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CONCISE COMMUNICATION

Correlation between Dermatology Life Quality Index (DLQI) scores and Work Limitations Questionnaire (WLQ) allows the calculation of percent work productivity loss in patients with psoriasis

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Abstract Data on indirect costs are vital for cost-effectiveness studies from a societal perspective. In contrast to quality of life, information on productivity loss is rarely collected in psoriasis trials. We aimed to identify a model to deduce indirect costs (presenteeism and absenteeism) of psoriasis from the Dermatologic Life Quality Index (DLQI) of affected patients to facilitate health economic evaluations for psoriasis. We undertook a cross-sectional mapping study including 201 patients with physician-diagnosed psoriasis and investigated the relationship between quality of life (DLQI) and productivity loss (Work Limitations Questionnaire, WLQ—using the "output demands" subscale) using linear bootstrap regression analysis to set up an equation model allowing the calculation of percent work productivity loss per DLQI unit increase. DLQI and WLQ scores were significantly correlated ($r = 0.47$; $p < 0.0001$) The final equation model suggests a 0.545 and 0.560 % decrease in productivity due to presenteeism and absenteeism per DLQI unit increase, with y-intercepts at 1.654 and 0.536, respectively. In the absence of data on indirect cost, work productivity loss due to psoriasis can be estimated from DLQI scores using the equations, $Y = 0.545 \times$ DLQI score $+ 1.654$ for presenteeism (%) and $Y = 0.560 \times$ DLQI score $+ 0.536$ for absenteeism (%).

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Introduction

Psoriasis is frequent, has substantial adverse impact on quality of life and constitutes a high burden for patients, their families and society [6, 7, 13]. The different conventional and biologic treatments approved for psoriasis substantially differ in both effectiveness and cost [14]. In this situation, cost-effectiveness analyses are important to guide health decision makers. Cost-effectiveness studies from the societal perspective, however, are currently impossible due to the lack of comparable data on indirect cost before and after treatment with the different psoriasis treatments. We previously reported that work productivity loss is related to quality of life impairment in psoriasis patients, whereas clinical severity of psoriasis was not as closely related to work productivity loss suggesting that work productivity loss may be deducted from the degree of quality of life impairment [11].

The collection of data on quality of life under treatment with different anti-psoriatic therapies has become standard in clinical trials with the Dermatology Life Quality Index (DLQI) being the most frequently used measurement instrument [4, 14, 16].

We aimed to identify a model to deduce indirect costs (presenteeism and absenteeism) of psoriasis from the DLQI of affected patients to facilitate health economic evaluations for psoriasis.

Methods

We conducted a web-based cross-sectional study including 201 currently employed patients, with 96 % having reported to suffer from physician-diagnosed psoriasis. Details of the study methods have been reported previously [11, 12]. The study primarily aimed to analyse the complex relationship between clinical signs, quality of life, psoriasis symptoms, depressive symptom, and work productivity loss due to absenteeism and presenteeism (i.e. lost productivity while on the job). The study was approved by the responsible ethical committee.

The presented analysis covers the mapping of the DLQI versus the WLQ. Dermatology-specific quality of life was assessed by means of the DLQI. The DLQI is a widely used instrument in psoriasis trials consisting of 10 questions relating to symptoms, feelings, daily activities, leisure, work, personal relationships and the effects of treatment on daily life within the past week. Scores can range from 0 to 30, with higher scores representing worse quality of life [4].

Health-related work productivity loss (absenteeism and presenteeism) was assessed through the Work Limitation Questionnaire (WLQ). Test reliability and construct validity of the WLQ have been validated by Lerner et al. [10]. The WLQ assesses the four domains time demands, physical demands, output demands and mental-interpersonal demands. For the domain output demands, the ability to precisely predict actual work productivity loss has been shown in a work-site study that compared scores of a self-administered Work Limitations Questionnaire (WLQ) with objective employee-level work productivity data provided by the employer. Data from the WLQ-domain output demands and measured actual work productivity (presenteeism) are strongly related: for every 10 % increase in on-the-job work limitations reported on the WLQ-domain output demands, objective employee-level work productivity declines by approximately 4.5 % [8, 9]. The output demands scale has five items concerning reduced work quantity and quality, and items of the output domain are scored from 0 % (no limitations) to 100 % (limited all the time) with higher limitations translating into lower work productivity [8, 9]. We investigated the relationship between quality of life (DLQI) and productivity loss (WLQ output demands scale) using linear bootstrap regression analysis to set up an equation model allowing the calculation of percent work productivity loss (absenteeism and presenteeism) per DLQI unit increase. In the resulting linear equation model, $Y = mx + b$, where "Y" is the percent work productivity loss, "m" the beta-coefficient from the regression model, "x" the DLQI score, and "b" the y-intercept. Analyses were performed with STATA 12.1.

Results

Mean age of the study population was 43 years (range 18–65 years). Sixty-one percent of participants were female. Nineteen percent currently received systemic treatment for psoriasis, 59 % only topical treatment, and 22 % reported no current treatment for psoriasis. By means of the self-administered PASI [2, 3], 50 % of patients were classified as having mild, and 50 % as having moderate-to-severe psoriasis [15]. The mean (±standard deviation; SD) DLQI score was 10.8 (±7.1; range 3–17). The mean WLQ output demands score was 16.8 (±20.1) reflecting a mean productivity loss due to presenteeism of 7.6 % (±9.1 %). On average, participants additionally missed 6.6 % (±15.4 %) of their working time within the past 4 weeks because of health problems (absenteeism). DLQI scores were significantly correlated with presenteeism ($r = 0.47$; $p < 0.0001$) and to a lesser degree also with absenteeism ($r = 0.29$; $p < 0.001$) allowing us to estimate the percent work productivity loss from the DLQI scores as intended.

The results of the final bootstrap regression analyses and example calculations of work productivity loss from DLQI scores are summarized in Table 1. The final equation model suggests a 0.545 and 0.560 % decrease in productivity due to presenteeism and absenteeism per DLQI unit increase, with y-intercepts at 1.654 and 0.536, respectively. We propose to use the following equations to estimate work productivity loss from DLQI scores in patients with psoriasis:

- % Presenteeism = 0.545 × DLQI score + 1.654.
- % Absenteeism = 0.560 × DLQI score + 0.536.

Discussion

Our study extends previous research by suggesting a method to estimate work productivity loss in patients with psoriasis from DLQI scores. In contrast to indirect cost and work productivity loss, the DLQI is assessed in the majority of trials on interventions for psoriasis [14]. Therefore, our study offers an option to conduct cost-effectiveness analyses of interventions for psoriasis from the societal perspective (for which information on indirect cost is essential [5]) despite the current lack of actual data on work productivity loss before and after treatment with the existing treatment options.

Cost-effectiveness analyses are essential for healthcare decision makers, because various different treatment options for moderate-to-severe psoriasis with varying direct cost and varying effectiveness are currently approved [14]. Effects of antipsoriatic treatment on work productivity can

Table 1 Results of bootstrap regression analyses: indirect cost estimated by DLQI scores

	Work productivity loss (%) per DLQI unit	Example: DLQI = 10
% Presenteeism	Beta-coefficient: 0.545 (0.377–0.716)	% Presenteeism = 10 × 0.545 + 1.654 = 7.104 %
	Y-intercept: 1.654 (−0.189–3.801)	
% Absenteeism	Beta-coefficient: 0.560 (0.229–0.982)	% Absenteeism = 10 × 0.560 + 0.536 = 6.136 %
	Y-intercept: 0.536 (−3.177–4.473)	

be estimated by including the difference in DLQI before and after treatment into the equations presented in Table 1.

We believe our study is generalizable to the majority of adult patients with psoriasis, as approximately half of the study sample represented mild and half of the sample moderate-to-severe psoriasis. However, as we did not include patients with DLQI values above 17, generalizability on patients with very strong adverse impact of psoriasis on quality of life may not be given. The actual degree of productivity loss in an individual patient may be different than estimated from our model. Because our model offers an estimate of work productivity loss based on this single study and because the methods used in this mapping study may introduce bias [1], we recommend to conduct a replication study, preferably in a longitudinal study design to verify the correlation of DLQ and WLQ over time, and to undertake sensitivity analyses, when applying our equation model for health-economic analyses. For sensitivity analyses, we recommend using the upper and lower values of the 95 % confidence intervals as presented in Table 1, i.e. 0.377 and 0.716 percent work productivity loss due to presenteeism per DLQI unit change, and 0.229–0.982 percent work productivity loss due to absenteeism per DLQI unit change. However, this may lead to a very wide variation of results, particularly for absenteeism, again underlining the recommendation for a replication study.

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