CRITICAL REVIEWS IN ORAL BIOLOGY & MEDICINE

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Oral Health-related Quality of Life: What, Why, How, and Future Implications

ABSTRACT

Despite its relatively recent emergence over the past few decades, oral health-related quality of life (OHRQoL) has important implications for the clinical practice of dentistry and dental research. OHRQoL is a multidimensional construct that includes a subjective evaluation of the individual's oral health, functional well-being, emotional well-being, expectations and satisfaction with care, and sense of self. It has wide-reaching applications in survey and clinical research. OHRQoL is an integral part of general health and well-being. In fact, it is recognized by the World Health Organization (WHO) as an important segment of the Global Oral Health Program (2003). This paper identifies the *what*, *why*, and *how* of OHRQoL and presents an oral health theoretical model. The relevance of OHRQoL for dental practitioners and patients in community-based dental practices is presented. Implications for health policy and related oral health disparities are also discussed. A supplemental Appendix contains a Medline and ProQuest literature search regarding OHRQoL research from 1990-2010 by discipline and research design (*e.g.*, descriptive, longitudinal, clinical trial, etc.). The search identified 300 articles with a notable surge in OHRQoL research in pediatrics and orthodontics in recent years.

KEY WORDS: quality of life, health services research, patient outcomes, evidence-based dentistry/health care, community dentistry, psychosocial factors.

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INTRODUCTION

Despite its relatively recent emergence over the past few decades, oral health-related quality of life (OHRQoL) has important implications for the clinical practice of dentistry and dental research. OHRQoL is an integral part of general health and well-being and is recognized by the WHO as an important segment of the Global Oral Health Program (WHO, 2003). International health campaigns utilize advertising and marketing strategies to enhance well-being by portraying positive oral health images that represent global health values. Efforts range from the elimination of dental pain to illuminations of aesthetic images using 'attractive' smiles with 'white' teeth. Such efforts are integrated into what is now referred to as OHRQoL. The specific aims of this paper include: (1) defining OHRQoL (*the What*); (2) explaining the importance of OHRQoL for dental practice and research (*the Why*); (3) describing how OHRQoL is used in research and examining research trends over time (*the How*); and (4) identifying implications of OHRQoL research for health policy.

WHAT IS OHRQoL?

In response to the WHO's definition of health as "a complete state of physical, mental, and social well-being and not just the absence of disease" (WHO, 1948), health service researchers have focused on health as a multidimensional construct. This concept of health status embraces the biopsychosocial model of health into which symptoms, physical functioning, and emotional and social well-being are incorporated (Kleinman, 1988). Quality of life (QoL), or individuals' "perceptions of their position in life in the context of culture and value systems in which they live, and in relation to their goals, expectations, standards, and concerns" (WHOQOL, 1995, 1405), is now recognized as a valid parameter in patient assessment in nearly every area of physical and mental healthcare, including oral health. Since Cohen and Jago (1976) first advocated the development of sociodental indicators, efforts have been invested in developing instruments to measure OHRQoL (Slade and Spencer, 1994; Broder *et al*., 2000; McGrath and Bedi, 2003). Further, the opportunity arose to consider how oral health affects aspects of social life, including self-esteem, social interaction, school and job performance, etc. Researchers began to postulate how oral health is related to health-related quality of life (HRQoL) (Gift and Atchison, 1995) and to understand the interrelationships between and among traditional clinical variables (like diagnosis), data from clinical examinations, and person-centered, self-reported health experience. The subjective evaluation of OHRQoL "reflects people's comfort when eating, sleeping and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health"(DHHS, 2000, 7). It is the result of an interaction between and among oral health conditions, social and contextual factors (Locker *et al*., 2005), and the rest of the body (Atchison *et al*., 2006).

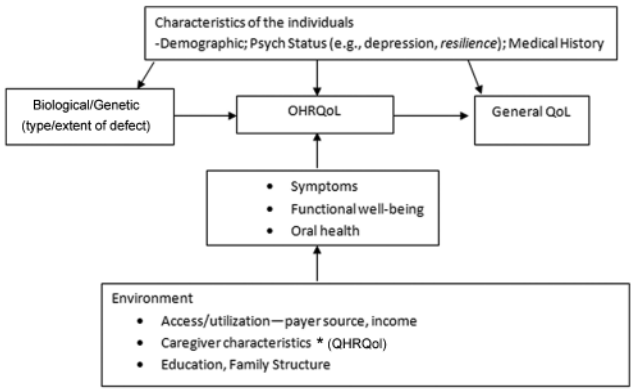

Figure 1. Theoretical model for OHRQoL.
*Applicable for children only.

Figure 2. Dimensions comprising oral health-related quality of life (OHRQoL).
*Excludes non-patient groups.

Our theoretical model for OHRQoL, which incorporates biological, social, psychological, and cultural factors, is depicted in Fig. 1. This model, adapted from Wilson and Cleary (1995), is built on psychological and social science theory and epidemiological findings (Patrick and Erikson, 1993; Barbosa and Gavião, 2008). This framework links *health status or clinical variables* (*e.g.*, type/extent of defect), *functional status* (*e.g.*, speech), oral-facial appearance, psychological status, *OHRQoL*, and overall *QoL*. The model recognizes the effects of *environmental or contextual* factors (*e.g.*, sociocultural factors, education, family structure) and access to care on oral health perceptions and related QoL. Theoretically, OHRQoL is a function of various symptoms and experiences and represents the person's subjective perspective.

With increasing focus of health policy to address health promotion and disease prevention, HRQoL and OHRQoL have come to incorporate both positive and negative perceptions of oral health and health outcomes (Broder and Wilson-Genderson, 2007). Thus, assessments of oral health can reflect both negative impact and enhancement of self and well-being. For example, people may seek oral healthcare for preventive (*e.g.*, cleanings) or elective (*e.g.*, orthodontics) treatment. Health psychologists have recognized that psychological assets such as optimism and resilience correlate with an individual's QoL, particularly how well she or he is able to cope with disease and poor health (Broder, 2001; Strauss, 2001; Lopez *et al*., 2003). This model incorporates positive psychology which has far-reaching implications in health delivery, since human strengths such as coping and social connectedness have been linked to better immunosuppressance, health outcomes, and mortality (Lopez *et al*., 2003). Common dimensions in OHRQoL instruments are given in Fig. 2, along with specific examples of items associated with each dimension. While traditional factors like oral health symptoms are illustrated in this figure, factors such as social and emotional well-being incorporate positive health states such as happiness and confidence. Recent OHRQoL instruments, like the Child Oral Health Impact Profile (COHIP), attempt to identify the impact of treatment (*e.g.*, satisfaction) along with the "positive influence of oral health and the appearance of the face and teeth on overall health and well-being among patients and the non-treatment-seeking individuals" (Broder and Wilson-Genderson, 2007, 21). Positive health attributes have also been incorporated into measures with youth (Patrick *et al*., 2002), adults (McGrath and Bedi, 2003), and older persons (Atchison and Dolan, 1990). In short, OHRQoL assesses positive and negative dimensions across the life course.

WHY IS OHRQoL IMPORTANT?

OHRQoL is important for both theoretical and practical reasons. The Surgeon General has identified OHRQoL as a health priority (DHHS, 2000), and "QoL issues are now at the forefront of public health policy" (Slade, 2002, 29). The Surgeon General's report and conference, *The Face of the Child*, highlighted the importance of children's oral health to their overall health and well-being and the profound impact that oral health can have on children's QoL (Mouradian, 2001; Wilson-Genderson *et al*., 2007). Oral health can affect anyone's life; OHRQoL research has shown its utility in the study of diverse populations including patients with oral cancer (Ship, 2002), toddlers with early childhood caries (ECC) (Filstrup *et al*., 2003), or children with craniofacial anomalies (Broder, 2007). Our literature review (see Appendix) provides an overview of the range of OHRQoL research and methodological designs.

Assessment of OHRQoL allows for a shift from traditional medical/dental criteria to assessment and care that focus on a person's social and emotional experience and physical functioning in defining appropriate treatment goals and outcomes (Christie *et al*., 1993). Patients' subjective evaluation of the

healthcare decision-making process is changing the dynamics of clinical practice and health outcomes monitoring and research (Inglehart and Bagramian, 2002). Medical and dental research on HRQoL has flourished because of: (1) the patient's more active role as a member of the treatment team; (2) the need for evidence-based approaches in health practices; and (3) the fact that many treatments for chronic diseases fail to 'cure' the health condition, thereby elevating the importance of HRQoL as a valuable health outcome variable (Najman and Levine, 1981).

Finally, OHRQoL is important because of its implications for oral health disparities and access to care. Unfortunately, socio-economic and racial/ethnic oral health disparities constitute a major social problem (Petersen *et al*., 2005). Health disparities can be explained, in part, by limited access to care. Locations within developing countries may have minimal dental health professionals, and rural areas often lack facilities offering dental services. In developed countries, treatment access is limited by high costs and sometimes by transportation difficulties (Sisson, 2007). OHRQoL can be useful in measuring the impact of oral health disparities on overall health and QoL. Policy implications are discussed in the "Implications" section.

HOW IS OHRQoL USED IN RESEARCH?

Based on the paradigmatic shift toward a patient-centered, bio-psychosocial approach to oral healthcare, OHRQoL has become central to dental research. In this section, we identify: (1) considerations for assessing OHRQoL; (2) the use of OHRQoL in survey research; and (3) utilization of OHRQoL as an outcome measure.

Considerations for Assessing OHRQoL

There are multiple considerations when OHRQoL is used in research. First, it is important to determine the specific purpose of the OHRQoL assessment, since research applications can vary [*e.g.*, assessing oral health impact by comparing treatment utilization of a community, comparing impact within/across age group(s)]. The OHRQoL assessment tool should discriminate between and among those applications by extent of the condition (*e.g.*, disease status) and potentially across diagnostic or treatment-seeking groups (*e.g.*, orthodontic *vs.* pediatric dental).

Another consideration is the use of generic *vs.* disease condition-specific instruments. Disease-specific measures may be advantageous over generic measures. First, they were developed for specific conditions (*e.g.*, cancer) to tap symptoms and impacts associated with that condition, which may increase their sensitivity compared with that of generic instruments. For example, the disease-specific Oral Health Impact Profile (OHIP) is more highly correlated to oral health conditions than is the generic QoL measure, the Short Form Health Survey (SF-36) (Lee *et al*., 2007). While a generic scale might query about fatigue or bodily discomfort, an OHRQoL measure would query about oral pain. A second advantage of disease-specific over generic measures is that generic tools generally have higher 'floor effects' (*i.e.*, no impact), since many of the symptoms tapped may not be prevalent or relevant among samples of individuals seeking dental care. OHRQoL measures are specific to oral health (*e.g.*, teeth, mouth, face) but are general in that a range of oral symptoms and impacts is included (*e.g.*, bleeding gums, appearance concerns). Thus, OHRQoL measures are appropriate across multiple oral health conditions but may not be sensitive to people seeking care for a health condition that does not have oral health manifestations, like Sickle Cell (Ralstrom, 2010).

One must keep in mind, however, that if a condition-specific OHRQoL measure is being developed, the condition and/or its symptoms must also be responsive to treatment. In short, the measure must have effective evaluative properties. If the OHRQoL assessment is meant to be used for population-based epidemiological sampling (*e.g.*, to assess deficits, negative impact), it should include a wide range of oral symptoms to properly tap a multitude of oral impacts. Thus, a generic measure is likely less responsive to change than an OHRQoL assessment used in a study focused on a single disease/condition.

OHRQoL instruments can also address issues related to age-specificity and oral health. Since oral health is "strongly age-dependent" (John *et al*., 2004), differences in OHRQoL have been found between children and adults (Tapsoba *et al*., 2000). While many instruments exist to measure adult OHRQoL (Slade, 2002; Al Shamrany, 2006), recent efforts have focused on measuring children's OHRQoL (COHRQoL). COHRQoL presents unique challenges, because children's dental, facial, and cognitive development changes drastically throughout childhood and adolescence. These challenges make proxy ratings a valuable resource for verifying (or contradicting) children's self-reported OHRQoL (Eiser and Morse, 2001; McGrath *et al*., 2004) and important for providers and researchers to utilize. It has been demonstrated that, compared with those of orthodontic and pediatric dental patients, children and caregiver ratings on OHRQoL were most discordant in the craniofacial population, with caregivers rating their children's QoL lower than the children rated themselves (Eiser and Morse, 2001; Wilson-Genderson *et al*., 2007). Therefore, obtaining both child and caregiver reports with OHRQoL instruments, like the COHIP, provides a more accurate depiction of COHRQoL than does either the child or caregiver report alone (Wilson-Genderson *et al*., 2007). Further, access to care and utilization can be dependent on caregivers' perceptions. Other proxy measurements include teacher ratings (*e.g.*, bullying about teeth, face, or mouth; social acceptance) given the amount of time children spend in school with their peers. For preschool children, caregiver assessments have been developed to measure oral health impact (Filstrup *et al*., 2003; Pahel *et al*., 2007).

OHRQoL in Survey Research

OHRQoL is utilized in health services research to examine trends in oral health and population-based needs assessment. Epidemiological survey research has examined trends in OHRQoL (*e.g.*, decayed surfaces), identified individual and environmental characteristics that affect OHRQoL (*e.g.*, income, education, etc.), and aided in needs assessment and health planning for population-based policy initiatives. Research has found that certain groups are at greater risk for low OHRQoL. For example, in Canada, children from low-income families have poorer OHRQoL than children from high-income families,

indicating a socio-economic disparity (Locker, 2007). While the individual characteristics and environment portions of our health model can theoretically predict outcomes, research has also found that sociodemographic factors (*e.g.*, race, education, and transportation difficulties) are strongly associated with low OHRQoL for elderly dentate patients in Alabama. Yet, such associations were not significant for the edentulous study participants (Makhija *et al*., 2006). Thus, the relationship between sociodemographic characteristics and OHRQoL is not clear-cut. For example, Latino immigrants report higher OHRQoL than non-Latino whites, although this difference is limited to first-generation Latinos (Sanders, 2010). Nevertheless, using data from the NHANES and National Health Survey for Children, the Surgeon General's Report purports that oral health disparities and reduced OHRQoL in the US are most prevalent among racial and ethnic minorities and those with socio-economic disadvantages (DHHS, 2000).

Research has revealed that certain medical, dental, and emotional conditions are also associated with low OHRQoL. For example, women with HIV (Mulligan *et al*., 2008), individuals with dental anxiety/fear (Mehrstedt *et al*., 2007), and individuals with periodontal disease (Ng and Leung, 2006) have lower OHRQoL compared with the general population. There appears to be a consistent association between clinical variables (like DMFS) and OHRQoL across age groups (Mason *et al*., 2006; Jensen *et al*., 2008; Lawrence *et al*., 2008; Kim *et al*., 2009). In a recent study that compared children seeking pediatric dental, orthodontic, or craniofacial care, OHRQoL varied not only across clinical groups but also by extent of defect (Broder and Wilson-Genderson, 2007). Thus, the greater the untreated dental decay, the lower the QoL, and the greater the malocclusion (overjet), the lower the QoL. Further, those with craniofacial conditions had lower QoL than the other treatment groups. Such baseline assessments may inform health practitioners of specific areas of focus from the patients' perspectives. Thus, *extent/type of medical condition* is included in our theoretical model.

Various factors associated with the *symptoms/functional well-being/oral health* sector of the theoretical model have been found to affect OHRQoL. For example, chewing ability has been found to affect the OHRQoL of the elderly (Kim *et al*., 2009). OHRQoL is also associated with perceived need for dental treatment, poor self-rated health, reduced mental health, fewer teeth, and relatively poor cognitive status for elderly persons with disabilities (Jensen *et al*., 2008). Dental aesthetics and facial appearance are also associated with OHRQoL (Klages *et al*., 2004; Broder and Wilson-Genderson, 2007).

Other researchers have considered mediating factors that can affect oral healthcare and health status. According to our theoretical model, it is important to understand how *characteristics of the individual* (*e.g.*, self-concept, psychological well-being) may interact with health perceptions. While past research has focused on negative effects, like depression and anxiety, currently, investigators are examining positive attributes like resilience and its impact on healthcare access and utilization and health perceptions. Barbosa and Gavião (2008) found that the relationship between clinical variables and HRQoL outcomes is mediated by various personal, social, and environmental factors. Across a variety of conditions, like temporomandibular disorders (TMD), anxiety and depression may be mediating or moderating variables in etiology, health utilization, and responsiveness to care (Gale and Dixon, 1987; Litt *et al*., 2009). Such findings have been supported by Patrick and colleagues (Patrick *et al*., 2002, 2007) in assessing QoL factors in adolescents across clinical groups. These findings may have implications in the evaluation of treatment needs and outcomes.

Including OHRQoL in survey research adds a powerful dimension in the planning and development of health promotion programs. By identifying groups who are vulnerable for low OHRQoL (*e.g.*, pregnant women, older persons), investigators can use data from survey research to create programs aimed at improving oral health and elevating OHRQoL. Thus, integrating oral healthcare into routine nursing programs is suggested (Jung and Shin, 2008). Other programs range from Head Start for preschool children to federally funded health centers for indigent or homeless adults.

OHRQoL as an Outcome Measure

More recently, OHRQoL assessments are being incorporated into observational clinical studies and trials to measure efficaciousness of treatment with the goal of improving care (see Appendix Table 1). Longitudinal studies involving OHRQoL seek to measure changes in scores from baseline to post-treatment. Currently, the second author is the PI on a six-center NIDCR-supported project, "Quality of Life in Children with Cleft" (DE018729). This prospective investigation is examining changes in OHRQoL and HRQoL following surgical interventions among school-aged children with cleft conditions. Collecting longitudinal data will allow us to use individual growth models to estimate change trajectories over time (McArdle and Bell, 2000; Moskowitz and Hershberger, 2002). The rationale behind elective interventions is that they improve QoL. However, subjective evaluations (like OHRQoL) are critical for determining if the interventions have the intended effect, and if that effect changes over time. In line with evidence-based care, it is crucial to understand treatment effectiveness from the patients' perspectives and the interrelationships between specific oral/facial issues and general QoL, psychological factors like depression or resilience, and family variables like cohesiveness.

Researchers studying oral health problems have used OHRQoL as an outcome measure to determine the effect of treatment on QoL. Awad *et al*. (2000) found that, compared with the use of conventional dentures, mandibular implant overdentures significantly improved OHRQoL for patients with edentulism in the short term. Likewise, Brazilian adolescents who had orthodontic treatment had better OHRQoL than their non-treatment counterparts (de Oliveira and Sheiham, 2004). Finally, a study in San Francisco found that rehabilitative dental treatment improved welfare recipients' OHRQoL and employment outcomes (Hyde *et al*., 2006).

The use of OHRQoL as an evaluative outcome measure is congruent with patient-centered care. Along with other clinical assessments, it allows oral healthcare professionals to evaluate the efficacy of treatment protocols from patients' perspectives (Wright *et al*., 2009). With multiple evaluative tools, professionals are better equipped to accurately weigh the risks and benefits

associated with treatment. In addition, it provides evidence that costs associated with treatment protocols are worth the expense if they generally improve patients' OHRQoL (Slade, 2002). Analysis of data from research using OHRQoL as an outcome measure will also assist patients and their families in treatment decision-making.

Based on our model, OHRQoL assessments can also identify individuals' strengths and weaknesses regarding their QoL. This could be useful in the development of adjunct multidisciplinary service programs, as well as the use of OHRQoL tools to measure outcomes of such interventions. For example, if psychological well-being is found as a deficit area for the elderly, psychological adjunct services may be incorporated into community-based projects. Physical therapy and/or cognitive behavioral therapy have also been utilized in clinical care for individuals with conditions ranging from chronic pain to cleft lip and palate (Kapp-Simon, 1995; Furto *et al*., 2006; Turner *et al*., 2006). In short, the multidimensional nature of OHRQoL can be useful for identifying at-risk populations and developing interventions that care for the 'whole' person.

A final consideration in the use of OHRQoL as an outcome measure is addressing and measuring clinically meaningful change. Since the 1980s, HRQoL researchers have known that statistically significant changes over time may not be meaningful to patients (Jaeschke *et al*., 1989). Researchers typically report statistical significance to demonstrate the importance of their outcome studies. Nonetheless, sample and size variation within these studies has played a very important role in determining statistical significance. While significant results showing pre-/post-group change may be appropriate for use in population-based health policy, it may not be appropriate for clinical care outcomes or clinical trials measuring within-group effects (Osoba *et al*., 1998; Turk, 2000; Koretz, 2005). According to Cella and co-workers (2002), determining the clinical significance of HRQoL data requires that attention be given to overall group differences and individual assessments. For this to be achieved, two issues need to be resolved: (1) whether a "statistically significant difference" between experimental and comparison groups has "clinical meaningfulness"; and (2) whether a "statistically significant difference" at the group level has relevance for "clinically meaningful change" at the individual level. HRQoL research has emphasized that this aspect of change can have patient-oriented applications. Despite the rise of clinically meaningful outcome reports across medical conditions (Sloan *et al*., 2002; Wyrwich *et al*., 2005), there is a dearth of published studies assessing clinically meaningful change in the oral health arena.

IMPLICATIONS OF OHRQoL RESEARCH AND HEALTH POLICY

The pervasive problem of low oral healthcare utilization and poor oral health (Sisson, 2007) is often the result of unequal access to care (Petersen *et al*., 2005; Edelstein, 2006). Given our current economic and healthcare challenges and the resulting political debate around curtailing healthcare costs, access to care is a major policy issue. Using the association between oral health conditions and QoL can be an effective mechanism to communicate with policymakers to reveal the importance of oral health and equal access to care (Al Shamrany, 2006). With increasing treatment options and the diversity of patient samples, we should consider sociocultural and psychological factors when assessing needs, outcomes, and clinical practice. Given the disparities in access to care and treatment rationing due to costs, comparing QoL across treatment groups may facilitate decision-making for patients, healthcare providers, and policymakers.

Recent legislation aims to improve oral health by increasing access to care and focusing research attention on subjective patient evaluations related to OHRQoL. For example, the Patient Protection and Affordable Care Act, Public Law 111-148, presents a wide range of tools, resources, and requirements to ensure that Americans have high-quality, patient-centered healthcare coverage. Currently, community health centers have been identified and grant-supported by the US Department of Health and Human Services' Health Resources and Service Administration (HRSA) as a mechanism to improve access—such centers may also include dental treatment. In 2009, almost 3.4 million individuals received dental services through these centers (HRSA, 2010). Given the prevalence and preventable nature of dental caries, measuring the impact of these services before and after treatment may improve evidence-based decision-making related to treatment needs, effectiveness, and policy perspectives.

Given the importance of health disparities to public policy, it is not surprising that NIH and NIDCR are committed to supporting oral health disparities research. NIDCR has supported Centers for Research to Reduce Oral Health Disparities since 2001. To date, both the Center at Boston University and CAN-DO at the University of California are studying the effect of early childhood caries (ECC) on young children's OHRQoL (Cunnion *et al*., 2010).

Presently, the Agency for Healthcare Research and Quality (AHRQ), NIDCR, and other NIH institutes are seeking to sponsor research in comparative effectiveness of care. The Patient-Centered Outcomes Research Institute has also been created to evaluate treatment efficacy and provide better information for patients and their doctors. Such efforts emphasize and support the application and relevance of HRQoL assessments.

The NIH has incorporated HRQoL research into its roadmap, emphasizing patient-oriented outcomes. Currently, there are at least three NIDCR-funded projects examining OHRQoL across the lifespan from childhood to old age, across geographic regions (*e.g.*, urban, rural, and international), and for chronic conditions such as cleft lip and palate. NIDCR also supports research that examines correlates of OHRQoL (*e.g.*, body image, health beliefs) and research that seeks to uncover social determinants of oral health.

Congruent with the NIH roadmap, dental-practice-based research networks (DPBRNs) have been created to enhance care and improve community health. These networks are grounded in evidence-based dentistry, which integrates scientific evidence, dentists' clinical expertise, and patients' needs and preferences (ADA and Center for Evidence-Based Dentistry, 2010). An integral part of DPBRNs includes subjective patient evaluations

about their oral health and treatment experiences. According to the Practitioners Engaged in Applied Research and Learning (PEARL) Network, by measuring OHRQoL in their patients, oral health professionals can enhance evidence-based care (Botello-Harbaum *et al*., 2010). Currently, the PEARL Network is completing longitudinal protocols to compare objective (clinician ratings) and subjective assessments (patient OHRQoL ratings) to measure treatment outcomes. Study findings will elucidate the interrelationships among oral healthcare and QoL factors. The PEARL projects exemplify how patients are an invaluable source of information regarding treatment protocols, outcomes, and how oral health is related to QoL.

In short, applied science is translational, and QoL assessments may be at the hub of evidence-based clinical care. Assessments of health perceptions from patients and community-dwellers can increase our understanding of healthcare access, expectations, and treatment effectiveness.

CONCLUSION

OHRQoL has a multitude of substantive applications for the field of dentistry, healthcare, and dental research as we move from bench to applied science and person-centered approaches to measure treatment needs and efficacy of care. Patient-oriented outcomes like OHRQoL will enhance our understanding of the relationship between oral health and general health and demonstrate to clinical researchers and practitioners that improving the quality of a patient's well-being goes beyond simply treating dental maladies. OHRQoL research can be used to inform public policy and help eradicate oral health disparities. Researchers are beginning to uncover what OHRQoL has to offer, and if recent studies are any indication, the future looks bright indeed.

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REFERENCES

ADA and Center for Evidence-Based Dentistry (2010). About evidence-based dentistry. Retrieved September 3, 2010, from http://ebd.ada.org/about.aspx.

Al Shamrany M (2006). Oral health-related quality of life: a broader perspective. *East Mediterr Health J* 12:894-901.

Atchison KA, Dolan TA (1990). Development of the Geriatric Oral Health Assessment Index. *J Dent Educ* 54:680-687.

Atchison KA, Shetty V, Belin TR, Der-Martirosian C, Leathers R, Black E, *et al*. (2006). Using patient self-report data to evaluate orofacial surgical outcomes. *Community Dent Oral Epidemiol* 34:93-102.

Awad MA, Locker D, Korner-Bitensky N, Feine JS (2000). Measuring the effect of intra-oral implant rehabilitation on health-related quality of life in a randomized controlled clinical trial. *J Dent Res* 79: 1659-1663.

Barbosa TS, Gavião MB (2008). Oral health-related quality of life in children: part II. Effects of clinical oral health status. A systematic review. *Int J Dent Hyg* 6:100-107.

Botello-Harbaum MT, Mathews AG, Wu J, Collie D, PEARL Network (2010). OHRQoL scores of patients participating in the PEARL Network (abstract # 2447). *J Dent Res* 89(Spec Iss B): http://iadr.confex.com/iadr/2010barce/webprogram/Paper139462.html.

Broder HL (2001). Using psychological assessment and therapeutic strategies to enhance well-being. *Cleft Palate-Craniofac J* 38:248-254.

Broder HL (2007). Children's oral health-related quality of life. *Community Dent Oral Epidemiol* 35(Suppl 1):5-7.

Broder HL, Wilson-Genderson M (2007). Reliability and convergent and discriminant validity of the Child Oral Health Impact Profile (COHIP Child's version). *Community Dent Oral Epidemiol* 35(Suppl 1):20-31.

Broder HL, Slade G, Caine R, Reisine S (2000). Perceived impact of oral health conditions among minority adolescents. *J Public Health Dent* 60:189-192.

Cella D, Bullinger M, Scott C, Barofsky I (2002). Group vs individual approaches to understanding the clinical significance of differences or changes in quality of life. *Mayo Clin Proc* 77:384-392.

Christie M, French D, Sowden A, West A (1993). Development of child-centered, disease-specific questionnaires for living with asthma. *Psychosom Med* 55:541-548.

Cohen LK, Jago JD (1976). Toward the formulation of sociodental indicators. *Int J Health Serv* 6:681-698.

Cunnion DT, Spiro A 3rd, Jones JA, Rich SE, Papageorgiou CP, Tate A, *et al*. (2010). Pediatric oral health-related quality of life improvement after treatment of early childhood caries: a prospective multisite study. *J Dent Child (Chic)* 77:4-11.

de Oliveira CM, Sheiham A (2004). Orthodontic treatment and its impact on oral health-related quality of life in Brazilian adolescents. *J Orthod* 31:20-27.

DHHS (2000). Oral health in America: a report of the Surgeon General. US Department of Health and Human Services and National Institute of Dental and Craniofacial Research. Rockville, MD: National Institutes of Health.

Edelstein BL (2006). The dental caries pandemic and disparities problem. *BMC Oral Health* 6(Suppl 1):2.

Eiser C, Morse R (2001). Can parents rate their child's health-related quality of life? Results of a systematic review. *Qual Life Res* 10:347-357.

Filstrup SL, Briskie D, da Fonseca M, Lawrence L, Wandera A, Inglehart MR (2003). Early childhood caries and quality of life: child and parent perspectives. *Pediatr Dent* 25:431-440.

Furto ES, Cleland JA, Whitman JM, Olson KA (2006). Manual physical therapy interventions and exercise for patients with temporomandibular disorders. *Cranio* 24:283-291.

Gale EN, Dixon DC (1987). Correlation of depression and anxiety scales in temporomandibular disorder patients (abstract). *J Dent Res* 66(Spec Iss):346.

Gift HC, Atchison KA (1995). Oral health, health, and health-related quality of life. *Med Care* 33(11 Suppl):57S-77S.

HRSA (2010). Primary health care: the Health Center Program. Retrieved December 16, 2010, from http://bphc.hrsa.gov/.

Hyde S, Satariano WA, Weintraub JA (2006). Welfare dental intervention improves employment and quality of life. *J Dent Res* 85:79-84.

Inglehart MR, Bagramian RA, editors (2002). Oral health-related quality of life: an introduction. In: *Oral health-related quality of life*. Chicago: Quintessence Publishing Co., Inc., pp. 1-6.

Jaeschke R, Singer J, Guyatt GH (1989). Measurement of health status. Ascertaining the minimal clinically important difference. *Control Clin Trials* 10:407-415.

Jensen PM, Saunders RL, Thierer T, Friedman B (2008). Factors associated with oral health-related quality of life in community-dwelling elderly persons with disabilities. *J Am Geriatr Soc* 56:711-717.

John MT, Hujoel P, Miglioretti DL, LeResche L, Koepsell TD, Micheelis W (2004). Dimensions of oral-health-related quality of life. *J Dent Res* 83:956-960.

Jung YM, Shin DS (2008). Oral health, nutrition, and oral health-related quality of life among Korean older adults. *J Gerontol Nurs* 34:28-35.

Kapp-Simon KA (1995). Psychological interventions for the adolescent with cleft lip and palate. *Cleft Palate Craniofac J* 32:104-108.

Kim HY, Jang MS, Chung CP, Paik DI, Park YD, Patton LL, *et al*. (2009). Chewing function impacts oral health-related quality of life among institutionalized and community-dwelling Korean elders. *Community Dent Oral Epidemiol* 37:468-476.

Klages U, Bruckner A, Zentner A (2004). Dental aesthetics, self-awareness, and oral health-related quality of life in young adults. *Eur J Orthod* 26:507-514.

Kleinman A (1988). The illness narratives: suffering, healing, and the human condition. New York: Basic Books.

Koretz RL (2005). Is statistical significance always significant? *Nutr Clin Pract* 20:303-307.

Lawrence HP, Thomson WM, Broadbent JM, Poulton R (2008). Oral health-related quality of life in a birth cohort of 32-year olds. *Community Dent Oral Epidemiol* 36:305-316.

Lee S, McGrath C, Samman N (2007). Quality of life in patients with dentofacial deformity: a comparison of measurement approaches. *Int J Oral Maxillofac Surg* 36:488-492.

Litt MD, Shafer DM, Ibañez CR, Kreutzer DL, Tawfik-Yonkers Z (2009). Momentary pain and coping in temporomandibular disorder pain: exploring mechanisms of cognitive behavioral treatment for chronic pain. *Pain* 145:160-168.

Locker D (2007). Disparities in oral health-related quality of life in a population of Canadian children. *Community Dent Oral Epidemiol* 35:348-356.

Locker D, Jokovic A, Tompson B (2005). Health-related quality of life of children aged 11 to 14 years with orofacial conditions. *Cleft Palate Craniofac J* 42:260-266.

Lopez SJ, Snyder CR, Rasmussen NH (2003). Striking a vital balance: developing a complementary focus on human weakness and strength through positive psychological assessment. In: *Positive psychological assessment: a handbook of models and measures*. Lopez SJ, Snyder CR, editors. Washington, DC: American Psychological Association, pp. 3-20.

Makhija SK, Gilbert GH, Boykin MJ, Litaker MS, Allman RM, Baker PS, *et al*. (2006). The relationship between sociodemographic factors and oral health-related quality of life in dentate and edentulous community-dwelling older adults. *J Am Geriatr Soc* 54:1701-1712.

Mason J, Pearce MS, Walls AW, Parker L, Steele JG (2006). How do factors at different stages of the lifecourse contribute to oral-health-related quality of life in middle age for men and women? *J Dent Res* 85:257-261.

McArdle JJ, Bell RQ (2000). An introduction to latent growth models for developmental data analysis. In: Modeling longitudinal and multilevel data: practical issues, applied approaches, and specific examples. Little TD, Schnabel KU, Baumert J, editors. Mahwah, NJ: Lawrence Erlbaum, pp. 69-107.

McGrath C, Bedi R (2003). Measuring the impact of oral health on quality of life in Britain using OHQoL-UK(W)((c)). *J Public Health Dent* 63:73-77.

McGrath C, Broder H, Wilson-Genderson M (2004). Assessing the impact of oral health on the life quality of children: implications for research and practice. *Community Dent Oral Epidemiol* 32:81-85.

Mehrstedt M, John MT, Tonnies S, Micheelis W (2007). Oral health-related quality of life in patients with dental anxiety. *Community Dent Oral Epidemiol* 35:357-363.

Moskowitz DS, Hershberger SL, editors (2002). Modeling intraindividual variability with repeated measures data. Mahwah, NJ: Lawrence Erlbaum.

Mouradian WE (2001). The face of a child: children's oral health and dental education. *J Dent Educ* 65:821-831.

Mulligan R, Seirawan H, Alves ME, Navazesh M, Phelan JA, Greenspan D, *et al*. (2008). Oral health-related quality of life among HIV-infected and at-risk women. *Community Dent Oral Epidemiol* 36:549-557.

Najman JM, Levine S (1981). Evaluating the impact of medical-care and technologies on the quality of life—a review and critique. *Soc Sci Med (F)* 15:107-115.

Ng SK, Leung WK (2006). Oral health-related quality of life and periodontal status. *Community Dent Oral Epidemiol* 34:114-122.

Osoba D, Rodrigues G, Myles J, Zee B, Pater J (1998). Interpreting the significance of changes in health-related quality-of-life scores. *J Clin Oncol* 16:139-144.

Pahel BT, Rozier RG, Slade GD (2007). Parental perceptions of children's oral health: the Early Childhood Oral Health Impact Scale (ECOHIS). *Health Qual Life Outcomes* 5:6.

Patrick DL, Erikson P (1993). Health status and health policy: allocating resources to health care. New York: Oxford University Press.

Patrick DL, Edwards TC, Topolski TD (2002). Adolescent quality of life, part II: initial validation of a new instrument. *J Adolesc* 25:287-300.

Patrick DL, Topolski TD, Edwards TC, Aspinall CL, Kapp-Simon KA, Rumsey NJ, *et al*. (2007). Measuring the quality of life of youth with facial differences. *Cleft Palate Craniofac J* 44:538-547.

Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C (2005). The global burden of oral diseases and risks to oral health. *Bull World Health Org* 83:661-669.

Ralstrom E (2010). The impact of oral health in adolescents with sickle cell disease. Columbus, OH: The Ohio State University, Graduate Program in Dentistry, Master of Science: 70. Retrieved January 18, 2011, from http://etd.ohiolink.edu/view.cgi/Ralstrom%20Elizabeth.pdf?osu1274754100.

Sanders AE (2010). A Latino advantage in oral health-related quality of life is modified by nativity status. *Soc Sci Med* 71:205-211.

Ship JA (2002). Oral health-related quality of life in patients with oral cancer. In: *Oral health-related quality of life*. Inglehart MR, Bagramian RA, editors. Carol Stream, IL: Quintessence Publishing Co., Inc., pp. 153-168.

Sisson KL (2007). Theoretical explanations for social inequalities in oral health. *Community Dent Oral Epidemiol* 35:81-88.

Slade GD (2002). Assessment of oral health-related quality of life. In: Oral health-related quality of life. Inglehart MR, Bagramian RA, editors. Carol Stream, IL: Quintessence Publishing Co., Inc., pp. 29-46.

Slade GD, Spencer AJ (1994). Development and evaluation of the Oral Health Impact Profile. *Community Dent Health* 11:3-11.

Sloan JA, Cella D, Frost M, Guyatt GH, Sprangers M, Symonds T (2002). Assessing clinical significance in measuring oncology patient quality of life: introduction to the symposium, content overview, and definition of terms. *Mayo Clin Proc* 77:367-370.

Strauss RP (2001). "Only skin deep": health, resilience, and craniofacial care. *Cleft Palate Craniofac J* 38:226-230.

Tapsoba H, Deschamps JP, Leclercq MH (2000). Factor analytic study of two questionnaires measuring oral health-related quality of life among children and adults in New Zealand, Germany and Poland. *Qual Life Res* 9:559-569.

Turk DC (2000). Statistical significance and clinical significance are not synonyms! *Clin J Pain* 16:185-187.

Turner JA, Mancl L, Aaron LA (2006). Short- and long-term efficacy of brief cognitive-behavioral therapy for patients with chronic temporomandibular disorder pain: a randomized, controlled trial. *Pain* 121:181-194.

WHO (1948). World Health Organization Constitution. Geneva, Switzerland: World Health Organization. Retrieved January 18, 2011, from http://www.who.int/governance/eb/who_constitution_en.pdf.

WHO (2003). The World Oral Health Report 2003: continuous improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme. Geneva, Switzerland: World Health Organization.

WHOQOL (1995). The World Health Organization quality of life assessment (WHOQOL): position paper from the World Health Organization. *Soc Sci Med* 41:1403-1409.

Wilson IB, Cleary PD (1995). Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. *J Am Med Assoc* 273:59-65.

Wilson-Genderson M, Broder HL, Phillips C (2007). Concordance between caregiver and child reports of children's oral health-related quality of life. *Community Dent Oral Epidemiol* 35(Suppl 1):32-40.

Wright WG, Jones JA, Spiro A 3rd, Rich SE, Kressin NR (2009). Use of patient self-report oral health outcome measures in assessment of dental treatment outcomes. *J Public Health Dent* 69:95-103.

Wyrwich KW, Bullinger M, Aaronson N, Hays RD, Patrick DL, Symonds T (2005). Estimating clinically significant differences in quality of life outcomes. *Qual Life Res* 14:285-295.