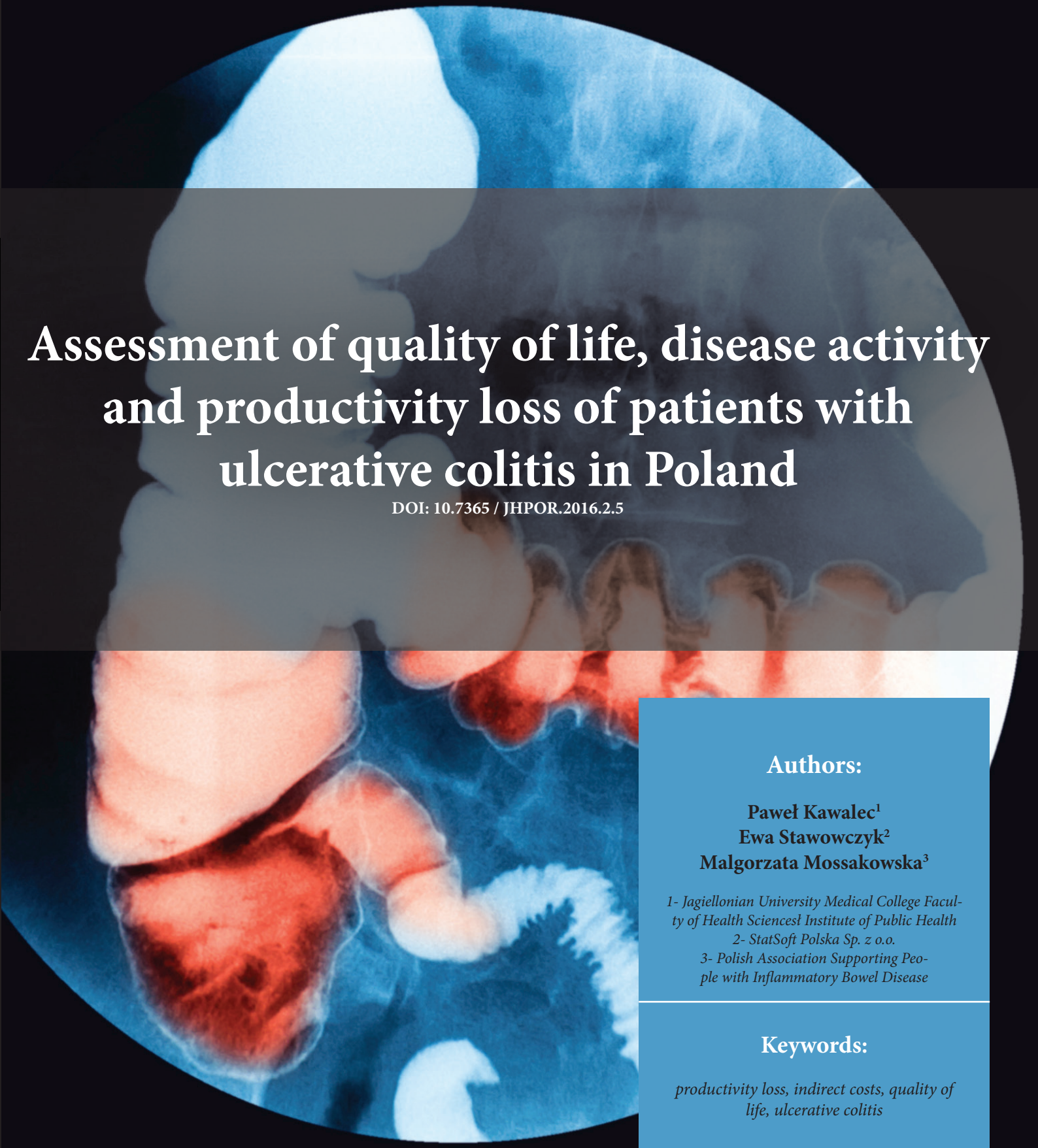

Assessment of quality of life, disease activity and productivity loss of patients with ulcerative colitis in Poland

DOI: 10.7365 / JHPOR.2016.2.5

Authors:

Paweł Kawalec[1]
Ewa Stawowczyk[2]
Malgorzata Mossakowska[3]

1- Jagiellonian University Medical College Faculty of Health Sciencesł Institute of Public Health
2- StatSoft Polska Sp. z o.o.
3- Polish Association Supporting People with Inflammatory Bowel Disease

Keywords:

productivity loss, indirect costs, quality of life, ulcerative colitis

Abstract

Purpose: The aim of the study was to assess the relationship between the disease activity and both indirect costs and health-related quality of life among ulcerative colitis (UC) patients in Poland.

Methods: A questionnaire-based, self-report survey was conducted using th (P-SCCAI) to assess disease activity, and the Work Productivity and Activity Impairment Questionnaire (WPAI) to assess productivity loss. The quality of life was presented as utility calculated using the EQ-5D-3L questionnaire. Additionally, the reduction of usual activities, other than paid work and the need of assistance were assessed. Indirect costs were assessed with the Human Capital Approach and were expressed in euros (€). Correlations were presented using the Spearman's coefficient, the between-group difference was assessed with Mann-Whitney U-test and Pearson c2 test.

Results: 305 full questionnaires were collected. Indirect cost due to absenteeism and presenteeism per year per working patient with disease in remission was €2,559 (95%CI:1,283-3,835) and due to informal care was €10.38 (95%CI:0-31.20). The corresponding values for patients with active disease were €5,605 (95%CI:4,744-6,466) and €645.36 (95%CI:333.77-956.96). The between-group differences in above values was statistically significant ($p<0.05$). The difference in utility values between patients with disease in remission (0.934, 95%CI:0.919-0.949) and patients with active disease (0.826, 95% CI:0.807-0.845) was statistically significant.

Conclusions: The statistically significant difference was identified in productivity loss and health related quality of life among patients with active disease and patients with disease in remission. The significant difference was also observed in the average reduction of usual activities and the need for assistance in performing usual activities.

Introduction

Ulcerative colitis (UC) is an idiopathic inflammatory bowel disorder characterized by an inflammatory reaction involving the colonic mucosa.[1, 2] The clinical course is unpredictable and marked by alternating periods of exacerbation and remission, which may occur spontaneously, in response to treatment changes or intercurrent illnesses.[3, 4] The prevalence of UC in Europe ranges from 4.9 to 505 per 100,000 people, while in North America it ranges from 37.5 to 248.6 per 100,000 peopl.[5]

People affected with UC require expensive, lifelong treatment, which generates great direct costs to the public payer. Additionally, it has a significant impact on the quality of life, especially in the active state of the disease. UC is assumed to impose a considerable medical and societal burden, especially when disease is active.

Indirect costs or productivity losses are the labour earnings that are forgone as a result of an adverse health outcome, i.e. illness, death, side effects, or time spend on treatment. Indirect costs consist of two major components: absenteeism and presenteeism. Absenteeism refers to the number of days on sick leave, periods of unemployment caused by a disease, and early leaving of the labour market due to sickness. Presenteeism refers to a situation when a sick person is present at work but his or her own productivity is lower than average due to the disease.[6] There are two main methods to calculate the indirect costs: the Human Capital Approach, and the Friction Cost Approach. The Human Capital Approach (HCA) converts the value of work which will not be done in the future due to disease into the real costs from a social perspective. The HCA can also take into account the loss of productivity associated with early retirement or early death of the patient. The HCA is based on the assumption that work not done due to disease is a decrease of human capital and is a burden to society. The Friction Cost Approach (FCA) takes into account productivity losses until a new person is employed as a substitute for the sick one. The FCA is based on the assumption that society can replace a sick person in order to prevent productivity losses. This method requires an access to detailed economic data and is more complicated than HCA, which is probably the reason why the vast majority of studies use the HCA during calculation of indirect costs.[6] Indirect costs calculated using FCA are generally much lower than those obtained with HCA.

To the best of our knowledge, there are no studies that would investigate the impact of UC severity on the productivity loss, reduction of usual activities due to the disease, other than paid work, the need of assistance in performing usual activities, and quality of life.

Therefore, we conducted a non-interventional cross sectional study to assess the relationship between the disease activity and the quality of life, informal care, indirect costs of patients with UC.

Objective

We aimed to collect data on disease activity, health-related quality of life and productivity loss of UC patients in Poland; the primary objective was to assess a

burden of productivity loss due to UC in Polish setting and secondary was to assess the impact of disease activity on quality of life and indirect costs in analysed patients.

Materials and Methods

Study design

A questionnaire-based, self-report survey was conducted using the Patient Simple Clinical Colitis Activity Index (P-SCCAI) to assess disease activity, and the Work Productivity and Activity Impairment Questionnaire (WPAI) to evaluate a productivity loss. The inclusion criteria included age of 18 years or above and the proven diagnosis of UC. All calculations were carried out for general population of patients with UC and also for subgroups of patients with an active disease and with a disease in remission. The differences of obtained values in those two groups were also assessed.

Questionnaire

The survey was conducted from October 2015 to the end of March 2016. The questionnaires were distributed through the Polish Association for the Support of People with Inflammatory Bowel Disease "J-elita". The information about the study has been provided by the e-mails, announcement in the magazines published by the Association, at the Association's forum, web portals and at events organised by the Association. The participants of the study could have send a scanned version of questionnaire to the Association, deposit it on the web server or submit at the events. The study was performed in a group of 305 patients with a diagnosis of UC, which were recruited by the different ways. The first part of the questionnaire regarded the comorbidities, prescribed treatment for UC, general characteristics of patients (age, sex, date of disease onset, place of living, working status) and disease activity. We used a patient-based self-translated version of standard questionnaire (SCCAI) to assess the disease activity which is defined as the P-SCCAI; patients referred to disease symptoms within the previous week. The P-SCCAI consists of the following domains: bowel frequency during the day and during the night, urgency of defecation, blood in stools, general well-being, and a number of defined extracolonic manifestations of UC; due to P-SCCAI score participants were categorize in two subgroups: with inactive disease/remission (P-SCCAI score < 5) and with active disease (P-SCCAI score ≥ 5).[7]

The health-related quality of life of the patients with the EuroQol questionnaire 5 dimensions 3 level version (EQ-5D-3L) was assessed.[8] In order to calculate the utility weights, the responses to the EQ-5D-3L were evaluated with the Polish tariffs.[9] We have also included questions on loss of productivity at paid work (presenteeism, absenteeism). To assess the productivity loss the Work Productivity and Activity Impairment (WPAI) questionnaire was used, which is a standard analytic tool commonly used to assess absenteeism and presenteeism in a number of diseases.[10] Considering experts suggestions, additional questions were added to WPAI questionnaire to include also the part-time employees, patients on rehabilitation benefit or other professionally inactive patients (on illness benefit, unable to work, still studying, inactive from other reason); we used these additional questions as an adjunctive part of the whole survey, without aggregation with the part based on the original WPAI questionnaire. The cost of presenteeism was calculated with inclusion of cost of productivity loss at paid work of €8.51 per hour, the percentage reduction of productivity at work and number of hours at work.

The last part of our questionnaire concerned the informal care and financial support due to UC. The influence of the disease on the usual activities, other than paid work (scale from 0 – 'no impact' to 10 – 'the greatest impact') and the need of assistance in performing usual activities (type of assistance, number of hours) were assessed.

Resource evaluation

The Human Capital Approach (HCA) was used to estimate indirect costs due to absenteeism and presenteeism. A macroeconomic indicator for Poland was considered – gross domestic product (GDP) per working hour of a person with professional activity in Poland in the year 2015. The correction factor of 0.65 was used, which is the conventional mean value of output elasticity of labour according to the Cobb-Douglas function of production.[11,12] The final unit cost of productivity loss at paid work per hour was estimated to be €8.51 (the exchange rate valid for 2015 was €1 = 4.18 PLN). The informal care included the time inputs of relatives and others without payment. The unit cost was estimated to be €5.27, which is an average income per hour of work in 2015.

Statistical analysis

Continuous variables were summarised using means and standard deviations (SDs) or 95% confidence intervals (CI), while nominal variables were summarised using frequencies. Mann-Whitney U test for continuous variables and Pearson c2 test for categorical variables were used to compare the subgroups – patients with active disease and patients with disease in remission.

Relationship between the disease activity and both the indirect costs and utility weights was assessed with Spearman r correlation coefficient.

Despite, no statistically significant differences between the characteristics of patients with active disease and patients

with disease in remission were identified, we adjusted the results for probable confounders, i.e.: age, sex, age at diagnosis, and comorbidities. The analysis of residuals was conducted to check the assumptions of classic least squares method. The normal distribution of residuals was assessed on a basis of scatterplots for each variable: total indirect cost, indirect cost due to absenteeism, indirect cost due to presenteeism, utility weights. The results of Durbin-Watson test proved that there is no autocorrelation between residuals. The assumptions of homoscedasticity were also met on a basis of scatterplots for predicted values against raw residuals. Taking above into account, the multiple regression was used to make the adjustment for confounders. The grouping variable was disease activity. Data for all patients were used when average and adjusted utility weight was calculated; data for working patients were included for indirect costs' calculations.

The relationship between utility weights and disease activity (P-SCCAI score) was presented on scatterplot. Absenteeism was presented as an annualized number of days missed from work, while presenteeism was expressed as a percentage of standard work efficiency achieved due to UC. Statistical analyses were performed using STATISTICA®. All calculations were based on exchange rate valid for 2015, which was €1 = 4.18 PLN.

Results

General characteristics

We obtained 305 completed questionnaires from patients fulfilling the inclusion criteria aged from 18 to 71 years (average age was 32.95 years, SD: 10.33; median value was 31.00 years).

Data on employment status was collected for all 305 patients, of which 214 (70.16%) were currently working. The general characteristics of working patients were presented in Table 1. The other persons do not work from following reasons (participants could have chosen more than one reason): still studying (15%, n = 47), certificate of disability (11%, n = 33), disability pension (3%, n = 8), pension (3%, n = 8), unable to work (2%, n = 7), rehabilitation benefit (2%, n = 6), illness benefit (1%, n = 4). Among all working patients, 183 were on full-time contract (Table 2).

Of 214 working patients, 200 (93.5%) provided data on disease activity with the P-SCCAI questionnaire. The mean P-SCCAI score was 8.37 (SD: 5.40, range: 0-24). Among 200 working patients with UC, 26.5% had remission according to P-SCCAI score.

The general characteristics of patients with active disease and patients with disease in remission were similar, no statistically significant differences were found (Table 1).

Absenteeism and presenteeism

The average annual number of days off work due to the illness among working patients was 29.87 (95% CI: 21.25 – 38.38; range: 0 – 312). The average reduction of work productivity due to absenteeism was 11.74% (95% CI: 8.42 – 15.05%, range: 0 – 100%). Mean cost of absenteeism was €1,947 (95% CI: 1,376-2,519) per year per patient with any occupational activity.

Average productivity loss at paid work of working patient was 23.56% (95% CI: 20.10 – 27.02%; range: 0 – 100%), which represents the extent of presenteeism. Data were presented for 208 working patients with UC; six working patients did not provide data on productivity loss at paid work. Mean cost of presenteeism was €2,862 (95% CI: 2,413-3,311) per year per patient with any occupational activity. Total average indirect cost per year per working patient was €4,826 (95% CI: 4,118-5,534).

The productivity loss was moderately but significantly ($p<0.05$) correlated with P-SCCAI score, with Spearman's coefficient of 0.3610 for absenteeism, 0.3744 for presenteeism and 0.4320 for both (Figure 1, Figure 2, and Figure 3, respectively).

Analysis was also performed in subgroups of patients with active disease and with disease in remission.

The average annual number of days off work due to the illness among working patients with disease in remission was 13.87 (95% CI: 0.37-27.36; range: 0 – 252). The average productivity loss due to absenteeism was 5.50% (95% CI: 0.15 – 10.86%, range: 0 – 100%). Mean cost of absenteeism was €934 (95% CI: 20 – 1,848) per year per patient with any occupational activity.

Average productivity loss at paid work of working patient with disease in remission was 13.14% (95% CI: 7.14 – 19.13%; range: 0 – 80%). Mean cost of presenteeism was €1,606 (95% CI: 742-2,471) per year per patient with any occupational activity. Total average indirect cost per year per working patient was €2,559 (95% CI: 1,283-3,835) and adjusted total indirect cost was €2,604.14 (95% CI: 935.61-4,272.67).

The average annual number of days off work due to the illness among working patients with active disease was 35.60 (95% CI: 24.58 – 46.62; range: 0 – 312). The average productivity loss due to absenteeism was 14.0% (95% CI: 9.69 – 18.24%; range: 0 – 100%). Mean cost of absenteeism was €2,319.82 (95% CI: 1,578-3,061) per year per patient with any occupational activity.

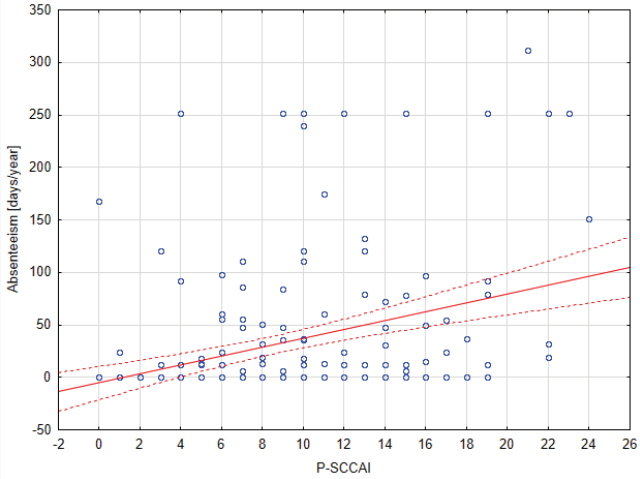

Figure 1. Correlation between the P-SCCAI and absenteeism.

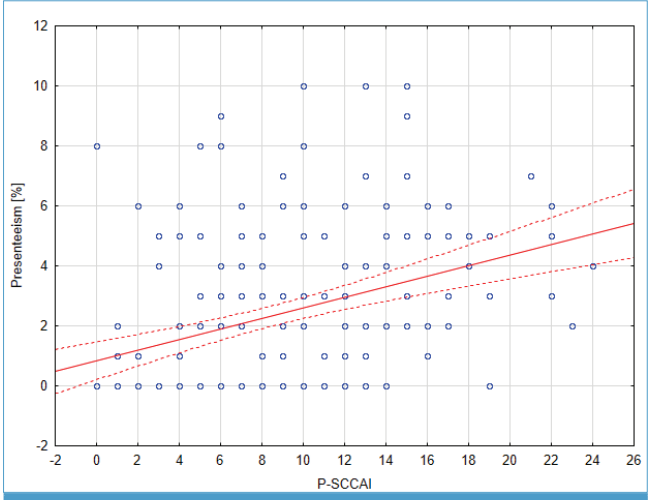

Figure 2. Correlation between the P-SCCAI and presenteeism.

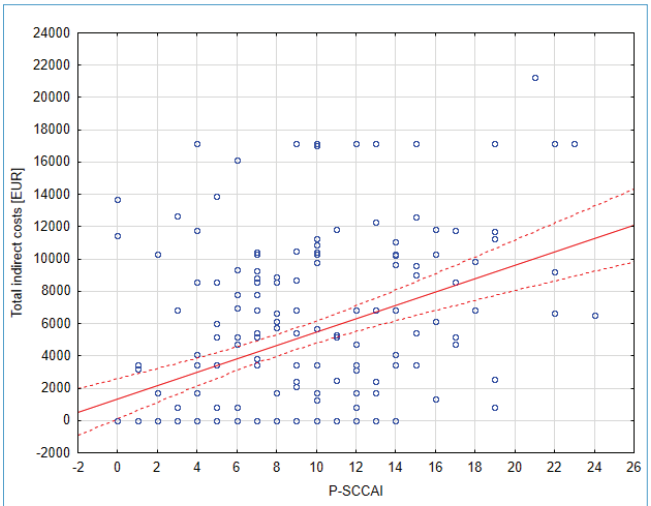

Figure 3. Correlation between the P-SCCAI and total indirect costs.

Average productivity loss at paid work of working patient with active disease was 27.29% (95% CI: 23.01 – 31.57%; range: 0 – 100%). Mean cost of presenteeism was €3,270 (95% CI: 2,726-3,814) per year per patient with any occupational activity. Total average indirect cost per year per working patient was €5,605 (95% CI: 4,744-6,466) and adjusted total indirect cost was €5,434.81 (95% CI: 4,263.95-6,605.67).

Mann–Whitney U test indicated the significant difference ($p<0.05$) in average value of all above parameters between two analysed groups: patient with active disease and patients with disease in remission.

Informal care

More than 96% (294 out of 305) patients indicated the influence of the disease on the usual activities, other than paid work. The average reduction of usual activities due to the disease was 26.97% (95% CI: 24.05 – 29.90%). Around 21% of working patients required assistance in performing usual activities, which is supported by their relatives in 93% of cases. Patients receive the assistance in performing usual activities for on average 9.48 (95% CI: 6.02 – 12.93) hours per week. The mean cost of productivity loss due to informal care was estimated to be €511.41 (95% CI: 283.35-739.48) per year.

Similar analyses were performed for two subgroups: working patients with active disease and working patients with disease in remission.

204 out of 212 patients with active disease (96%) indicated the influence of the disease on the usual activities, other than paid work. The average reduction of usual activities due to the disease was 32.11% (SD: 25.63%). Around 27% of working patients with active disease required assistance in performing usual activities, which was supported by their relatives in 93% of cases. Patients with active disease receive the assistance in performing usual activities for on average 9.08 (95% CI: 5.36 – 12.80) hours per week. The mean cost of productivity loss due to informal care among working patients with active disease was estimated to be €645.36 (95% CI: 333.77-956.96) per year and adjusted indirect cost due to informal care was €638.40 (95% CI: 263.23-1,013.56).

Almost all (71 out of 72) patients with disease in remission reported the influence of the disease on usual activities, other than paid work. The average reduction of usual activities due to the disease was 10.85% (95% CI: 7.08 – 14.61%). Only 1 out of 53 working patient with disease in remission (2%) required assistance in performing usual activities, which was supported by its relatives, for 2 hours per week. The mean cost of productivity loss due to informal care among working patients with disease in remission was estimated to be €10.38 (95% CI: 0-31.20) per year.

Table 1. General characteristics of working patients with UC included in the study.

Characteristic		All patients	Active disease	Remission	P-value[a]
Age [years]		33.76 (SD: 7.83), range: 21-59	33.62 (SD: 7.90), range: 21-59	33.91 (SD: 7.69), range: 24-52	0.793
Male		90 (42.9%)	58 (40.3%)	24 (46.2%)	0.462
Disease onset [years]		27.49 (SD: 7.94), range:3-58	26.82 (SD: 7.74), range: 3-58	28.55 (SD: 8.01), range: 8-51	0.130
Place of living	City < 100,000 citizens	58 (27.4%)	44 (30.1%)	10 (18.9%)	0.114
	City ≥ 100,000 citizens	130 (61.3%)	86 (58.9%)	36 (67.9%)	0.248
	village	24 (11.3%)	16 (11.0%)	7 (13.2%)	0.661
Comorbidities		73 (34.1%)	51 (34.7%)	14 (26.4%)	0.270

a between patients with active disease and patients with disease in remission

Table 2. Working status of study participants.

Category	Number of persons	Percentage[a]
Paid work	214	70.2%
Certificate of disability	68	22.3%
Still studying	59	19.3%
Other reason for not working	18	5.9%
Illness benefit	10	3.3%
Disability pension	10	3.3%
Unable to work	10	3.3%
Pension	8	2.6%
Rehabilitation benefit	6	2.0%

a out of 305 participants, it does not sum up to 100% as participants could have chosen more than one status

Table 3. The results of multiple regression (weights b) – adjustment for confounders.

Variable	Cost of absenteeism	Cost of presenteeism	Total indirect costs	Cost of informal care
Age	54,28	-30,121	26,114	54,515
Sex	-1129,44	477,813	-669,575	-350,929
Disease activity	1124,61	1693,201	2830,672	499,073
Age at diagnosis	-76,03	8,653	-66,603	-55,900
Comorbidities	1164,44	154,840	1294,789	352,138

Mann–Whitney U test indicated the significant difference ($p<0.05$) in the average reduction of usual activities due to the disease and the need for assistance in performing usual activities between two analysed groups: patients with active disease and patients with disease in remission.

Health-related quality of life

Data on the quality of life were reported by almost all respondents (302 out of 305; 99.02%). Utility indexes among study participants were correlated with P-SCCAI score (Spearman's coefficient of -0.609, $p<0.05$). An average utility index in all patients was estimated to be 0.852 (95% CI: 0.837-0.867), and 0.867 (95% CI: 0.850-0.885) for working patients. Patients with active disease had significantly lower utility indexes (0.826, 95% CI: 0.807-0.845, adjusted value 0.845, 95% CI: 0.821-0.869) compared to patients with disease in remission (0.934, 95% CI: 0.919-0.949, adjusted value 0.947, 95% CI: 0.913-0.981). The corresponding values for working patients with active disease and with disease in remission were: 0.839, 95% CI: 0.816-0.863 (adjusted value: 0.854, 95% CI: 0.825-0.882) and 0.943, 95% CI: 0.926-0.960 (adjusted value: 0.949, 95% CI: 0.910-0.989). The difference in utility values between above groups was statistically significant based on Mann–Whitney U test ($p<0.05$).

Discussion

This study examined the relationship between disease activity and both indirect costs and quality of life of patients with UC. Within the analysis two subgroups were assessed: patients with active disease and patients with disease in remission. Additionally, in our work, the reduction of usual activities due to the disease, other than paid work and the need of assistance in performing usual activities were assessed. It seems that patients with active disease have lower quality of life and generate higher indirect costs but there has been no evidence to confirm this in Poland. We observed that the productivity loss was moderately but significantly correlated with P-SCCAI score. The same relationship was observed for utility weights and P-SCCAI score. Our study proved there is a statistically significant difference in utility weights and indirect costs between patients with active disease compared with patients with disease in remission. The study also revealed the influence of the disease on the usual activities, other than paid work.

There have been no previous attempts to assess the relationship between the disease activity and both indirect costs and quality of life of patients with UC in Poland. Therefore, it seems necessary to assess the quality of life and productivity loss among Polish patients with active disease and among patients with disease in remission and to compare obtained results.

Our project involved the assessment of the indirect costs of both absenteeism and presenteeism, based on our own survey questionnaire. Additionally it assessed the reduction of usual activities, other than paid work and quality of life of patients with UC. The assessment was made for the whole group of working patients and also for two subgroups: patients with active disease and patients with disease in remission. The methodology used and the results obtained provide novel data that fill the information gap.

In order to compare our results with findings of other investigators, we performed a review of medical databases. We discovered some studies considering the association between the disease activity and quality of life or indirect costs but there are no such studies for Poland.

The study by Casellas et al.[13], which included UC patients, showed that Spearman's correlation coefficients between health-related quality of life measure with IBDQ (Inflammatory Bowel Disease Questionnaire) and clinical and colonoscopic indices were statistically significant ($p<0.01$) and equal from -0.67 to -0.61 and from -0.70 to -0.67, respectively, depending on the questionnaire – full form IBDQ-36 or short form IBDQ-9. The results obtained in our analysis showed a slightly lower correlation of -0.55, but the quality of life was measured in different way – using EQ-5D questionnaire, as well as disease activity, which was measured with P-SCCAI questionnaire. Gibson et al.[14] calculated the mean EQ-5D-5L scores among UC patients, which were greater for patients in remission (0.81, SD: 0.18) than for patients with active disease (0.72, SD: 0.19, $p<0.001$). The same dependence was observed in our analysis. Patients in remission and with mild disease had much less impairment than patients with moderate/severe disease for every type of work and activity impairment (i.e. work time missed, overall work impairment, impairment while working, activity impairment). In study by Mandel et al.[15], among employed IBD (UC and CD) patients, absenteeism and presenteeism was reported in 25.9% and 60.3% patients, respectively, leading to a 28% loss of work productivity and a 32% activity loss. It was significantly different according to IBD activity assessed with WPAI according to partial Mayo score in case of UC. The significant difference in productivity loss between patients with active disease and patient with disease in remission was also observed in our analysis. Among 226 UC patients, good correlation was also observed in Taleban et al.[16] between the Mayo endoscopic score and health-related quality of life measured with Short Inflammatory Bowel Disease Questionnaire (SIBDQ; $r = -0.56$), and disease activity measured with Simple Clinical Colitis Activity Index (SCCAI; $r = 0.55$).

A review of medical databases was also carried out to identify the studies which concern the indirect costs of UC, regardless of the disease activity. We discovered no such studies for Poland. However, a systematic review performed by Kawalec and Malinowski was identified[17] indicating that only 18 studies on the indirect costs of inflammatory bowel diseases were conducted worldwide: six studies on Crohn's disease, only one for UC and 11 on inflammatory bowel diseases in general. Only abstract was available for study concerning UC[18], where only privately insured U.S. employees were included. Total annual indirect costs were calculated to be 4,087 USD (2010 values) and it included lost wages from time away from work due to disability and medically-related absenteeism.

Our study was the first one to assess the relationship between the disease activity measured with P-SCCAI with quality of life measured with EQ-5D and indirect costs, but similar assessments were made taking into account different measures of health related quality of life and activity of the disease. All of identified studies confirm the results of our analysis. Health related quality of life and productivity loss are significantly different among patients with active disease and patients with disease in remission. Additionally, our study assessed the influence of the

disease on the usual activities, other than paid work and the need of assistance in performing usual activities in two subgroups: patients with active disease and patients with disease in remission. No other similar assessments were found.

In our analysis, we did not calculate the indirect costs resulted from disability pension as we did not have detailed information about the reason of disability pension – if it resulted from UC or from other disease. The sample size of the study was fairly good but there is possible sampling bias. The sample could not fully represent the whole UC population, as we cooperated with "J-elita" Association of IBD (Inflammatory Bowel Diseases) patients in Poland; Association has about 1 650 members, which constitutes just about 10-15% of all patients with the condition in Poland. The project of our study enables the inclusion of patients which are treated in all kinds of medical centres and also those who are not currently treated. There were also no limitations concerned the activity of the disease, and place of living. In the analysed group we recorded a high percentage of individuals who live in big cities (with 100,000 citizens or more) and a small percentage of village citizens, which might have influenced labour market activity and might have affected our results. Data on disease activity were self-reported by the patients, which may be another limitation.

Conclusions:

The statistically significant difference was identified in productivity loss and health related quality of life among patients with active disease and patients with disease in remission. The significant difference was also observed in the average reduction of usual activities and the need for assistance in performing usual activities.

Acknowledgments:

The study was funded and performed according to scientific grant (Jagiellonian University Medical College; statutory project Drug Management Department, Institute of Public Health JU MC). The authors would like to thank the Polish Association Supporting People with Inflammatory Bowel Disease "J-elita" (j-elita.org.pl) for the help in collecting individual patients' data.

PK and ES conceived the conception and design of the study, including protocol and questionnaires preparation. MM provided critical input and revised the questionnaires. PK, ES and MM contributed in acquisition of data. PK and ES carried out the data management, statistical analysis, interpretation of data and prepared the draft of the manuscript. All authors contributed to editing the manuscript and approved the final version submitted for publication. PK is the guarantor.

References

1. Baumgart DC, Sandborn WJ. Inflammatory bowel disease: clinical aspects and established and evolving therapies. Lancet 2007; 369: 1641–57.
2. Feagan BG, Reinisch W, Rutgeerts P, et al. The Effects of Infliximab Therapy on Health-Related Quality of Life in Ulcerative Colitis Patients. Am J Gastroenterol 2007; 102: 794–802.
3. Kornbluth A, Sachar DB, The Practice Parameters Committee of the American College of Gastroenterology. Ulcerative Colitis Practice Guidelines in Adults: American College of Gastroenterology, Practice Parameters Committee. Am J Gastroenterol 2010; 105: 501–23.
4. Ordás I, Eckmann L, Talamini M, et al. Ulcerative colitis. Lancet 2012; 380: 1606–19.
5. 5. Tontini GE, Vecchi M, Pastorelli L, et al. Differential diagnosis in inflammatory bowel disease colitis: State of the art and future perspectives. World J Gastroenterol 2015; 21: 21–46.
6. Krol M, Brouwer W. How to Estimate Productivity Costs in Economic Evaluations. PharmacoEconomics 2014; 32: 335–44.
7. Evertsz' FB, Nieuwkerk PT, Stokkers PCF, et al. The Patient Simple Clinical Colitis Activity Index (P-SCCAI) can detect ulcerative colitis (UC) disease activity in remission: A comparison of the P-SCCAI with clinician-based SCCAI and biological markers. J Crohns Colitis 2013; 7: 890–900.
8. Krol M, Brouwer W. How to Estimate Productivity

Costs in Economic Evaluations. PharmacoEconomics 2014; 32: 335–44.

9. Golicki D, Jakubczyk M, Niewada M, Wrona W, Busschbach JJ. Valuation of EQ-5D health states in Poland: first TTO based social value set in Central and Eastern Europe. Value Health. 2010; 13:289-97.
10. Reilly MC, Zbrozek AS, Dukes EM. The validity and reproducibility of a work productivity and activity impairment instrument. PharmacoEconomics 1993; 4: 353–65.
11. Central Statistical Office of Poland, http://stat.gov.pl/en/ Last Access: January 2016.
12. Havik K, Mc Morrow K, Orlandi F, et al. The production function methodology for calculating potential growth rates and output gaps. Economic Papers 535, November 2014, http://ec.europa.eu/economy_finance/publications/economic_paper/2014/pdf/ecp535_en.pdf.
13. Casellas F, Alcalá MJ, Prieto L, Miró JR, Malagelada JR. Assessment of the influence of disease activity on the quality of life of patients with inflammatory bowel disease using a short questionnaire. Am J Gastroenterol. 2004.
14. Gibson PR, Vaizey C, Black CM, et al. Relationship between disease severity and quality of life and assessment of health care utilization and cost for ulcerative colitis in Australia: a cross-sectional, observational study. J Crohns Colitis. 2014 Jul;8(7):598-606.
15. Mandel MD, Bálint A, Lovász BD, et al. Work disability and productivity loss in patients with inflammatory bowel diseases in Hungary in the era of biologics. Eur J Health Econ. 2014 May;15 Suppl 1:S121-8.
16. Taleban S, Stewart KO, Li DK, et al. Clinical Activity and Quality of Life Indices Are Valid Across Ulcerative Colitis But Not Crohn's Disease Phenotypes. Dig Dis Sci. 2016;61(9):2627-35.
17. Kawalec P, Malinowski KP. Indirect health costs in ulcerative colitis and Crohn's disease: a systematic review and meta-analysis. Expert Rev Pharmacoecon Outcomes Res 2015; 15: 253–66.
18. Cohen R, Rizzo J, Yang M, et al. Direct and Indirect Utilization and Costs Associated with Ulcerative Colitis. Am J Gastroenterol 2012; 107: S608–95.