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A Review of the Oral Health-Related Quality of Life (OHRQL) Model for Dental Hygiene: Eighteen Years Later

Cynthia C. Gadbury-Amyot,

University of Missouri-Kansas City School of Dentistry

Kylie Siruta Austin, and

University of Missouri-Kansas City School of Dentistry

Melanie Simmer-Beck

University of Missouri-Kansas City School of Dentistry

Abstract

Purpose—The purpose of this paper is to review available evidence to determine the impact of the Oral Health-Related Quality of Life (OHRQL) Model for Dental Hygiene on education, research and practice.

Methods—A search was conducted in PubMed using the search terms oral health-related quality of life, OHRQL, and dental hygiene and limited to publications between 1998 and 2016. Google Scholar was also used to identify citations for the two original OHRQL model papers to capture literature widely read by practicing dental hygienists but not indexed in PubMed. A total of 40 publications met the predetermined search strategy. Full publications were obtained and reviewed to determine how this research is being used in education, research and practice.

Findings—The OHRQL is being utilized to a very limited degree in education, research and practice. The literature shows how the OHRQL is actively being used in the school where the model originated in addition to a dental hygiene program in Japan. Studies have been conducted on a variety of research instruments, including the OHRQL, designed to capture oral health-related quality of life outcomes. Japanese researchers have used the OHRQL in studies designed to determine the impact of oral healthcare delivery on patients' oral health-related quality of life.

Conclusion—Eighteen years of literature confirms that the OHRQL is being used minimally in education, research and practice. Greater emphasis is needed around the collection and assessment of oral health-related quality of life measures for providing patient-centered care.

Keywords

oral health related quality of life; dental hygiene; health related quality of life

INTRODUCTION

As early as 1946, the World Health Organization (WHO) emphasized that health goes beyond just the physical and should include consideration of patients' quality of life.⁽¹⁾ In a position paper published in 1995, the WHO described health as a "state of complete physical, mental, and social well-being and not merely the absence of disease and infirmity."⁽²⁾ The WHO's commitment to the assessment of quality of life illustrates their commitment to the promotion of a holistic approach to health and health care. In that same vein, the WHO describes health care as a humanistic transaction between health care professional and patient, with the patient's well-being being the ultimate goal. WHO further concluded that, at a minimum, quality of life assessment should include physical, psychological, and social dimensions. In this context, the term physical refers to individuals' perceptions of their physical state; psychological deals with the individuals' perception of their cognitive and affective state; and, social encompasses individuals' perception of the interpersonal relationships and social roles in their life. Present day sees health-related quality of life and well-being as a new health measure being captured and evaluated in the HealthyPeople 2020 initiative.⁽³⁾

Healthy People 2020 states, "When quality of life is considered in the context of health and disease, it's commonly referred to as health-related quality of life (HRQOL)".⁽³⁾ This term is used to capture the impact of disease on an individual's daily life as there is a growing consensus that disease as measured by professionals conceptually and empirically differs from illness as self-assessed by the individual. The Healthy People 2020 initiative emphasizes the importance of health-related quality of life (HRQOL) and well-being by incorporating it into its four overarching goals, with a distinct emphasis in one goal "promoting quality of life, healthy development, and health behaviors across all life stages" (Figure 1).⁽³⁾

Similar to HRQOL, oral health-related quality of life is a multidimensional concept dealing with quality of life specific to oral health and diseases. Inglehart, habil and Bagramian defined it as one's own assessment of his or her well-being in connection with functional, psychological, and social aspects, as well as pain and discomfort when these are related to orofacial concerns.⁽⁴⁾ Oral health-related quality of life serves as the oral health version of the HRQOL model as it recognizes that when oral health is compromised, overall health and quality of life could be diminished.

The OHRQL model was developed in 1998 for use in dental hygiene by a group of University of Missouri-Kansas City (UMKC) School of Dentistry dental hygiene researchers who wanted to define a model of care to address the multidimensional nature of oral problems.⁽⁵⁾ It is based on the premise that a satisfactory level of oral health, comfort, and function is an integral component of general health and was designed to assist dental hygienists in better assessing and planning dental hygiene care by considering individual's perceptions of and reactions to their own oral health status. The use of only clinical measures to assess oral health of patients has been criticized because it fails to consider functional aspects of health and does not reflect the concerns and perceived needs of the individual.⁽⁶⁾

The OHRQL model consists of a combination of three existing models - the Wilson and Cleary HRQL Model⁽⁷⁾, the Natural History of Disease Model⁽⁸⁾, and the Neuman's Systems Model for Nursing⁽⁹⁾. Characteristics of the individual and/or population that could potentially influence and modify the domains are included as components in the OHRQL model.⁽⁵⁾ It specifically assesses the domains of symptom status, functional status, and oral health perceptions (Figure 2).

In 1999, Gadbury-Amyot et al., conducted a study with the purpose of examining the validity and reliability of the OHRQL instrument developed to capture the biopsychosocial impact of oral conditions and diseases as illustrated in the OHRQL model.⁽¹⁰⁾ While several instruments existed at the time, none were able to comprehensively obtain all the aspects of health-related quality of life as what was being proposed in the OHRQL model. The instrument, designed with an adult population in mind, was comprised of questions within seven subscales – pain, dry mouth, eating/chewing function, speech function, social function, psychological function, and oral health perception. For each of the seven subscales, the coefficients were found to be acceptable, ranging from .79 to .89. These estimates of reliability are comparable to other instruments used in dentistry and dental hygiene to assess various aspects of HRQL.^(11–13) Similarly, the model demonstrated acceptable construct validity, as apparent in the difference in subscale mean patterns for groups expected to differ, and similarity in patterns with no expected differences.⁽¹⁰⁾

Since 1999, the UMKC School of Dentistry Division of Dental Hygiene has utilized the OHRQL instrument to collect oral health-related data. Research recently funded by the National Institute of Dental and Craniofacial Research (NIDCR) has investigators collecting oral health-related quality of life measures.⁽¹⁴⁾ One of these grants is led by two of the authors on this paper. The intent of collecting oral health-related quality of life data is that it be factored into the treatment planning process, thereby providing the patient perspective, and subsequently affording a more complete measure of oral health/disease. While this health measure has become engrained in the educational process at one dental hygiene program, the authors decided to undertake the current study to determine the impact of the OHRQL model (1998) and the accompanying instrument (1999) over the past 18 years.^(5, 10)

Therefore, the purpose of this paper is to review available evidence to determine the impact of the OHRQL on education, research, and practice.

METHODS

A search was conducted in PubMed using the following search terms: oral health-related quality of life AND OHRQL AND dental hygiene. Filters included English language and published between 1998 (when the original article regarding the OHRQL by Williams, et al. was published) and 2016 (the present). A total of five articles were found with one being the Gadbury-Amyot, 1999 article. Next, Google Scholar was used for the identification of citations for both the OHRQL model papers (Williams, et al, 1998; Gadbury-Amyot, et al, 1999). This resulted in a total of 55 citations, 25 for Williams et al. and 30 for Gadbury-Amyot et al. The rationale for using Google Scholar was to capture citations from journals that are widely read by practicing dental hygienists but not indexed in PubMed. After

eliminating citations that were not in English, accounting for duplicate citations between the Williams et al., and Gadbury-Amyot et al. articles, the result was a total of 40 unique citations. Copies of the 40 articles were obtained and reviewed by the authors to determine how this research is being used in education, research and practice (Table 1).

RESULTS

OHRQL in the Literature

Education—Five of the citations in Table 1 are in the category of education.^(15–19) Two of these articles are authored or co-authored by faculty from the University of Missouri-Kansas City Division of Dental Hygiene where the model was developed.^(15, 18) A group of researchers in Japan described the process involved with implementing the OHRQL into their dental hygiene curriculum.⁽¹⁶⁾ In the Japan study the program adopted two theoretical models; the Dental Human Needs Conceptual Model,⁽²⁰⁾ and the OHRQL model⁽⁵⁾. The same OHRQL measurement instrument⁽¹⁰⁾ developed and used at UMKC, was translated into Japanese for the purpose of utilizing it in the study. The procedures used to translate the OHRQL data collection instrument are described in the article. Students used both models and found them to be beneficial in the dental hygiene curriculum as it helped students expand the perspective from which they view the patient. Student participants reported the OHRQL as more helpful in assessment and problem identification than the Human Needs model.⁽¹⁶⁾ Stolberg and Tillis write about the need for a baccalaureate degree as entry level education for dental hygiene.⁽¹⁹⁾ In their article, the OHRQL is cited as an example of how the science of dental hygiene is expanding; therefore, the need for a more comprehensive education would equate to a baccalaureate versus an associate degree.

Research

Theory: Six articles in Table 1 discussed the importance of the relationship between theory and the dental hygiene body of knowledge.^(21–26) The American Dental Hygienists' Association (ADHA) has been central to the promotion of conceptual models through their sustained support of dental hygiene researchers. As early as 1982, at the world's first conference on dental hygiene research, the importance and value of research and theory to the profession, and ultimately to society, was emphasized.⁽²⁷⁾ This discussion was continued in 1987 at the Second ADHA National Conference on Dental Hygiene Research, where a specific call for theory development was a focus of the meeting.⁽²⁸⁾ Fast forward to work conducted by the 2000–2001 ADHA Council on Research's work on prioritizing the National Dental Hygiene Research Agenda⁽²²⁾ where the importance of the relationship between theory and the dental hygiene body of knowledge was again stressed. The 2000–2001 revised research agenda highlighted the development and implementation of three theoretical models for education, research and practice; the Human Needs Model⁽²⁹⁾, the Oral Health-Related Quality of Life Model⁽⁵⁾, and the Client Self-Care Model⁽²¹⁾. Bowen's article, published as part of a special commemorative issue of the Journal of Dental Hygiene in celebration of the 100th year of dental hygiene (1913–2013), provides an excellent historical perspective of the evolution of dental hygiene research.⁽²⁴⁾ The emphasis on theory is further supported and encouraged in an article by Cobban et al. in 2007 where the authors, dental hygiene educators and researchers from Canada, also emphasized the

importance of theory development for the advancement of the discipline.⁽²³⁾ By 2016 Walsh et al. was making a compelling argument for the importance of scholarship and dental hygiene scholarly identity for advancing the discipline and profession of dental hygiene.⁽²⁵⁾ Walsh et al. pointed to the three dental hygiene conceptual models that have been developed specifically for the purpose of describing a unique process of care distinct for dental hygiene and emphasized the importance of continuing these scholarly pursuits to build the body of knowledge for dental hygiene. Stolberg and Tillis advocated in their 2016 article, the need for dental hygiene education to evolve to an entry level baccalaureate degree to meet the challenges of an increasing complex oral healthcare environment.⁽¹⁹⁾ The importance of the OHRQL model for the practice of dental hygiene is discussed in their paper where they highlight that poor oral health extends beyond oral impacts into quality of life consequences. Finally, a paper published in 2016 by MacDonald and Bowen, compares nursing to dental hygiene in the use of theory for advancing their respective professions.⁽²⁶⁾ Their execution of a theory analysis of the Dental Hygiene Human Needs Conceptual Model resulted in the finding of very little research being conducted on this model. In contrast, the authors noted that the OHRQL has experienced activity by researchers and propose that the development of an accompanying measurement instrument may have contributed to its higher visibility in research.

Instrument Validation

Six citations reviewed in Table 1 focused on the validation of instruments used for the collection of oral health-related quality of life measures.^(10, 30–34) An additional five citations were dissertations, with four identifying OHRQL as one of several measurement instruments for assessing oral health related quality of life measures.^(35–39) Redmond's dissertation, rather than addressing oral health related quality of life, instead referred to the OHRQL for direction on the development of a measurement instrument that could be used in evaluation of a method for quantifying change in foot posture.⁽³⁵⁾

Research Using the OHRQL Instrument

Five of the articles reviewed in Table 1 are empirical research studies carried out using the OHRQL instrument for data collection.^(40–44) Saito served as principle investigator on three of the articles pertaining to OHRQL and patient care and as senior investigator on the fourth. The Sato et al. study exploring the incorporation of the OHRQL model in a dental hygiene curriculum in Japan was discussed above in describing how OHRQL has been used in education.⁽¹⁶⁾ With the translation of the OHRQL instrument being completed in 2007, Saito and colleagues were able to utilize the Japanese translation for related research conducted in subsequent years. In 2009, Saito used the OHRQL in the treatment of a patient diagnosed with chronic desquamative gingivitis as a pre-post measure of the impact on oral health related quality of life.⁽⁴⁰⁾ The post-treatment questionnaire results showed a positive effect on the patient's perceived oral health-related quality of life. This case report was followed by research published in 2010 and 2011 on patients diagnosed with periodontal disease to determine the impact of therapy, both non-surgical and surgical, on patients' oral health related quality of life.^(41, 42) Again, using a pre-post, single-group design with the OHRQL, it was found that periodontitis negatively affected patients oral health related quality of life, and the periodontal therapy resulted in more positive perceptions. Makino-Oi et al.,

conducted a study in 2016 examining periodontal patients to determine the effect of periodontal surgery on oral health-related quality of life.⁽⁴³⁾ A significant improvement in oral health-related quality of life as a result of periodontal therapy was found. Finally, a study conducted by Voelker et al. at the University of Missouri-Kansas City, explored the correlation of saliva characteristics and their relationship to cigarette smoking.⁽⁴⁴⁾ Data collection included the use of the OHRQL instrument however it is not clear exactly how that data was used.

Research Not Using the OHRQL Instrument

Six of the articles in Table 1 are studies that were conducted but for which the OHRQL was not used in the collection of data.^(45–50) Three of these studies were conducted on adolescent populations; therefore the OHRQL would not have been the instrument of choice.^(47–49) However, in all six of the articles, the OHRQL was referenced as an example of research looking at self-reported measures of oral health.

Practice

Patient Care: Five articles in Table 1 were categorized as practice (patient care).^(51–54) One of the cited articles was co-authored by a UMKC dental hygiene faculty member.⁽⁵⁴⁾ This article provided a review of best practices when providing care for patients with Parkinson's Disease. A case study was utilized where the authors illustrated the advantages of using the OHRQL to assess the patient's quality of life. The authors encouraged practitioners to consider how quality of life perceptions by patients influence oral health and with these added health measures treatment planning can be much more customized to meet the needs of each patient's unique circumstances and perceptions. Heydecke et al., authored a chapter in a book on oral health-related quality of life where they examined the impact of medical conditions on both oral health and oral health-related quality of life.⁽⁵¹⁾ In this instance, Gadbury-Amyot et al,¹⁰ is cited along with findings from the study, e.g., healthier oral conditions were associated with more positive patient self-reported oral health-related quality of life. Coleman et al. explore the issue of chronic disease in an aging population and barriers encountered in promoting oral health in nursing home settings. The OHRQL model is cited for its multidimensional approach to patient care.⁽⁵²⁾

Patient Perceptions of Oral Health-related Quality of Life—A few of the citations addressed globally the importance of obtaining patient perceptions regarding oral health-related quality of life.^(55–57) In the case of Benyamini et al. the researchers summarize multiple studies to examine if self-reported oral health had a relationship to self-rated overall health, confidence and satisfaction in elderly populations.⁽⁵⁵⁾ The OHRQL model was cited among a list of other research to illustrate the impact of oral health on health-related quality of life. A paper written by three nurse researchers cited the OHRQL as one of several prediction models of health-related quality and life and point to the emphasis that Healthy People 2010 placed on collecting these measures.⁽⁵⁶⁾ Brondani, expanding on earlier work, examined the concept of oral health-related quality of life through a retrospective examination of thirty years of literature.⁽⁵⁷⁾ The OHRQL was one of sixteen models that were analyzed in this 2014 study. Seven years following the publication of Brondani's dissertation (2007)⁽³⁸⁾ where the OHRQL was not favorably reviewed, the authors

commended the OHRQL for its ability to capture and portray the multidimensionality of OHRQL along with the relational aspects between the domains of the OHRQL model as illustrated by the arrows in Figure 2. This was in contrast to their overall finding that in 30 years dental research has evolved little, with the portrayal of the consequences of oral diseases being represented in a linear fashion.

DISCUSSION

In the original article that reviewed the development of the OHRQL model for dental hygiene, the authors outlined potential implications for dental hygiene in the areas of education, research and clinical practice.⁽⁵⁾ The trends among the research reviewed in this study suggest that educators, researchers and clinicians are taking into account patient perceptions towards their oral health when providing patient care. Findings of studies assessing oral health-related quality of life issues have demonstrated that this domain can no longer be viewed as separate from those related to overall health because oral diseases and conditions can significantly compromise the quality of life of patients.

A consistent conclusion made by the authors in the identified citations was that more research is needed for OHRQL in order to increase its validation and usefulness. It is of particular interest that Brondani's dissertation published in 2007 concluded that none of the 16 instruments that he reviewed (OHRQL being one) served as a "gold standard" for use in the collection of subjective oral health measures.⁽³⁸⁾ However, in a follow up article published in 2014 Brondani & MacEntee referred to the OHRQL as one model that illustrates the dynamic relationship between the six primary domains: health/preclinical disease, biological/clinical disease, symptom status, functional status, health perceptions and quality of life.⁽⁵⁷⁾ These domains are illustrated in Figure 2 by bidirectional arrows to reflect the current understanding of oral health as always fluctuating.

Future Utilization

Combining quality of life measures with traditional oral health assessment measures has gained attention from both an international and a national perspective, yet continue to be used very minimally in education or clinical practice. Several indicators including the World Health Organization's position paper from 1995, Healthy People 2020's goal on promoting quality of life, NIDCR's emphasis on collection of oral health-related quality of life measures, and an evolving body of literature on oral health-related quality of life, would suggest the need for an increased emphasis in the practice of dentistry and dental hygiene on oral health-related quality of life measures. Change begins at the educational level with programs incorporating curriculum aimed at the importance of the collection of these quality of life measures along with subsequent incorporation into treatment planning. Recognizing a growing consensus that disease measured by professionals is different than illness/health self-assessed by individuals⁽⁴⁾, one must question why this model is not used more commonly. This study confirms that it is not routine practice in dentistry and dental hygiene. The authors recognize this challenge as an opportunity for further research to determine the factors/barriers that prevent clinicians and educators from incorporating the OHRQL model into daily practice.

CLINICAL RELEVANCE

Scientific rationale for study

Quality of life is widely accepted as being an important aspect of overall health. International and governmental organizations have implemented measures to gauge HRQOL and oral health-related quality of life as a method to promote patient-centered care. The use of the OHRQL model and instrument in education, research and practice was evaluated to determine its impact to date and to make future recommendations.

Principle findings

OHRQL measures are not being widely utilized by dentists and dental hygienists.

Practical implications

In the era of providing patient-centered high-quality care, the OHRQL model and instrument provide a structured and validated framework that could easily be incorporated into clinical practice to foster a holistic approach to treatment planning.

CONCLUSION

In reviewing the literature surrounding the OHRQL, it is clear that there has been interest in this model by educators, researchers and practitioners. Additional efforts are needed to make the collection and subsequent interpretation of patient perceptions of oral health-related quality of life a part of treatment planning and ultimately the delivery of patient-based care. This review of 18 years of published literature suggests that more must be done in our educational curricula to make this a part of students' way of thinking when it comes to patient-centered care. More research is needed to better understand the impact of oral healthcare on patient's oral health-related quality of life.

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Figure 1.
Healthy People 2020 incorporation of health-related quality of life and well-being into four overarching goals

Figure 2.
The Oral Health-Related Quality of Life Model

Table 1

PubMed and Google Scholar Citations

Article Citation *= Williams, et al += Gadbury-Amyot et al	Summary of Article	Reference to OHRQL	Review categories of education, research, and practice
*Gadbury-Amyot, et al. "Validity and reliability of the oral health-related quality of life instrument for dental hygiene." <i>J Dent Hyg</i> (1999); 73(3): 126–34. ¹⁰	This article discusses the process used to examine reliability, construct validity, and produce a concise instrument for assessing oral health related quality of life.	This study reviews the development of the OHRQL measurement instrument.	Research (Instrument validation)
*Calley, et al. "A proposed client self-care commitment model." <i>J Dent Hyg</i> (2000); 74(1):24–35. ²¹	This article discusses a review of the literature around client care and proposed a model for application in dental hygiene process of care, dental hygiene education, and research.	The OHRQL model was cited as literature that placed an emphasis on patient involvement in the process of care.	Research (Theory)
*+Keselyak, Gadbury-Amyot "Application of an Oral Health-Related Quality of Life Model to the Dental." <i>J Dental Educ</i> (2001); 65(3): 253–61. ¹⁵	This article discusses the process utilized to incorporate the OHRQL model into the Dental Hygiene curriculum at the University of Missouri-Kansas City School of Dentistry. Perceptions of students and faculty that utilized it within the curriculum and challenges that they faced are covered.	Study carried out in dental hygiene program that developed the model – readers referred to Williams et al, 1999.	Education
*Gadbury-Amyot, et al. "Prioritization of the national dental hygiene research agenda." <i>J Dent Hyg</i> (2002); 76(2):157–166. ²²	This article discusses a list of research initiatives/areas of emphasis as determined by the American Dental Hygienists' Association (ADHA) Council of Research at the Second National Conference on Dental Hygiene Research, including a call for the establishment of a relationship between theory and the dental hygiene body of knowledge.	The OHRQL model was cited as one of the three theoretical models that has been incorporated into dental hygiene education, practice, and research since the Second National Conference on Dental Hygiene Research held in 1987 where participants called for dental hygiene theory development.	Research (Theory)
+Heydecke, Guido, and John P. Gobetti. "Impact of medical conditions on oral health and quality of life." In <i>Oral health-related quality of life</i> . Ed. Inglehart, habil, & Bagramian, Chicago, IL: Quintessence (2002): 139–52. ⁵¹	The book chapter examines the impact of a variety of medical conditions on oral health and oral health-related quality of life.	OHRQL is cited to illustrate the impact of oral conditions on a person's oral health-related quality of life.	Practice (Patient Care)
*Benyamini, Yael, Howard Leventhal, and Elaine A. Leventhal. "Self-rated oral health as an independent predictor of self-rated general health, self-esteem and life satisfaction." <i>Soc Sci Med</i> (2004); 59(5): 1109–1116. ⁵⁵	This article summarizes multiple studies done to determine if self-reported oral health affected the elderly population's self-rated overall health, confidence, and satisfaction. It was concluded that dental care led to improvements in self-image and social interaction.	The OHRQL model is mentioned among a list of researchers that have concluded that oral health is an important part of health-related quality of life and hence of general quality of life.	Research
+Skaret, et al. "Oral Health Related Quality of Life (OHRQoL) review of existing instruments and suggestions for use in oral health outcome research in Europe." <i>European Global Health Indicators Development Project</i> .	This article discusses a study in which the researchers used existing literature to evaluate oral quality of life instruments in terms of psychometric properties and recommended new research directions to further increase their qualities for future oral health outcome research.	OHRQL cited as one of several OHRQoL instruments used in research during the period of 1985–2004 and evaluated in this study.	Research (Instrument validation)

Article Citation *= Williams, et al += Gadbury-Amyot et al	Summary of Article	Reference to OHRQL	Review categories of education, research, and practice
Quintessence, Paris (2004): 99–110. ³⁰			
+Redmond, A. "Foot posture in neuromuscular disease: development and evaluation of a novel method for quantifying change in foot posture using Charcot-Marie-Tooth disease as a clinical model." [dissertation] University of Sydney, Australia (2004). ³⁵	This dissertation that had two main research aims - To describe the prevalence and scope of leg and foot problems in the most common form of peripheral neuropathy Charcot-Marie-Tooth (CMT) disease and To identify, develop and validate a method by which structural changes occurring in the lower leg and foot of people with CMT can be quantified in the clinical setting.	The author referred to the OHRQL for direction in instrument development for the dissertation study.	Research– Dissertation
+Dietrich, Thomas, et al. "The accuracy of individual self-reported items to determine periodontal disease history." <i>European journal of oral sciences</i> 113.2 (2005): 135–140. ⁴⁵	This article examines the diagnostic accuracy of individual self-reported items as related to periodontal health in a German population by developing a questionnaire.	OHRQL referenced as one of several studies that have evaluated self-reported measures of oral health.	Research (did not use OHRQL)
+Oscarson, N. "Health economic evaluation methods for decision-making in preventive dentistry." [dissertation] Umea University, Sweden (2006). ³⁶	This dissertation that had four main research aims - 1) To evaluate caries-preventive measures from a societal perspective, 2) To demonstrate the use of resources in preventive dentistry, 3) to develop and discuss techniques suitable for evaluating dental care costs and outcomes, and 4) to test costs and consequences within a health economic decision model adapted to preventive dental care.	OHRQL was listed in a table as one of several published indicators for oral health-related quality of life	Research– Dissertation
*Jönsson, Birgitta, et al. "Improved compliance and self-care in patients with periodontitis—a randomized control trial." <i>Int J Dent Hyg</i> (2006); 4: 77–83. ⁴⁶	This article describes a randomized single-blind control trial was conducted to test an intervention aimed at health promotion regimens for patients with periodontal disease. The Client Self-care Commitment Models was used. Clinical data was also collected and it was determined that patients in the intervention group increased their interdental cleaning and reduced plaque index significantly compared to the control group.	OHRQL is mentioned in the article as a new paradigm in healthcare that includes a greater emphasis on client (patient) involvement and commitment to positive health behaviors and ultimately to decision making.	Research (did not use OHRQL)
*Coleman, P., C. Hein, and J. Gurenlian. "The promise of transdisciplinary nurse-dental hygienist collaboration in achieving health-related quality of life for elderly nursing home residents." <i>Grand Rounds in Oral-Systemic Medicine</i> (2006); 1:40–9B. ⁵²	This article reviews chronic disease trends in the aging population with emphasis on oral health. Barriers to promoting oral health in nursing home settings and the impact on quality of life are discussed.	OHRQL is mentioned as a component of a multi-dimensional concept of reporting HRQL to describe certain domains of physical and psychosocial functioning, as well as perceptions of health and opportunity	Practice (Patient Care)
+Steele, M. Reliability and validity of the Oral Health Scale of the PedsQL: measuring the relationship between child oral health and health related quality of life. [dissertation]. Lawrence: University of Kansas; (2006). ³⁷	This dissertation examined the reliability and validity of the PedsQL Oral Health Scale.	OHRQL was referred to along with several other studies for determining effect size for the dissertation research.	Research—Dissertation

Article Citation *=Williams, et al +=Gadbury-Amyot et al	Summary of Article	Reference to OHRQL	Review categories of education, research, and practice
*Cobban, et al. "An argument for dental hygiene to develop as a discipline." Int J Dent Hyg (2007); 5:13–21. ²³	In this article the authors posit that professional disciplines are able to link actions of practitioners to the science that is the foundation of that practice. The purpose of the paper was to examine whether this is happening in dental hygiene. They conclude that while dental hygiene has some characteristics of a discipline, more work is needed through research production by and for dental hygienists and that this research should be founded on theoretical or conceptual frameworks.	OHRQL is included in this paper as part of an intentional effort by dental hygiene in developing theories to guide dental hygiene research and practice. The authors conclude that the Human Needs Model, Oral Health-Related Quality of Life, and the Client Self-care Commitment Model all describe a process of care that is both unique and distinct for dental hygiene.	Research (Theory)
*+Sato, Y., et al. "Application of the Dental Hygiene Human Needs Conceptual Model and the Oral Health-Related Quality of Life Model to the dental hygiene curriculum in Japan." Int J Dent Hyg (2007); 5:158–164. ¹⁶	This article reports on the incorporation of the Dental Hygiene Human Needs Conceptual Model (DHHN) and the Oral Health-Related Quality of Life Model (OHRQL) into a dental hygiene curriculum in Japan. The results showed that the OHRQL instrument was more helpful in assessment and problem identification than the DHHN instrument.	The authors obtained permission to develop a Japanese version of the OHRQL instrument that was developed by UMKC-SOD faculty members to incorporate into the dental hygiene curriculum in Japan.	Education
*+Brondani, M. Sociodental indicators and a re(de)defined model for oral health in old age. [dissertation] University of British Columbia, BC; 2007. ³⁸	The purpose of this dissertation was to review and appraise the validity of psychometric instruments used in dentistry. An extensive literature review resulted in identification of 16 instruments that met the inclusion criteria and were subsequently analyzed.	The OHRQL instrument was one of sixteen that was analyzed.	Research– Dissertation
+Brondani, and MacEntee. "The concept of validity in sociodental indicators and oral health-related quality-of-life measures." Community Dent Oral (2007); 34:472–478. ³¹	This article was an extension of the dissertation research listed above where the authors explored the issue of psychometric validity and how it has been applied to oral health-related quality of life instruments.	As with the dissertation – the OHRQL instrument was one of sixteen analyzed.	Research (Instrument validation)
+Locker, David, and Finbarr Allen. "What do measures of 'oral health-related quality of life' measure?." Community Dent Oral (2007); 35(6):401–411. ⁵³	This brief article defines and discusses different methods that are used to measure OHRQL.	OHRQL is listed in Table 1 that includes oral health outcome measures developed to date.	Practice (Patient Care)
+Hebling, and Pereira. "Oral health-related quality of life: a critical appraisal of assessment tools used in elderly people." Gerontology (2007); 24:151–161. ³²	As the title implies, the purpose of this study was to undertake a critical appraisal of oral health-related quality of life measurements used for research in the elderly.	Of 20 measurements identified by the researchers, they determined only seven fulfilled all of their quantitative-qualitative criteria. OHRQL was one of the 20 measures selected for evaluation. OHRQL was not chosen as one of the seven due to the lack of published studies and number of items. Fifty six (56) items were included in the original instrument.	Research (Instrument validation)
*Daniel, Susan J., et al. <i>Mosby's dental hygiene: concepts, cases, and competencies</i> . St Louis: Mosby Elsevier, 2008. ¹⁷	The book chapter on sealants examines the research surrounding the use of dental sealants.	It is not clear how the OHRQL model is referred to in this book chapter. While it is listed in the references, we could not find an actual reference within the body of the chapter.	Education

Article Citation *=Williams, et al +=Gadbury-Amyot et al	Summary of Article	Reference to OHRQL	Review categories of education, research, and practice
+Saito, et al. "Chronic desquamative gingivitis and oral health-related quality of life." <i>J Dermatol Case Rep</i> (2009); 3(3):47–49. ⁴⁰	This was a case report on a patient with Chronic Desquamative Gingivitis. As part of the report, the authors describe the use of the OHRQL for measure oral health related quality of life.	OHRQL was the instrument used for collecting health relate quality of life measures.	Research (OHRQL used)
+Ekbäck, G. "Satisfaction with oral health and associated factors in Sweden and Norway–cross-sectional and longitudinal perspectives." [dissertation] University of Bergen, Norway (2010). ³⁹	This is a dissertation whose main objective was to contribute to the validation of a single global measure of oral health in the context of younger and older age groups in Sweden and Norway.	OHRQL is listed within a table in which OHRQL instruments used in research between 1985 and 2009 are listed.	Research– Dissertation
*Chen, M. et al. "Fixed orthodontic appliance therapy and its impact on oral health-related quality of life in Chinese patients." <i>The Angle Orthod</i> (2010); 80(1): 49–53. ⁴⁷	This article summarized a study designed to determine whether or not OHRQL status is affected by orthodontic therapy. The results support the fact that OHRQL serves as a foundation for assessing, planning, implementing, and evaluating dental hygiene care.	Oral health related quality of life was defined in the study by citing the OHRQL.	Research (did not use OHRQL)
*Croffoot, Connie, et al. "Evaluating the effects of coaching to improve motivational interviewing skills of dental hygiene students." <i>J Dent Hyg</i> (2010); 84(2):57–64. ¹⁸	The article discussed the implementation of Motivational Interviewing coaching into a dental hygiene curriculum. It discusses the research behind motivational interviewing and the strategies that were used to implement it into the curriculum.	OHRQL was cited as a model for use in oral hygiene. The authors acknowledge that the use of this model may not be well-integrated into dental hygiene curriculum.	Education
*+Saito, Atsushi, et al. "Effect of initial periodontal therapy on oral health-related quality of life in patients with periodontitis in Japan." <i>J Periodontol</i> (2010); 81(7):1001–1009. ⁴¹	The purpose of the study was to gain insight into patient perceptions of oral health and the impact that periodontitis and treatment have on self-assessed quality of life.	OHRQL used for data collection (Japanese version).	Research (OHRQL used)
+Leger, RR, et al. "Evidence-based practice with community participation: select experiences with patients with spina bifida and sickle cell disease." (2010). ⁵⁶	This paper was written by three nurse researchers exploring the need for well-designed research that can then be translated into best practices for the care of patients (evidence-based practice). They advocate the use of community-based participatory research principles and methods as a way to empower study participants.	The OHRQL is mentioned as one of several prediction models of health-related quality of life and the emphasis by Healthy People 2010 on collecting these variables.	Research
*+Saito, Atsushi, et al. "Potential impact of surgical periodontal therapy on oral health-related quality of life in patients with periodontitis: a pilot study." <i>J Clin Periodontol</i> (2011); 38(12):1115–112. ⁴²	The purpose of this study was to explore change in perceived OHRQL for patients that undergo surgical periodontal therapy.	OHRQL used for data collection (Japanese version).	Research (OHRQL used)
+Heravi, Farzin, et al. "Do malocclusions affect the oral health-related quality of life?" <i>Oral health & preventive dentistry</i> 9.3 (2011). ⁴⁸	This study examined the relationship between untreated malocclusions and oral health-related quality of life in a male adolescent population in a high schoolers in Mashad, Iran.	OHRQL was referred to in the development of Heravi et al's instrument for use in their study.	Research (did not use OHRQL)
+Hjermstad, et al. "The EORTC QLQ-OH17: a supplementary module to the	The aim of this study as noted in the title was to develop a supplementary module to the	OHRQL was one identified in the literature search as one of 31 relevant questionnaires that were	Research (Instrument validation)

Article Citation *=Williams, et al +=Gadbury-Amyot et al	Summary of Article	Reference to OHRQL	Review categories of education, research, and practice
EORTC QLQ-C30 for assessment of oral health and quality of life in cancer patients." Eur J Cancer (2012); 48(14): 2203–221. ³³	European Organization for Research and Treatment of Cancer Core Questionnaire (EORTC QLQ-C30) focusing on oral health and related quality of life issues in all cancer diagnoses.	reviewed by the researchers. These instruments were evaluated for relevant items to include in the EORTC QLQ-OH17 which focused on oral health-related quality of life issues in cancer patients. The study does not indicate what items were taken from which questionnaire.	
+Brondani, Mario, and Sarah He. "Translating Oral Health-Related Quality of Life Measures: Are There Alternative Methodologies?." Soc Indic Res(2013); 111:387–40. ³⁴	The purpose of this study was to explore the translation of existing oral health-related quality of life instruments into other languages using online translator tools.	OHRQL was listed as one of several instruments for measuring oral health-related quality of life.	Research (Instrument validation)
*Bowen, Denise M. "History of dental hygiene research." J Dent Hyg (2013); 87(Suppl 1):5–22. ²⁴	This article provides a timeline and overview of the history of dental hygiene research and the outcomes.	OHRQL is addressed when discussing within the theory of dental hygiene section after discussing the human needs model and the development of the OHRQL as a result.	Research (Theory)
+Voelker, Marsha A., et al. "Preliminary Findings on the Correlation of Saliva pH, Buffering Capacity, Flow, Consistency and Streptococcus mutans in Relation to Cigarette Smoking." J Dent Hygiene (2013); 87(1):30–37. ⁴⁴	The purpose of this preliminary study was to examine the relationship of caries risk, salivary buffering capacity, salivary pH, salivary quality (flow, consistency) and levels of Streptococcus mutans in relation to cigarette smoking.	Subjects in the study had comprehensive medical and dental histories taken including additional data focusing on smoking, OHRQL, and Cambra.	Research (OHRQL used)
*Brondani, Mario A., and Michael I. MacEntee. "Thirty years of portraying oral health through models: what have we accomplished in oral health-related quality of life research?." Qual Life Res (2014); 23:1087–1096. ⁵⁷	This study examined different models of oral health aimed at representing oral health-related quality of life.	Follow up to dissertation with OHRQL being one of the models examined.	Research
+Farzanegan, et al. "Evaluation of relationship between oral health-related quality of life and occlusion traits among female adolescents." Dent Res J(2014); 11(6):684–8. ⁴⁹	This article addressed a study utilized to determine if malocclusion affected the OHRQL status of young females.	Patient perceptions about OHRQL were assessed.	Research (did not use OHRQL)
*Hodgson and Simmer-Beck. "Providing care to patients with Parkinson's Disease. Dimensions of Dental Hygiene (2014); 12:49–53. ⁵⁴	This article outlined for dental hygienists things to consider when planning treatment for patients with Parkinson's Disease. A case study was used to illustrate the dental hygiene process of care in this population.	The OHRQL instrument was used to assess the case study and guide the reader through how the collection and consideration of oral health quality of life measures can have a positive impact on treatment.	Practice (Patient Care)
*+Makino-Oi, A., et al. "Effect of periodontal surgery on oral health-related quality of life in patients who have completed initial periodontal therapy." J Periodontol Res (2016); 51:212–20. ⁴³	This study was designed to investigate the impact of surgical periodontal therapy on the oral health-related QoL of patients who have received initial periodontal therapy.	Patients in the study were assessed using the OHRQL model.	Research (OHRQL used)
*Stolberg, and Tilliss. "The Baccalaureate-Educated Dental Hygienist." J Evid	This article posits that the baccalaureate degree as entry level education for dental hygiene will prepare hygienists to meet the	OHRQL is cited for its importance in collecting health outcomes measures that go beyond clinical parameters.	Education

Article Citation *=Williams, et al +=Gadbury-Amyot et al	Summary of Article	Reference to OHRQL	Review categories of education, research, and practice
Based Dent Prac (2016); 16(Suppl):136–143. ¹⁹	challenges of an increasing complex healthcare environment.	Understanding the impact of disease and oral conditions on ones quality of life is recognized as an important aspect to dental hygiene's process of care.	
*Mendez, M., et al. "Impacts of supragingival and subgingival periodontal treatments on oral health-related quality of life." <i>International journal of dental hygiene</i> (2016). ⁵⁰	This article examined the impact of various phases (baseline, 30 days after the state of tx, and 30 days at end of tx) of a non-surgical periodontal treatment protocol on oral health-related quality of life.	OHRQL was noted as one of several instruments for collecting oral health-related quality of life measures.	Research (did not use OHRQL)
*Walsh, M. et al. "The dental hygiene scholarly identity and roadblocks to achieving it." <i>J Dent Hygiene</i> (2016); 90(2):79–87. ²⁵	The purpose of this paper was to discuss the importance of the dental hygiene scholarly identity to advancing the dental hygiene discipline and its structural hierarchy of knowledge to promote the public's oral health, to introduce potential roadblocks, and introduce the concept of follower-ship. This article distinguishes between dental hygiene scientists versus scholars and how each contributes to the profession.	OHRQL is cited as one of three dental hygiene conceptual models that describe a unique process of care distinct for dental hygiene.	Research (Theory)
*+MacDonald, L. and Bowen, DM. "Theory analysis of the Dental Hygiene Human Needs Conceptual Model". <i>Int J Dent Hyg</i> (2016). ²⁶	The purpose of this paper was to conduct a theory analysis of the Dental Hygiene Human Needs Conceptual Model.	The authors compare nursing which uses theory in a robust manner, to dental hygiene where theory is not widely used or discussed. The OHRQL is cited as one of the three existing theories in dental hygiene. They discuss the paucity of research around the Human Needs Conceptual Model compared to the OHRQL.	Research (Theory)