Statistics for Health Care Research

Areas of learning covered in this chapter

Who and what is this book for?
How you can use this book and use statistics to enhance practice
What is evidence-based health care?
How are statistics used to enhance evidence based health care?
How statistics can help you to evaluate professional knowledge and professional values as the evidence base for practice (EBP).

Scope of the book

This book aims to expand health care students and professionals’ knowledge and understanding of statistics within health care practice. We hope that through reading and using this book you will be encouraged to evaluate statistical analysis and their relationship to evidence-based practice. There are many different approaches to investigating questions in health care practice. This book deals with quantitative approaches to investigating problems in health care, which require an understanding of some of the basic rules and principles of statistics. Understanding research in health care requires appreciating both qualitative and quantitative approaches to analysing data. Students of health care professions, both medical and non-medical, can expect to encounter a range of research approaches, which use particular statistical techniques to derive answers to particular patient problems. To this end, health
care practice involves understanding of a range of research techniques within health-related subjects, including the use of statistics.

For many students and practitioners of health care, statistics is a subject that can often appear incomprehensible, daunting and, worse still, far removed from the real issues and problems encountered when caring for people. This book tries to demystify some of the more commonly used statistical tests and help readers understand the language of research that uses statistics, which both novice and advanced researchers find very off-putting to read. Undertaking the exercises within and at the end of each chapter will encourage you to think critically and reflectively about the research that you encounter, both in terms of the statistical process and the dynamic health care context in which studies are executed. This book can be used as a basis for taught courses on statistics at both pre-registration and post-registration level and as a reference guide for those using statistics in health care settings. The book is an introduction and aims to take you from novice to advanced beginner. Statistics is a vast subject which many people find difficult. We hope to make the learning process easier, but we can’t promise an effort-free process.

The book is divided into eighteen chapters. Each contains explanations of its terms and use for reference. A glossary has been provided and every time you encounter a word in bold print you can look up a short definition in the glossary. In the test and at the end of each chapter you will find questions and exercises. Using these exercises will allow you to practise and thus become more proficient.

The book begins by taking a ‘how to’ approach, which explains how specific statistical tests can be performed. We have included details of how to calculate many of the statistics by hand. This is because doing at least some of the statistics by hand will help you to get a feel for the processes. As the statistical techniques become more advanced, readers are

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Glossary

When you see a term in bold you may want to look it up in the glossary of terms at the end of the book. This will explain terms used and help you to remember key words.

Professional values

- To practice within the various codes of conduct, which regulate your chosen Health care discipline.
- Be aware of cause and effect of health and ill health.
- Track progression and regression of health states and disease.
- Serve society by implementing the best practice based on available evidence.
- Teach new generations of Health care Professionals by using up to date research findings.
- To be self-governing and self-regulating in order to protect and serve the public.
directed towards suitable computer packages and other literature. This is because there are already excellent texts about some statistical concepts, which deal with some statistical techniques, although not many texts, have health care as a focus. This can make understanding statistics difficult for students of health care, as statistics often appear far removed from patient problems. Examples of statistical techniques commonly used will be explored and the results of a hypothetical questionnaire on sexual health and a clinical trial are used to encourage you to practise and explore statistics. We encourage you to try calculating statistics by hand, at least at first. This will help you to develop a feel for what is going on. Computers with statistical packages are not always available in health care settings. As tests become more advanced and you feel more confident, do use the statistical computer packages that are available. (A short guide to using SPSS and Excel can be found at www.sagepublications.com.)

Box 1.1

Reflective exercise

Take a few moments to think about the decisions made in Health care today.

- How do we make decisions about what is the best care for patients and clients?
- How do you make decisions about what is best for you?
- How do you feel about making decisions that may affect another person’s life?
- About people’s health?
- About circumstances which may affect a persons’ ability to: give birth, father or mother children, recover from cancer, cope with devastating trauma, cope with loss or grief, help someone integrate back into society after mental illness

How do we as health care providers analyse such problems and then come to reach decisions that have an impact on many people’s lives? The answers to these questions lies in the basis we use for our professional knowledge, the power we have to implement changes in practice and what constitutes our evidence base for our practice.

The use of clinical and community-based studies will form a central thread to allow data analysis to be explored from the perspective of differing subject areas. As well as analysing data from the studies provided we encourage you to analyse your own data, collected in response to some sample questions.
We encourage you to think critically about data analysis and research design and how appropriate research design impacts upon evidence-based practice. This is because an understanding of statistics is essential if the numerous reports and documents issued within the health industries are to be scrutinised and considered in a critical manner.

After reading the book, we hope that your skills of critical analysis will have become more refined. We hope that you will have a better understanding of the process of research and the use of statistics and all that is involved in getting answers to problems. We hope that you will be able to understand the importance of carefully reading and reviewing research reports in order to come to conclusions about their relevance to your area of practice. It is also hoped that you will begin to feel comfortable talking the language of quantitative research, which can aid when presenting a case for changing or improving an area of practice.

The use of statistics in health care research

There has been an increase in the development of research-based and evidence-based practice (EBP). For students undertaking professional health care education, and those practising as professionals in health care, understanding the statistical terms used in research is of paramount importance when evaluating research studies.

One of the key aims of this text is to enable the development of a greater understanding of the process and practice of using statistics in order to find answers to complex health problems.

After the initial preparation to practise health care, qualified practitioners are charged with a duty to care for patients and clients in the best manner possible. This means taking account of patients’ and clients’ family life and their involvement with others, the knowledge and skills attributed to practice, medical orders and the role of the allied health professions (AHPs). Understanding statistical terms helps practitioners to make sense of the many research studies that underpin EBP, takes account of professional values as service providers to the public and enables practitioners to undertake studies themselves.

What are the goals of health care research?

The primary goal of health care research is to aid patient and client care by developing a unique scientifically based body of knowledge which
can be used to help us with decision making, to develop new practice and promote the professional role.

The degree to which a body of people such as health care professionals can be judged as professional resides to a large extent on the body of specialist knowledge that they can draw on for practice. Developing a specialist knowledge base by a process of scientific enquiry can aid the professional standing of a professional health care provider.

The ultimate aim of health care providers is the delivery of safe, effective care for patients and clients. This is an essential prerequisite in all health care professionals’ codes of conduct.

Understanding statistics is just one way of ensuring that professional practice is based on the best available evidence to date by which to treat and help the wider community. Health care research shares many of the qualities of practice interventions, as they are both practical and intellectual activities, which have a defined language to learn. Good practice and good research do not spring from *ad hoc* or sloppy practice. Health care practice and health care research both use processes which when applied rigorously can improve patient care. Health care practice that is ritualised, not research-based and not assessed, not planned and (more important) not evaluated to see if it makes a difference to patient care can kill people, as it leads to unsafe practice. Evidence of this is to be found in the various catalogues of disciplinary hearings concerned with the safe conduct of health care providers of all disciplines.

Research, from whichever perspective, that is not rigorous, systematic, ethical and well designed can have devastating effects on people’s lives. The thalidomide drug research is a case in point. Maynard (2003) suggested that medication errors occurring in health care in the United States kill twice the number of people who died in the terrorist attack on the World Trade Center on 11 September 2002. The prevalence of Methicillin-Resistant *Staphylococcus Aureus* (MRSA) in Britain causes great concern and many cases of atriogenesis. In France four times more antibiotics are consumed *per capita* than among Dutch patients, with higher levels of antibiotic resistance as a result (Maynard 2003). Understanding statistics in health care research, then, is every professional health care provider’s business.

**Professional knowledge and evidence-based practice**

Florence Nightingale argued that systematic and routine data should be gathered from patient care settings in order to determine whether or not
interventions were effective. Today implementing practice based upon statistical evidence is still problematic. The difficulties can to a large extent be attributed to the lack of engagement of health care providers in the process of change (Maynard 2003). Instituting change in health care relies on an understanding of statistics. Understanding the language of statistics gives all health care providers a common language despite the differences between the professions. The difficult question remains, however: in gaining consensus in deciding what exactly constitutes evidence? If we examine the credibility of evidence-based practice (EBP) in health care through exploration of its philosophical origins, there are several key features that emerge as important considerations. First, we need to evaluate critically the declared purposes and strengths of what exactly constitutes the evidence base for practice in health care. Second, we require an analysis of the implicit reasons for implementation of EBP. Third, we require a critical discussion of the strengths and limitations of EBP within the context of modern health care.

It is questionable whether evidence-based practice is a borrowed or unique concept. Whatever considerations and issues are raised, there can be no doubt about the impact of statistics upon the prevailing views of professional practice. The implications of ensuing debate on statistical concepts for health care providers are numerous and have significant implications for the future of the professions. This is because the implications range from immediate curriculum development and delivery of professional practice in health care education and training to a multi-professional and multicultural perspective, including the role and preparation of educators, clinicians and students. The quantitative paradigm has had a massive impact on the knowledge base for the practice of health care professionals. Some authors maintain that, philosophically, EBP is fundamentally utilitarian (Colyer and Kamath 1999). If that is the case, an understanding of statistics is essential for EBP.

Having read this chapter and completed the exercises, you should be familiar with the following ideas and concepts:

- Using this book to develop your understanding of statistics
- Evidence-based practice
- The relation between quantitative research and evidence-based practice
- How quantitative research contributes to the development of professional knowledge and professional values
- The importance of statistics in health care practice
Exercises

1. When considering introducing change to your practice, what type of evidence do you require to support that change?

2. Consider the last time change was introduced to your practice. What evidence was it based on? What role did you play in the decision? Did the change have a statistical basis?