Research in a Dental Practice Setting

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Abstract: **There is a shortage of research from dental practice. The aim of this article is to stimulate more interest in dental research. This is done by explaining the basic principles of doing research in a dental practice setting. Examples are taken from the author's own practice. Emphasis is placed on the following points: how to develop and research ideas; factors specific to dental practice; how articles and journals are rated; making a protocol for the study; examiners' reliability and statistical analysis.**

Dent Update **2004; 31: 423–430**

Clinical Relevance: **Evidence-based dentistry requires dentists to be able critically to review articles relevant to the practice of dentistry.**

Good research done in a dental practice setting seems to be in short supply. The dental community would welcome more research to be undertaken from practice. However, for a number of reasons, it seems to be difficult to do something about it.

Why should we be Doing More Research in Dental Practice?

More than 90% of patients are treated in dental practice, so it is the most relevant place to test materials, instruments and techniques. New materials are thoroughly tested in laboratories, often on animals and finally on patients, generally in academic institutions. The real test, however, comes when the materials become available to general dentists. How many times have you not exchanged the following words with your colleagues: 'Have you tried this new product X? Does it really work?' And, how many times have products, instruments or techniques which have been marketed with great promise, turned out to be flops for general dental practitioners?

One explanation could be the discrepancy between the 'ideal' conditions under which new materials, instruments or techniques are tested and the more 'realistic' conditions in dental practice. In other words, the difference between efficacy and effectiveness.

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Why is More Research not Done in General Dental Practice?

It could be considered that there is a general lack of interest amongst GDPs to carry out research. This is probably due to a number of factors:

- Lack of knowledge about how to get started;
- Lack of training;
- The extra time involved;
- Loss of clinical time and therefore anticipated reduced income and
- Few available research grants.

In addition, there are inherent problems associated with doing research in dental practice. Probably the most relevant problem is that of bias. Key problems are patient selection, that the researcher is blinded to the variables and calibration of the operator/ investigator.

This article will discuss these, and other relevant aspects of carrying out research in dental practice. Whenever possible, points will be illustrated by research done in the author's practice.

DEVELOPING AN IDEA

This is probably the hardest part about doing research in practice. It needs to be an idea that one feels so strongly about that it nearly turns into an obsession. A strong personal drive is often necessary to overcome all the obstacles before the research is completed.

There is, however, an easy way out of developing ideas oneself. One can take part in multi-practice studies as data gatherer, where ideas and protocols are determined by academic institutions, health boards, commercial companies or similar. Taking part in this type of study provides valuable experience and there may even be a small monetary reward involved. Ideas are usually best developed from personal observations and the questioning of these observations. The what, why, how,

This seemed to take too much time and would not be very practical in a practice setting.

Loss of Clinical Attachment

This requires:

- Thorough education and calibration of the clinician and
- That the operator is blinded to the variables.

This is difficult to achieve in a single-handed practice.

Inter-Radicular Loss of Bone on Multi-rooted Teeth

This does not seem to be suitable for a periodontal practice because:

- Stents for the x-rays are required;
- There is a need to calibrate the operator on the probing of the furcation areas;
- In addition, it seems to be difficult to find a standard method which would enable one to make a scientific statement.

Change in Tooth Mobility

This method suffers from two major drawbacks:

- It is difficult to make scientific decisions without elaborate methodology and equipment and
- No well-defined methodology exists in the literature.

Periodicity of Symptoms

The shortcomings of this method are:

- It is not a very objective method of measuring the success of periodontal therapy;
- It is difficult to define accurate measurements for symptoms including patient variations.

Tooth Loss over Time

This is the ultimate measure of the success of periodontal therapy because:

- It is easily identified;
- Objective;
- It does not require any complicated or time-consuming training of the operator and
- There are studies in the literature with which to compare the results.

Therefore, the decision was easy; the success of periodontal therapy should be measured in terms of tooth loss over time. A ten-year retrospective study would be a suitable way of getting an idea of the success of periodontal therapy in the author's practice.[4]

In addition, other aspects of periodontal therapy also seemed pertinent to include in such a quality control study. First of all, it would be interesting to find out something about the patients' preconceptions of the pending periodontal therapy. Seventy-nine patients were interviewed to find out the following:

- Level of anxiety;
- Where they sought their information about the pending periodontal therapy and
- A risk assessment of the various signs and symptoms of periodontal disease.

It was found that the majority of patients (79%) were anxious about their pending therapy. However, at the same time, the majority of patients were supportive of the treatment suggested to them.[5]

Secondly, it would be interesting to find out how much discomfort was experienced by the patients during the various stages of periodontal therapy. Visual analogue scores were recorded to assess the patients' perceptions of the various stages of conventional periodontal therapy. The results showed low levels of discomfort of all stages of periodontal therapy.[6]

Thirdly, the question of compliance with maintenance therapy was addressed. Most of the periodontal literature indicates that doing periodontal therapy without a systematic maintenance therapy is only marginally better than not doing periodontal therapy at all. At the same time, the literature shows that only 16-46% of the patients attend for maintenance therapy. It seemed pertinent to find out what level of maintenance was achieved in the author's practice. A 10-year retrospective study of 159 patients was carried out and a very high level of maintenance (87%) was recorded. Various factors and theories relevant to the patients' compliance were studied and discussed and the paper was accepted for publication.[7]

HOW TO RESEARCH YOUR IDEAS

The easiest way is to speak to an authority in the chosen field and find out whether the idea is worth pursuing. Alternatively, one can research the idea oneself. The internet is a good research tool. Traditionally, the MEDLINE search has been the main source of bibliography used in dental research, but the Cochrane Oral Health Group Specialty Trial Register and EMBASE are also internet-based. Articles are listed with selected key words. When these words are used in the search tool, the titles of all the articles relating to these subjects appear. Or else one can search author surname. This is especially useful if one author has done a lot of research in a particular field.

Another approach is to find a good recent review article in the particular field and to use the relevant articles in the reference list.

In addition, numerous 'chat lines' or study clubs exist on the internet for dentists to discuss interesting cases, problems and new developments.

Other search tools include Biological Abstracts/BIOSIS, Current Contents, Life Sciences, Clinical Medicine, Dental Abstracts, Index Medicus, Research Alert, Science Citation Index and SciSearch.

Hierarchy

It is important to be aware that a hierarchy exists in both the journals and

the articles that are published therein.

Peer-reviewed Journals

This means that a minimum of two independent authorities in the field critically evaluate the article before recommending acceptance, acceptance with changes or rejection of the article. Sometimes a third reviewer, usually a statistician, is involved in addition to the editor or the editorial board in the reviewing process. A number of articles are rejected in this process because of serious weaknesses in, for example, the methodology or in the statistics.

Non-refereed Journals

The same article could in theory be submitted and accepted to a non-refereed journal. These are often journals with a substantial commercial element and obviously a previous rejection from a refereed journal would not be mentioned if the article is then published in such a journal. It is therefore valuable to have a working knowledge of what is regarded as a scientific journal and what it regarded as a less strong scientific journal.

What is a Strong Scientific Journal?

One would assume that the old familiar national dental journal or, indeed, any journal with a large number of subscribers would be good scientific journals. However, within the scientific community, the Science Citation Index and/or the Journal Impact Factor are regarded as the best measures of the scientific strength of the journal. These indicies actually count the number of times articles published in a journal are quoted in refereed journals. Obviously, the more times articles from a journal are quoted, the stronger the scientific value of that journal. Some of the journals now even advertise with Impact Factor. For example, 'Impact Factor Rating for 2001:18/50' means an 18th placing out of 50 dental journals.

The Strength of Articles

A hierarchy also exists amongst articles owing to the strength of the study design. 'Case reports' and 'Review articles' are regarded as having the lowest scientific values. They are, however, important in their own right. The case report is important in describing rare cases and novel approaches. However, it should be given the least weight when making a treatment plan for a patient. A good review article can provide the reader with an excellent update on a particular topic, but as scientific evaluations or studies they do not possess much strength.

The next type of study on the ascending ladder is the 'Case series'. The strength of this study design depends largely on how many and how the cases were selected.

'Case control studies' are nearly always 'retrospective studies' and are used to study risk factors for diseases or occurrences. A control group, preferably matched, is used and the statistical analysis is usually by odds ratio. The main weaknesses of this type of a study is that the information collected is not necessarily ideally what is sought, but what is available, since such a study is not planned in advance. This is because the hypothesis is formulated after events have occurred. In addition, there may be uncertainties about what has happened from day zero until the observation date. This complicates the collection and the treatment of the data. The final disadvantage of this study is difficulty in dealing with confounding. Confounding is the confusion of two causal factors so that the expected effect by one factor is partially or totally caused by the other factor.

'Population-based cross-sectional studies' are the next studies on the ladder. They are used to investigate the association between the risk factors and the 'prevalence' (existing cases). An example might involve a risk assessment of factors such as behavioural traits, genetic and environmental factors thought to be associated with disease, health and quality of life. Analysis is usually done as odds ratio, risk ratio or relative risk. The advantage of these studies is that they can better control for confounding and also assess 'effect modification'. 'Effect modification' occurs when a third variable can affect the direction of the association.

The strongest form of epidemiological evidence is the 'Cohort (prospective) study'. This study is used for comparing incidence (new cases with disease or occurrences) for relatively common diseases. The cohort study is an exposure-based study design. Risk ratio, relative risk and attributable risk are common ways of analysing these studies.

The ideal clinical study is a 'Randomized controlled clinical trial (RCT). In the case of risk factors, it is often referred to as an intervention trial. However, because of the nature of clinical studies, especially ethical consideration, a true RCT is difficult to achieve and there are not many of these studies in the dental or in the medical field. Naturally, in a dental practice it would be even more difficult to carry out a true RCT.

'Meta-analysis' consists of statistical analysis of a number of studies examining the same or similar variables. A positive meta-analysis for a product or a technique gives a strong scientific indication that it actually works.

A 'systematic review' is at the top of the scientific hierarchy. Unlike an ordinary review article, the systematic review seeks to solve current controversies or answer specific scientific or clinical questions. Meta-analysis is usually a part of the analysing process of the systematic review. In addition, emphasis is placed on assessing the heterogeneity of the reviewed studies. That means assessing how many studies show a positive, neutral or negative result. A systematic review also considers the strength of the studies, preferring to base the conclusions on randomized controlled clinical trials. If there are not enough good scientific studies, the systematic review will use this as a conclusion.

Examples of problems which could be solved by systematic reviews are,

Other methods of statistical analysis include Chi Square, Odds Ratio, Regression Analysis and the Multiple Regression Analysis.

Although the analysing of the data need to be left to the experts, there are some simple rules of thumb on how to examine the analysed data. The statistical significance is usually set at t or $p \leq 0.05$, however, it is also useful to examine the standard deviation (S.D.) and the Variance to get an idea of how widely spread the scores are. Regression analysis indicates possible risk factors with the disease. For example, it is possible to identify an association between age, sex, smoking and periodontal disease. The Multiple Regression Analysis allows grouping of factors that individually do not reach statistical significance. For example, if only age is associated with periodontal disease, when grouped together maybe age, sex and smoking are all related to periodontal disease. The strongest association for a risk factor to be related to disease is called relative risk. It is the ratio of risk of disease between the exposed group and the non-exposed group. When the ratio is 1, it means that there is no difference between the exposed and non-exposed groups. A figure higher than 1 indicates a risk of disease in the exposed group. However, in addition, the figure higher than 1 also needs to be outside the 95% confidence interval for the relative risk factor.

In case control studies, the information about exposure is gathered after the disease has occurred. In these types of studies odds ratio is used. Similar to the relative risk, it indicates the relative likelihood of disease based on exposure. The presentation of odds ratio is similar, sometimes identical to, the relative risk using a figure higher or lower than 1. It should also include a statement whether this is inside or outside the 95% confidence interval.

Relevant Discussion

Comparison between the findings and the current knowledge in the field.

Conclusion

Should truly reflect the findings.

Pilot Study

If possible, it is important to carry out a pilot study once the protocol is ready. This serves the purpose of uncovering any large problems prior to starting the main study. These problems may include patient co-operation, collection, recording and analysis of the data, etc.

CONCLUSION

This article is an attempt to stimulate interest in carrying out research in dental practice. Most people involved in this field admit that not nearly enough research is being planned or done at present. It is hoped that the information given could arouse the reader's interest and provide an insight into how to go about embarking on the world of dental research by:

- Gathering relevant literature;
- Understanding the hierarchy of types of articles and journals in which they are published;
- Defining and justifying the aim of research;
- Outlining materials and methods, including patient selection, bias, data collection, statistics, relevant discussion and determining whether the conclusion truly reflects the findings.

It is also hoped that this article may also act as a guide to 'evidence-based dentistry'. If evidence-based dentistry involves only experts assessing the evidence, we are only one step removed from traditional textbook learning. True evidence-based dentistry relies on the individual dentists being able to assess the relevant literature.

FURTHER READING

A number of textbooks covering specific areas of research are available, e.g. research methods and statistics in the health sciences. The author finds that there is a shortage of textbooks on how to do research in dental practice. For the present article, I have found two useful articles in the periodontal literature.[8,9] These are especially useful in explaining study design and basic statistics.

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JULY/AUGUST CPD Answers

1. A, D	6. C, D
2. B, C, D	7. B, C
3. A, D	8. A, B, C, D
4. B, C, D	9. C
5. A, D	10. B, C