Understanding the jigsaw of evidence-based dentistry. 3. Implementation of research findings in clinical practice

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Part one¹ of this three-part series provided an overview of evidence-based dentistry (EBD), provided one definition of EBD and, having introduced the EBD matrix, concentrated on the research synthesis part of the jigsaw puzzle. Part two² focused on the middle row of this puzzle, the dissemination of research results. This final article deals with perhaps the most vital but the most often overlooked element of the puzzle: implementation of research findings in clinical practice.

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the views of primary care dentists is an important first step⁵ to undertaking research in, about and along with primary dental care.⁶ Considerable achievements came from an initiative at the end of the 1990s in the UK National Health Service (NHS) to set up a research and development programme in primary dental care.⁷ Key problems in this area are always how to maintain meaningful involvement of the primary-care team and how to build financial sustainability of any programme or process.

An important mechanism when building long-term research participation, which has showed promise but also mixed success in medicine to date, is to develop practice-based research networks (PBRN). In the UK, examples of such networks in dentistry include the (national) Scottish Dental PBRN⁸ which was set up at the end of the 1990s. There are more local initiatives, such as those around Manchester.⁹ In the US, a welcome recent development is that the National Institute for Dental and Craniofacial Research (NIDCR) is mounting a major initiative setting up dental PBRN which will have the capacity in the future to mount NIDCR-funded studies in dental practice. In the UK, it is hoped that the formation of an Oral Health Unit of the National Primary Care Research and Development Centre (based at Manchester University) coupled with the establishment of a 'virtual' centre for improving oral health¹⁰ (which is developing collaborating centres) should increase the volume, quality and appropriateness of research conducted in primary dental care. The potential involvement of dental associations in this area is also very encouraging.

It is to be hoped that in the future this type of research will be (and will be seen to be) more relevant to everyday dentistry. This should be in terms of subject matter and ownership, and research should be increasingly well-designed, methodologically sound and carried

Effective implementation of research findings

To maintain health and manage and prevent dental disease effectively in this era of evidence-based healthcare and EBD we must ensure that clinical practice reflects not just findings of systematic reviews of all the relevant literature (the objective state of the science) but also the current expert and consensus views on clinical practice (the state of the art). The science and the art should be integrated into a rational framework to support clinical decisions and clinical practice for the individual patient. This framework must acknowledge that the evidence base to support much in dentistry can be deficient in range and quality. This will be the case for some years to come. The value of the developing, objective, unbiased evidence base that we do have in many areas must also be recognised, however. These findings should be used without delay to either support current clinical practice or to bring about change, as appropriate. We do still need a more predictable and efficient way to move the objectively synthesised findings of research into day-to-day clinical dental practice.

It used to be assumed that if the barrier to disseminating research findings to clinicians and opinion formers² could be overcome, then clinical practice would inevitably change once clinicians and others were acquainted with the new knowledge. Not surprisingly, however, it has been shown that clinicians behave

just like other human beings. Behaviour-change by dentists is not a simple Pavlovian response to new information or apparent incentives. There is now a limited but developing evidence base from medical practice on the subject of behaviour change by clinicians.^{3,4} This literature confirms that there have been significant and unpredictable delays in research findings becoming integrated into routine clinical practice. As a consequence, significant benefits to patients (in many instances, in terms of lives saved) have either not been achieved, or have only been apparent some 10 years or more after scientific opinion accepted that a particular intervention represented optimal care. EBD seeks to minimise such delays in getting research findings into dental practice.

The importance of a research culture in primary dental care

To secure long-term improvements in oral health for patients, in dental services, professional practice and often in dentists' self esteem, dental research needs to involve the primary-care team and play some part in the day-to-day culture of routine dentistry. Too often 'research' has been seen as having an impenetrable mystique, as being surrounded by incomprehensible jargon and being remote from general practice. There has been considerable progress in fighting this in recent years. Establishing

out in balanced partnerships between primary dental care teams, academic researchers and appropriate methodologists. This research should be seen as belonging more to general dentistry than it has previously been. If it is then disseminated actively in a variety of ways to primary dental care teams and implemented effectively using current best evidence methods to support clinicians, it should have a good chance of influencing future clinical practice.

Evidence-based information

Reports of inappropriate or out-of-date care abound across different healthcare settings, countries and specialities. In the UK, the recognition of the failure to translate research findings into medical or clinical practice has led the government to propose the introduction of so-called clinical governance to, “assure and improve clinical standards at local level throughout the National Health Service”.¹¹ In response to these concerns, there is an increasing focus on improving the *implementation* of research findings into practice.

One of the greatest challenges for a clinician practising evidence-based dentistry, and for researchers seeking to implement research findings, is to determine how best to synthesise and present robust and accurate information at or close to the chair-side or in the consultation room.

There are two strands to this problem: first, how to sift, sort and appraise the information in an unbiased way and then, secondly, how to manage the communication and related information-technology (IT) challenges to ensure that this material is available rapidly, reliably and affordably. One way to address the first issue is the dental ‘Clinical Care Pathways’, which are being developed for the NHS in England and Wales. These are explicitly based on best evidence.¹² Ways to address the second element are via the new IT initiatives being mounted in many countries, working around rapid, linked bibliographic databases (eg, the National Electronic Library for Health (NeLH) in the UK) and the provision of updated material in electronic form on the internet or via other electronic media, such as the updated CD-ROMs produced by the Cochrane Collaboration (www.cochrane-library.com/).

Evidence-based guidelines in dentistry

Evidence-based guidelines are a tool to help address the problems of implementing research findings. They are not a panacea but have an important role to play. As there is still considerable confusion about the generic term ‘guideline’, it may help to cite the specific the Scottish Intercollegiate Guidelines Network (SIGN) definition for clarity, “Clinical guidelines are systematically developed statements which assist in decision making about appropriate health care for specific clinical conditions”.¹³

Experience with evidence-based guidelines of the SIGN type in medicine have usefully shown what they are not. They are not and should not be: (i) ‘an empty marketing slogan’, (ii) ‘cookbook’ medicine (or dentistry), (iii) the end of clinical freedom, or (iv) about change for change’s sake. They should be a tool used by the clinician to help inform his or her individual decisions about the care of a specific patient.¹⁴

Inevitably, a broad spectrum of views is held by primary-care dentists about the value of clinical guidelines and the relative merits of those produced somewhat informally by expert groups — the so-called GOBSAT method: Good Old Boys Sat Around a Table — compared with the more methodologically complex varieties. It should be noted that both Boys and Girls can contribute to GOBSAT guidelines and that sometimes only one or two experts are involved. The credibility of the EBD movement is also variable in different groups, some seeing the process as an inappropriate conspiracy against clinical freedom, whereas others see it as the salvation of future dental practice (see www.odont.uio.no/prosthodont/ebd/). This divergence of views should be respected. It is encouraging to note that even those who were once overtly hostile to the EBD process see some value in systematic evaluation of the evidence and in embracing uncertainty.¹⁵

The FDI World Dental Federation has already established a useful listing of many dental guidelines on its comprehensive website (www.fdiworldental.org). In the UK, there have been two full SIGN evidence-based guidelines devoted to dental topics published so far. They have considered targeted caries prevention for 6–16-year-olds presenting

for dental care¹³ and appropriate management of third molar teeth.¹⁶ A new initiative from the National Dental Advisory Committee in Scotland is the development of ‘subguideline’ clinical-standards documents to complement the more comprehensive evidence-based guidelines. In England, a range of national guidelines has been published¹⁷ but these have been produced using a different approach, and represent distilled expert opinion rather than the outcome of a multiprofessional group considering systematic reviews against a predefined methodology. The UK Faculty of General Dental Practitioners has also produced a number of guidelines, where the approach varied with quantity and quality of evidence available, for example, in the areas of dental radiography and clinical examination and record keeping.^{18,19} Evidence from medical-guideline implementation suggests that optimal results are achieved if a guideline is developed to rigorous standards on a national basis and then adapted locally to produce a locally owned guideline.¹⁴ A development programme for dental clinical guidelines has also been established recently in Canada.²⁰

In medicine, guideline developers steer a course between making useful, reliable evidence-based material available and swamping practitioners with too many guidelines to read, appraise and use. It is likely that there will be a move to the use of international-guideline clearing houses and standardised quality-appraisal systems for guidelines. Although this is not yet a problem for dentistry, rational planning on similar lines is desirable. The quality assurance aspect is also important because of the variety of guidelines available, often put together with different methodologies, rigour and objectivity.

Grading the strength of evidence that supports a particular recommendation in a guideline and communicating this to the user is very important. There are a variety of conventions in use in addition to the system employed here in *EBD*.²¹ Clinical guidelines are based on the best available evidence and their development is facilitated by the availability of high-quality research. Ideally, for clinical interventions, recommendations can be made on the basis of meta-analyses of homogeneous, high-quality randomised trials directly relevant to the needs of the

target group. It is often in areas where the evidence is weak or conflicting, however, that guidance for clinicians is most needed and most valuable. Where the scientific evidence needed to answer key clinical questions is of poor quality, inconsistent or nonexistent, methods recognised as valid and transparent for developing consensus can be used by guideline formulators when making their recommendations. The strength or weakness of the research evidence is still made explicit in these guidelines. Examples of these latter situations are Good Practice Guidelines on Examination and Record Keeping¹⁹ and the imminent NICE guidelines on dental recall intervals.²²

Once again, dentistry can learn from medicine and ensure that it is both rigorous and transparent in the methods used to develop guidelines and that it communicates research findings to clinicians effectively, in an unbiased and user-friendly way.¹⁴ These tasks are becoming more important as the volume of new research findings deserving to be implemented into practice increases. The volume can be expected to increase further with the development of new technologies and particularly the anticipated maturation of genetics-based diagnostic and therapeutic interventions. Thus, the effective delivery of EBD to dentists and their patients needs itself to employ strategies based on evidence for the implementation of research findings.

The need for implementation research

Implementation research is the scientific study of methods that promote the uptake of research findings, and hence reduce inappropriate care. It includes the study of influences on healthcare-professionals' behaviour, and interventions to enable them to use research findings more effectively. It has demonstrated, for example, that didactic lectures and journal articles by themselves do not change practice. The specific recipe for success in identifying interventions appropriate for specific clinical situations is, as yet, rather poorly defined.⁴

Work has started in dentistry that explores the application of the evidence-base on behaviour-change from health psychology to our clinical field. This has shown that psychological models have some considerable promise in bridging the gap between clinical guide-

lines and clinicians' behaviour.²³ A Medical Research Council Component grant project on Process Modelling in Implementation Research²⁴ is under way, exploring the views of doctors and dentists in this field using a variety of theoretical models of behaviour change and, in particular, the theory of planned behaviour²⁵ to assess what influences clinicians' behaviour. In the future, this approach should allow the generation of research evidence that will inform a more rational selection of appropriate implementation strategies to suit particular needs.

Implementation via an informed dental team and an informed patient

The end point of EBD is the practical use of research findings by individual dentists in delivering optimal care to well-informed patients (Figure 1). This is both the key and the hardest part of the process. The classic definition of evidence-based medicine is, "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients". The same concept should hold true for EBD. The success of the process depends, therefore, not on any automated remote methodology. It needs the skill and judgement of the clinician, being conscientious and explicit in finding and considering relevant research findings and making clinical decisions about the management of patients. The clinician must also determine how to use

the current best evidence while recognising that, in many fields, definitive evidence will be lacking. This deficit will decrease in time, with publication of new findings in the months and years to come.

Patients' appropriate involvement in EBD is important. They should be able to participate in an informed dialogue about what the current best evidence suggests would be appropriate care, and see how this may change over time. In the internet age, patients are accessing a huge variety of resources of very variable quality and objectivity. Dentists will increasingly be required to debate this information with patients and to direct them towards unbiased and robust sources of information. If EBD does not impact upon patient care and patient opinion, then it has failed in a key objective.

The ways in which EBD will affect the dentist-patient dialogue will be different in different countries. The culturally accepted types and styles of dentist-patient communication vary, as do the tensions and difficulties encountered in planning and delivering effective dental care. The EBD format should, nevertheless, assist all parties in securing a more informed process as decision-making is increasingly shared. In the UK, both the clinical care pathway on oral health assessment¹² and the NICE guideline in recall interval²² promote increased patient involvement in decision-making. A number of initiatives are also under way that seek to identify how best to involve

Figure 1. Effective implementation of research findings should contribute to dental care and to new primary research using the evidence-based dentistry matrix (EBD matrix figures[©] NB Pitts).

representative patient interests in much of the wider EBD matrix. Patient involvement now ranges from the initial decisions regarding the prioritising of research proposals at the funding stage, to involvement in systematic reviews, dissemination, the shaping of dental services, and in implementation activities and guideline development. These developments are challenging and important. Patient involvement should be more than a token gesture, yet it can be difficult to secure effective and representative lay and patient participation in some of these activities.

The importance of joining-up the matrix

The components of EBD, grouped by the three key phases of the EBD jigsaw — synthesis of research findings, dissemination of research findings and implementation of research findings — have each been described individually in the two earlier editorials^{1,2} and in this one in order to introduce and explain the EBD matrix concept. Although the components have been discussed as if they are discrete entities it should be appreciated that, for the matrix and EBD to function properly, there must be a flexible range of effective links between these various components.

Examples of cross-specialty and cross-matrix links include those developing in the field of dental caries. In 2001 the National Institutes of Health (NIH) convened an evidence-based Consensus Development Conference on the diagnosis and management of dental caries throughout life.²⁶ This brought together a series of systematic and non-systematic reviews of a broad range of evidence on the diagnosis and management of dental caries, debating the findings with a carefully chosen panel of methodological experts from outside the field and with a range of clinicians and experts in the field. This process produced a range of recommendations for research and for clinical practice.

Since that time, elements of the same issues have been examined from the research standpoint of caries clinical trials at the 2002 International Consensus Workshop on Caries Clinical Trials (ICW-CCT).²⁷ The final consensus statements of the ICW-CCT set out agreements on where the synthesis of this particular evidence leads, to inform the

design of future clinical trials. Much of this synthesised evidence also has implications for clinical practice and for dental epidemiology or dental public health. Parallel activities have therefore been developing key recommendations of the NIH Consensus Development Conference by bringing together the evidence and undertaking new primary research, while at the same time promoting communication of current evidence between functionally disparate groups working in caries epidemiology, caries research and appropriate clinical caries management. This work is being tackled by the 'ICDAS' committee — refining an International Caries Detection and Assessment System.²⁸ All of these strands, when taken together and linked through the components of the EBD matrix, can provide information that will help clinicians make rational clinical decisions for individual patients about the balance between preventive and restorative care.²⁹

There are at present a number of gaps in communications and linkages between the various elements of the EBD matrix whatever the specific subject matter. A major challenge to EBD is to smooth out these linkages in order to facilitate the transfer and conversion of new knowledge into improved care within a realistic time-frame.

The EBD processes described in these papers must also be iterative. Steps should be repeated and refined as new studies are completed and as new evidence is weighed against all of what has gone before. There should therefore be a number of cycles in which the end result of dentist–patient interactions are fed back into new primary research (Figure 1) in order to inform the next generation of evidence-based clinical care.

Delivering the vision of EBD

Presently, not all the elements of the EBD matrix are equally well-developed nor well-recognised. For EBD to deliver improved patient care, all of the components need to be developed to become equal in stature and in perceived value.

The number of people and organisations who have (or perhaps should have) an interest in pursuing the EBD agenda is large: extensive coordination and collaborations will be required to make a significant and optimal impact on clinical practice and patient care. These

collaborations must overcome the pressure of recent years for researchers and research groups to become ever-more competitive and must be broader than just the traditional research community.

Further challenges to delivering EBD are gaining more widespread acceptance of the inevitably extended timescales required for both generating and reporting new research, as well as for commissioning and undertaking comprehensive systematic reviews. It is therefore important to ensure that unrealistic expectations regarding timeframes, or on the amount of research that is available or is achievable, are not generated within dentistry, by policy makers or by patient groups. It is necessary to develop a culture in which the clinical and wider dental communities are ready to deal with a range of best evidence and best practice that can help manage clinical uncertainty. The dental community should then be ready to assess and implement the findings of research as and when these become available, not just at infrequent transitions or crisis points.

We all — dentists, researchers, policy makers, patients and other interested parties — need to see the big picture, which includes all the elements of the evidence-based jigsaw. This is important if clinical practice is to continue to change for the better over time. In the years ahead, dentistry should be able to incorporate the findings of both previously carried out but not yet implemented research, as well the findings of new, even not yet planned, research.

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