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Wittevrongel, Valère; Reneman, Michiel F

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Valère Wittevrongel & Michiel F. Reneman

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RESEARCH PAPER

Capturing case complexity: is clinician selected dose of vocational rehabilitation related to questionnaire results?

Valère Wittevrongel[a] and Michiel F. Reneman[b]

[a]Vocational Rehabilitation Center Winnock, Groningen, The Netherlands; [b]Department of Rehabilitation Medicine, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands

ABSTRACT

Background: To establish an optimum dosage interdisciplinary vocational rehabilitation, it is important to be able to reliably and validly assess case complexity. Assessment of case complexity is currently clinician based because no validated means to assess case complexity is presently available. Indices assumed to associate with case complexity can contribute to the choice of dosage. The objective of this study was to explore the extent in which results of questionnaires were associated with the choice of treatment dosage in vocational rehabilitation.

Methods: Design: cross-sectional study of observational data. The study population consisted of workers on part-time or full-time sick leave due to chronic multifactorial problems. Thousand eighty-nine patients who were referred to a privately owned organization with outpatient vocational rehabilitation centers in the Netherlands between July 2016 and March 2017 were allocated to one of the three programs based on case complexity as determined by clinicians based on clinical interview and questionnaires.

Results: Questionnaires accounted for 13% of the variance in the total group, 13% in patients with chronic musculoskeletal pain ($n = 662$) and 29% in patients with chronic fatigue ($n = 235$).

Conclusion: The results of the questionnaires contribute little in the assessment of case complexity and dose recommendation.

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KEYWORDS
Vocational rehabilitation; case complexity; treatment dose; chronic multifactorial complaints; sick leave

➤ IMPLICATIONS FOR REHABILITATION

- Assessment of case complexity of patients with chronic multifactorial complaints and disability is complex.
- The results of this study suggest that case complexity and choice of treatment dose is slightly explained by questionnaire results. It is largely determined on heuristics developed by knowledge and experience of clinicians.
- No reliable and validated means to assess case complexity is presently available in the field of rehabilitation and optimum treatment dose cannot be determined transparently.
- Routinely collected clinical data of baseline characteristics, process measures and results are a valuable source that can be used to answer research questions.

Introduction

Cognitive and behavioral factors play a perpetuating role in sickness absence due to chronic multifactorial physical and mental complaints and may thus be important for the design of vocational rehabilitation (VR) [1–3]. Interdisciplinary VR is effective in reducing complaints and improving functioning, including return to work [4–9]. However, there is a great heterogeneity in content and dosage, and optimal dosage of VR is unknown [10–11]. Optimal dosage is assumed to be related to case complexity [12]. Case complexity is defined as the extent to which combinations of factors influence functioning, and it may comprise of both a number of factors and their relative weights. Complex cases might need different treatments and different dosages compared with low complexity cases [12]. To investigate the relationship between case complexity and treatment dosage, it is important to be able to reliably and validly assess case complexity. Because many interacting factors are assumed to influence chronic multifactorial complaints and disability, assessment of case complexity is inherently complex. To our knowledge, no validated means to assess case complexity is presently available in this field.

Assessment of case complexity of patients with chronic multifactorial musculoskeletal pain is currently clinician based, not transparent and with low reliability [12]. Questionnaires that measures indices assumed to associate with complexity in patients with chronic multifactorial complaints may be used by clinicians to assist their clinical reasoning. In case of VR, indices that can be used in patients who are on sick leave are: duration and percentage of sick leave [13–14], psychosocial risk factors for prolonged disability and prolonged sick leave [15–17], health related quality of life (HRQL) [18–19] and disability associated with pain [20–21]. It is unknown to what extend these indices are used to determine case complexity. In this retrospective study, we aimed to test the contribution of the results of questionnaires to the final dose recommendation of VR, as made by clinicians.

The main objective of this study was to explore the extent in which duration and percentage of sick leave, psychosocial risk

CONTACT Valère Wittevrongel research@winnock.nl Vocational Rehabilitation Center Winnock, Winnock Groningen, Friesestraatweg 214H, 9743 AD Groningen, The Netherlands

factors for prolonged disability and prolonged sick leave, HRQL and disability associated with pain were associated with choice of treatment dosage in a VR program. A secondary objective was to explore if the contribution of the results of questionnaires to the final dose recommendation of VR differs between the largest diagnostics groups (patients with chronic musculoskeletal pain and patients with chronic fatigue).

Methods

Setting

Data were retrieved from patients who were referred to Winnock by an occupational physician in the framework of legislation or by an insurance company. Winnock is a privately owned organization with outpatient VR centers in 10 cities in the Netherlands. Interdisciplinary rehabilitation teams consisting of rehabilitation physicians, psychologists, physical therapists and occupational specialists aim to guide patients back to normal functioning and return to work.

Design

A cross-sectional study within care as usual. Reporting was done following the STROBE recommendations.

Procedure

Data were retrieved from patients who were referred to one of the centers between July 2016 and March 2017. The set of questionnaires was sent by mail to the patients a few days before baseline assessment. Duration of sick leave and the amount of sick leave were administered during the interview with the occupational specialist.

Clinical procedures

At baseline an interdisciplinary team, consisting of a rehabilitation physician, a psychologist and an occupational specialist, assesses case complexity and decide on the dose of the VR, presumably based on case complexity. Case complexity was assessed with questionnaires and an interview with members of the baseline team. The clinicians implicitly have operationally defined case complexity on the complexity of health problems, the degree of disturbance in functioning in work and the changeability of the patient. Questionnaire results were provided to assist clinicians in their clinical reasoning. The complexity of health problems, the degree of disturbance in functioning in work and the changeability of the patient are rated mild, moderate or severe. On the basis of these results, the interdisciplinary team determines the VR dosage, which can be a short, intermediate or long program, consisting of an intensive outpatient group-based interdisciplinary program of respectively 1, 2 or 3 weeks, 30 h a week (outcome variable). The interdisciplinary program consists of physical exercise and cognitive behavioral therapy, used to reappraise their situation and to perform more appropriate cognitive and behavioral coping responses. A subset of physical activity that is planned, structured and repetitive, is also used in a cognitive behavioral therapy perspective and is viewed as a coping style influencing mental and physical health by changing one's attitudes toward their complaints. Graded activity aims to improve functioning, even if the underlying complaint is still present. Physical and mental training sessions are provided for the participants during the full time weeks. It is assumed that complex cases will need more time to reappraise their situation and to perform more appropriate cognitive and behavioral coping responses. The whole VR program consist of four phases: (1). interdisciplinary baseline assessment; (2). intensive outpatient interdisciplinary VR phase; (3). return to work phase and (4). follow-up phase. The duration of the whole program is 12 months.

Study sample

Inclusion criteria: age between 18 and 65 years, employed and a contract for at least 12 h a week, sufficient knowledge of the Dutch language, and at baseline assigned to one of the three programs. The population consisted of patients with diverse chronic complaints: chronic musculoskeletal pain ($n = 662$), concretely: lower back pain and pain in pelvic region, fibromyalgia, whiplash associated disorder, pain in upper extremities, pain in lower extremities and neck pain; chronic fatigue ($n = 235$); residual symptoms of diseases/sequelae ($n = 85$, e.g., post heart-failure, CVA); psychological complaints ($n = 81$, psychological strain, anxiety disorders) and headache and migraine ($n = 35$). Exclusion criteria were: physical complaints that first need further evaluation, severe psychopathology (psychotic symptoms, suicidal behavior, borderline), drug addiction, complex labor-dispute.

Independent variables

Sick leave duration in weeks: time (weeks) between partial or total absence from work and interdisciplinary baseline measurement. Sick leave percentage: percentage of contract hours that a patient was absent from work.

The Work Reintegration Questionnaire (WRQ) is based upon the model wherein the emotional distress and subjective disability are hypothesized to directly prolong disability. The aim of the WRQ is screening of psychosocial risk factors for prolonged disability and the prediction of the time of sick leave of employees that are disabled from work. It consists of 72 items that are distributed over eight scales: depression, fear-avoidance beliefs, job strain, low job satisfaction, job autonomy, self-doubt, perfectionism and stressful home situation. The range of the scales differ, higher scores being worse [15–17].

The RAND-36 is a generic instrument to survey HRQL [18,19]. It is composed of 36 questions and standardized response choices, organized into eight multi-item scales: mental health (psychological distress and well-being), social functioning (limitations in social activities because of physical or emotional problems), role emotional (limitations in usual role activities because of emotional problems), general health (general health perceptions), role physical (limitations in usual role activities because of physical health problems), bodily pain, vitality (energy and fatigue), physical functioning (limitations in physical activities because of health problems). All raw scale scores are linearly converted to a 0–100 scale, with higher scores indicating higher levels of functioning or well-being. Normative data are available [18].

The Pain Disability Index (PDI) is an inventory that asks the respondent to rate the degree to which pain interferes with functioning in seven areas: family and domestic responsibilities, recreation, social activity, occupation, sexual behavior, self-care, and life-support activity [20]. The questionnaire is constructed on a 0–10 numerical rating scale and can be considered as an interval scale in which 0 means "no disability" and 10 "maximum disability" for all seven areas. The PDI is translated into Dutch and validated [21].

Table 1. Demographic and clinical variables of the 3 VR dose groups.

	Short ($n = 30$; 2.7%)	Middle ($n = 771$; 70.2%)	Long ($n = 297$; 27%)
Gender male: *n* (%)	10 (33.3)	297 (38.5)	104 (35)
Age: mean (sd)	44.2 (11.3)	44.7 (10.6)	44.9 (10.2)
Complaints: *n* (%)			
Lower back/pelvic	3 (10.0)	145 (18.8)	43 (14.5)
Chronic fatigue	7 (23.3)	154 (20.0)	74 (24.9)
Fibromyalgia	5 (16.7)	90 (11.7)	37 (12.5)
WAD	0	77 (10.0)	36 (12.1)
Upper extremities	4 (13.3)	84 (10.9)	23 (7.7)
Lower extremities	3 (10.0)	60 (7.8)	8 (2.7)
Neck	2 (6.7)	31 (4.0)	11 (3.7)
Sequelae	3 (10.0)	54 (7.0)	28 (9.5)
Psychological	3 (10.0)	55 (7.1)	23 (7.7)
Head/migraine	0	21 (2.7)	14 (4.7)
Sick leave duration: mean weeks (sd)	12.3 (12.5)	15.9 (13.9)	21.2 (13.3)
Frequency: mean % (sd)	38.1 (38.7)	49.5 (40.9)	66.0 (37.7)
WRQ: mean (sd)			
Depression [range: 13–52]	27.3 (6.9)	30.7 (8.0)	33.5 (8.0)
Fear-avoidance [range: 10–40]	26.7 (6.3)	29.7 (6.7)	32.4 (5.9)
Job strain [range: 7–28]	15.2 (4.5)	15.6 (5.4)	16.7 (5.6)
Job autonomy [range: 6–24]	14.9 (5.0)	16.7 (4.9)	16.1 (4.6)
Job satisfaction [range: 12–48]	16.8 (8.3)	26.1 (7.9)	26.0 (7.6)
Self-doubt [range: 11–44]	23.1 (5.8)	23.5 (6.6)	24.9 (6.9)
Perfectionism [range: 12–48]	32.7 (6.5)	35.4 (6.5)	36.2 (6.2)
Stressful home [range: 7–28]	11.9 (4.9)	13.3 (5.2)	15.0 (5.5)
RAND-36: mean (sd)			
Mental health	62.0 (21.1)	55.4 (18.8)	50.7 (19.1)
Social functioning	61.2 (21.5)	43.0 (24.8)	32.8 (21.6)
Role emotional	45.7 (21.8)	38.2 (25.3)	32.7 (25.3)
General health	54.9 (20.1)	49.4 (17.9)	43.1 (17.4)
Role physical	41.6 (18.7)	27.1 (19.9)	21.0 (17.7)
Pain	52.8 (26.4)	47.3 (26.3)	46.0 (26.8)
Vitality	44.4 (15.7)	36.4 (16.2)	30.4 (15.8)
Physical functioning	76.0 (22.4)	64.5 (21.9)	60.3 (22.3)
PDI: mean (sd)			
Family/Home	3.9 (2.3)	5.5 (2.1)	5.9 (1.9)
Recreation	4.3 (2.6)	5.9 (2.2)	6.4 (2.0)
Social activity	3.9 (2.5)	5.6 (2.2)	6.2 (2.0)
Occupation	5.5 (2.3)	6.9 (2.1)	7.4 (2.0)
Sexual behavior	3.0 (3.0)	4.7 (2.9)	5.4 (2.8)
Self care	2.3 (2.3)	3.1 (2.5)	3.6 (2.5)
Life-support activities	2.5 (2.4)	3.8 (2.6)	4.2 (2.5)

WAD: whiplash associated disorders; WRQ: work reintegration questionnaire; RAND-36: Rand 36-Item Health Survey; PDI: pain disability index.

Data analysis

The dependent variable was VR choice, being light (short program,1 week), moderate (intermediate program, 2 weeks) or heavy (long program, 3 weeks). The independent variables were: duration of sick leave, percentage of sick leave, scores on WRQ scales, RAND-36 scales and PDI items.

To calculate which factors were associated with the selected VR program, multiple linear regression analyses was used, both on the total group and on the largest subgroups separately. Missing values in PDI were imputed using linear interpolation when missing one or two values. A p value of 0.05 was considered statistically significant.

Results

Patient characteristics

During the recruitment period, 1328 patients were referred. Of them, 201 were not employed and 13 worked less than 12 h a week, 1 was older than 65 years and 15 of them were not assigned to a treatment program (no indication for interdisciplinary VR). In total, 1098 patients were included in this study, of which 662 patients had chronic musculoskeletal pain, 235 had chronic fatigue, 85 residual symptoms of diseases/sequelae (e.g., post heart-failure, CVA), 81 psychological complaints (psychological strain, anxiety disorders), 35 headache and migraine. Of 156 patients 1 or 2 items of the PDI were missing. Before linear interpolation the PDI mean sum score was 36.2 (sd 12.6) and after linear interpolation the mean sum score was 36.2 (sd 12.1). Demographic and clinical variables of the 3 VR dose groups are presented in Table 1.

Results of the multiple linear regression analysis indicated that there was a collective significant relation between independent variables and choice of VR dosage ($F\ (25,\ 894) = 5.25$, $p < .001$, $R^2 = 0.13$ (Table 2). Sick leave percentage, WRQ scores on fear-avoidance beliefs and stressful home situation and RAND-36 scores on social functioning, general health and bodily pain were significant predictors in the model (Table 2).

Predictors for choice of VR dosage separated for patients with chronic musculoskeletal pain and chronic fatigue are presented in Table 3. Results of the patients with chronic musculoskeletal pain indicated that there was a collective significant relation between the independent variables and choice of VR dosage ($F\ (25,\ 617) = 2{,}97$, $p < .001$, $R^2 = 0.13$). WRQ sores on fear-avoidance

Table 2. Standardized regression coefficients predicting patients' VR dose.

Coefficient	B	SE B	β	p value
Constant	1.99	0.232		0.000
Sick leave duration (weeks)	–0.003	0.003	–0.089	0.340
Sick leave %	0.003	0.001	0.246	0.009
WQR				
Depression	0.002	0.003	0.027	0.599
Fear-avoidance	0.006	0.003	0.083	0.049
Job strain	0.004	0.003	0.049	0.179
Job autonomy	–0.005	0.004	–0.046	0.201
Job satisfaction	–0.003	0.002	–0.049	0.220
Self-doubt	0.002	0.003	0.022	0.593
Perfectionism	0.000	0.003	0.002	0.954
Stressful home	0.008	0.003	0.085	0.018
RAND 36				
Mental health	0.001	0.001	0.032	0.517
Social functioning	–0.002	0.001	–0.115	0.013
Role emotional	0.001	0.001	0.063	0.120
General health	–0.002	0.001	–0.086	0.017
Role physical	–0.002	0.001	–0.068	0.121
Bodily Pain	0.002	0.001	0.10	0.012
Vitality	0.000	0.001	–0.014	0.754
Physical functioning	–0.001	0.001	–0.058	0.180
PDI				
Family/Home	0.010	0.011	0.043	0.375
Recreation	0.009	0.011	0.040	0.418
Social activity	–0.019	0.012	–0.086	0.110
Occupation	–0.003	0.010	–0.012	0.793
Sexual behavior	0.005	0.007	0.027	0.493
Self care	–0.005	0.009	–0.023	0.591
Life-support activities	0.005	0.008	0.024	0.561

WRQ: Work Reintegration Questionnaire; RAND-36: Rand 36-Item Health Survey; PDI: Pain Disability Index.
$R^2 = 0.13$.

beliefs and RAND-36 scores on social functioning and general health were significant predictors in the model. Results of the patients with chronic fatigue indicated that there was a collective significant relation between independent variables and choice of treatment dosage ($F\ (25,\ 178) = 2.86,\ p < .001,\ R^2 = 0.29$). Sick leave duration, sick leave percentage, RAND-36 scores on pain, PDI scores on recreation and social activity were significant predictors in the model.

Discussion

In a sample of patients admitted for VR, it was shown that choice of VR dosage was largely a clinical decision, which could be explained by questionnaire results in 13% of the total sample, 13% in patients with chronic musculoskeletal pain and 29% in patients with chronic fatigue. The influence of questionnaire results in clinical decision making is low and the results of this study may suggest that the questionnaires do not cover for the construct case complexity sufficiently or they do not measure it properly. Case complexity was operationally defined on the complexity of health problems, the degree of disturbance in functioning in work and the changeability of the patient, e.g. motivation, goals, abilities, are determined exclusively in an interview with members of the team. It is not clear whether and to witch extend the scores of the questionnaires are actually used to support their clinical reasoning. Moreover, the same factors related to treatment dose may have led to different choices of dose by different teams [22].

The difference in explained variance between patient groups might be explained by a difference in clinician experience with

Table 3. Standardized regression coefficients predicting patients' dose of treatment for patients with chronic musculoskeletal pain en chronic fatigue.

Diagnosis	Chronic pain ($n = 665$)[a]				Chronic fatigue ($n = 235$)[b]			
Coefficient	B	SE B	β	p value	B	SE B	β	p value
Constant	2.33	0.294		0.000	1.34	0.541		0.015
Sick leave duration (weeks)	0.003	0.004	0.079	0.521	–0.018	0.008	–0.469	0.019
Frequency (%)	0.001	0.001	0.061	0.620	0.009	0.003	0.743	0.000
WRQ								
Depression	0.001	0.004	0.014	0.841	0.002	0.008	0.030	0.793
Fear-avoidance	0.008	0.004	0.110	0.043	0.004	0.008	0.044	0.657
Job strain	0.007	0.004	0.072	0.135	0.009	0.007	0.102	0.202
Job autonomy	–0.006	0.005	–0.059	0.218	–0.014	0.008	–0.136	0.090
Job satisfaction	–0.004	0.003	–0.068	0.167	–0.001	0.005	–0.015	0.855
Self-doubt	0.000	0.004	–0.002	0.968	0.002	0.007	0.031	0.732
Perfectionism	–0.001	0.004	–0.012	0.799	0.001	0.006	0.009	0.908
Stressful home	0.008	0.004	0.091	0.064	0.010	0.007	0.114	0.137
RAND-36								
Mental health	–0.000	0.002	–0.001	0.982	0.005	0.003	0.207	0.057
Social functioning	–0.003	0.001	–0.137	0.029	–0.002	0.002	–0.120	0.222
Role emotional	0.001	0.001	0.033	0.555	0.000	0.002	–0.016	0.856
General health	–0.003	0.001	–0.127	0.013	–0.002	0.002	–0.081	0.293
Role physical	–0.001	0.002	–0.031	0.594	–0.001	0.002	–0.025	0.787
Bodily Pain	0.001	0.001	0.050	0.367	0.003	0.002	0.162	0.041
Vitality	0.002	0.002	0.060	0.325	–0.004	0.003	–0.166	0.204
Physical functioning	–0.002	0.001	–0.084	0.137	0.000	0.002	0.017	0.838
PDI								
Family/Home	0.008	0.014	0.033	0.603	0.005	0.024	0.022	0.829
Recreation	0.001	0.014	0.007	0.921	0.053	0.023	0.229	0.023
Social activity	–0.021	0.016	–0.098	0.176	–0.053	0.025	–0.229	0.036
Occupation	–0.014	0.013	–0.064	0.268	0.012	0.023	0.051	0.599
Sexual behavior	–0.004	0.009	–0.027	0.619	0.025	0.014	0.046	0.088
Self care	–0.001	0.011	–0.044	0.946	0.009	0.019	0.044	0.643
Life-support activities	0.123	0.010	0.689	0.206	–0.006	0.017	–0.030	0.734

WRQ: Work Reintegration Questionnaire; RAND-36: Rand 36-Item Health Survey; PDI: Pain Disability Index.
[a]$R^2 = 0.13$.
[b]$R^2 = 0.29$.

these groups, being less experienced with patients with chronic fatigue. In such case, it is hypothesized that clinicians might rely more on questionnaire results to assist in their clinical reasoning and decision making. Regardless of this difference, however, the results of this study support others [12], suggesting that case complexity is currently determined largely independent from results of validated instruments. Many studies of predictive models find that most variance is not explained, as is expected in a non-linear model [23].

Case complexity is a heterogeneous concept and it seems that the conceptualization in the field of VR is just beginning. Currently, there is no consensus about the concept and about features that define complex cases [24]. Theoretical models to account for case complexity have been proposed in the last decades [25–27]. These models conceptualize complexity as arising from a combination of different biological, socioeconomic, environmental, cultural and behavioral factors that are associated with outcome prognosis. The biopsychosocial model of illness describes the main relevant domains. Individual patients may have several risk factors across these domains, and the overall complexity level is supposed to result from the sum of risk. The choice of factors is influenced by results of scientific research about factors that facilitate or hinder success of rehabilitation and return to work, and are designated as predictors that are supposed to exert negative or positive treatment outcomes. There is doubt about the predictive value of many variables presumed to facilitate or hinder the effectiveness of therapy [24]. In the majority of studies, mostly longitudinal, questionnaires provide data addressing the responsiveness of factors to clinically relevant changes in health over time [28–30]. Most of the studied factors that are supposed to influence treatment outcomes lie in the psychosocial domain. It is not clear if and in which extent these factors contribute to the construct case complexity. Moreover, existing literature on case complexity has mainly identified its components descriptively and in isolation [31]. There is little evidence about the nature and strength of the inter-relationships between the domains and individual factors. Factors can accumulate and interact to influence care outcomes [24]. Research has rarely comprehensively examined how combinations of factors interact and have impact on patients. This inhibits researchers' ability to track the clinical epidemiology of patient complexity [31].

In many areas of health care and medical decision making, models have been proposed. Determining the best means of decision making is important, because it determines the quality of client care. Using statistical methods where client data are entered in formulas can increase accuracy with 13%, although prediction accuracy varies by type of prediction, the setting in which predictor data are gathered, the type of statistical formula used, and the amount of information available to the clinicians and formulas [32]. Currently, clinicians seem to rely on 'rules of thumb', heuristically developed by knowledge and experience. Clinicians rely on heuristics more heavily when levels of complexity increases [33]. This means in decision making a greater influence from prior experiences in the higher complexity cases. However, clinicians' prognostic assessment of patients tends to be inaccurate [24].

Three key problems seem to be apparent: a lack of conceptual clarity about case complexity, a gap between clinical judgment and research evidence, and limitations in clinicians' ability to select the optimal treatment dose [24]. The gap has been reflected in concerns from those in practice about the applicability of findings from research as a guide to clinical judgement and concerns from those in research about how clinical judgement is conducted. Research and practice are united in their commitment to providing the best knowledge and methods to improve the quality of decision-making. In complex systems, unpredictability and paradox are ever present, and some things will remain unknown [34]. Search for the optimal balance between standardized screening instruments and clinical experience in clinical decision-making seems useful. Moreover, the alliance between health care provider and patient may be an important key to reveal complex causes of decreased function and vocational participation as clinician–patient communication influences health outcomes. In a qualitative study among patients and healthcare providers, several factors were considered important when determining a treatment dose: patient-related factors, treatment-related factors and external factors [22]. Clinical practice might be improved by taking these factors into account when contemplating on dosage and making more explicit dosage decisions with a patient, being a mutual decision between professional and patient [22].

There are some strengths and limitations of this study. To our knowledge, this is the first practice based study that explored the extent in which results of questionnaires were associated with choice of treatment dosage in a VR program. The data set that is used is extensive, allowing sufficient stability of the models. On the other hand, a limited set of questionnaires was used and other questionnaires might cover the construct better. Clinicians decisions in selections of programs lack transparency, and although formally unknown, reliability is likely to be low. Another limitation of this study is the fact that group sizes differ, especially the number of patients in the short program was small. Finally, this study was performed in the Netherlands within the context of the Dutch healthcare system and the Dutch jurisdiction. This limits generalization, but reliably and validly assessing case complexity and establishing optimal treatment dose are relevant issues all over the world.

Ethical approval

This study was performed in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. All data were treated as confidential and used only for scientific purposes.

Disclosure statement

No potential conflict of interest was reported by the authors.

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