

D.I.O.H.T.R.E.P TECHNOLOGY

DENTAL INFORMATICS, ORAL HEALTH TRANSLATION FOR RESEARCH, EDUCATION AND PRACTICE

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ABSTRACT

Aims: To emphasize on DIOHTREP technologies and enlist various dental informatics and oral translational researches used for improving delivery of dental care in recent global scenario.

Objective: To identify, synthesize and enlist various evidence data on DIOHTREP technologies.

Materials & Method: The literature for this review was obtained from published articles, internet news clippings, online indexed manuals and books, thesis and Government projects from year 2014 to until (August 2015), by using various databases. The data was extracted by one investigator in 2 weeks. Key terminologies used were dental informatics, oral health translational research etc. The literature with these search terms anywhere in title or abstract was considered in initial phase and was further segregated into those focusing on applicability of dental informatics, oral health translation research, education. The relevant information in line with the objectives of this review were considered for discussion.

Results: DIOHTREP is expanding past the scope of clinical dental informatics by building upon its worldwide reputation for fostering creative research on translation problems from an informatics prospective.

Conclusion: DIOHTREP has achieved to build a learning health system which is responsive to research findings by improving timely delivery of quality oral healthcare. However, these concepts requires significant effort and financial support. Dentistry should learn from the failures as much as it does from the successes. Only then will we realize the promise of dental informatics and new scopes of oral translational researches.

Keywords: Dental informatics, Oral health translation research, Oral health information system, DIOHTREP.

Introduction

With the growing era of technologies, it is important for dental professionals to involve themselves in it and evolve to provide a much better oral health care. The translational research programs specifically for oral health are going hand in hand with dental informatics. The approach towards a higher quality oral health care for the public is the main objective of these projects. We believe that translational research moves in a bidirectional manner from one type of research to another—from basic research to patient-oriented research, to population-based research, and back—and involves collaboration among scientists from multiple disciplines.¹

Although a Medline search indicates that the term translational research appeared as early as 1993, there were relatively few references to this term in the medical literature during the 1990s, and most references were to research about cancer. But, today the literature includes a plethora of attempts in various fields to define the term.¹

In a recent announcement about applying for a CTSA, the NIH offered the following definition: “Translational research includes two areas of translation. One is the process of applying discoveries generated during research in the laboratory, and in preclinical studies, to the development of trials and studies in humans. The second area of translation concerns research aimed at enhancing the adoption of best practices in the community. Cost-

effectiveness of prevention and treatment strategies is also an important part of translational science”.¹

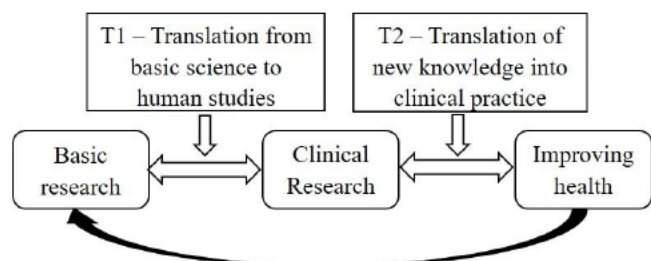


Figure 1: Model of Translation of research proposed by National Institute of Health

According to this definition, translational research is part of a unidirectional continuum in which research findings are moved from the researcher’s bench to the patient’s bedside and community. In the continuum, the first stage of translational research (T1) transfers knowledge from basic research to clinical research, while the second stage (T2) transfers findings from clinical studies or clinical trials to practice settings and communities, where the findings improve health. Translational efforts often focusing on overcoming barriers that impede the progress of clinical research.² [Figure 1]

Steven Woolf (2008) explained that “translational research means different things to different people” and raised an argument that “if T2 research is going to result in the

knowledge needed to improve health and the quality of life, then T1 research must include sciences related to populations (e.g., epidemiology, psychology, economics, and behavioral sciences)”¹.

ACRT Evaluation Committee hence gave a definition of translational research “Translational research fosters the multidirectional integration of basic research, patient-oriented research, and population-based research, with the long-term aim of improving the health of the public. T1 research expedites the movement between basic research and patient-oriented research that leads to new or improved scientific understanding or standards of care. T2 research facilitates the movement between patient-oriented research and population-based research that leads to better patient outcomes, the implementation of best practices, and improved health status in communities. T3 research promotes interaction between laboratory-based research and population-based research to stimulate a robust scientific understanding of human health and disease.”¹ [Figure 2]

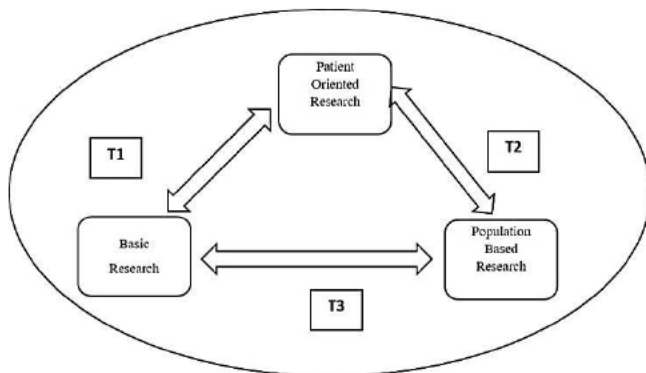


Figure 2: Model for translational research, as proposed by the Evaluation Committee of the Association for Clinical Research Training.

The progress in the field of dental informatics is at a good level but still most dentists are unaware of what is it, its applications, goals, objectives, opportunities and also the barriers as challenges to follow it in day to day dental practice. Dental informatics have come up with various tools for the clinical and research practices. These advancements in turn can help the translational research projects. It is the solution for many longstanding problems in the field of dentistry. These innovations can create a path of new developing scopes in the clinical, research and educational practices.

The term D.I.O.H.T.R.E.P is nothing but collaboration of dental informatics (DI) with oral health translational research (OHTR) for education and practice (EP).

This explains the emphasis on the application of informatics from bench to bedside and also adopt various strategies developed by this system for delivering oral healthcare to a large scale population considering the time constraints. It is briefly explained in the figure 3.

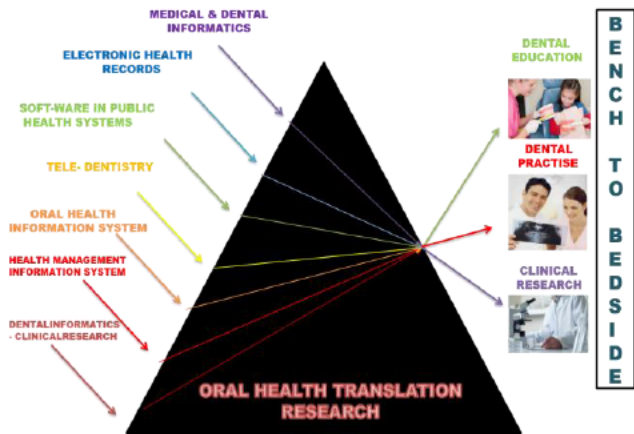


Figure 3: Explaining the concept behind DIOHTREP Technology

In this review, following the research question that are the advances in DIOHTREP technologies translated from clinical trials to dental chairside applications for improving oral education and treatment system?

The objectives of present review are:

- (i) To identify and synthesize various evidence based data on Dental informatics used in oral health translational research.
- (ii) To enlist all the technologies involved and their applications in the oral care.
- (iii) To brief the mechanism used behind them.
- (iv) To explain the scope, feasibility and utility of these technologies.

Materials & Methodology

Criteria for considering studies for this review

The studies focusing the application of dental informatics in oral health translational researches were included.

The inclusion criteria in this review are:

- (i) Articles relevant to the objectives of this review
- (ii) Language of publication comprehensible by the reviewer (English)
- (iii) Articles which are accessible online
- (iv) Outcome parameters of the articles: Feasibility, applicability and utility of this technology i.e.) dental informatics, oral health translational research (or) combination of these. Involvement of articles when there was at least one parenting variable discussed.
- (v) Articles from 2014 to until 2015

The included articles are reviewed in depth and excluded according to the following criteria:

- (i) If the source of information is not authenticated
- (ii) Involvement of medical application

Data Collection

The data collection was done for two weeks (21st Aug’15 to 4th Sept’15) by computerized searches of Central PubMed,

Science Direct, Google scholar, Institutional Websites, Internet news clippings, online manuals and books. By checking the reference list of the articles, the eligibility was determined by only one reviewer who independently extracted the data. The terminologies or keywords used for the search were:

- (i) Dental Informatics
- (ii) Oral health translational research
- (iii) Oral health information system
- (iv) Automating Translational Research Methods
- (v) Search Filters for prognostic biomarkers
- (vi) Prototype development
- (vii) Translational Research for Oral Health and Cranio-maxillofacial Disorders
- (viii) Clinical Decision Support System
- (ix) Dissemination and Implementation Research in Health

Screening of retrieved scientific literature was done by following the title, abstract and body of the articles (or) materials for inclusion parameters. The search strategy of this review is compiled and given in figure 4.

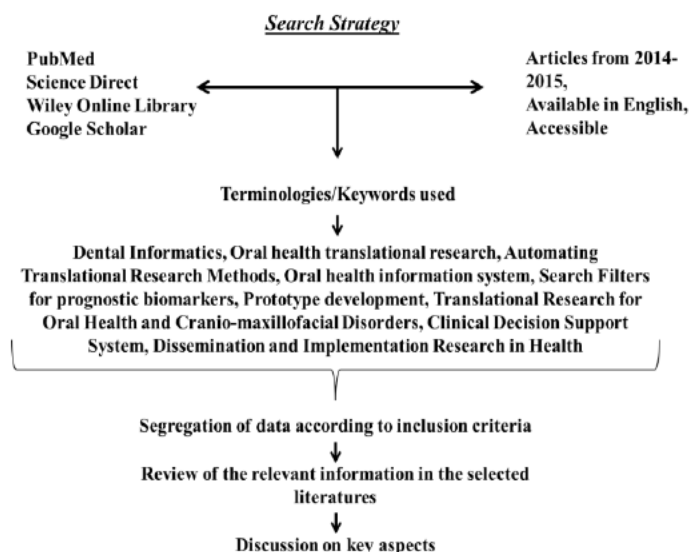


Figure 4: Search Strategy

Results

There are various problems addressed below a dentist faces during the practice. Many such obstacles are been overcome by dental informatics. A few areas of current research includes⁹:

- Maximizing workflow support
- Supporting clinical; decision making and evidence based dentistry
- Accommodating trends in clinical data acquisition
- Reducing practice management and administration costs
- Understanding patients use of the internet for health related information
- Relaying the most up to date clinical practices and information to dentists

Authors	Focus Area	Conclusion of literature	Scope of the technology
Ali AA et al (2015) ³	Three-dimensional surface laser scans	The combination of a long face, reduced nose prominence and width, and a retrognathic mandible may be diagnostic facial features of SBD that may warrant a referral to specialists for the evaluation of other clinical symptoms of sleep disordered breathing.	Early diagnosis of sleep disordered breathing is essential. Dental professionals can play an important role by recognizing distinct facial morphologies of long face, reduced nose prominence and a retro-gnathic mandible and referring these children to specialists for further assessment.
Russell SL et al (2015) ⁴	Clinical Decision Support System	Developed CDSS is available for downloading and adaptation to diverse dental settings and other primary care sensitive conditions.	Enhance primary care screening and coordination by dental hygienists at chairside, leading to improved patient care
Parrish L et al (2014) ⁵	-File hosting service - Transmitting intra-oral images using smart phone technology	The camera function of smartphones was found to be useful for intra-oral photography in situations where a sophisticated intra-oral camera system is unavailable, and the resulting photographs need to be conveniently transmitted.	Uninitiated practitioner can take usable intra-oral photographs using a smartphone in situations of remote, suboptimal conditions.
Lam R et al (2014) ⁶	Modified approach to dental coding	These codes are amenable to dental informatics which has been shown to enhance research at both the clinical and population level.	This is a cost effective method to supplement existing research methods.
Jain A et al (2014) ⁷	Tele dentistry	Useful in long-distance clinical training and continuing education, screening and dentist-laboratory communication.	Increased patient access to dental care, improved quality of care and the cost effectiveness.
Rush et al (2014) ⁸	Electronic Dental Records for Tobacco dependence counselling	Able to design an effective tobacco dependence treatments process	HPDC adopted the resulting tobacco dependence treatment process in all its clinics.

Table 1: Summary of the key articles included in the present review

Dental informatics has the potential to improve the effectiveness, efficiency and overall quality of oral care provided to the patients. There are various elements in patient’s care that are enhanced through dental informatics. Like¹⁰

- (i) Administration: Electronic insurance claims, electronic prescriptions, recall tracking.
- (ii) Clinical care : Validate, integrate decision support systems, digital radiography, effective and efficient user input and output devices more susceptible for chair side computing
- (iii) Charting Records: Universally accessible electronic patient oral health records and medical history, Medical alert systems, increased patients involvement in health care decisions
- (iv) Patient Education: Educational software and materials, intraoral camera and patient specific risk assessment and instructions.

There are various studies of past one year which are compiled in table 1.

Discussion

The overarching mission of Dental informatics along with oral health translational research is to support research and education aimed at improving delivery of dental care and patient outcomes, as well as treatment of oral and maxillofacial conditions, particularly those related to systemic health. There are numerous research projects which are ongoing. Few are been discussed as follows:

- (i) Cloud technology to improve electronic health records in dentistry. The system will support the extensive educational and research needs of the dental schools. This next generation, electronic health record system offers data sharing opportunities for large scale research projects with the aim of improving patient outcomes.¹¹
- (ii) Case based simulation environment to improve translation of evidence based dental research into practice. Dentists will treat simulated patients with either chronic heart failure (CHF) or xerostomia over a series of encounters making a wide range of treatment decisions and receiving immediate feedback.¹²
- (iii) Translational research for oral health and cranio-maxillofacial disorders by Predictive analysis of growth discrepancies and deformities using 3D radiographing and photo-imaging as well as genetic analysis.¹³
- (iv) Development of designs by utilizing dental informatics and implementing them to identify the risk factors for diseases such as infections, chronic facial pain, temporomandibular joint disorders.¹³
- (v) Automating translational research methods¹⁴: Screening non-randomized studies for inclusion in systemic reviews of evidences, development of search filters to retrieve prognostic biomarker studies and development of prototype to explore the content of research articles.
- (vi) Use of various evidence based strategies for the development of workforce to improve care in rural areas.¹³

Presently the researches are trying to promote social interactions to change clinical practice in dentistry by investigating the behaviors of practicing dentists and staffs, developing prototypical informatics solution based on new knowledge.¹⁵ Studies planning to establish the effectiveness of a tobacco cessation intervention delivered by dental providers using an Electronic Health Record(EHR) integrated Clinical Decision Support System (CDS) are also one of the oral health translational projects involving dental informatics.

Hence DIOHTREP is expanding past the scope of clinical dental informatics by building upon its worldwide reputation for fostering creative research on translation problems from an informatics prospective.

Conclusion & Recommendation

Though DIOHTREP has achieved to build a learning health system which is responsive to research findings by improving timely delivery of quality oral healthcare. The advances in DIOHTREP technologies are translated from clinical trials to dental chairside applications.

Various research centers should involve this combination technology in order to overcome various obstacles in the field of practicing and research for the betterment of dental education, clinical as well bench skills. The evolution is an important step required in this millennium for the development of dental specialty.

However, these concepts requires significant effort and financial support. Many technologies fail to be implemented. Dentistry, however, should learn from the failures as much as it does from the successes. Only then will we realize the promise of dental informatics and new scopes of oral translational researches.

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