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Different rhinologic diseases cause a similar multidimensional decrease in generic health-related quality of life

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ABSTRACT

Background: Previous studies illustrated that chronic rhinosinusitis and allergic rhinitis represent individual and socioeconomic burdens to a patient. However, few studies exist on the health-related quality of life (HRQoL) amongst other rhinologic patients. Our study investigated the generic HRQoL in different rhinologic diseases.

Methodology: Unselected adult rhinologic patients requiring special care at the Helsinki University Hospital were enrolled in this cross-sectional, questionnaire-based prospective study in February, May, August, and November 2014. Patients were mailed a medical history questionnaire and a generic 15-dimension (15D) HRQoL questionnaire. Diagnostic data were collected from electronic patient records following outpatient visits. Patient HRQoL scores were compared to an age- and sex-standardised general population sample obtained from a large national health examination survey.

Results: This study consisted of 337 rhinologic patients (mean age 50.2 years, 50.4% men). The mean 15D score amongst rhinologic patients (0.865) was both statistically significant and clinically poorer than that amongst the general population (0.929). Rhinologic patients fared poorly on most dimensions of the 15D instrument, particularly on sleep, discomfort and symptoms, breathing and vitality. Patients with obstructive sleep apnoea (OSA) were particularly affected. Yet, comparing the five most common rhinologic diagnostic groups revealed no significant differences in the mean 15D scores.

Conclusions: Rhinologic diseases, independent of the underlying cause, substantially and negatively affect patients' HRQoL. OSA decreases HRQoL in these patients, although patients without an OSA diagnosis still suffer from a clinically important impairment of HRQoL and poor quality sleep.

INTRODUCTION

The prevalence of chronic rhinosinusitis (CRS) has been estimated at 10.9% (range 6.9–27.1%) in Europe [1], while the mean prevalence of allergic rhinitis (AR) is 23% in European countries [2] and as high as 30% in Finland [3]. The adverse consequences of AR and CRS on health-related quality of life (HRQoL) and socioeconomic factors have recently been recognised [1, 2]. Both conditions have a demonstrated impact on the lower airways as well [4, 5]. A recent European Union parliament symposium set a target for a 30% reduction in the disease burden of allergy-related and chronic airway diseases within the next 10 years [6]. While for both CRS and AR a diminished HRQoL has been associated with poor quality sleep, their relationship with obstructive sleep apnoea (OSA) remains unclear [7, 8].

Only a few studies have assessed HRQoL in rhinologic patient groups other than CRS and AR. Non-allergic rhinitis (NAR) is as common as allergic rhinitis, but only one study previously evaluated HRQoL in NAR [9]. This recent study demonstrated a diminished HRQoL amongst NAR patients using a rhinitis-specific questionnaire. Other previous studies primarily evaluated select patients undergoing surgical procedures. For example, Hytönen et al. measured the pre- and post-operative HRQoL of septoplasty patients [10]. Croy et al. and Alakärppä et al. studied the pre- and post-operative HRQoL of septoplasty and functional endoscopic sinus-surgery (FESS) patients [11, 12]. Moreover, Naraghi et al. compared pre- and six-month post-operative HRQoL of septoplasty, FESS, septorhinoplasty, and septoplasty combined with turbinoplasty patients [13].

Furthermore, comparisons between HRQoL of rhinologic patients and patients with other diseases remain quite scarce. A recent study showed that the mean SF-6D (Short-Form Six-Dimension) utility score in CRS was lower than that observed in patients with Parkinson's disease or moderate chronic obstructive pulmonary disease [8]. The limitations that moderate to severe AR imposes on patients' social lives have emerged as comparable to those amongst patients suffering from moderate to severe asthma [2].

This study aimed to measure the generic HRQoL in unselected patients referred to a tertiary healthcare unit due to nasal or sinonasal symptoms and to determine whether some diagnostic groups are more affected than others.

PATIENTS AND METHODS

Ethical considerations

This study was approved by the Research Ethics Board of the Helsinki University Hospital (Dnro 128/13/03/02/2013).

Patients

This is a cross-sectional, questionnaire-based study designed to collect data on HRQoL amongst unselected patients with different rhinologic diseases or symptoms. The study was conducted in the Department of Otorhinolaryngology – Head and Neck Surgery at Helsinki University Hospital, a large referral department providing secondary and tertiary ear, nose, and throat healthcare services to over 1.6 million inhabitants (29% of the Finnish population) in southern Finlan[14]. After receiving referrals, all adult patients with a rhinologic disease or symptom requiring a special healthcare assessment were asked to participate in the study. Approximately 750 patients were mailed a medical history questionnaire and a generic HRQoL questionnaire. The patients returned the questionnaires by mail or during an outpatient visit. Written informed consent was obtained from all study subjects. Patients from emergency room visits were excluded. The study periods consisted of four months: February, May, August, and November 2014. In a small pilot study, data were also collected in August and November 2013. An asthma question ('Do you have physician-diagnosed asthma?') was first added to the questionnaires in mid- May 2014.

The general population 15-dimension (15D) data concerning general HRQoL in the catchment area of the hospital were obtained from a large, representative national health examination survey carried out in 2011 [15]. For comparison, individuals (n = 1329) falling within the same age range of patients were selected. This sample was weighted to reflect the age and sex distribution of the patients. Patient ICD-10 diagnosis data were collected from the electronic patient records following an outpatient visit(s). Earlier data concerning OSA and AR patient history were also recorded. The primary diagnosis was based on the disease needing active treatment. For example, patients scheduled for septoplasty due to nasal obstruction were categorised as having a septal deviation as the primary diagnosis (Table 1).

15D HRQoL questionnaire

The HRQoL questionnaire is a generic, standardised, validated, self-administered HRQoL instrument that can be used both as a profile and a single-index score [16]. The questionnaire consists of 15 dimensions (15D): moving, seeing, hearing, breathing, sleeping, eating, speech, excretion, normal activities, mental functioning, discomfort and symptoms, depression, distress, vitality, and sexual activity (Figure 1). For each dimension, the respondent must choose one of the five levels that best describes her/his state of health at that moment (best level = 1; poorest level = 5). Missing responses (provided there were no more than three) in across all dimensions can be predicted through linear regression using the respondent's age, sex, and responses to other dimensions as independent variables. The value of 15D is based on applying the multi-attribute utility theory. The single index score (15D score), representing the overall HRQoL on a scale from 0 to 1 scale (1 = full health, 0 = being dead) and the dimension level values reflecting the goodness of levels relative to no problems along a dimension (1) and to being dead (0) are calculated from the questionnaire using a set of population-based preference or utility weights. Mean dimension level values are used to create 15D profiles for groups. The generic, clinically important minimal difference (MID) in the 15D scores is ±0.015 [17].

Statistical analysis

Data analysis and statistics using the independent sample t-tests were performed by a professional statistician. The difference between the groups was considered statistically significant at $p < 0.05$.

RESULTS

A total of 349 patients returned questionnaires. Nine patients were excluded because of incomplete answers in the HRQoL questionnaires and three patients were excluded because they were under 18 years old. Thus, 337 patients were included in the analysis.

The response rate was recorded during a one-month period (November 2014), reaching 46.3%. There were no statistically significant age or sex differences between respondents (mean age 48.6 years, 47.2% male) and non-respondents (44.1 years, 46.0% male).

The mean age (±SD, range) for all respondents was 50.2 years (15.5, 18–85); 50.4% were men (Table 1). Among rhinologic patients, we found no difference in the mean 15D score between men and women (p = 0.549). However, we found a statistically significant sex difference in the mean (±SD) value for the dimension on sexual activity, where men fared poorer than women [0.808 (0.244) vs. 0.885 (0.184), p = 0.001].

The most frequent primary diagnosis was CRS (n = 121, 36%), followed by NAR (n = 62, 18%), AR (n = 44, 13%), and septal deviation (n = 35, 10%). Other common diagnoses included epistaxis (n = 10, 3%), anosmia (n = 10, 3%), headache (n = 6, 2%), and a deformity of the nose (n = 3, 1%). Figure 1 shows the mean 15D profiles for the five most common disease groups. There was neither a statistically significant difference in the mean 15D scores nor in the mean dimension level values between these rhinologic diagnostic groups. When comparing AR and NAR patients, only one dimension differed: patients with AR fared worse than NAR patients in discomfort and symptoms (0.672 vs. 0.757, p < 0.05).

We also found that 50% of patients never smoked, while 14.1% (n = 47) were current smokers. The mean 15D score between never smokers, those who quit smoking, and those who were current smokers did not differ statistically (p = 0.309)

Only 128 patients answered the asthma question. Amongst these, 25 patients (19.4 %) had asthma. The mean (±SD) 15D scores did not differ between asthmatic and non-asthmatic patients [0.865 (0.077) vs. 0.865 (0.112), p = 0.982].

The mean (±SD) 15D score of patients [0.865 (0.101)] was significantly lower than that of the age- and sex-standardised general population sample [0.929 (0.023), p < 0.001; Figure 2]. This difference was also clinically important. Compared to the general population, patients fared significantly poorer on all 15 dimensions except for moving.

Furthermore, we compared the mean 15D scores among rhinologic patients to the corresponding scores from patients in other disease groups previously studied (Figure 3) [18-21]. The mean (±SD) 15D score was lowest for depression [0.729 (0.120)], followed by Addison's disease [0.853 (0.122)],

rhinologic patients [0.865 (0.101)], head and neck cancer patients [0.872 (0.104)], and hysterectomy patients [0.907 (0.071)]. We should note, however, that these groups were not weighted to reflect the age and sex distribution of the rhinologic patients.

Diagnosed OSA was found in 10.5% of rhinologic patients. We found that OSA patients scored poorer than the general population on all other dimensions except for seeing, eating, and speech (Figure 4). In addition, rhinologic patients without an OSA diagnosis scored poorer than the general population on all other dimensions except for moving (Figure 5). Patients who had a rhinologic disease and OSA also scored clinically and significantly poorer than rhinologic patients without an OSA diagnosis [mean (±SD) 15D scores were 0.816 (0.103) and 0.871 (0.099), respectively, $p = 0.002$; Figures 4 and 5].

DISCUSSION

Synopsis of key findings

This study demonstrates that HRQoL amongst rhinologic patients is substantially poorer compared to the age- and sex-standardised general population. We found that rhinologic patients performed significantly poorer on nearly all 15 dimensions of the generic 15D questionnaire. In particular, sleep, discomfort and symptoms, vitality, and breathing affected HRQoL amongst these patients. The most frequent primary rhinologic diagnoses in our clinic were CRS, with and without polyposis, followed by rhinitis, AR and NAR, and septal deviation. We found no statistically significant HRQoL differences between rhinologic groups. When compared to other disease groups, rhinologic patients fared poorer than, for example, patients entering treatment for head and neck cancer. Finally, OSA in rhinologic patients decreased the HRQoL, but patients without an OSA diagnosis still fared more poorly than the general population.

Strengths of the study

The strength of this study is that these rhinologic patients were compared to a large age- and sex-standardised sample of the general population living in the same area as the patients. To our knowledge, no similar comparison and investigation of unselected rhinologic patients appears in the literature. Furthermore, the total number of patients in our study was higher than in most previously published HRQoL studies [10-13]. In addition, the advantage of the 15D instrument used in this study is that it has also been used to study patients with several other health conditions from the same

metropolitan area [18-21]. This allows a comparison of our rhinologic patients to patients affected by other diseases.

Limitations of the study

Despite the strengths of this study, we should also note several limitations. First, the response rate was estimated during a one-month period, rather than amongst all patients invited to participate. The estimate for the response rate, 46%, is fairly low, although consistent with the average from a recent multicentre study [1]. Furthermore, the number of patients recruited to this study was high, and we found no statistically significant age or sex differences between respondents and non-respondents. In addition, we systematically examined physician-diagnosed asthma amongst only a portion of patients. Yet, its presence did not appear to decrease HRQoL. The diagnosis of obstructive sleep apnoea was based on the medical records of patients who visited our clinic. An OSA diagnosis was based on sleep studies interpreted by physicians at different levels and from various specialties from within the healthcare system. We did not, however, collect data on the number of patients tested for OSA.

Comparison with other studies

Nasal obstruction is a typical symptom in all rhinologic diseases and may be a common factor explaining the impaired sleep dimension in the 15D scores and, consequently, substantial deterioration in HRQoL amongst our patients. However, it is important to note that the aetiology and pathophysiology of poor quality sleep are diverse.

Nasal problems, particularly, nasal obstruction, disturb sleep both subjectively (as perceived poor quality sleep) and objectively (as observed in sleep studies) [22]. Nasal obstruction can cause snoring and mild sleep-disordered breathing [23] and may predispose individuals to OSA, as shown in other causes of upper airway obstruction [24, 25]. OSA results in excessive daytime sleepiness and is also known to considerably worsen general HRQoL amongst patients along important domains (i.e., sleeping, elimination, depression, vitality, and sexual activity) [26]. We compared patients with different rhinologic diseases with and without OSA to the general population and observed that an OSA diagnosis clearly explained part of the poor HRQoL amongst our patients. In this study with a cohort of unselected rhinologic patients evaluated using a generic measurement, OSA negatively affected sleep and several other dimensions. A clinically important impairment to HRQoL along the

same dimensions was also found in rhinologic patients without an OSA diagnosis. The treatment of nasal disease in non-OSA patients has been shown to improve sleep quality [7].

The effect of NAR on quality of life was first studied only recently [9]. HRQoL in NAR patients was at least equally impaired compared to AR when investigated using a rhinitis-specific questionnaire. Our results revealed a similar decrease in general HRQoL accompanying NAR and AR, equalling that in CRS, thus illustrating the detrimental effect of NAR on patient health.

An **unexpected** finding in our study was that HRQoL did not differ between different rhinologic groups. It appears that structural and inflammatory diseases categorised by the primary diagnosis had a similar detrimental effect on HRQoL. Croy et al. investigated the preoperative HRQoL amongst septoplasty, sinus surgery, and sinus and septal surgery groups. According to their results, sinus patients had a significantly lower HRQoL measured using the generic SF-36 instrument, compared to septum patients irrespective of age and sex [11]. In another study, a comparison of the preoperative HRQoL amongst four rhinologic surgical groups also showed differences between these groups [13]. By contrast, a recent Finnish study investigating septoplasty and FESS patients preoperatively reported results comparable to our study. HRQoL was similarly and significantly impaired between the two patient groups when compared with the control group [12]. In the present study, we evaluated unselected rhinologic patients, rather than only patients awaiting surgical treatment. Therefore, our data are new and our findings represent HRQoL amongst rhinological clinic patients referred for special care.

Another new finding in our study was the poorer HRQoL amongst rhinologic patients compared to patients with other chronic diseases, such as those with head and neck cancer or uterine disorders [20, 21]. Although other patient groups were studied at different times and the comparison was not standardised for age and sex, the difference appears real. That is, our patients were in the same age range as the hysterectomy patients and approximately ten years younger than the head and neck cancer patients. Consequently, the known diminishing effect of ageing on HRQoL cannot explain this difference. A plausible explanation lies in the symptoms of rhinologic disease, such as poor quality sleep, considerably affecting overall patient well-being more than the less disabling symptoms that, for instance, are associated with head and neck cancer during the pretreatment stage.

Clinical applicability of the study

This study of unselected rhinologic patients emphasises the assessment of sleep quality and signs of sleep apnoea in rhinologic practices in order to improve generic HRQoL. This approach to evaluating all patients with nasal problems may aid understanding the disease mechanisms and suggests that HRQoL is equally impaired in most common nasal diseases. Such findings may have implications for the allocation of treatment in rhinological clinics.

Conclusions

This cross-sectional, questionnaire-based study shows that HRQoL of patients is substantially impaired regardless of the different rhinologic diseases when compared to the age- and sex-standardised general population. In general, a lower HRQoL in NAR similar to AR and CRS was found. Moreover, OSA impairs HRQoL in rhinologic patients, but HRQoL is also low in patients without an OSA diagnosis. In clinical practice, we should pay more attention to improving the quality of sleep amongst rhinologic patients.

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LEGENDS FOR ILLUSTRATIONS

Figure 1

The mean 15D profiles for five common rhinologic disease groups standardised for age: chronic rhinosinusitis without nasal polyps (CRSsNP, n = 73), non-allergic rhinitis (NAR, n = 62), chronic rhinosinusitis with nasal polyps (CRSwNP, n = 48), allergic rhinitis (AR, n = 44), and septal deviation (n = 35).

Figure 2

The mean 15D profile of rhinologic patients (n = 337) compared to the general population standardised for age and sex (n = 1329). The mean 15D score for rhinologic patients is 0.865, while that for the population is 0.929; $p < 0.001$. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Figure 3

The mean 15D scores for rhinologic patients compared with patients with depression (n = 89, mean age 40 years, 41% men), Addison's disease (n = 107, mean age 50 years, 20% men), head and neck cancer (n = 214, mean age 63 years, 66% men), and hysterectomy (n = 337, mean age 53 years).

Figure 4

The mean 15D profile for rhinologic patients with diagnosed obstructive sleep apnoea (with OSA, n = 33) compared to that of the age- and sex-standardised general population. The mean 15D score for rhinologic patients with OSA is 0.816 while that for the population is 0.928; $p < 0.001$. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Figure 5

The mean 15D profile for rhinologic patients without diagnosed obstructive sleep apnoea (without OSA, n = 304) compared to that of the age- and sex-standardised general population. The mean 15D score for rhinologic patients without OSA is 0.871, while that for the population is 0.929; $p < 0.001$. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

LEGENDS FOR TABLES

Table 1

Patient characteristics, primary diagnoses, and health-related quality of life in rhinologic patients.

REFERENCES

1. Hastan D, Fokkens WJ, Bachert C, Newson RB, Bislimovska J, Bockelbrink A, et al. Chronic rhinosinusitis in Europe--an underestimated disease. A GA(2)LEN study. Allergy. 2011;66(9):1216-23.

2. Bousquet J, Van Cauwenberge P, Khaltaev N, Aria Workshop G, World Health O. Allergic rhinitis and its impact on asthma. J Allergy Clin Immunol. 2001;108(5 Suppl):S147-334.

3. Haahtela T, von Hertzen L, Makela M, Hannuksela M, Grp APW. Finnish Allergy Programme 2008-2018 - time to act and change the course. Allergy. 2008;63(6):634-45.

4. Ciprandi G, Vizzaccaro A, Cirillo I, Tosca M, Massolo A, Passalacqua G. Nasal eosinophils display the best correlation with symptoms, pulmonary function and inflammation in allergic rhinitis. Int Arch Allergy Immunol. 2005;136(3):266-72.

5. Kariya S, Okano M, Higaki T, Noyama Y, Haruna T, Ishihara H, et al. Chronic rhinosinusitis patients have decreased lung function. Int Forum Allergy Rhinol. 2014;4(10):828-33.

6. Muraro A, Fokkens WJ, Pietikainen S, Borrelli D, Agache I, Bousquet J, et al. European symposium on precision medicine in allergy and airways diseases: report of the European Union parliament symposium (October 14, 2015). Rhinology. 2015;53(4):303-7.

7. Alt JA, DeConde AS, Mace JC, Steele TO, Orlandi RR, Smith TL. Quality of Life in Patients With Chronic Rhinosinusitis and Sleep Dysfunction Undergoing Endoscopic Sinus Surgery: A Pilot Investigation of Comorbid Obstructive Sleep Apnea. JAMA otolaryngology-- head & neck surgery. 2015;141(10):873-81.

8. DeConde AS, Soler ZM. Chronic rhinosinusitis: Epidemiology and burden of disease. Am J Rhinol Allergy. 2016;30(2):134-9.

9. Segboer CL, Terreehorst I, Gevorgyan A, Hellings PW, van Drunen CM, Fokkens WJ. Quality of life is significantly impaired in non-allergic rhinitis patients. Allergy. 2017.

10. Hytonen ML, Lilja M, Makitie AA, Sintonen H, Roine RP. Does septoplasty enhance the quality of life in patients? EurArchOtorhinolaryngol. 2012;269(12):2497-503.

11. Croy I, Hummel T, Pade A, Pade J. Quality of life following nasal surgery. Laryngoscope. 2010;120(4):826-31.

12. Alakarppa AI, Koskenkorva TJ, Koivunen PT, Alho OP. Quality of life before and after sinonasal surgery: a population-based matched cohort study. European Archives of Oto-Rhino-Laryngology. 2017;274(2):795-802.

13. Naraghi M, Amirzargar B, Meysamie A. Quality of life comparison in common rhinologic surgeries. Allergy Rhinol (Providence). 2012;3(1):e1-7.

14. Finnish Local and Regional Authorities. Hospital Districts 2018.

https://www.kuntaliitto.fi/sites/default/files/media/file/Ervat_Sairaanhoitopiirit2017_0.pdf

15. Koskinen S, Lundqvist A. Health, functional capacity and welfare in Finland in 2011. Report 68/2012. Helsinki: National Institute for Health and Welfare (THL); 2012. Contract No.: Generic.

16. Sintonen H. The 15D instrument of health-related quality of life: properties and applications. Ann Med. 2001;33(5):328-36.

17. Alanne S, Roine RP, Rasanen P, Vainiola T, Sintonen H. Estimating the minimum important change in the 15D scores. Qual Life Res. 2015;24(3):599-606.

18. Suominen K, Karlsson H, Rissanen A, Valtonen HM, Rasanen P, Sintonen H, et al. Perceived burden of illness in patients entering for treatment in a university hospital--is the threshold to secondary care higher for patients with depression than for those with somatic disorders? Eur Psychiatry. 2011;26(7):441-5.

19. Kluger N, Matikainen N, Sintonen H, Ranki A, Roine RP, Schalin-Jantti C. Impaired health-related quality of life in Addison's disease--impact of replacement therapy, comorbidities and socio-economic factors. Clin Endocrinol (Oxf). 2014;81(4):511-8.

20. Aro K, Back L, Loimu V, Saarilahti K, Rogers S, Sintonen H, et al. Trends in the 15D health-related quality of life over the first year following diagnosis of head and neck cancer. Eur Arch Otorhinolaryngol. 2016;273(8):2141-50.

21. Taipale K, Leminen A, Rasanen P, Heikkila A, Tapper AM, Sintonen H, et al. Costs and health-related quality of life effects of hysterectomy in patients with benign uterine disorders. Acta Obstet Gynecol Scand. 2009;88(12):1402-10.

22. Olsen KD, Kern EB, Westbrook PR. Sleep and breathing disturbance secondary to nasal obstruction. Otolaryngol Head Neck Surg. 1981;89(5):804-10.

23. Georgalas C. The role of the nose in snoring and obstructive sleep apnoea: an update. Eur Arch Otorhinolaryngol. 2011;268(9):1365-73.

24. Holmlund T, Franklin KA, Levring Jaghagen E, Lindkvist M, Larsson T, Sahlin C, et al. Tonsillectomy in adults with obstructive sleep apnea. Laryngoscope. 2016;126(12):2859-62.

25. Ayappa I, Rapoport DM. The upper airway in sleep: physiology of the pharynx. Sleep Med Rev. 2003;7(1):9-33.

26. Lacasse Y, Godbout C, Series F. Health-related quality of life in obstructive sleep apnoea. Eur Respir J. 2002;19(3):499-503.

	N (%)	Mean age	Mean 15D score (SD)
All patients	337	50.2	0.867 (0.101)
Age groups			
< 35 yrs	63 (19)		0.877
35-55 yrs	146 (43)		0.868
> 55 yrs	128 (38)		0.857
Gender			
Male	170 (50.4)	51	0.869 (0.104)
Female	167 (49.6)	50	0.862 (0.862)
Smoking			
No	166 (49)	50	0.872 (0.096)
Yes	47 (14)	41	0.847 (0.108)
Quit	121 (36)	54	0.866 (0.103)
Sleep apnea			
No	304 (90)	50	0.871 (0.099)
Yes	33 (10)	56	0.816 (0.103)
Asthma			
No	103 (80.6)		0.865 (0.112)
Yes	25 (19.4)		0.865 (0.077)
Main disease groups			
Chronic rhinosinusitis without nasal polyposis	73 (22)	50	0.856
Chronic rhinosinusitis with nasal polyposis	48 (14)	56	0.876
Septal deviation	35 (10)	43	0.875
Rhinitis	106 (31)		
Non-allergic rhinitis	62 (18)	47	0.879
Allergic rhinitis	44 (13)	50	0.868
Others	76 (23)		0.851