

# **An Introduction to Research for Primary Dental Care Clinicians**

## **Part 1: The First Three Stages In A Research Project**

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### **Introduction to the series**

In the United Kingdom and many other developed countries, the importance of evidence informed clinical practice is well established. Such evidence comes from research. If the research is clinical, as opposed to laboratory based, it should ideally take place in the clinics where the care is provided, rather than in other locations where the outcomes may well not be the same. Because over 90% of oral healthcare is provided in a primary dental care setting, it is logical that much research should take place in this sector. Although the vast majority of oral research has hitherto taken place in universities and laboratories, there appears to be increasing interest in collaborative research in primary care.<sup>1</sup>

A survey of general dental practitioners (GDPs) in 2005<sup>2</sup> found that, although they appreciated the importance of research for providing evidence to improve patients' care, only a small percentage had been involved in research. Nevertheless, the majority were interested in taking part and just under half thought that research in primary care should be performed by those working in this area.

Since 2005, an increasing number of dentists working in primary dental care have been taking Master's degrees and some dental care professionals (DCPs) have been taking either Master's or Bachelor's degrees. A few are studying for part-time PhDs. Because Master's degrees invariably include a research project and Bachelor's degrees include research modules, there is an increasing interest and involvement in research in primary dental care.

Against this background, a series of papers addressing the stages in a research project has been produced to help anyone who wishes to carry out oral research to gain a basic understanding of what is involved. The series provides an overview of the different stages in a research project and the relevance of research to primary dental care. It introduces readers to the basic principles of research methodology but does not provide an in-depth review of all aspects of research.

### **Stages in a research project**

1. The initial idea (asking a research question).
2. Searching the literature.
3. Refining the research question.
4. Planning the study.
5. Writing a protocol.

6. Obtaining ethics approval and funding.
7. Piloting the methodology and project management.
8. Collecting data.
9. Analysing the data.
10. Writing and disseminating the results.

This series will update and replace the Faculty of General Dental Practice (UK)'s research leaflets.

### **Stage 1. The Initial Idea (Asking a Research Question)**

The key factors when deciding upon a topic to study are that it is interesting and important to the individual or group concerned and that it is feasible to study it in a primary care practice/clinic. Most research questions that are relevant to primary dental care are likely to be clinical.

#### **Asking the clinical question**

Evidence-based primary care practice requires that clinicians draw on the best available research to facilitate their decision-making. The first step in this procedure is to source the relevant research literature, and this is dependant on asking a well-designed clinical question. There are two types of question that can be asked, and the type helps to determine which resources to access in order to answer the clinical question:

- 'Background' questions ask for general knowledge about a condition or specific topic.
- 'Foreground' questions ask for specific knowledge to inform clinical decisions or actions.

#### **Background questions**

These ask for general knowledge about a disease or disease process and have two essential components.

1. A question root (who, what, when, etc) with a verb.
2. A disorder, test, treatment, or other aspect of healthcare.

Examples of these are: 'What causes mouth ulcers'? Or 'Does antibiotic or topical antiseptic prophylaxis reduce the risk of bisphosphonaterelated osteo necrosis of the jaw?'

#### **Foreground questions**

These ask for specific knowledge about managing patients with a disease and have three or four essential components. Asking a good research question is not easy and it is essential that

any clinical question is answerable. Sackett et al (1997)<sup>3</sup> suggested the use of PICO, a mnemonic used to describe the four elements of a good clinical foreground question.

**P**atient and/or problem.

**I**ntervention.

**C**omparison (optional, include if relevant).

**O**utcome.

The following describes these in greater detail:

**Patient:** Describe as accurately as possible the patient or group of patients of interest.

**Intervention** (or cause, prognosis): What is the main intervention or therapy that you wish to consider?

**Comparison** (optional): Is there an alternative treatment to compare? Including no disease, placebo, absence of risk factor, and so on.

**Outcome:** What is the clinical outcome?

An example is: ‘Are resin-based composites as effective as amalgam restorations in adults?’ Applying PICO to ascertain whether the four elements of a good clinical question are satisfied, the following shows that they are and that the question forms the bases of a possible answerable clinical study.

**P** = Patients requiring a posterior class III cavity restoration.

**I** = Placement of a resin-based composite restoration.

**C** = Placement of an amalgam restoration.

**O** = What are the survival rates of these two types of restoration?

## **Stage 2. Searching the Literature**

The next stage is to perform a literature search to source previous studies on the topic, the methodologies used, the results obtained, and to assess the quality of these studies.

This section of the paper helps not only those who wish to embark on a research project but also any dental author who wishes to access the scientific literature prior to carrying out a review or a systematic search. Investigating the background literature to similar or related studies is essential for the success of a research project and is vital not only for planning a project but also when writing the introduction and discussion sections of any paper.

Papers in journals are the premier source as they represent the most up-to-date knowledge available. Books, monographs and other printed material such as statistical and government publications are important but due to the time lag between writing and publication can be less current than journal papers.

- MEDLINE® is the key to obtaining all (post-1950) references to journal articles.
- The Index to Dental Literature (IDL) has been the hard copy equivalent to MEDLINE for searching dental references prior to 1950. It is now no longer published.
- The Internet, specifically the web, is an essential tool for research.

Healthcare and dental libraries and online sources are all useful. However, the most useful resource is undoubtedly the MEDLINE database which, over the last 20 years, has become the most widely used resource for rapid literature reviews.

## **Journals**

Journals are vital for keeping up to date in dentistry<sup>4</sup> and for disseminating research findings quickly and efficiently to the scientific community. They include the following.

- *Primary Dental Care*, the journal of the Faculty of General Dental Practice (UK). Its main role is to publish practice-based research but it also includes review articles, case reports, and reports of important meetings and conferences.
- Specialty journals, such as the International Endodontic Journal or Journal of Orthodontics, cover clinical and research aspects of various dental specialties.
- Journals of a non-specialist nature, such as the Journal of Dentistry or Journal of Dental Research, are of equal importance, when reviewing the literature.
- National dental journals, such as the Journal of the American Dental Association or British Dental Journal, include clinical research, case reports and news items.
- Most journals occasionally publish ‘review articles’ which are a brief history or condensed reviews of a particular subject. Typically, a long list of references relating to publications on the same topic or similar topics is found at the end of review articles. See some of the papers that have been published in Dental Update for good examples; Santini (2010) has been a well-received publication, with over 160 references on a currently relevant issue.<sup>5</sup> Such lists can save researchers time when searching for background literature on the topic of their project.
- Recently, a number of peer-reviewed journals have started to publish papers online as soon as they have been accepted, prior to their appearance in hard copy. Some new journals publish solely online. Both types enable new knowledge to be disseminated more rapidly than traditional paper-only journals.

## **Books, monographs, official and statistical publications**

Because books and monographs have a longer lead-in time to publication than journals, they may not be as up to date but they can provide an introduction, general overview or historical perspective. In addition to textbooks on specific subjects, research methodology, statistical techniques and planning, there are reference texts such as *Clinical Periodontology and Implant Dentistry*.<sup>6</sup> Such reference texts review all the published papers within the subject. Three excellent books for novice researchers are:

- *How to Read a Scientific Paper*,<sup>7</sup> which sets out the basics of evidence-based medicine and includes a very useful chapter on searching the literature.
- *Critical Thinking: Understanding and Evaluating Dental Research*,<sup>8</sup> which explains how to understand and evaluate dental research and also has an excellent chapter on searching the dental literature.
- *Statistical and Methodological Aspects of Oral Health Research*,<sup>9</sup> which gives advice on research methodology.

Theses and dissertations are either published just by a university or, in the case of some Swedish dental schools, in association with the Swedish Dental Journal. They often publish important new findings and should not be overlooked. However, they may not be easy to find as they are not listed on MEDLINE and may only come to light as a reference in a published paper.

Official and statistical publications include annual reports and statistics issued by government agencies and statutory bodies such as the Office for National Statistics (formerly the Office of Population Censuses and Surveys), which periodically publishes the definitive dental health surveys for the United Kingdom.<sup>10</sup> An excellent example of an influential (USA) government agency report is the *Health Effects of Ingested Fluoride* published by the National Academy Press.<sup>11</sup> Finally, British and European standards change occasionally and there are many governmental reports relating to dental equipment.

### **Peer-reviewed and non-peer reviewed literature**

Peer review (or refereed) literature has been screened by individuals who are knowledgeable about the topic of the paper, book or thesis concerned. The reviewers are normally authorities with a track record of papers published on the subject. They are independent of the authors on whose work they are reporting. Peer reviewers assess the whole paper and report comments and suggestions to the journal editor, including whether or not they consider the manuscript worthy of publication. The process does not guarantee that the results and conclusions in the work are either true or correct. However, the process provides a check on the quality of the work and should help to ensure that poorly conducted research or badly written papers are not published.

The term 'non-peer reviewed literature' includes 'free' dental and other journals and magazines, daily and weekly newspapers, and online material such as Wikipedia. In general, they should not be quoted in a scientific paper as they are not peer reviewed and may contain opinions that cannot be supported with objective scientific facts.

### **Indexes and abstracts**

Indexes and abstracts enable dental practitioners and researchers to identify relevant journal articles from the plethora of published articles and are, therefore, almost as important as the journals themselves.

- The Index to Dental Literature (IDL), the main printed index for dentistry until the very end of the 20th century, is no longer published. It was published quarterly and cumulated annually, and also listed dissertations, theses and new book titles.
- Index Medicus, was published monthly and cumulated annually by the National Library of Medicine in the USA from the late 19th century. It formed the basis of the computerised index MEDLARS, which allowed interactive computerised literature searching, thereby revolutionising medical and dental research methods.

These paper-based indexes are now used for historical research purposes only.

### **Computerised literature: keywords**

All papers should contain keywords. They are usually found immediately following the paper's abstract and summarise the main areas covered by the paper; for example, dental caries, epidemiology, 12-year-olds, United Kingdom. Abstracts are found at the beginning of a paper and may often be available via MEDLINE. They should be used to identify the original paper. The use of keywords during searching enables easy access to papers on the same or similar topics. However, the use of keywords is not without problems because computers are unable to search for anything other than the exact word used. Thus, if the keyword crown were used, only papers that listed crown as a keyword would be accessed. Papers with the keyword crowns, and others that did not include this word but listed terms such as bonded crowns or gold crowns, would not be found. In other words, searching using keywords is very precise and does not consider concepts.

### **Medical Subject Headings (MeSH)**

To overcome the potential problems when keywords are used in a search, classification systems that group keywords as concepts have been developed. Perhaps the most widely used in healthcare research is the Medical Subject Headings (MeSH)<sup>12</sup> system. This has been produced by the United States National Library of Medicine and is used for indexing journal articles in a number of databases, including MEDLINE. The indexers review all papers that are accepted for inclusion in MEDLINE and apply subject headings appropriate to their content. The drawback with this approach is that although the classification is more intuitive than the use of keywords, it can be open to human error if the topic area is new to the indexer.

### **MEDLINE**

MEDLINE (a contraction of MEDlars onLINE) is the major international reference database for biomedical computerised literature. It is available in virtually all dental/medical libraries. It indexes the contents of journals in the fields of medical, dental, nursing, biomedical and allied sciences.

Online computerised literature searching involves interrogating a dedicated web server that stores the data. This has several advantages. More than one concept (thesaurus terms, subheadings, 'free-text' words or phrases) can be searched simultaneously to achieve very

specific results virtually instantaneously. The search often includes abstracts, which give more information than the title and thus help to identify the most relevant or useful articles. A retrospective search enables researchers to check whether the proposed research topic has been previously undertaken thus avoiding reinventing the wheel. There are also sections that generate information on new publications on specific topics weekly or monthly thus keeping researchers up to date with recently published literature. This is particularly useful as a mechanism for updating researchers during the lifetime of their project.

The web-based versions of MEDLINE, all derived from the same source at the National Research in Primary Dental Care: Part 1 Primary Dental

- Holds 200 'live' journal titles, together with a large number of ceased publications.
- Has an impressive book stock.
- Loans books by post to members.
- Has recently started to acquire e-books available for BDA members to access via the web.
- Has a range of DVDs on dental subjects.
- Offers a free MEDLINE searching service.
- Can provide photocopies of journal articles (subject to provisions of the Copyright Act 1988).
- Has an online library catalogue ([www.bda.org/catalogue](http://www.bda.org/catalogue)) that can pinpoint books, monographs, theses or pamphlets on any subject.

Postgraduate medical centre libraries are extremely useful as centres for studying and researching. They are generally underrated and underused by general dental practitioners practising in the NHS.

Most British universities with dental schools have excellent library facilities. The libraries of University College London now include the library of the Eastman Dental School. Anyone carrying out postgraduate research under the official auspices of a university has access to its library services.

The Library and Lumley Study Centre of The Royal College of Surgeons of England (35-43 Lincoln's Inn Fields, London WC2A 3PE. Tel: 020 7869 6555/6556) has extensive dental collections, both historic and modern. Subscribing Members and Fellows of the College, including Diplomates of the Faculty of Dental Surgery and Faculty of General Dental Practice (UK), are eligible to join the Library and then make use of its facilities. Opening hours are from 09:30-17:30, Monday to Friday.

The Royal Society of Medicine (1 Wimpole Street, London W1G 0AE. Tel: 020 7869 2900) has the UK's largest medical library with some dental material. It offers its members excellent library facilities, including access to many biomedical databases, such as MEDLINE, Embase, DH-Data, and Allied and Complementary Medicine (AMED). These can also be accessed remotely within the members-only section of the RSM website.

The British Library at St Pancras (96 Euston Road, London NW1 2DB. Tel: 0843 208 1144) offers a Science Reading Room that contains a wealth of information and resources to assist in research. The Medicine and Life Sciences section is located on floor 2. To use the reading rooms, it is essential first to obtain a reader pass, which is available to anyone conducting bona fide research.

Any large public library can often obtain virtually any literature for non-medical/dental subjects from the British Library as an 'interlibrary loan' request.<sup>15,16</sup>

### **Stage 3. Refining the Initial Idea into a Research Question**

Having performed a literature search, the researcher must consider whether the methodologies and results of previous studies on the same or related topics make it necessary to revise the initial idea (research question). Once this stage has been completed, the study can then be planned, as will be described in detail in the next paper in this series.

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