

## THE USE OF SINO-NASAL OUTCOME TEST (SNOT) INSTRUMENT IN QUALITY IMPROVEMENT PROGRAMS FOR PATIENTS WITH CHRONIC RHINOSINUSITIS

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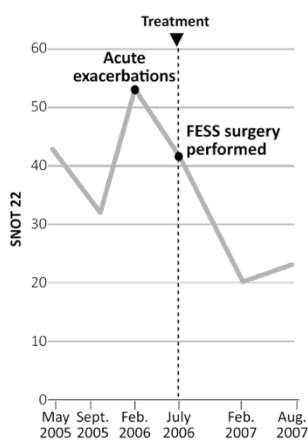
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**Introduction.** Chronic rhinosinusitis (CRS) is the second most frequent reported chronic health condition (after arthritis), affects up to 14% of the US population, and results in significant disease burden in patients. (Adams, Hendershot, and Marano 1996) The best approximation of CRS disease burden, defined as its impact on patient's functional status and disease-related quality of life, is to use patient-reported outcome measures (PROM). (Benninger et al. 2003; Morley and Sharp 2006) The most widely used PROM for CRS patients is the Sino-Nasal Outcome Test (SNOT) instrument. The SNOT instrument is a collection of several validated instruments (SNOT-16, SNOT-20, SNOT-22) defined by the number of included items. All of the SNOT instruments are derived from the Rhino-Sinusitis Outcome Measure (RSOM-31). (Piccirillo et al. 1995) The scores of each question range from 0 to 5, according to the severity of the symptom, with 5 being the worst. The score of the test is the sum of the question scores. Higher scores represent a lower health related-quality of life. In addition, patients identify the five items that affect them the most. Typically, the impact of treatment is assessed with the SNOT Absolute Change Score.

**SNOT-22.** The SNOT-22 questionnaire is the most frequently used SNOT instrument and is composed of 22 questions that encompass nasal, paranasal, psychological and sleep-associated symptoms. (Hopkins et al. 2009) Compared to its parent questionnaire (SNOT-20) (Piccirillo, Merritt, and Richards 2002), the SNOT-22 test includes two additional symptoms: nasal obstruction and reduced olfaction and taste. A difference of 8.9 or greater between two compared SNOT instruments is considered clinically significant. (Piccirillo, Merritt, and Richards 2002)

SNOT-22 has been successfully evaluated in patients with CRS and found to demonstrate robust internal consistency, reliability, responsiveness, and validity. (Browne et al. 2007; Hopkins et al. 2009)

**Exacerbation and Intervention**  
SNOT-22 scores over time show improvement after FESS surgery.



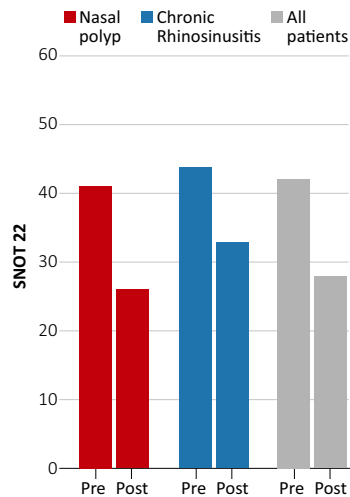
The SNOT-22 is the most appropriate and robust outcome tool for use in patients with CRS. This conclusion is based on a review of 15 available rhinosinusitis questionnaires where the authors concluded that SNOT-22 is reliable, valid, responsive to clinical change, and easy to use for both patients and administrators. (Morley and Sharp 2006) One of the biggest advantages of SNOT-22 over the other tests, is that, it combines questions specific to sinonasal disease with general health questions that can be assessed either alone or together, both in preoperative and postoperative situations. Another advantage of SNOT-22 is the added feature that allows patients to indicate which symptoms are most important to them. This added feature can help health care providers tailor treatment plans to address specific measures of patient quality of life. (Gill and Feinstein 1994; Piccirillo, Merritt, and Richards 2002)

In the Figure (left), referred to as a Snotogram, SNOT-22 scores are shown over time. The Snotogram graphically shows both acute exacerbations and response to interventions. (Hopkins et al. 2009) This information can be used to help personalize treatment and quantify individual patient outcomes.

SNOT-22 has been shown to be a strong predictor of outcomes after surgery. In a published study of 3,128 subjects, SNOT-22 was used to prospectively measure outcomes in patients undergoing a range of surgical procedures for CRS. (Hopkins et al. 2006) The study found significant reductions in

**Before and After Results**

All groups show improvement post-surgery with reduced SNOT-22 scores.



SNOT-22 scores post-sinonasal surgery, and these reductions were maintained across a five-year period.

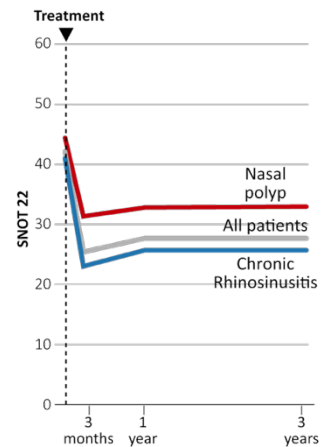
Indeed, as shown in the Figure (left), before and after surgery SNOT-22 scores were able to distinguish between distinct patient groups in this study, with patients with polyps reporting a higher improvement in SNOT-22 scores than patients without polyps. (Hopkins et al. 2006)

The SNOT-22 has also been shown to be a reliable outcome measure in septal surgery. (Buckland, Thomas, and Harries 2003) In addition, SNOT-22 has been validated to discern between disease-affected patient groups and those without rhinosinusitis. (Hopkins et al. 2006)

In the Figure (right), long-term improvement among two groups of sinusitis patients is presented as SNOT-22 scores. The Figure shows how repeated measures of SNOT-22 can help identify different patterns of response to treatment. (Hopkins 2009)

**Long-Term Improvement**

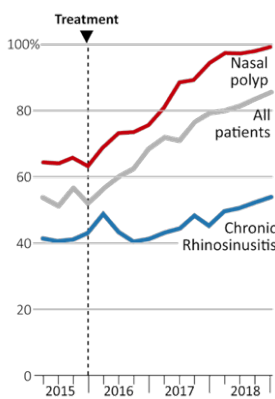
Nasal polyp patients tend to respond better to treatment.



In the Figure (below), long-term improvement among groups of sinusitis patients is presented as the percentage of patients who achieved a clinically meaningful change in SNOT-22 scores from baseline. As can be seen, nasal polyp patients were much more likely to achieve a clinically meaningful change than chronic rhinosinusitis patients without nasal polyps.

**A Meaningful Difference**

Percentage of patients with a clinically meaningful difference increases over time.



clinically meaningful change in SNOT-22 scores from baseline. As can be seen, nasal polyp patients were much more likely to achieve a clinically meaningful change than chronic rhinosinusitis patients without nasal polyps.

**Conclusion.** SNOT is easy for patients to use as either a paper/pencil application or electronically through email attachments or simple links to an organizational database. Completion of SNOT takes less than five minutes and can be done with limited staff and time. Completion of SNOT can facilitate the routine clinical visit to quickly inform the health care provider of the full range of problems associated with rhinosinusitis. The response to the questionnaire can guide subsequent treatment strategies. In addition, the

SNOT Change Score can be supplemented with other outcome measures to quantify effects over time and to provide a more complete description of the outcome. (Piccirillo, Merritt, and Richards 2002)

*The SNOT-16, SNOT-20, and SNOT-22, RSOM-31 are copyright protected by Washington University in St. Louis School of Medicine. SNOT-22 was developed from a modification of SNOT-20 and validated by National Comparative Audit of Surgery for Nasal Polyposis and Rhinosinusitis, Royal College of Surgeons of England with permission from Washington University in St. Louis School of Medicine. For more information, please contact Craig Weilbaeher PhD Business Development Associate, Washington University in St. Louis, Office of Technology Management, phone: (314)747-0685 e-mail: cweilbaeher@wustl.edu.*

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