

Quality of Life in Patients with Chronic Rhinosinusitis

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Abstract Health-related quality of life (HRQoL) is a domain of quality-of-life assessment that is influenced by the individual's perception of his or her health status. Measurement of HRQoL can enable physicians to understand how an illness interferes with a patient's day-to-day life, improve patient–physician communication, and optimize clinical outcomes. Chronic rhinosinusitis (CRS) is one of the most common chronic diseases, affecting 14–16% of the adult US population. In addition to significant health care costs, CRS has been shown to substantially reduce HRQoL. In this review article, we discuss the definition and interpretation of HRQoL data and describe several validated rhinosinusitis HRQoL instruments. Additionally, we review how CRS functions to lower HRQoL and the effect of medical and surgical intervention on improving HRQoL status. By understanding the relationship between CRS and associated chronic conditions, clinicians can target their evaluation to problems that will maximize clinical success.

Keywords Chronic · Rhinosinusitis · Sinusitis · Quality of life · Asthma · Allergy · Endoscopic · Surgery

Introduction

Rhinosinusitis is characterized by concomitant inflammation of the nasal and sinus mucosa. Recent evidence has demonstrated that sinus and nasal inflammation coexist, suggesting that the term *rhinosinusitis*—rather than sinusitis—more accurately reflects the pathophysiology of this chronic inflammatory condition [1]. In 2007, Rosenfeld et al. [2] published clinical guidelines on adult rhinosinusitis that updated the diagnostic criteria of chronic rhinosinusitis (CRS). An important revision was the requirement of empiric evidence of sinonasal inflammation, either on anterior rhinoscopy or endoscopy, in addition to the symptomatic criteria.

CRS is one of the most common chronic diseases, affecting 14–16% of the adult US population and yielding a significant health care burden with annual direct costs of about 5.8 billion dollars [3]. Because CRS has been shown to substantially reduce health-related quality of life (HRQoL) [4], most health care burden relates to loss of productivity, office visits, and medical expenses. The purpose of this review is to provide an updated discussion on how CRS affects HRQoL. By understanding the relationship between CRS and associated chronic conditions that function to lower HRQoL, clinicians can target their evaluation to problems that will maximize clinical success.

Health-Related Quality of Life

Measurement of medical outcomes is integral for the development of innovative health care delivery and improvement of patient care outcomes. HRQoL is a domain

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of quality-of-life assessment that is influenced by the individual's perception of his or her health status [5]. Physicians often use HRQoL to measure the effects of chronic illness and to better understand how an illness interferes with a patient's day-to-day life. Using HRQoL assessment has been shown to improve patient–physician communication [6] and clinical outcome [7]. However, due to the many instruments available, diversity of items and responses assessed, and lack of familiar units, clinicians often find interpretation of HRQoL studies difficult [8]. For further information regarding HRQoL study evaluation, refer to an article by Schunemann et al. [8] entitled “Interpreting the results of patient reported outcome measures in clinical trials: the clinician's perspective.”

HRQoL is self-determined and encompasses domains of life directly affected by changes in health. Commonly assessed domains include the following: 1) functional status (eg, ability to prepare food, clean house, and dress independently), 2) mental or emotional status (eg, depression, ability to concentrate), 3) social status (eg, interaction with others), and 4) overall quality of life [5]. An important question that continues to be investigated is what determines a clinically significant change in HRQoL? A concept called the *minimal important difference* refers to the smallest change in HRQoL that patients perceive as beneficial in the absence of significant side effects or excessive cost [9]. Determination of the optimal minimal important difference for HRQoL instruments continues to be investigated. Based on a study by Norman et al. [10], we define a clinically significant change in HRQoL as greater than half of the SD for each specific health domain.

Rhinosinusitis Health-Related Quality-of-Life Instruments

Several validated HRQoL instruments have been developed to assess diseases of the paranasal sinuses. A systematic review by Chester and Sindwani [11] demonstrated that of 18 survey instruments developed for HRQoL assessment after sinus surgery, only 5 were used more than twice: Chronic Sinusitis Survey (CSS) (12 studies), Sinonasal Outcome Test (SNOT) (11 studies), Medical Outcomes Study 36-item Short Form Health Survey (SF-36) (10 studies), Rhinosinusitis Symptom Inventory (RSI) (4 studies), and Rhinosinusitis Disability Index (RSDI) (3 studies). However, in a recent study by van Oene et al. [12], which evaluated the quality of rhinosinusitis HRQoL surveys, only the Rhinosinusitis Outcome Measure-31 and Rhinosinusitis Quality of Life (RhinoQoL) surveys had adequate levels of discriminant validity (eg, CRS patient scores are different than those of controls) and responsiveness (eg, total score change after an intervention). Table 1 provides a summary of commonly used rhinosinusitis HRQoL surveys.

The CSS is a six-question survey designed to measure sinusitis-specific symptoms and medication use within the preceding 8-week period (score range, 0–100) [13]. Lower total and subscale scores indicate a greater impact of CRS on HRQoL.

The SNOT-22 is a 22-item outcome measure applicable to sinonasal conditions and surgical treatments (score range, 0–110). It was derived from the SNOT-20, with two questions added to measure nasal blockage and sense of

Table 1 Summary of commonly used rhinosinusitis health-related quality-of-life surveys

Survey	Year developed	Questions, <i>n</i>	Domains, <i>n</i>	Domains assessed	Time to completion, <i>min</i>
CSS	1995	6	2	CRS symptoms Medication use	<5
SNOT-22	2003	22	1	Symptom scale	7
RSDI	1997	30	3	Physical Functional Emotional	5
RSI	2003	20	3	CRS symptoms Medication use Work and social	5
RSOM-31	1995	31	7	Nasal Eye Ear Sleep General Emotional Functional	15
RhinoQoL	2005	17	3	Symptom severity Bothersomeness Impact scale	7

CRS chronic rhinosinusitis; CSS Chronic Sinusitis Survey; *RhinoQoL* Rhinosinusitis Quality of Life survey; *RSDI* Rhinosinusitis Disability Index; *RSI* Rhinosinusitis Symptom Inventory; *RSOM* Rhinosinusitis Outcome Measure; *SNOT* Sinonasal Outcome Test

taste/smell [14]. Higher total scores on the SNOT-22 imply greater impact of CRS on HRQoL.

The RSI evaluates the CRS Task Force major and minor symptoms on a 6-point Likert scale (0 indicates symptom absent, 5 indicates symptom very severe) [15]. Furthermore, it documents medication use, physician office visits, and work absence directly related to CRS. Higher scores imply greater impact of CRS on quality of life.

The RSDI is a 30-question survey made up of three individual subscales to measure the impact of sinus disease on the physical, functional, and emotional domains on a continuum (score range, 0–120) [16]. Higher total and subscale scores represent a greater impact of CRS on HRQoL.

The Rhinosinusitis Outcome Measure-31 is a self-administered, 31-item survey that evaluates 7 domains: nasal, eye, ear, sleep, general, emotional, and functional problems [17]. Pretreatment items are ranked using a five-category “bothersome” scale according to the degree of disturbance patients receive in their life as a result of CRS. Higher scores imply a greater impact of CRS on HRQoL.

The RhinoQoL survey is a recently developed and validated HRQoL instrument for CRS [18]. It is a 17-item survey that evaluates 3 domains: symptom frequency, bothersomeness, and impact scale. Individual item scores are ranked from 0 (worse possible health status) to 100 (best possible health status). Lower total scores imply a greater impact of CRS on HRQoL.

Symptoms of Chronic Rhinosinusitis and Health-Related Quality of Life

The symptoms of CRS can be disabling and can significantly reduce HRQoL. The most common presenting symptoms of recalcitrant CRS include nasal congestion, fatigue, headache, hyposmia or anosmia, and facial pain; of these, headache was reported as the most disabling [19]. A 2004 review by Linder and Atlas [20] discusses HRQoL as it pertains to acute and chronic rhinosinusitis. The purposes of the following sections are to discuss recently published articles on the topic of CRS and HRQoL. Furthermore, we discuss common chronic illnesses that have been associated with CRS, such as depression, olfactory dysfunction, fatigue, sleep disturbance, and sexual dysfunction, as they often contribute to reduced HRQoL.

General Quality of Life and Health-related Quality of Life in Chronic Rhinosinusitis

It is commonly accepted that patients with a diagnosis of CRS, prior to making a decision to undergo endoscopic sinus surgery, present with reduced general quality of life

and HRQoL [20]. A recent Canadian study by Macdonald et al. [21] evaluated CRS patients using the SF-36 and CSS. They demonstrated a significant reduction in preoperative SF-36 health domains and CSS scores, indicating a significant effect on quality of life and HRQoL. Significant improvement was noted following endoscopic sinus surgery in both the SF-36 and CSS [21]. A Polish study presented similar results following the evaluation of CRS patients with the SF-36 survey [22]. When CRS is further stratified into CRS with or without nasal polyposis, recent evidence suggests that HRQoL differs between the subgroups. A 2010 study by Zheng et al. [23] demonstrated that individuals with CRS with nasal polyposis had better HRQoL scores compared with those with CRS without polyposis. When all CRS quality-of-life and HRQoL studies are evaluated, it is clear that CRS is an international disease, with collectively reduced HRQoL.

Depression in Chronic Rhinosinusitis

Depression affects 10–16% of the general population [24] and is commonly associated with increased symptom severity of concurrent chronic illnesses. A recent study by Brandsted et al. [25] demonstrated that 25% of patients with CRS were being actively treated for depression, which is higher than in the general population. CRS patients with depression had lower mean preoperative HRQoL and quality-of-life scores compared with patients with CRS without depression. When evaluating postoperative outcomes, they identified worse HRQoL outcomes compared with patients without depression. Similarly, Mace et al. [26] demonstrated that depressed patients with CRS had lower preoperative and postoperative HRQoL scores compared with nondepressed patients with CRS. However, depressed patients with CRS received similar HRQoL improvements after endoscopic sinus surgery. In addition to the elevated rates of depression within the CRS population, a 2007 study by Wasan et al. [27] identified higher rates of anxiety disorders. Using the Hospital Anxiety and Depression Scale, 43%, 26%, and 26% of CRS patients reported low, moderate, and high levels of anxiety, respectively. In conclusion, depression and anxiety are commonly associated with CRS and function to lower HRQoL. Although depression and CRS likely function independently to lower HRQoL, clinicians should be aware of the higher rate of depression and manage this appropriately. Future research may elucidate whether treatment of concurrent depression improves HRQoL in patients with CRS.

Olfactory Dysfunction in Chronic Rhinosinusitis

Olfactory dysfunction is commonly associated with CRS, with hyposmia and anosmia rates of 45% and 22%,

respectively [28]. Normal olfactory function is not only important for protective purposes (eg, detecting spoiled foods or occupational hazards), but it is an important aspect of social, functional, and emotional well-being. As a result, olfactory dysfunction has been shown to reduce overall quality of life [29]. A recent study by Litvack et al. [28] evaluated HRQoL in patients with CRS and olfactory dysfunction. In contrast to earlier published studies, they failed to identify a reduction in HRQoL among patients with CRS and olfactory dysfunction. They hypothesized that the surveys used to measure HRQoL—CSS and RSDI—failed to capture the important aspects often associated with olfactory impairment, such as cooking, eating, and detecting safety hazards. Further research to determine whether CRS-related olfactory dysfunction impairs HRQoL is needed.

Fatigue, Sleep Disturbance, and Sexual Dysfunction in Chronic Rhinosinusitis

The persistent symptoms associated with CRS can impair vitality and impact other important functions, such as sleep and sexual activity. A 2010 study by Benninger et al. [30] demonstrated that patients with CRS had significantly reduced sleep and sexual activity scores on the RSDI. All patients failed medical therapy and underwent endoscopic sinus surgery, with significant improvements on both postoperative scores. Fatigue and fibromyalgia are commonly associated with CRS and recently have been demonstrated to improve following endoscopic sinus surgery for recalcitrant CRS [31, 32]. A recent systematic review and meta-analysis by Chester et al. [33••] confirmed the improvement of fatigue following endoscopic sinus surgery. Although most physicians do not specialize in managing chronic diseases of fatigue, pain, sleep, and sexual dysfunction, several recent studies have demonstrated that management of CRS can have beneficial effects on these comorbid illnesses and improve HRQoL.

Mucosal Status and Health-Related Quality of Life

Elevated sinonasal mucosal eosinophilia counts have been associated with diseases such as asthma, allergy, and aspirin intolerance, as well as higher endoscopy score and CT staging in patients with CRS [34]. A recent study by Soler et al. [35••] demonstrated that elevated mucosal eosinophilia at the time of surgery predicted lower HRQoL and general quality-of-life improvements after endoscopic sinus surgery.

A biofilm consists of a community of bacteria living within a protective extracellular matrix. Sinonasal mucosal biofilms have been consistently demonstrated in patients

with recalcitrant CRS [36]; however, their role in affecting postoperative outcomes is controversial [37]. A prospective study by Singhal et al. [38] demonstrated that 71% of patients with recalcitrant CRS had biofilms. The presence of biofilms predicted lower preoperative HRQoL and was associated with persistent postoperative symptoms at a mean 16-month follow-up [38]. A recent study by Hai et al. [39] demonstrated that patients with biofilm CRS received significant HRQoL improvements after endoscopic sinus surgery. However, the degree of biofilm reduction did not correlate with HRQoL improvement [39], making the correlation between biofilm and CRS clinical outcome controversial.

CT Staging of Chronic Rhinosinusitis and Health-Related Quality of Life

CT is a commonly used radiographic investigation during the evaluation of CRS. Typical CT findings of CRS include mucosal thickening, bony changes, and sinus opacification. Although CT can help confirm a diagnosis of CRS and is essential for surgical planning, two recent studies failed to demonstrate a correlation between HRQoL scores and CRS CT stage [23, 40]. Both studies demonstrated that patients with severe nasal polyposis and high CT stage CRS often have better HRQoL scores compared with patients without nasal polyps and lower CT stage.

Medical Management of Chronic Rhinosinusitis and Health-Related Quality of Life

The mainstay of CRS management is medical treatment, including nasal saline irrigations, topical or systemic steroids, systemic antibiotics, long-term macrolide therapy, leukotriene receptor antagonists, and antihistamines. Several primary studies and reviews have demonstrated improved HRQoL following medical management of CRS [41, 42]. However, there is a subset of patients with CRS who, despite best medical management, have persistent symptoms and reduced HRQoL. These patients with recalcitrant CRS are candidates for endoscopic sinus surgery.

Endoscopic Sinus Surgery and Chronic Rhinosinusitis Health-Related Quality of Life

With the inception of endoscopic techniques, powered instrumentation, and image guidance systems, in addition to advancements in our understanding of sinonasal physiology, sinus surgery has evolved into a safe and effective management option for patients with recalcitrant CRS [43].

There is a dearth of literature demonstrating the positive effects of endoscopic sinus surgery on HRQoL outcomes in patients with recalcitrant CRS [21, 44]. In 2010, Smith et al. [45] reported on a multi-institutional study evaluating the determinants of endoscopic sinus surgery outcomes. All patients noted HRQoL improvement following endoscopic sinus surgery. Furthermore, patients who underwent primary endoscopic sinus surgery were 2.1 times more likely to improve on the RSDI and 1.8 times more likely to improve on the CSS compared with patients undergoing revision sinus surgery.

Conclusions

Based on the review of the literature, we can conclude that CRS impairs HRQoL. The symptoms of chronic nasal congestion, facial pressure and pain, headache, hyposmia, and anosmia can significantly reduce HRQoL. Elevated rates of depression, anxiety, sleep disturbances, sexual dysfunction, and fatigue have been linked to CRS, and all function to lower HRQoL. Active medical and, when indicated, surgical treatment of CRS has been shown to significantly improve HRQoL.

Acknowledgment Dr. Smith has received grant support from the National Institutes of Health and the National Institute on Deafness and Other Communication Disorders.

Disclosure Dr. Smith has served as a consultant for Intersect. Dr. Rudmik reported no potential conflicts of interest relevant to this article.

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