

Cost-effectiveness of psychotherapy for cluster B personality disorders

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Abstract

Background:

Recommendations of current clinical guidelines are informed by limited economic evidence.

Aims:

A formal economic evaluation of three modalities of psychotherapy for patients with cluster B personality disorders.

Method:

A probabilistic decision-analytic model to assess the cost-effectiveness of outpatient, day hospital, and inpatient psychotherapy over 5 years in terms of cost per recovered patient-year and cost per quality-adjusted life year (QALY). Analyses were conducted from both societal and payer perspectives.

Results:

From the societal perspective, the most cost-effective choice switched from outpatient to day hospital psychotherapy at a threshold of €12,274 per recovered patient-year; and from day hospital to inpatient psychotherapy at €113,298. In terms of cost per QALY, the optimal strategy changed at €56,325 and €286,493 per QALY, respectively. From the payer perspective, the switch points were at €9,895 and €155,797 per recovered patient-year, and €43,427 and €561,188 per QALY.

Conclusions:

Outpatient psychotherapy and day hospital psychotherapy are the optimal treatments for patients with cluster B personality disorders in terms of cost per recovered patient-year and cost per QALY.

Declaration of interest:

None

Introduction

Cluster B personality disorders (PD), including borderline, antisocial, histrionic, and narcissistic PD, are among the most prevalent mental disorders in the general population^{1,2} and mental healthcare settings.^{3,4} Moreover, these disorders are associated with high societal costs and a low quality of life.^{5,6} Although different in many respects, a common feature of cluster B PD is a rather dramatic and impulsive manifestation that is considered more persistent and resistant to change than cluster C PD (i.e., avoidant, dependent, and obsessive-compulsive PD) but less so than cluster A PD (i.e., paranoid, schizoid, and schizotypal PD). Currently, several treatments with demonstrated efficacy for borderline PD are being adapted and tested for antisocial PD, suggesting a partially common nature to these disorders.⁷ Additionally, contemporary classification models of PD increasingly focus on dimensions rather than categories, and cluster B PD seem to have similarly high scores on dimensions of behavioral and emotional disinhibition, and antagonism.⁸ This paradigm shift makes it clinically relevant to include the full range of cluster B PD in analyses rather than focus solely on the more common borderline PD.

A multidisciplinary clinical guideline in the Netherlands recently identified various modalities of psychotherapy, including outpatient, day hospital, and inpatient psychotherapy, to be preferential for cluster B PD⁹, consistent with two other clinical guidelines that focused on borderline PD.^{10,11} While based on strong evidence of efficacy,¹² the economic impact of these recommendations has not yet been explored, and few cost-effectiveness analyses of PD interventions exist that can guide decision making with respect to clinical practices and health care resource allocation. Recently, the Study on Cost-Effectiveness of Personality disorder Treatment (SCEPTRE) was conducted with the purpose of providing data for economic evaluations of various psychotherapeutic treatments for PD. Used in a decision-analytic framework, the data on health benefits and resource use from this study can be synthesized to evaluate the relative performance of health interventions under conditions of uncertainty and imperfect data.¹³ The objective of this study was to assess the cost-effectiveness of three modalities of psychotherapy in treating cluster B PD (i.e., outpatient psychotherapy, day hospital psychotherapy, and inpatient psychotherapy) and to inform decision makers about the value of these treatment options. We incorporated clinical and economic patient-level data from the SCEPTRE trial in a simulation model to compare the strategies over a five-year time horizon in terms of costs per recovered patient-year and costs per quality-adjusted life year (QALY).

Methods

Model

We used a previously-developed Markov cohort model^{13,14} to simulate the transition of a cohort of patients with cluster B PD through mutually-exclusive and collectively exhaustive health states over time, based on data from the SCEPTRE trial. The model is then used to estimate the impact of different interventions on the patient population. The underlying clinical process driving the current model and by which the health states are defined is 'clinically significant change', based on a statistical approach to defining meaningful change in psychotherapy research.¹⁵ To calculate the cut off points and the reliable change index required for this approach, norm scores based on the Symptom Checklist-90 Revised (SCL-90-R) were used as treatment outcome measures for both the functional and the dysfunctional population.¹⁶ Patients are classified into one of four health states: (1) recovered (if the magnitude of change is statistically reliable and the patient ends up within normal limits on the variable of interest), (2) improved (if the patient shows statistically reliable change but ends therapy still somewhat dysfunctional), (3) unchanged (if the magnitude of change is not statistically reliable, the method cannot determine whether or not the change is clinically significant), and (4) relapsed or deteriorated (if a statistically reliable change is in the opposite direction to that indicative of improvement). At anytime, patients can also die from

suicide or age-specific background mortality. The structure of the Markov model is shown in **Figure 1**.

Four types of parameters were used in the model: (1) transition probabilities, which govern the movement between the five states at each cycle, (2) treatment costs of the three modalities of psychotherapy, (3) costs of health care utilization and productivity losses incurred by patients in each state, and (4) health state utilities, which reflect the health-related quality of life experienced by patients in each state. These data were obtained from a single patient-level data source (i.e., the SCEPTRE trial), a nonrandomized clinical trial. Strengths and limitations of the study design have been discussed elsewhere.^{17,18} To overcome the problem of selection bias, we controlled for initial differences in patient characteristics with the propensity score method (see below). The results are based on intention-to-treat analyses.

Transitions between health states in the model was assumed to occur at a constant interval of every six months, corresponding to multiple changes in pathology, symptoms, treatment decisions, or costs for patients with PD.

To be consistent with many other trial-based economic evaluations in the literature, we chose a five-year time horizon, which is two years beyond the duration of the clinical trial. With respect to the transition probabilities, we extrapolated for the last two years of the analysis and considered several methods of extrapolation. Based on the trends observed during the study, we elected to average the last two observations (i.e., years 2 and 3) from the trial and hold those values constant in years 4 and 5 of the analysis. For other model inputs, data collection did not stop at three years; indeed, we relied on questionnaires that were administered in the fourth year to estimate the costs and utilities associated with different health states and kept these values constant for the fifth year. We reported results as costs per recovered patient-year and costs per quality-adjusted life year (QALY) over the five years using the model; costs and QALYs were discounted at an annual rate of 4.0% and 1.5% respectively, consistent with guidelines for economic evaluations in the Netherlands.¹⁹ In a sensitivity analysis, we studied the impact of applying a 3% discount rate for both costs and health outcomes as recommended by UK and US economic guidelines. The base case analysis was conducted from the societal perspective, and a secondary analysis from the payer perspective.

Recruitment and assignment

Patients were recruited from a consecutive series of admissions to six mental health care institutes in the Netherlands offering specialized psychotherapy for adult patients with PD. Diagnoses were based on the Dutch version²⁰ of the Structured Interview for DSM-IV Personality (SIDP-IV).²¹ For this particular analysis, inclusion criteria were a diagnosis of cluster B PD, age 18 to 70 years, assignment to a specified dosage of psychotherapeutic treatment for PD, and Dutch literacy. Exclusion criteria were psychotic disorders (e.g., schizophrenia), organic cerebral impairment, and mental retardation. Comorbid Axis I and Axis II disorders were allowed.

From March 2003 to March 2006, 1379 individuals completed the intake procedure and were selected for various treatment options. Of those, 241 patients were eligible, provided informed consent, and entered the study (**Table 1**). Patients were assigned to one of three treatment groups, based on a comprehensive assessment battery combined with the expert opinion of clinicians: outpatient, day hospital, and inpatient psychotherapy. In the outpatient strategy, patients are offered up to two sessions per week. In the day hospital strategy, patients are offered psychotherapy combined with sociotherapy and/or non-verbal therapies for 1-5 days per week. The inpatient strategy offers the same, but patients reside in the treatment centers 5-7 days per week. Mean (SD) duration of treatment for these three strategies was 15.1 (7.1), 10.4 (4.7), and 9.3 (2.9) months, respectively.

Input data

Transition probabilities – The proportion of patients in each of the health states was determined at 6, 12, 18, 24, 30, and 36 months after baseline from the SCEPTRE trial.

Based on the difference between the frequency distributions over time, the probabilities of transitioning from one state to another in each six-month time period were calculated. Transition probabilities among the recovered, improved, unchanged, and relapsed or deteriorated health states are available upon request.

Costs – Costs were estimated from both societal and payer perspectives. The calculations from the societal perspective included direct medical costs (i.e., primary treatment costs and costs of health care utilization post-discharge) and direct non-medical costs (i.e., lost productivity due to time spent in treatment), as well as indirect costs (i.e., future lost productivity due to disease), while the payer perspective included only direct medical costs. Mean primary treatment costs for the three strategies were calculated by multiplying the resource quantities with the 2007 unit costs or prices of the corresponding treatment options. We obtained data from the hospital finance departments on staff salaries, equipment, buildings and departmental overheads, and used a micro-costing approach to derive the cost of a treatment session and an inpatient day. The resource quantities were collected from the hospital data systems. Costs due to productivity loss because of patients' time in treatment were also estimated and included in the analysis from the societal perspective. For patients with paid employment at enrollment, mean costs were calculated by multiplying the actual days (inpatient psychotherapy, day hospital psychotherapy) and hours (outpatient psychotherapy) spent in treatment by the net income of the patient per day and per hour, respectively. The mean (SE) treatment costs were €7,445 (511) for outpatient psychotherapy, €23,279 (1,738) for day hospital psychotherapy, and €35,218 (1,354) for inpatient psychotherapy.

Post-discharge costs due to health care utilization and productivity losses, likely to be substantial, were also included. The *Trimbo*s and Institute for Medical Technology Assessment (*iMTA*) Questionnaire on *Costs Associated with Psychiatric Illness* (TiC-P) was used to collect data on direct medical and indirect costs.²² For direct medical costs, the total number of medical visits (e.g. outpatient visits, hospital lengths of stay, use of medication) was multiplied by the 2003 unit prices of the corresponding health care services.^{23,24} The reference unit prices of health care services for 2003 were adjusted to prices in 2007 using the consumer price index.²⁵ The mean direct medical costs over the recall period of the TiC-P (i.e., four weeks) were multiplied by 6.5 to calculate the six-month costs to correspond to the model cycle length. For indirect costs, we obtained data on absence from work, reduced efficiency at work, and difficulties with job performance from the TiC-P short form of the Health and Labor Questionnaire.²⁶ The days of short-term absence from work and actual hours missed at work because of health-related problems were multiplied by the net income of the patient per day and per hour, respectively. The number of lost working days per patient was calculated, taking into account the number of days and hours of paid employment of the patient per week. To value long-term absence from work, we applied the friction-cost method, which takes into account the fact that a formerly unemployed person may replace a person who becomes disabled.²⁷ The period needed to replace a worker (the so-called friction period) is estimated to be five months; we therefore assumed the maximum indirect costs to society were limited to productivity losses during a period of five months. The cost estimates from the societal perspective used in the analysis are summarized in **Table 2**. For each strategy, the model calculates the expected cost by taking a weighted average of the costs of each health state and the proportion of the cohort in each health state at each six-month period; the total expected cost of the strategy is then calculated by summing over the five year time horizon.

Health utilities – To reflect the diminished quality of life of patients with PD, health utility weights were assigned to each health state, based on the EuroQol EQ-5D which records quality of life in five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression.²⁸ Each dimension is divided into three response levels: no problems, some or moderate problems, and extreme problems or complete inability. A total of 243 different possible health states are each weighted to derive a single index score between

-0.33 (worst imaginable health state) and 1.00 (best imaginable health state). The Dutch norm scores were used for calculating the mean EQ-5D index values.²⁹ The mean quality of life utilities of a year spent in each of the model health states for each cycle are summarized in **Table 2**. The expected number of QALYs for each strategy was estimated by weighing the duration of time in a particular health state by the utility of that health state and then summing over all health states in each cycle. The expected number of QALYs per patient over five years was calculated by summing over all cycles.

Mortality rates – Patients in the recovered health state were assumed to face a risk of death equivalent to that observed in the general population. These age- and sex-specific mortality rates were obtained from standard life tables.³⁰ Moreover, we assumed patients in the improved, unchanged and relapsed or deteriorated health states faced an elevated risk of death due to suicide, based on the SCEPTRE data.

Propensity score method

To overcome the problem of selection bias, we controlled for initial differences in patient characteristics with the multiple propensity score method.³¹ The estimated propensity score is defined as the conditional probability of assignment to a particular treatment, given a set of observed pre-treatment characteristics. Details of the method and the variables used to estimate the propensity scores are described elsewhere.³² Multinomial regression analyses were conducted to adjust the transition probabilities for the multiple propensity scores.

Analysis

In order to reflect uncertainty in our parameter values, we conducted a probabilistic analysis in which distributions were assigned to the input parameters of the model (i.e., gamma distributions for costs, beta distributions for utilities, and Dirichlet distributions for probability parameters).¹³ Multiple simulations were conducted in which a single value for each parameter was randomly sampled from the corresponding distribution, creating a unique parameter set. One thousand parameter sets were sampled and used in the model to calculate the expected costs, expected recovery rate, and QALY for each strategy.

The mean values of costs, recovered patient-years, and QALYs across all 1000 simulations were used to calculate incremental cost-effectiveness ratios (ICER) associated with each strategy, defined as the additional cost divided by the additional health benefit associated with one strategy as compared with the next-less-costly strategy. The most cost-effective strategy was then identified by comparing the ICERs of different strategies against various threshold values, which reflect the decision maker's willingness-to-pay (WTP) for an additional unit of effect. Strategies below a specific WTP value generally represent good value for money; the "most cost-effective" strategy is the strategy with the highest ICER below the WTP threshold, representing the option that yields the highest level of benefit for an acceptable cost.

In order to report on the impact of the uncertainty in the parameter values, cost-effectiveness acceptability curves (CEAC) were created to indicate the probability of each option being cost-effective conditional on the decision maker's WTP for a recovered patient-year or QALY.³³ Finally, the cost-effectiveness acceptability frontier (CEAF) was plotted to portray each CEAC over the range of threshold values for which each option is estimated to be the most cost-effective, as well as the threshold ICER at which there are changes in the optimal modality (i.e., "switch points").³⁴

Results

Five-year costs and health outcomes

The mean five-year costs and health outcomes from the societal perspective are presented in **Table 3**. The table shows that the mean costs are substantially lower for

outpatient psychotherapy, suggesting that the higher treatment costs of the day hospital and inpatient modalities are not offset by savings elsewhere, such as reductions in costs due to health care utilization and productivity losses. The rank ordering of strategies by effect is the same for both recovered patient-years and QALYs, indicating inpatient psychotherapy as the most effective option. With respect to the percentage of patients residing in the recovered health state at year five, day hospital psychotherapy is associated with the highest percent recovered. Outpatient psychotherapy appears to be consistently the least effective option.

Cost-effectiveness analysis from the societal perspective

The cost-effectiveness ratios for each strategy, reported as cost per recovered patient-year and cost per QALY over a five-year time horizon, are displayed in **Table 4**. Outpatient psychotherapy yields the lowest costs and health benefits; day hospital psychotherapy shows higher costs and effects and was associated with an ICER of €12,274 per recovered patient-year and an ICER of €56,325 per QALY compared to outpatient psychotherapy. Inpatient psychotherapy yields the highest costs and health benefits and was associated with an ICER of €113,298 per recovered patient-year and an ICER of €286,493 per QALY compared to day hospital psychotherapy.

To display the impact of parameter uncertainty, we plotted the relationship between cost and health outcomes for each of the three competing psychotherapy modalities over 1000 simulations in the cost-effectiveness plane (**Figure 2**). When plotting costs against recovered patient-years (panel A), we found substantial uncertainty about both costs and effects for all treatment options. When using QALYs as the health measure (panel B), we found equal uncertainty about costs, whereas the uncertainty in effect was less substantial. The observed differences among the three treatment modalities relating to the effects were more pronounced in terms of recovered patient-years than QALYs.

Figure 3 shows the cost-effectiveness acceptability curves (CEAC), which indicate the probability of each strategy being cost-effective at different values of the societal willingness-to-pay (WTP) for a unit of health benefit. In terms of cost per recovered patient-year, outpatient psychotherapy has the highest probability of being cost-effective for values of the societal WTP below €12,500. For values between €12,500 and €103,100 per recovered patient-year, day hospital psychotherapy is likely to be the most cost-effective. For values above €103,100 per recovered patient-year, inpatient psychotherapy has the highest probability of being cost-effective. In terms of costs per QALY, the same pattern of results can be observed, but the switch points were located at threshold values of €59,700 and €298,000, respectively. By definition, the CEAC crosses the Y-axis at the probability that the intervention under evaluation is cost-saving, as a WTP of zero implies that only cost determines cost-effectiveness (formula: $WTP \cdot \Delta \text{effect} - \Delta \text{costs} > 0$).³⁵ According to the current analysis, outpatient psychotherapy has a probability of being cost-saving in approximately 84 percent of model simulations; in contrast, day hospital and inpatient psychotherapy have a negligible probability of being cost-saving.

While it is helpful to know the impact of uncertainty on results, the probability of a strategy being cost-effective is not sufficient to determine the optimal option. Decisions should be made on the basis of expected net benefit, regardless of the uncertainty associated with the decision.³³ To identify the optimal treatment option (i.e., the option with the highest expected net benefit for a given cost), the cost-effectiveness acceptability frontiers (CEAF) were plotted (**Figure 4**). The CEAF of cost per recovered patient-year shows the range of threshold values over which outpatient psychotherapy (€0 to €12,274), day hospital psychotherapy (€12,274 to €113,298), and inpatient psychotherapy (above €113,298) have the highest expected net benefit and can be considered the optimal choice. The switch points, at which there is a change in the optimal option, correspond to the ICERs between outpatient and day hospital psychotherapy, and day hospital and inpatient psychotherapy. In terms of cost per QALY, the switch points were located at threshold values of €56,325 and €286,493, respectively. If society's WTP for a QALY is below the threshold value of €56,325 outpatient psychotherapy is the most cost-effective choice; above this value (and below €286,493), the optimal strategy would be day hospital psychotherapy. When we

varied the discount rate to 3% per year for both costs and health outcomes, the optimal option changed from outpatient psychotherapy to day hospital psychotherapy and from day hospital psychotherapy to inpatient psychotherapy at threshold values of €12,120 and €132,866 per recovered patient-year, and €58,035 and €283,755 per QALY, respectively.

Cost-effectiveness analysis from the payer perspective

The CEAF of cost per recovered patient-year and cost per QALY from the payer perspective show the same pattern of results as from the societal perspective. However, the switch points were located at different threshold values: €9,895 and €155,797 per recovered patient-year, and €43,427 and €561,188 per QALY. When using a discount rate of 3% per year on outcomes, the switch points shifted marginally to threshold values of €9,495 and €204,278 per recovered patient-year, and €44,580 and €500,151 per QALY.

Discussion

Using decision-analytic modeling, we estimated the cost-effectiveness of three modalities of psychotherapy for cluster B PD over a five-year time horizon from both societal and payer perspectives. To our knowledge, this is the first assessment of the cost-effectiveness of treatment modalities for this population based on a formal decision-analytic modeling approach. As recommendations of current clinical guidelines in the Netherlands have been informed by limited economic evidence, we believe this study has the potential to inform clinical decision-making and health care resource allocations.

Our findings indicate that when the societal WTP does not exceed €12,274 per recovered patient-year, outpatient psychotherapy provides the highest expected net benefit. If society is willing to pay more than €12,274 per recovered patient-year, day hospital psychotherapy is the optimal choice. Notably, inpatient psychotherapy would not be considered the most cost-effective treatment modality unless the threshold value reached €113,298. Defining an acceptable threshold for a recovered patient-year is challenging, and without a common health metric, the cost-effectiveness ratios cannot be readily compared with interventions for other illnesses; for example, the costs of a cluster B PD recovered patient-year can only be compared to a depression recovered patient-year if they experience the same burden of disease. The use of QALYs as the health outcome allows for such a comparison across disease burdens, although there is no universally-accepted threshold value. Our results in terms of cost per QALY can be interpreted according to recommendations by the Dutch council for Public Health and Health care.³⁶ For acutely life-threatening illnesses (with a maximum burden of disease), an explicit maximum of €80,000 per QALY was recommended. For less life-threatening illnesses that only affect quality of life, the council recommends a proportional lower acceptable threshold. Cluster B PD are associated with a severe impairment in quality of life.⁶ The observed burden of 0.49 (i.e., mean EQ-5D index value of 0.51; range, 0.50 to 0.52) indicates that treatments may cost up to €39,200 per QALY to be acceptable. Based on this threshold value, outpatient psychotherapy can be identified as the most cost-effective and thus optimal option as it provides the greatest benefit below the threshold.

The adoption decision for outpatient psychotherapy is robust over the discount rates applied, which could be expected because we only model outcomes over a five-year time horizon.

Our results suggest that the two cost-effectiveness measures with different health outcomes yield similar trends in results, with outpatient psychotherapy being the optimal intervention at low levels of the societal WTP, day hospital psychotherapy at higher levels, and inpatient psychotherapy at the highest levels. The switch points in terms of cost per QALY occurs at higher threshold values, which can be explained by the fact that the distinction between modalities regarding health benefits was more pronounced in terms of recovery rate than in terms of QALYs. Consequently, the relatively low costs of outpatient psychotherapy carries more weight in the calculations of cost per QALY than of cost per

recovered patient-year and leads to more favorable results for outpatient psychotherapy. Previous studies have suggested that the EQ-5D may be insensitive in capturing changes in the quality of life of patients with borderline PD.^{37,38} However, the health state utility weights calculated and used in the current analysis indicate that the EQ-5D, used to generate QALYs, can be considered sensitive to changes in patients with cluster B PD. For example, patients in the recovered health state show health utility weights (i.e., a quality of life) approaching the utility weight observed in the normal (nonclinical) population (0.85); patients in the unchanged health state have a relatively stable utility weight compared to their value at enrollment (0.51); and patients in the relapsed or deteriorated health state were assigned much lower health utilities compared to enrollment. Despite the sensitivity of the EQ-5D in distinguishing quality of life associated with particular health states, QALYs are nonetheless less adequate measures for discriminating levels of change between the different modalities of psychotherapy.

The cost-effectiveness results for the two effect measures indicate that outpatient psychotherapy and day hospital psychotherapy are more cost-effective for cluster B PD than inpatient psychotherapy. Our findings are consistent with the scarce existing economic evidence identified by Brazier and colleagues in their systematic review evaluating the cost-effectiveness of psychological interventions for borderline PD.³⁸ Based on best available evidence, their review suggests that both outpatient and day hospital treatment (i.e., dialectical behavioral therapy and mentalization based therapy) are likely to be a cost-effective treatment modality for borderline PD.

Several clinical implications can be derived from our analyses. From a health-economic perspective, outpatient psychotherapy and day hospital psychotherapy should be considered the options of first choice for patients with cluster B PD, based on accepted WTP thresholds. Interestingly, this conclusion is consistent with several efficacy and effectiveness studies.¹² Note however, that this study attempts to inform recommendations from the public health (i.e., population) perspective and should be not used for individual decision-making. Although we used primary patient-level data from a clinical study, we used those data to inform population averages (and plausible ranges) for our parameters. As a result, we were limited in our ability to examine individual-level heterogeneity such that there will undoubtedly be some patients for whom inpatient psychotherapy may be the best option. Also, we have to emphasize that cost-effectiveness is only one aspect of medical decision-making, so in daily clinical practice other important factors that were not considered in our model must be considered, such as individual preferences, past history, insufficient or even pathogenic social support systems. Our study has identified inpatient psychotherapy as an effective but expensive option; future research should test patient-treatment matching hypotheses in this respect.

The major strength of this study was the collective use of the state of the art methodology and patient-level primary data to evaluate the cost-effectiveness of health care interventions. Decision-analytic modeling provides a framework for informed decision making under conditions of uncertainty. Specifically, it allows for exploration of the impact of uncertainty across multiple parameters simultaneously, and projection of results beyond the time horizon of the clinical trial. Furthermore, the availability of primary data from such a large patient trial provided a unique opportunity to inform the parameters of our model, as most modeling studies are based on secondary data. Data from future studies can be used to update the parameters of this existing probabilistic cost-effectiveness model.

Assumptions were made in this model-based analysis. To correspond to the model cycle length, the costs of health care utilization post-discharge were multiplied by 6.5 to estimate the half-yearly costs. The extrapolation of these costs is based on the assumption that the recall period of four weeks of the TiC-P is representative for half a year. This assumption was tested in the same population in a previously published study, indicating that on a population level there was no significant difference between the costs as measured with a recall period of a year compared to a recall period of four weeks.⁵ We therefore believe that the costs calculated in the present study are a reasonable estimation of the actual costs generated over the model cycle length of six months.

Our analysis has several limitations. First, the model is developed using data from a treatment-seeking patient population, and in particular for those who seek specialized psychotherapy for personality problems. Therefore, the applicability of the results to non-treatment seekers, forensic care, or patients who admit with a primary Axis I diagnosis, is limited. Second, despite the fact that this population is known to use criminal justice resources, these costs were not included in the analysis, which leads to an underestimation of the true societal costs. Third, this study compares only three modalities of psychotherapy, whereas the included treatments may also differ in terms of other characteristics such as theoretical orientation and therapeutic techniques. This limitation is somewhat mitigated by studies showing that theoretical orientation as a treatment parameter might only account for minor differences in effects – if any,^{39,40} and is not likely to be associated with costs. This is however not true for duration as a treatment parameter; future research should therefore address optimal dosing in terms of treatment duration. Finally, our analyses were based on a clinical trial with a nonrandomized study design. That patients were not randomized over treatment conditions, however, is not a drawback but rather an advantage within the context of economic evaluations, because nonrandomized studies are likely to be more representative and thus externally valid with respect to costs and effects.^{17,18} Moreover, randomization between existing treatment options is no longer feasible, because once information about a therapy's clinical effectiveness is available, patients may not be willing to participate in experiments simply to evaluate its value for the cost. Exactly because of this reason, the same research group recently failed to conduct a randomized clinical trial comparing inpatient and outpatient psychotherapy for cluster C PD. To overcome the problem of selection bias, we controlled for initial differences in patient characteristics with the propensity score method.³²

It can be concluded from our model-based analysis that outpatient psychotherapy and day hospital psychotherapy are the optimal treatments for patients with cluster B PD in terms of cost per recovered patient-year and cost per QALY. The ultimate selection depends on what cost-effectiveness threshold is considered acceptable and what perspective is adopted. The decision whether or not to adopt a treatment strategy is inevitably made in a context of uncertainty surrounding the cost-effectiveness of these strategies, and therefore there is a possibility of making a wrong decision on a patient level. Future work should include a so-called value of information analysis which evaluates the extent to which additional evidence might reduce the probability and the consequences (costs) of a wrong decision and compares that improvement with the cost of information.

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Tables and Figures

Tables

Table 1. Demographic and clinical characteristics of 241 study participants

Modality of psychotherapy	Outpatient (n=57)	Day hospital (n=99)	Inpatient (n=85)
Age, mean (SD), y	35.4 (8.7)	31.4 (8.2)	28.9 (7.2)
Sex %			
Female	64.9	76.8	70.6
Comorbidity Axis II %			
pure cluster B (no comorbid cluster A/C)	33.3	37.4	48.2
cluster B and cluster A	8.8	0	3.5
cluster B and cluster C	49.1	45.5	40.0
cluster B and both cluster A and C	8.8	17.2	8.2
Personality disorder %			
borderline	71.9	80.8	80.0
narcissistic	29.8	22.2	18.8
histrionic	19.3	9.1	14.1
antisocial	8.8	5.1	3.5

Table 2. Model parameters: Mean health state costs and utilities over time from the societal perspective

Health states		Recovered	Improved ^c	Unchanged	Relapsed or det.
Health state costs ^a , mean (SE)					
years	1 to 2	€ 6,637 (3,064)	€ 9,639 (4,848)	€ 10,846 (3,763)	€ 24,481 (13,204)
	3	€ 2,472 (458)	€ 3,899 (1,013)	€ 5,705 (1,533)	€ 5,554 (2,312)
	4 to 5	€ 2,188 (491)	€ 11,395 (8,215) ^d	€ 4,751 (1,297)	€ 5,767 (2,830)
Health utilities ^b , mean (SE)					
years	1	0.78 (0.03)	0.64 (0.11)	0.67 (0.06)	0.39 (0.10)
	2	0.82 (0.02)	0.65 (0.03)	0.59 (0.03)	0.47 (0.07)
	3	0.83 (0.02)	0.58 (0.05)	0.60 (0.04)	0.45 (0.18)
	4 to 5	0.87 (0.02)	0.67 (0.04)	0.69 (0.03)	0.34 (0.15)

^a Mean cost estimates of a half year spent in each of the model health states. Estimates include post-discharge costs due to health care utilization and productivity losses. As costs may vary according to time in model we calculated different cost estimates for the first two years, third, and last two years in the model.

^b Mean quality of life utilities of a year spent in each of the model health states. In the model the reported utility weights were divided by two to fit the half-yearly cycle. As quality of life may vary according to time in model we calculated different utility weights for yearly time intervals until year three. For the last two years in the model a constant utility weight was used.

^c The improved state includes both patients who start relatively well and improve, and who start sicker and improve, which on average will equal the unchanged scores.

^d Several patients induced very high costs due to costly services, such as long-term admissions into inpatient treatment settings, and long-term absence from work.

Table 3. Discounted costs and health outcomes over five years from the societal perspective

Modality of psychotherapy	costs ^a	recovered patient-years ^b	costs ^a	QALYs ^c	% recovered ^d
Outpatient	€ 78,548	1.1449	€ 80,247	3.1080	24.7
Day hospital	€ 89,323	2.0227	€ 91,090	3.3005	48.6
Inpatient	€ 96,264	2.0840	€ 97,351	3.3223	36.1

^a Values represent mean costs per patient, including treatment costs and costs involved with spending time in each of the model health states.

^b Mean number of years spend in the recovered health state per patient.

^c Mean number of QALYs gained per patient.

^d Percentage of patients resided in the recovered health state at year five.

Table 4. Cost-effectiveness from the societal perspective over a five-year time horizon^a

Modality of psychotherapy	Cost per recovered patient-year	Cost per QALY
Outpatient	-	-
Day hospital	€ 12,274	€ 56,325
Inpatient	€ 113,298	€ 286,493

^a The values represent incremental cost-effectiveness ratios (ICER) i.e., the additional cost divided by the additional health benefit compared with the next-less-costly treatment, expressed as cost per recovered patient-year and cost per QALY. Note: because of rounding errors there may be some discrepancy between the results presented in this table and calculations when using the values from Table 3.

Figures

Figure 1. State transition diagram of the Markov model for psychotherapy

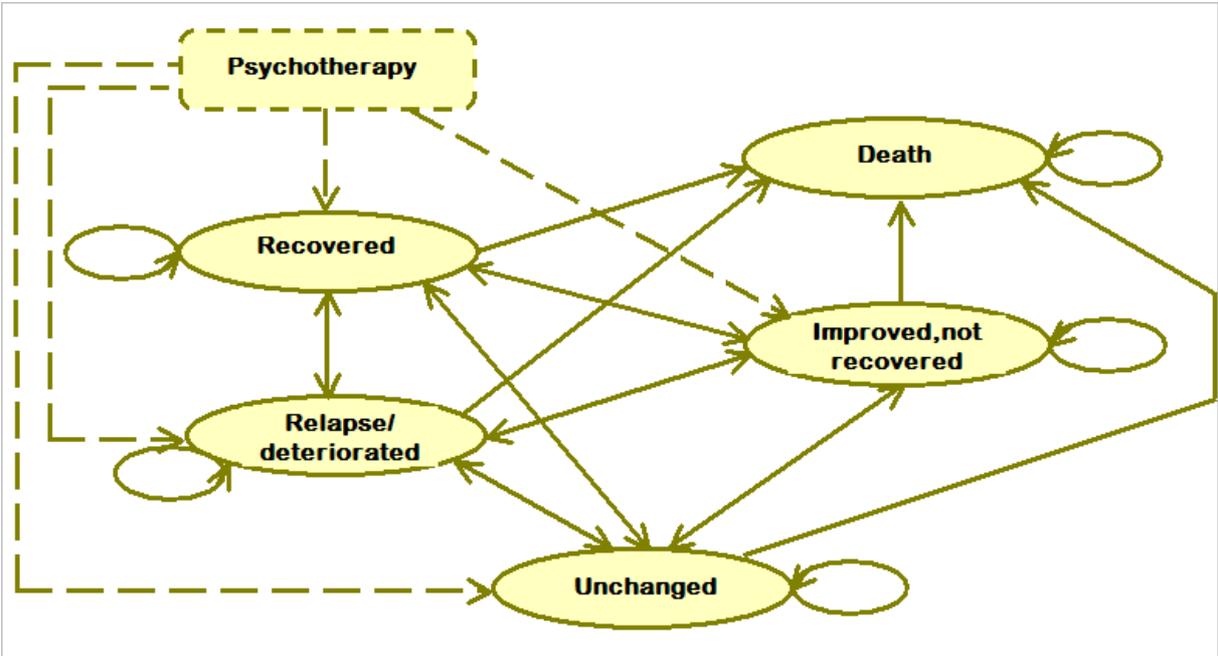


Figure 2. Scatter plots showing the costs and health outcomes of the treatment strategies from 1000 Monte Carlo simulations. A, for recovered patient-years. B, for QALYs.

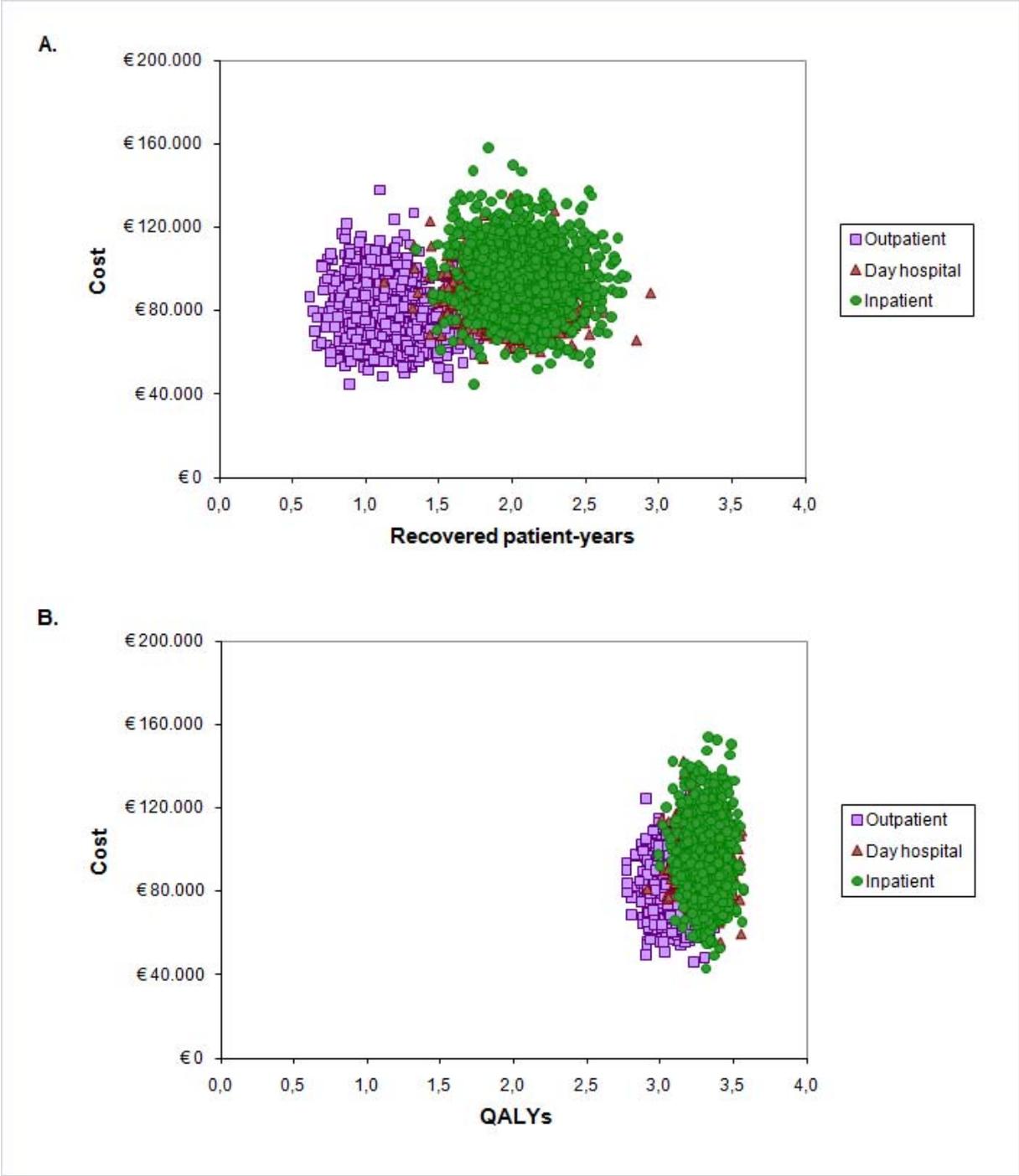


Figure 3. Cost-effectiveness acceptability curves (CEAC) showing the probability of each modality being cost-effective at different values of the societal WTP. A, CEAC for recovered patient-year. B, CEAC for QALY.

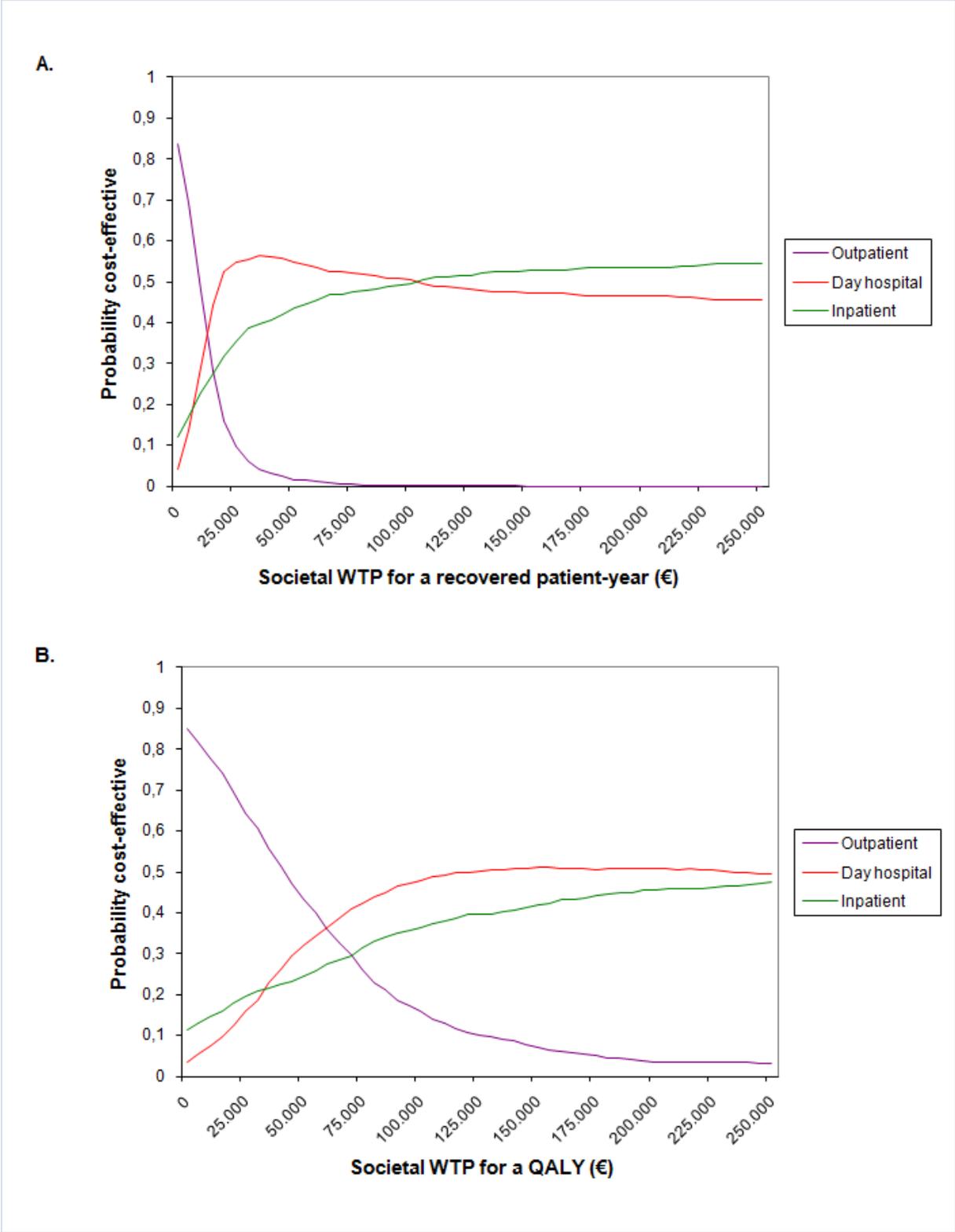
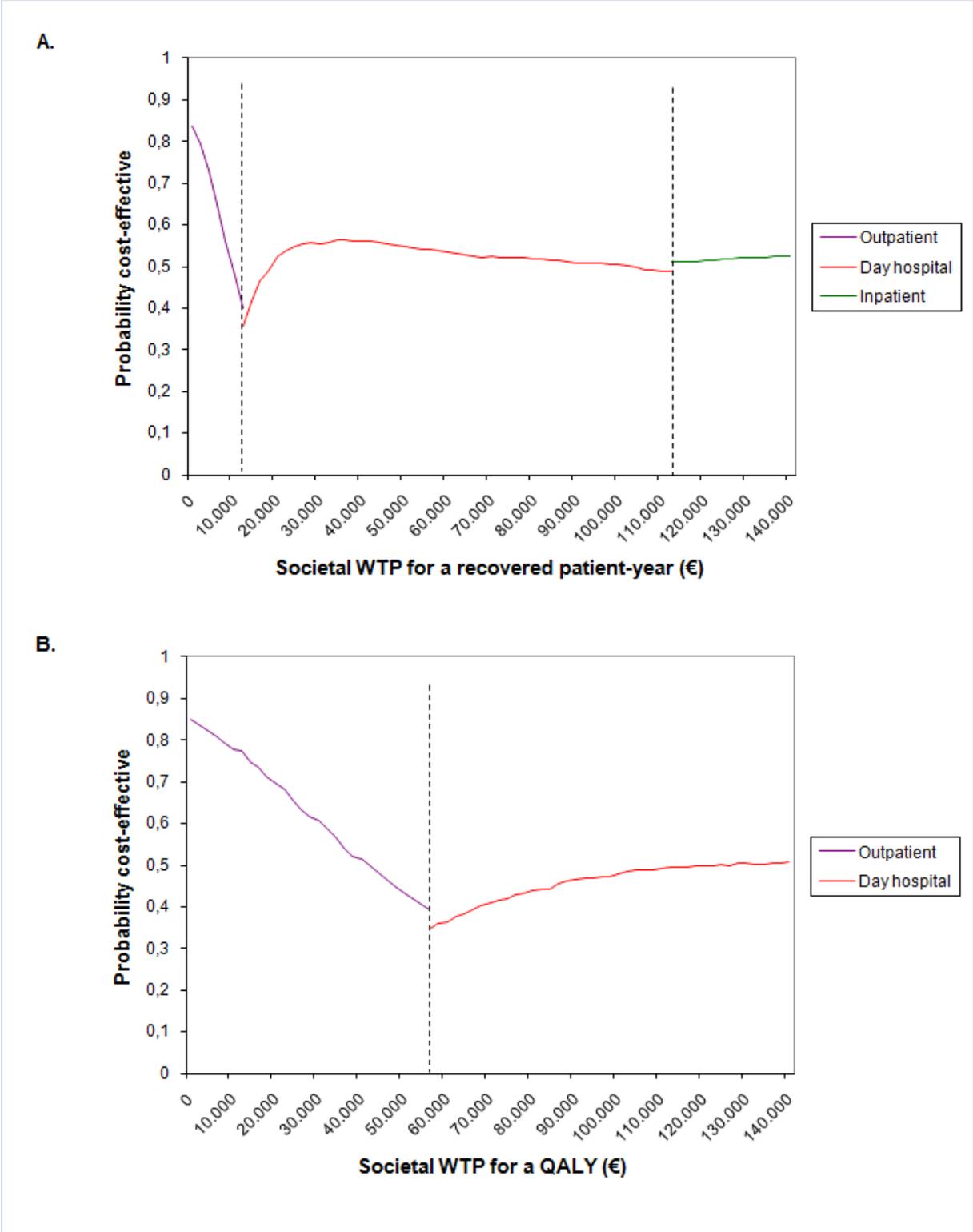


Figure 4. Cost-effectiveness acceptability frontiers (CEAF) showing the optimal modality for each value of the societal WTP. A, CEAF for recovered patient-year. B, CEAF for QALY.



Footnote: The switch points, at which there is a change in the optimal option from outpatient psychotherapy to day hospital psychotherapy and from day hospital psychotherapy to inpatient psychotherapy, were located at threshold values of €12,274 and €113,298 per recovered patient-year and €56,325 and €286,493 (not displayed in figure) per QALY.

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 AB - BACKGROUND: Recommendations on current clinical guidelines are informed by limited economic evidence. AIMS: A formal economic evaluation of three modalities of psychotherapy for patients with cluster B personality disorders. METHOD: A probabilistic decision-analytic model to assess the cost-effectiveness of out-patient, day hospital and in-patient psychotherapy over 5 years in terms of cost per recovered patient-year and cost per quality-adjusted life-year (QALY). Analyses were conducted from both societal and payer perspectives. RESULTS: From the societal perspective, the most cost-effective choice switched from out-patient to day hospital psychotherapy at a threshold of 12,274 euros per recovered patient-year; and from day hospital to in-patient psychotherapy at 113,298 euros. In terms of cost per QALY, the optimal strategy changed at 56,325 euros and 286,493 euros per QALY respectively. From the payer perspective, the switch points were at 9895 euros and 155,797 euros per recovered patient-year, and 43,427 euros and 561,188 euros per QALY. CONCLUSIONS: Out-patient psychotherapy and day hospital psychotherapy are the optimal treatments for patients with cluster B personality disorders in terms of cost per recovered patient-year and cost per QALY.
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