-five gutts of elixir vitriol three times a day upon an empty stomach, using a gargle strongly acidulated with it for their mouths. Two others took two spoonfuls of vinegar three times a day upon an empty stomach, having their gruels and their other food well acidulated with it, as also the gargle for the mouth. Two of the worst patients, with the tendons in the ham rigid (a symptom none the rest had) were put under a course of sea-water. Of this they drank half a pint every day and sometimes more or less as it operated by way of gentle physic. Two others had each two oranges and one lemon given them every day. The two remaining patients took the bigness of a nutmeg three times a day, of an electuray recommended by an hospital surgeon made of garlic, mustard seed, rad. raphan, balsam of Peru and gum myrrh, using for common drink barley-water well acidulated with tamarinds, . . . with the addition of cremor tartar, they were gently purged three or four times during the course.

As I shall have occasion elsewhere to take notice of the effects of other medicines in this disease, I shall here only observe that the result of all my experiments was that oranges and lemons were the most effectual remedies for this distemper at sea.

(p. 549)

Besides being an example of an early well-documented and controlled trial, the story of scurvy also illustrates complications during the journey from *bench to trench*, or from research to application. The practice of using citrus as an anti-inflammatory remedy was common among the Portuguese by the 1500s. During a long expedition in 1601, Sir James Lancaster, commander in the British navy, observed:

Here two of our men, whereof the one was diseased with skuruie, and other had bene nine moneths sicke of the fluxe, in short time while they were on the iland recoured their perfect health. We found in this place great store of very wholesome and excellant good greene figs, oranges, and lemons very faire.

(Markham, 1877, p. 18)

Unintentionally, it seems, Lancaster observed a quasi-experiment when sailors on one of the four vessels under his command received several teaspoons of lemon juice as extra nutrition during a period of food scarcity on board. Later, he observed that many sailors had fallen sick on the other three ships.

However, it wasn't until the mid-1700s when James Lind conducted his experimental study that a causal relationship was established between a regimen of citrus and recovery from scurvy. It would take another 40 years before Sir Gilbert Blane was able to convince British naval authorities to adopt a preventive diet for their sailors (Claridge & Fabian, 2005).

As Claridge and Fabian (2005) summarized, the James Lind Library is rich with many other examples of experimental thinking, notably in surgical science and practice during this historical period. For example, British surgeon William Cheselden's records of surgical techniques to remove bladder stones (lithotomy) during the early 1700s included outcome differences (mortality) based on the age group of the patients—an example of one method to fairly assess medical interventions. In France, the surgeon Ambroise Paré experimented with different treatments for burns on the human body:

Treatment with standard medical practice vs. that recommended by a “country woman.” The country woman stated that . . . I should lay two raw Onions beaten with a little Salt; for so that should hinder the breaking out of blisters or pustules . . . the next day found those places of his body whereto the Onions lay, to be free from blisters, but the other parts which they had not touched, to be all blistered.

(Claridge & Fabian, 2005, p. 549)

Obviously, there exists not only a significant span of time but also tremendous advances in methodology between the treatment of burns using onions during the early 1700s and today's understanding of EBM, represented by the international Cochrane Collaboration; contributions by Sackett and his colleagues on EBM processes; advanced, mandatory, or recommended evidence guidelines; and user-friendly evidence-based clearinghouses. As so meritoriously noted by Claridge and Fabian (2005), a transitional period bridges this temporal and scientific gap.

EBM during the transitional era

This era began during the 1800s and ultimately led to the modern era of medicine, the beginning of which arguably is directly related to the British physician Archie L. Cochrane's 1972 book, *Effectiveness & Efficiency: Random Reflections on Health Services*. As described by Soydan (1999), the foundations of scientific methodology, including comparative methods and statistical measures, rapidly developed during the 19th century. Social and statistical analysis became the central concern of scholars from all scientific communities, including social workers. A review of pioneering medical scientists during this period reveals their advocacy for and practice of medical and

behavioral information collection, systematization, and comparison as methods of understanding medical issues and improving medical treatment and other interventions.

Kenneth W. Goodman (2003) traced the intellectual birth of EBM to Thomas Beddoes, an English physician who in an 1808 letter to Sir Joseph Banks proposed two strategies to address “the prevailing discontents, imperfections, and abuses, [*sic*] in medicine” (p. 4), namely the systematic collection and indexing of medical facts and increased publication of research results. Goodman (2003) poignantly interpreted the approach as follows:

Thomas Beddoes is suggesting a moral link between information management and medical practice. He is proposing outcomes research and fantasizing about systematic reviews; demanding databases and hoping for data mining; insisting on broader dissemination, and doing so two centuries ago, or before the World Wide Web would, at least in principle, put every publication on every desktop.

(p. 5)

In 1834, a French physician by the name of Pierre Charles Alexandre Louis published his *Essay on Clinical Instruction*, introducing his *numerical method* as a tool for clinical assessment and establishing his legacy as the founder of modern epidemiology. As quoted by Goodman (2003), Louis asserted:

As to different methods of treatment, it is possible for us to assure ourselves of the superiority of one or other . . . by enquiring if the greater number of individuals have been cured by one means than another. Here it is necessary to count. And it is, in great part at least, because hitherto this method has not at all, or rarely been employed, that the science of therapeutics is so uncertain.

(p. 5)

In the United States, Dr. Benjamin Waterhouse conducted the first smallpox vaccination trials around 1800. The concept of inoculation was controversial and it took time to introduce the smallpox vaccine as a public health procedure. When Waterhouse published his first essay in 1799, *New Inoculation*, his ideas received mixed reactions; some applauded, some doubted, and many, especially his physician colleagues, criticized and ridiculed (Cohen, 1980). In June 1800, with a vaccine he received from England, Waterhouse successfully vaccinated his 5-year-old son—the first case of vaccination in the United States. To publicly verify that the vaccine worked, he wanted to test it on a larger scale. He wrote to the Small-Pox Hospital in Brookline, Massachusetts:

I have collected everything that has been printed, and all the information I could procure from my correspondents, respecting this distemper (cow-pox), and have been so thoroughly convinced of its importance to humanity that I procured some of the vaccine matter, and therewith inoculated seven of my family. The inoculation has proceeded in six of them exactly as described by Woodville and Jenner, but my desire is to confirm the doctrine by having some of them inoculated by you. . . . If you accede to my proposal, I shall consider it as an experiment in which we have co-operated for the good of our fellow citizens, and relate it as such in the pamphlet I mean to publish on the subject.

(Cohen, 1980, p. 92)

Waterhouse was supported by Presidents Jefferson and Madison, both of whom were very interested in the vaccination issue, and ultimately received honors from medical societies both at home and abroad.

Advancement of knowledge on topics such as the relationship between microorganisms and infections, coupled with the introduction of anesthesia and the discovery of X-rays, provided the immediate chronological backdrop to further developments in methods of randomized controlled studies and the first explicit shift from opinion-based medicine to medical care based on the systematic measurement of patient treatment outcomes. Perhaps no one represents this transition more so than Ernest Amory Codman (1869–1940), an American physician who developed the *end result idea*. His approach emphasized the collection of systematic information on 5- by 8-inch cards, including preoperative and postoperative data, representing an early version of outcome studies. Furthermore, Codman strongly advocated for making the information cards available to the public to ensure transparency.

For example, from 1911 to 1916, he recorded data for 337 patients who were discharged from his hospital and reported 123 medical errors that were not properly reported. He sent copies of his records to other hospitals and requested they implement the same policy to create standards for benchmarking (Swensen & Cortese, 2008). Codman's end result idea gained much opposition in the medical community. He advocated for professional advancement and primacy to be based on proven systematic knowledge and specialization, whereas the medical community practiced seniority as the principle of decision making (Kaska & Weinstein, 1998). The controversy prompted him to resign in 1914 from Massachusetts General Hospital, where he practiced surgery. However, Codman's ideas were ultimately recognized and manifested in the establishment of the American College of Surgeons' Committee for Hospital Standardization in the late 1920s, which later became the Joint Commission on Accreditation of Hospitals, then the Joint Commission on Accreditation of Healthcare Organizations, and now

simply the Joint Commission. Several modern researchers credited Codman as the pioneer of EBM (Claridge & Fabian, 2005; Kaska & Weinstein, 1998; Swensen & Cortese, 2008).

The advent of the randomized controlled trial (RCT) was an important step in the development of EBM. Perhaps one of the earliest examples of a well-conducted RCT is a study conducted in 1931 by J. Burns Amberson and colleagues (Diaz & Neuhauser, 2004). The researchers conducted a clinical trial testing the use of sanocrysin to treat pulmonary tuberculosis and reported their findings in the *American Review of Tuberculosis*. They divided 24 patients into two pair-matched groups of 12 and used a single coin flip to assign the subjects to sanocrysin treatment or a control treatment. To reduce observer bias, treatment assignments were only known to two of the authors of the report and the nurse in charge of the ward. The researchers followed the patients for between 16 months and 3 years, and ultimately concluded that use of sanocrysin was not justified (Diaz & Neuhauser, 2004).

In 1937, G. W. Theobald reported findings of an experiment on the effects of calcium and vitamins A and D on incidence of pregnancy toxemia. Women in their 24th week of pregnancy were randomized (by each subject drawing a bead from a box that contained equal numbers of blue and white beads) into two groups. The experiment group received calcium lactate and vitamins A and D in predesigned daily dosages, whereas the other group served as a control. Results indicated that those receiving dietary supplements experienced fewer incidents of hypertension, headaches, insomnia, edema, and other negative outcomes. Theobald (1937) concluded that “the difference in the incidence of ‘complications’ between the two groups must, if not due to chance, be attributed to the substances given” (p. 1399).

Another early example of an RCT involved streptomycin, an antibiotic originally used to treat pulmonary tuberculosis that was isolated at Rutgers University in 1943. Beginning in the mid-1940s, the Medical Research Council in the United Kingdom conducted clinical trials that featured randomized allocation of patients, although the term *random allocation* was rarely used at the time. The trials were based on British physician Austin Bradford Hill’s series of articles in the *Lancet* in 1937 describing principles of random allocation. Patients were assigned to different treatment groups using a statistical series based on random sampling of numbers at each medical center involved in the study. In the treatment group, patients received streptomycin and bed rest, whereas those in the control group received only bed rest. The details of the random allocation series were unknown to the coordinator and the investigators, and kept in sealed envelopes. After a patient was accepted for treatment and before admission to the streptomycin treatment hospital, the envelope was opened and the card in the envelope indicated to which group the patient was assigned. Patients were not told before admission that

they would receive special treatment. Control patients did not know at any time while receiving treatment that they were in a control group—in fact, they received the same treatment they would have experienced under normal circumstances. Streptomycin and control patients were largely kept in separate wards. These randomized controlled studies of streptomycin in the mid-1940s have been recognized as a milestone in the history of random allocation of patients, although most of the principles were not as novel as many believe (Yoshioka, 1998).

Before proceeding to an overview of the advancement of EBM during the last few decades, let us summarize the lessons learned from historical events discussed in the previous sections. What historical experience and insights have been gained during centuries of human civilization to form the backdrop to the emergence of a modern understanding of EBM?

It seems obvious that at least three fundamental components of EBM were developed during a lengthy historical period; namely, the intellectual provinces of the comparative mind, the experimental mind, and the numeric mind. These components seem to be embedded in the human experience and were developed alongside the advancement of complex skills. James Lind's experiments stand as glorious and sophisticated historical examples of comparative and experimental methods. With the birth of modern statistical principles, an understanding of how numbers may be structured and used for better explanation and knowledge of medical phenomena has developed. Later, principles of random allocation and control mechanisms were developed and became increasingly sophisticated, creating the vital operational tool of EBM. It appears to us that all foundational components of EBM were in place by the 1960s and 1970s, albeit after a long and painful historical development. The publication of *Effectiveness & Efficiency: Random Reflections on Health Services* by Archie Cochrane (1972) served as a simple but necessary trigger of our modern understanding of EBM.

Modern era

Modern EBM has been characterized by two events. The first, as previously mentioned, was the publication of Cochrane's *Effectiveness & Efficiency*; the second, an almost parallel event, was the development of a new approach to training medical students launched in 1967 by David Sackett and colleagues at McMaster University in Canada. Interestingly, the former referred to EBM as the use of *gold-standard* evidence (evidence-based interventions) in medical practice, whereas the latter referred to EBM as a process of effective and sustainable implementation of evidence-based interventions in real-life situations.

Archie Cochrane, an epidemiologist, was commissioned by the Nuffield Provincial Hospitals Trust to write a book evaluating Britain's National

Health Service. Cochrane focused his attention on more informed and equitable health care. As a backdrop to his perspective, he declared in the book that his professional career was affected by early life experiences; first traveling in Europe during the 1930s as a medical student and observing poverty and disparities, and then spending 4 years as a medical officer in German prisoner-of-war camps. He served in a camp in which more than 20,000 prisoners had a daily diet of approximately 600 calories each. Prisoners faced epidemics of typhoid, diphtheria, infections, and jaundice. Medication was limited to aspirin and skin antiseptics. The young physician thought many would die of diphtheria in the absence of specific therapy. However, only four deaths occurred during the outbreak, three of which were due to gunshot wounds inflicted by the Germans. He concluded:

This excellent result had, of course, nothing to do with the therapy they received or my clinical skill. It demonstrated, on the other hand, very clearly the relative unimportance of therapy in comparison with the recuperative power of the human body.

(Cochrane, 1972, p. 5)

The second experience of importance during these formative years was in another camp for prisoners with tuberculosis. Many died. During World War II, there was no evidence or knowledge that streptomycin was an effective therapy for tuberculosis. Cochrane experienced the reality of a lack of evidence-based therapy. Although he had clinical freedom to use various treatments, he noted:

My trouble was that I did not know which to use and when. I would gladly have sacrificed my freedom for a little knowledge. I had never heard then of “randomised controlled trials,” but I knew there was no real evidence that anything we had to offer had any effect on tuberculosis and I was afraid that I shortened the lives of some of my friends by unnecessary intervention.

(Cochrane, 1972, p. 6)

Cochrane’s book, powered by his historical experiences, became the modern document of EBM, in which Cochrane returned to Sir Austin Bradford Hill’s principles of random allocation and defined the RCT as the best tool for producing high-quality evidence. In this book, Archie Cochrane emphasized the importance of access to high-quality evidence as the foundation of accurate, effective, transparent, and equitable health care.

The impact of Cochrane’s book cannot be emphasized enough. It led to the establishment of the evidence-based Cochrane Centre, which in

March 1993 became the UK Cochrane Collaboration. The concept of the Cochrane Collaboration was presented at a conference organized by Kenneth Warren and Fredric Mosteller at the New York Academy of Sciences and in October 1993, and the international Cochrane Collaboration was formally launched at its first colloquium in Oxford, England. Today, the Cochrane Collaboration is the single most influential international network dedicated to locating, appraising, and synthesizing effectiveness studies (RCTs and quasi-experimental designs) of health interventions. The Cochrane Collaboration publishes the Cochrane Library, perhaps the most focused and comprehensive source of evidence on health, mental health, and public health. In 2012, the number of reviews in the Cochrane Database of Systematic Reviews exceeded 5,000. Its impact factor in 2011 was 5.715. More than 30,000 people work with the network in more than 100 countries, including more than 70% who are authors of Cochrane reviews. A dozen regional centers and nearly 20 center branches organize training, review production, and other related activities. The scientific standards of the collaboration have affected and elevated the standards of many evidence-producing organizations, scientific communities, and agencies that produce professional guidelines. Since 2011, the collaboration has maintained an official relationship with the World Health Organization. As discussed later in this chapter, the Cochrane Collaboration also has served as the role model for the international Campbell Collaboration, a clearinghouse focused on education, crime and justice, and social welfare.

Published in 1997 by David Sackett, Scott Richardson, William Rosenberg, and Brian Haynes, *Evidence-Based Medicine: How to Practice and Teach EBM* is widely viewed as the bible of EBM. In 1995, Sackett and Rosenberg published a small article in which they declared the need and rationale for EBM. They defined the issue as follows:

Given the extremely rapid growth of randomized trials and other rigorous clinical investigations, the issue is no longer how little of medical practice has a firm basis in such evidence; the issue today is how much of what is firmly based is actually applied in the front lines of patient care. For although we clinicians really *do* need to keep up to date with clinically-important information, direct observations suggest that we usually fail to do so.

(Sackett & Rosenberg, 1995, p. 620)

They based their assessment in part on their experiences since the late 1960s at McMaster University, where Sackett helped develop a new medical program. In their article, Sackett and Rosenberg reviewed available empirical studies demonstrating the gap between a growing amount of evidence and the absence of this evidence in medical practice. Specifically, they conducted

a study of the self-reported information needs of 47 physicians. They concluded that, during an average half-day of medical practice, four decisions would have been changed if clinically useful evidence had been available and used. Only 30% of information needs were met in clinics. The physicians reported three barriers to adequate access to evidence: lack of time to keep up to date with current evidence, out-of-date textbooks, and disorganized patient records. Another study (Antman, Lau, Kupelnick, Mosteller, & Chalmers, 1992) employed a comprehensive meta-analytic approach and revealed that most textbooks failed to recommend thrombolytic therapy, even for well-defined indications of heart attack, 6 years after the first meta-analysis showed it to be efficacious. As a result of these and other insights, Sackett and his colleagues (1997) outlined EBM as a professional work model. Essential professional components of evidence-based medical practice included lifelong and continuing education; seeking and applying evidence-based medical summaries developed by others; and learning about, accepting, and using evidence-based protocols developed by colleagues.

The classic EBM model and its offspring are presented later in this chapter. However, at this point we elaborate on the relationship and continuity between EBM and EBP as designed for social work and other related professional fields, such as education, rehabilitation of criminals, mental health, public health, and policy development.

Evidence-based social work practice

Although the term *evidence-based social work practice* has been a direct adaptation of *evidence-based medicine* for the last decade or so, it would be a mistake not to recognize the longstanding scientific tradition in the social and behavioral sciences that has significantly paralleled the tradition in medical sciences, as described in previous sections. The adaptation of language was pioneered by scholars such as Eileen Gambrill and Leonard Gibbs (Gambrill, 1999, 2001; Gibbs, 2003; Gibbs & Gambrill, 2002) in the United States and Geraldine Macdonald (1999) and Brian Sheldon (2003) in Europe, and internationally by a group of scholars associated with the Campbell Collaboration (Boruch, Soydan, de Moya, & the Campbell Collaboration Steering Committee, 2004; Gray, Plath, & Webb, 2009). However, there was a prelude to these developments of the early 2000s, including the work of Edward Mullen and James Dumpson (1972) in *Evaluation of Social Intervention*. In this section, we briefly present the historical underpinnings of EBP in the social sciences.

Scientific analysis of society, human behavior, and the foundations of action for societal change was established in the 18th century through several mostly concurrent developments. Most notably, the writings of a group of scientists and economists in Scotland that included Adam Smith, Adam Ferguson, and John Millard, as well as the work of Enlightenment pioneers

in France, made major contributions to our current understanding of scientific analysis of society and human behavior (Soydan, 1993a, 1993b, 1999, 2012).

For instance, Adam Ferguson reformulated an old concept about human progress in his *law of progression*, a basic assumption that human nature integrates a desire to improve the conditions of society and humankind. Although the 18th century served as the period during which the foundations of social scientific methodology were developed, the 19th century was the era of formulating how this scientific knowledge (evidence) could and should be used to improve human behavior and change societal and human circumstances for the better. In general, the concept was that problem-generating social and human conditions could and should be addressed by employing scientific analysis, the central concern of the post French Revolution era. During the early 19th century, Henri Saint Simon pioneered a science-based model of societal betterment (Soydan, 1999). Many others followed, including figures such as August Comte (positivism) and Karl Marx (Marxism).

If we had to cite one important development during the modern era that significantly influenced EBP, our choice would be the idea of the *experimenting society* developed by Donald Campbell, the namesake of the international Campbell Collaboration. This concept represents an accumulation of several decades of thought and scholarship that combined the development of scientific methodology and techniques with a longstanding dedication to the use of social sciences in public policy. Campbell (1988) dedicated a book chapter to the idea.

The experimenting society

It is critical to point out the fundamental resemblance between Donald Campbell's professional experience and that of many of the pioneers of experimental medicine whose work has been described in previous sections. Campbell was a methodologist who developed the modern principles of applying experimental and quasi-experimental research designs in the social and behavioral sciences. In this sense, he was a true frontline scientist who understood the merits (and deficits) of experimental designs in terms of scientific knowledge production. He wrote: "They know me for my lists of threats to validity in quasi-experimental research and for my list of design alternatives that will help render these threats less plausible" (Campbell & Russo, 1999, p. 10). Campbell continued:

Since 1969 (Campbell, 1969e) at least, this concern has been focused on applied social science, on treating the ameliorative efforts of government as field experiments. In the American social science community,

this falls within the designation of *policy research*. My aspect of it is known as *program evaluation*. I am reporting here on our experience in developing methods for program evaluation and their implications for the question, “Can the open society be an experimental society?”

(Campbell & Russo, 1999, p. 11)

Campbell’s idea of the experimental society was influenced by Karl Popper’s philosophy of science. Popper advocated falsifiability and not verifiability as the decisive criterion of empirical science, or in other words, scientific evidence. He famously stated that “it must be possible for an empirical scientific system to be refuted by experience” (Popper, 1972, p. 41). Interestingly, Popper was also an arduous defender of the *open society*, a democratic and transparent society, in contrast to the one advocated by Karl Marx and others (Popper, 1962). Not surprisingly, as much as Campbell viewed the methodology and technique of experimentation as the gold standard of scientific evidence and as an important component of the experimenting society, he also expressed a certain degree of pessimism, doubting that his utopian model would persist given the historical absence of such a society. However, he also modified his pessimism by pointing out that, in his model, utopia is a process rather than a social structure or a goal in and of itself, as many historical concepts of utopia have been.

The most fundamental characteristic of the experimenting society, Campbell stated, is its scientific, problem-solving, and self-healing orientation. The human environment is loaded with endless correlations. Positivists once assumed it was possible to establish and accumulate evidence about all correlations, ultimately creating a map of everything in the human environment. However, this assumption proved to be impossible in a dynamic, interactive, and ever-changing environment. Campbell wrote:

From among all the observable correlations in the environment, humans and their predecessors focused on those that were manipulative correlations. From this emerged the human predilection for discovering “causes” rather than mere correlations. In laboratory science, this search is represented by experiment, with its willful, deliberate intrusion into ongoing processes. Similarly for the ameliorative scientist: Of all of the correlation observable in the social environment, we are interested in those few that represent manipulative relationships, in which—by intervening and changing one variable—we can affect another. No amount of passive description of the correlations in the social environment can sort out which are “causal” in this sense. To learn about the manipulability of relationships one must try out manipulation.

(Campbell & Russo, 1999, pp. 23–24)

The best possible way of obtaining evidence on how interventions work and what outcomes they produce, Campbell concluded, is randomized assignment models. “Although I am a strong advocate of good quasi-experimental designs in which randomization is not possible, detailed consideration of specific cases again and again reinforces my belief in the scientific superiority of randomized-assignment experiments” (Campbell & Russo, 1999, p. 24).

In terms of the philosophy of the experimenting society, Donald Campbell reiterated the wisdom of Karl Popper and some of his contemporaries. It is, of course, a scientific society “in the fullest sense of the word ‘scientific.’ The scientific values of honesty, open criticism, experimentation, willingness to change once-advocated theories in the face of experimental and other evidence will be exemplified” (Campbell & Russo, 1999, p. 16). Furthermore, it is an active society (modeled after Etzioni) that promotes exploratory innovation as opposed to inaction; a learning society (modeled after Dunn); and a society that is honest, self-critical, egalitarian, and committed to testing reality.

In sum, although EBP is an adaptation of EBM, the idea of EBP has its own historical foundations embedded in the dedication of humankind to societal betterment and scientific development. The idea of using scientific evidence to remedy societal problems dates back at least to the late 1700s and developed significantly beginning in the early 1800s. We find the most explicit and influential progress in the early advancement of modern EBP in the work of Donald Campbell. This history represents the linear perception of the relationship between scientific evidence and problem solving—the connection of a problem to a scientifically supported solution. A more sophisticated stage, the dialectical model of EBP in which various components interact, is the focus of the following sections of this chapter.

Evidence-based practice as a process

As noted earlier in this chapter, EBP as a process was first formulated as EBM by Sackett and his colleagues in the mid-1990s as a way to help medical professionals make better-informed, conscientious, explicit, and judicious decisions. This also encouraged, or in fact presupposed, patient participation in treatment decision making. Several decades later, the original definition of EBM and EBP stands exceptionally intact and strong. However, the original definition has been the subject of debate, opposition, distortion, and clarification. A definition that captured all essential dimensions of EBP as a process with great applicability in social work practice was suggested by Allen Rubin, an American social worker:

EBP is a process for making practice decisions in which practitioners integrate the best research evidence available with their practice

expertise and with client attributes, values, preferences, and circumstances. When those decisions involve selecting an intervention to provide, practitioners will attempt to maximize the likelihood that their clients will receive the most effective intervention possible in light of the following: (1) the most rigorous scientific evidence available; (2) practitioner expertise; (3) client attributes, values, preferences, and circumstances; (4) assessing for each case whether the chosen intervention is achieving the desired outcome; and (5) if the intervention is not achieving the desired outcome, repeating the process of choosing and evaluating alternative interventions.

(Rubin, 2008, p. 7)

The essential message of this model is that the three elements of EBP are all important and necessary dimensions of making the best possible intervention decision. In essence, achieving the best possible client outcome is contingent on the best possible integration of practitioner expertise, client values and expectations, and the best available evidence.

Later, this model was slightly revised, given a more user-friendly and realistic characterization, and illustrated (Figure 2.1).

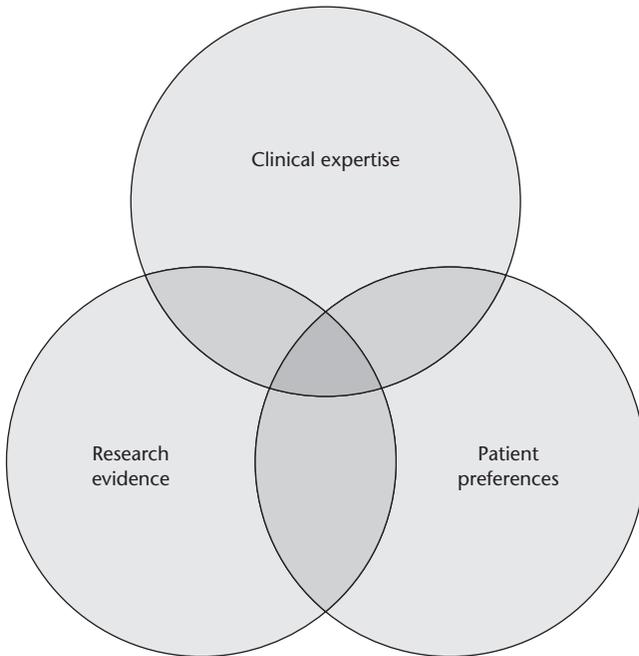


FIGURE 2.1 An updated model for evidence-based clinical decisions

Adapted from Haynes, Devereaux, and Guyatt, 2002.

This definition of EBM may be seen as a simple modification of the original model, but it emphasizes the prominence of the organizational setting in which EBP takes place. *Clinical state and circumstances* refers to the conceptualization of a service organization that may function both as a facilitator and moderator of any evidence-based intervention being implemented (see Chapter 4). *Clinical expertise* represents expertise in integrating research evidence with client preferences and actions in the specific setting of the organization. This model does not necessarily indicate that the service organization itself exists, functions, and strives to survive in larger settings that include components such as social policy arrangements, legislation, economic structures, and cultural patterns. However, it would be correct to stress that the Haynes, Devereaux, and Guyatt (2002) model of EBP operates in a macro environment whose impact is not always very clear.

Later, Sholonsky and Wagner (2005) adapted the Haynes et al. model and detailed all three components to demonstrate the cyclical nature of EBP when applied to an individual client (Figure 2.2). During the cyclical process, current best evidence is integrated with assessment of risk, and resources are directed to clients at highest risk. Action is taken in the context of the clinical state and circumstances as well as client preferences.

We characterize this model of EBP as a dialectical model—a system in which interacting components may not always be harmonious and may have contradictory perspectives and values. For example, even if evidence

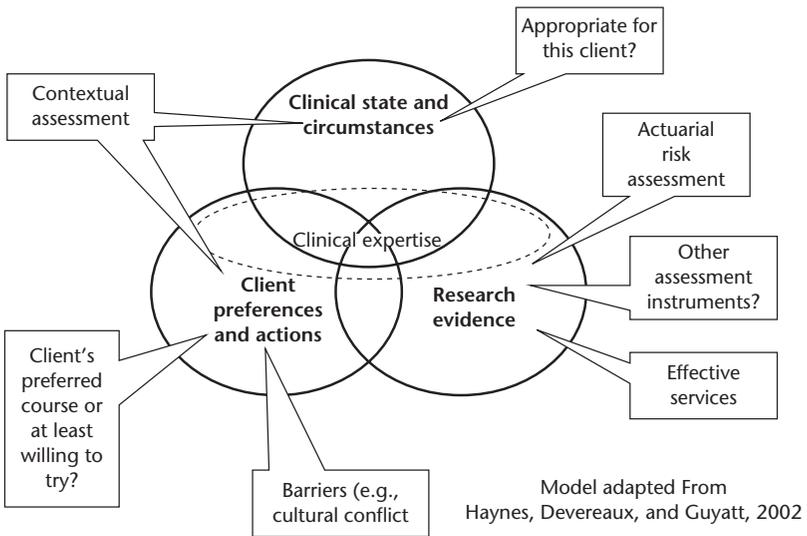


FIGURE 2.2 The cyclical nature of evidence-based practice

Reproduced from Sholonsky & Wagner, 2005, with permission.

indicates that an abortion is necessary for the survival of a patient, this intervention method may conflict with the patient's value system and ultimately her personal preference, or may be prohibited by law. A dialectical model of EBM advances beyond earlier conceptualizations of evidence-to-practice models that were linear or characterized by simple feedback mechanisms. In a complex dialectical model, a decision is contingent on the specific client, organizational, and cultural context.

The EBP model was originally implemented in clinical settings, first in medical practice and later in other human services. In its simplest form, clinical application of the model involves a client or patient and a professional. However, real-life situations may involve more than two individuals. A social worker in a school environment may have a student client whose parents and teachers become a part of the treatment program, the social worker may consult a supervisor and colleagues, and so on.

However, the EBP model is applicable in many other settings. For example, a job creation intervention may involve several neighborhoods or communities and an antiviolenence intervention may involve all classes in a school or all schools in a district. On an aggregate level, evidence-based policy may involve entire subpopulations (e.g., all teenage girls in a state, all households under a certain income level).

Steps in applying evidence-based practice

The EBP model (Sackett et al., 1997) was formulated as a five-step process of working with patients. Although various aspects of this model have been modified over the years, it is our assessment that the five-step model remains a lasting and standard EBP approach. This model is conceptualized as a very flexible tool that presupposes critical thinking, willingness to pursue lifelong learning, openness to new ideas, mindfulness about new and strong evidence, and avoidance of the fallacy of authority-based information. We briefly review the steps of the model and point out some critical issues related to applying the model in social work practice.

Step 1: Formulating an answerable question

Like scientists and other professionals, social workers are confronted with problems that need a solution. Problems that clients experience or issues that a troubled community faces may come in various degrees of complexity—they may be apparent or vague, simple or perplexing, at least at first glance. The initial task of the social worker is to systematize and assess the many aspects of a problem and narrow them to an answerable question. Even at this stage, it is good practice to consider what effective evidence-based interventions

are available. After all, a problem becomes treatable only when there is an effective or promising intervention available to be implemented.

As any professional knows, problem formulation is a process and may take some time in real-life settings. The professional may need to use a trial-and-error method and revise the problem several times before establishing a solvable question.

Step 2: Finding the evidence

This step of the EBP process is typically perceived as the process of reviewing all sources of knowledge for evidence-based interventions using Internet-based search engines. However, conducting a comprehensive and complex data search can be time consuming and beyond the skills of many professionals. Although we would agree with the need for an evidence search on a broad platform, we would hope that most organizational settings will offer support to individual workers on a daily basis. In other words, EBP can be implemented optimally if social work takes place in organizations that maintain an infrastructure that helps individuals or groups of workers simplify this stage. In Chapter 4, we describe organizational structures that promote and routinize implementation of EBP and point out advances in service delivery organizations to eliminate the burden of exhaustive data searches.

Furthermore, since the launch of the first models of EBP, much progress has been made in bringing evidence to end users. At one time, individual practitioners were expected to conduct time-consuming data searches nearly every time they had to find a solution to a client problem. Over the years, various types of data support systems have been developed and tailored to efficiently address the needs of individual workers and service delivery organizations. Practitioners and their organizations can now easily access and navigate tailored tools such as authorized guidelines, advanced sites such as the Cochrane and Campbell libraries, and evidence-based clearinghouses. These and other evidence sources are reviewed in Chapter 3.

Step 3: Critically appraising evidence quality

In rational, open, democratic societies of the modern world, scientific knowledge is given great prominence in comparison to other sources, such as religious or normative knowledge. Although as scientists we take a similar position, we also want to emphasize that scientific knowledge is associated with problems that often mislead professionals.

First of all, all scientific and good evidence is merely an estimate of an assumed truth. Estimates are probabilities and not absolute truths. Strong scientific evidence provides the probability of a given event, such as when

X (independent factor) occurs, Y (dependent factor) will follow. This specific scientific circumstance, a condition of scientific evidence production, limits our knowledge and mandates caution.

Furthermore, production of scientific evidence is always threatened by factors that undermine the quality and strength of the evidence. Most of these factors are identified as threats to validity of evidence and widely described in the literature. However, scientists continue to produce biased evidence and journals and other scientific media continue to publish biased studies, not necessarily intentionally but often due to practical difficulties, lack of skills, and negligence. This type of threat and others such as publication bias and other biases have been identified and described by both the Cochrane Collaboration and the Campbell Collaboration. Since the emergence of these two international evidence production networks, there has been an increased awareness of evidence quality and strength, which represents a positive step for EBP.

However, from the perspective of service delivery, either as an individual worker or an institution, the risk of flaws in scientific evidence will always be present. Social workers and service delivery organizations need to exercise caution, particularly when considering interventions with weak, flawed, or nonexistent evidence.

Acquiring the skills to independently appraise the quality and strength of evidence is necessary. Such training not only involves the basic ability to read and understand threats to validity, but also the ability to separate good- and high-quality sources of evidence from those with less acceptable qualities.

Step 4: Matching evidence and client

One of the greatest innovations of EBP is the enumeration of conditions in which scientific evidence can or may be implemented. In the original model of EBP (Sackett et al., 1997), the locus of EBP was identified as the interaction of the best scientific evidence, client values and expectations, and the professional expertise of the practitioner. In a revised and refined model by Haynes et al. (2002), EBP was defined as the adaptation and integration of the best available scientific evidence, client preferences and actions, and clinical conditions and circumstance as shaped by the practitioner's expertise and interaction with all involved parties. Later in this book, we further expand and elaborate on the component of clinical conditions and circumstance by highlighting the organizational settings in which service delivery takes place. A specific aspect of matching the evidence with the client is the discourse on translation and implementation of evidence-based interventions, which we addressed in a previous book (Palinkas & Soydan, 2012).

As the EBP models referred to in this book imply, the ultimate implementation of an evidence-based intervention is a result of trade-offs, interactions, and negotiations orchestrated by the social worker. The process of EBP is the best possible optimization of all components of the model, as agreed to by all parties, in the pursuit of the best possible outcome for the client. This process requires transparency and is contingent on the professional skills of the social worker to derive the best model of EBP in each individual situation.

Step 5: Following up on outcomes

The purpose of any evidence-based intervention is the betterment of clients, be they individuals, family members, a secondary school, or a neighborhood. Outcomes of EBP need to be monitored to observe and assess whether the intended results occurred and if any unintended (and potentially harmful) results were produced.

Follow-up and measurement of outcomes can be formally accomplished in several ways and complemented with informal observations and conversation. Rubin (2008) described the use of behavioral recording forms, individualized rating scales, and standardized scales, in addition to providing sources of such tools.

EBP and related concepts

During a 2006 conference titled *Improving the Teaching of Evidence-Based Practice in Social Work*, a group of researchers addressed challenges facing EBP (Proceedings of the Conference, 2007). One of the obstacles discussed was the revision of the original definitions and intentions of EBP. Changing definitions of scientific concepts over time, and even changing terms for scientific concepts, is a common practice in the social sciences. These shifts might be an expression of scientific refinement as well as distortions of original intentions embedded in definitions and terminology.

Whatever the case may be, EBP proved to be no exception. Over the years, the terms *evidence-informed practice* and *evidence-supported practice* in particular have been used as alternatives to EBP in both literature and everyday language. During the evolution of EBP, some scholars at one point or another have used alternative terms such as *evidence-informed practice* without redefining the concept (e.g., Bowen & Zwi, 2005; Chalmers, 2005; Gambrill, 2008). At times, evidence-informed practice seemed to represent a broader perspective of the research base of professional practice that included various types of research designs, or simply acknowledged that available evidence is not always the best and thus loosened the rigorous rules required by the gold

standard of EBP (see Chapter 3). Although proponents of EBP consider the gold standard as the desired basis for professional practice, they also realize that such an approach is not always possible or feasible in real-life situations, particularly because of the scarcity of rigorous and high-standard research in various practice fields (e.g., Bowen & Zwi, 2005; Rycroft-Malone, 2008). These issues remain unsettled, and whether or not the gold standard of evidence—represented by randomized controlled studies of the outcomes of social and behavioral interventions—should or could be the only basis of EBP will be for future developments to determine.

However, the term *evidence-informed practice* may also take unexpected turns. For example, Arnd-Caddigan (2011) borrowed from one of the core competencies prescribed by the Council on Social Work Education, the certifying institution of schools of social work in the United States, and noted that such a “broad term can encompass a great deal of difference in interpretation” (p. 372). She defined *practice-based evidence* as a form of evidence-informed practice and developed an epistemology that may legitimize practice-based evidence in therapeutic interventions. In her conclusion, Arnd-Caddigan (2011) stated:

Much of this knowledge is on an implicit level. When trained in reflective practice and adept at entering an intersubjective field with a client, the therapist may be able to discern, even if not articulate, that it *feels* different to be with a client. Much of this implicit knowledge can be brought to the symbolic narrative domain. Therefore, the next step is to push for articulation, exploring how it feels different. These feelings become the evidence that change is occurring. While the direction and nature of the important changes that occur in therapy are usually not predictable, it does not mean that they have not occurred, or that they are not discernible post hoc.

(p. 376)

Similarly, practice-based research (PBR) has been presented by a number of researchers as an alternative to EBP throughout the years (e.g., Dodd & Epstein, 2012; Nevo & Slonim-Nevo, 2011). One of the strongest proponents of PBR is Irwin Epstein, a prominent professor with Hunter College’s Silberman School of Social Work (Dodd & Epstein, 2012; I. Epstein, 1996, 2001). In introducing the agenda of their book, Dodd and Epstein (2012) referred to a 2001 book chapter by Epstein in which PBR is defined as “the use of research-inspired principles, designs and information gathering techniques within existing forms of practice to answer questions that emerge from practice in ways that inform practice” (p. 11). Furthermore, they characterized PBR as:

research conducted by practitioners for practice purposes. The goal is to inform practice and practitioners throughout the research process. Thus, PBR emphasizes immediate practical applications by practitioner-researchers who conduct PBR studies. These studies may be conducted by individual social workers, teams of social workers or multi-disciplinary teams, with or without research consultation. When that consultation is available however, it is fully collaborative rather than dominated by research considerations.

(Dodd & Epstein, 2012, p. 5)

Dodd and Epstein (2012) made it clear that PBR is conceptualized “as a reaction to conventional ways of thinking about, writing about and teaching social work research” (p. 13). The authors differentiated between EBP and PBR, with EBP representing prior research that is deductive, privileges RCTs, and is driven by academics, whereas PBR represents practice wisdom that is inductive, rejects RCTs, and is driven by practitioners.

It is not an objective of this book to critique the concepts and definitions related to or developed alongside EBP. However, we want to note that, although EBP and PBR are not compatible on a number of issues, notably their approach to and appreciation of the value of scientific designs and scientific rigor in determining outcomes of social work interventions, they agree significantly in terms of the role of professional practice and practitioners. For instance, the classic definition of EBP as a process suggests that a practitioner’s professional judgment and skills are vital components of the process. Without the professional judgment to integrate and harmonize all components of the EBP process, there would be no EBP. Furthermore, it is notable that EBP acknowledges the importance of client involvement and client characteristics. Gambrill (2006) aptly indicated how and in what ways EBP involves clients, including: (1) taking into consideration client differences when implementing tested and generalized interventions powered by scientific vigor; (2) supporting clients to develop critical appraisal skills; encouraging client input in the design and critique of research related to practice; (3) involving clients as informed participants in decision making (as strongly promoted by the Cochrane and Campbell collaborations); and (4) involving clients to take advantage of their firsthand and unique knowledge in the translation and implementation of EBPs.

Similarly, before rejecting RCTs as a rigorous research design, it is necessary to properly understand and assess the context in which RCTs and similarly useful research designs are tailored to operate. Randomized controlled effectiveness studies, when conducted properly with enough statistical power, generate the best possible or least biased estimates of the effects of social work interventions. However, they can only do so in a context of generalizability, which means implementation and replication in diverse, real-life conditions. Furthermore, there are limits to evidence generation and knowledge, as any proponent of EBP would agree (Soydan, 2008b).