Economic Evaluation of Day Hospital versus Intensive Outpatient Mentalization-Based Treatment alongside a Randomized Controlled Trial with 36-Month Follow-Up

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This work was supported in part by a grant from ZonMw (grant no. 171202012). The funder of the study had no role in the study design, data collection, data analysis, data interpretation or writing of the report. We would like to thank all research assistants for collecting the data. We are also most grateful to the patients who participated in this study. Patrick Luyten and Dawn Bales have been involved in the training and dissemination of mentalization-based treatment. The other authors declare that they have no competing interests.

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Keywords: economic evaluation, mentalization-based-treatment, borderline personality disorder, randomized controlled trial, adult

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Date of first submission: 22 Jul 2021

Date of submission revision: 31 January 2022

Abstract

Mentalization-based treatment (MBT) has demonstrated robust effectiveness in the treatment of borderline personality disorder (BPD) in both day hospital (MBT-DH) and intensive outpatient MBT (MBT-IOP) programs. Given the large differences in intensity and associated treatment costs, there is a need for studies comparing their cost-effectiveness. A health economic evaluation of MBT-DH versus MBT-IOP was performed alongside a multicenter randomized controlled trial with a 36-month follow-up. In three mental health-care institutions in the Netherlands, 114 patients were randomly allocated to MBT-DH (*n* = 70) or MBT-IOP (*n* = 44) and assessed every 6 months. Societal costs were compared with quality-adjusted life years (QALYs) gained and the number of months in remission over 36 months. The QALY gains over 36 months were 1.96 (*SD* = 0.58) for MBT-DH and 1.83 (*SD* = 0.56) for MBT-IOP; the respective number of months in remission were 16.0 (*SD* = 11.5) and 11.1 (*SD* = 10.7). Societal costs were €106,038 for MBT-DH and €91,368 for MBT-IOP. The incremental cost for one additional QALY with MBT-DH compared with MBT-IOP was €107,000. The incremental cost for 1 month in remission was almost €3000. Assuming a willingness-to-pay threshold of €50,000 for a QALY, there was a 33% likelihood that MBT-DH is more cost-effective than MBT-IOP in terms of costs per QALY. Although MBT-DH leads to slightly more QALYs and remission months, it is probably not cost-effective when compared with MBT-IOP for BPD patients, as the small additional health benefits in MBT-DH did not outweigh the substantially higher societal costs.

Keywords: economic evaluation, mentalization-based-treatment, borderline personality disorder, randomized controlled trial, adult

Borderline personality disorder (BPD) is one of the most prevalent mental disorders in psychiatric populations (Leichsenring et al., 2011; Paris, 2010) and is associated with high psychiatric comorbidity (Barrachina et al., 2011; Skodol et al., 1999; Trull, 2000; Zanarini et al., 1998), poor quality of life (Soeteman et al., 2008), and high societal costs (Laurenssen et al., 2016; Soeteman et al., 2008). Previous studies and systematic reviews have provided evidence for the cost-effectiveness of a number of treatments for BPD (Meuldijk et al., 2017; Stevenson & Meares, 1999). Mentalization-based treatment (MBT) is an empirically supported treatment for BPD based on the assumption that key features of BPD such as impulsivity, affect dysregulation, and problems with interpersonal relationships are related to impairments in mentalizing, that is, the ability to understand oneself and others in terms of mental states (e.g., needs, thoughts, feelings, wishes, and desires) (Bateman & Fonagy, 2016; Cristea et al., 2017; Storebø et al., 2020). Two types of MBT for adult BPD patients have been developed and empirically evaluated: day-hospital MBT (MBT-DH) (Bales et al., 2014; Bales et al., 2012; Bateman & Fonagy, 1999, 2001, 2008; Laurenssen et al., 2018) and intensive outpatient MBT (MBT-IOP) (Bateman & Fonagy, 2009; Jørgensen et al., 2014; Jørgensen et al., 2013; Kvarstein et al., 2015). MBT-DH and MBT-IOP are similar in duration, with treatment lasting up to 18 months. Whereas both treatments offer weekly individual psychotherapy sessions, they differ markedly in the intensity of group psychotherapy. MBT-DH consists of a 5 days per week day-hospitalization program, which includes nine group therapy sessions per week. MBT-IOP is a 2-day outpatient program offering two group therapy sessions per week. The cost-effectiveness of MBT-DH has previously been compared with ‘specialized treatment as usual’ (S-TAU), which comprised an outpatient treatment tailored to the individual needs of patients with BPD, offered by a well-established treatment service. MBT-DH was not cost-effective compared with S-TAU in analyses focusing on quality-adjusted life years (QALYs) as the outcome, but was more cost-effective than S-TAU in analyses using BPD remission as the outcome (Blankers et al., 2019). There has never been a formal cost-effectiveness comparison of MBT-DH and MBT-IOP, which is urgently needed considering the large differences in the intensity and associated treatment costs of the two interventions.

Here, we report the first long-term health economic evaluation of MBT-DH versus MBT-IOP alongside a randomized controlled trial (RCT) comparing their effectiveness at 36-month follow-up (Smits et al., 2020; Smits et al., 2019). We compared health-care utilization and other societal costs with effects in terms of quality-adjusted life years (QALYs) gained and the number of months in remission over 36 months. Given that MBT-DH and MBT-IOP did not differ in terms of effectiveness (Smits et al., 2020; Smits et al., 2019), but the cost of MBT-DH could be substantially larger than that of MBT-IOP, we expected that the greater benefits of MBT-DH would not outweigh the lower costs of MBT-IOP and that MBT-DH would not be more cost-effective than MBT-IOP.

Method

Study Design, Participants, Randomization, and Assessments

The design of the RCT has been fully described in the study protocol (Laurenssen et al., 2014). Participants were patients diagnosed with BPD as assessed using the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (First et al., 1996), referred to one of three participating mental health-care treatment sites in the Netherlands, who met inclusion criteria and provided written informed consent. All participants were randomly assigned to MBT-DH or MBT-IOP. Patients were assessed before randomization, at the start of treatment, and then every 6 months up to 36 months after the start of treatment.

The study protocol was approved by the Medical Ethical Committee of Erasmus Medical Center, Rotterdam, The Netherlands (NL38571.078.12). For the design and reporting of this economic evaluation, we followed the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement (Husereau et al., 2013) and the ISPOR guideline for economic evaluation alongside RCTs (Ramsey et al., 2015).

Interventions

Both treatment programs focus on improving BPD patients' capacity for mentalizing (Bateman & Fonagy, 2004, 2016), and consist of a pretreatment phase and a main treatment phase. The pretreatment phase focuses on engaging patients in treatment and crisis management by means of individual sessions and a 12-session psycho-education group. The main treatment phase comprises weekly individual psychotherapy sessions, individual crisis management, and psychiatric consultation upon request, following American Psychiatric Association guidelines. The intensity of group therapy during the main treatment phase differs markedly between the two programs. MBT-IOP involves two group therapy sessions per week, whereas MBT-DH entails a day-hospital program 5 days a week for 6 hours per day, including nine group therapy sessions per week, comprising daily group psychotherapy, twice-weekly art therapy, and weekly mentalizing cognitive group therapy and writing therapy, ending each week with a social hour and a community meeting. After the main treatment phase, individually tailored stepped-down care is offered in both programs, aimed at relapse prevention, maintaining and further enhancing mentalizing skills, and stimulating social reintegration.

Outcomes

Resource use and valuation

Health-care utilization, use of medication, and productivity gains or losses were measured using the first section of the Trimbos Questionnaire for Costs associated with Psychiatric illness (TiC-P) (Hakkaart-van Roijen et al., 2002), a well-validated instrument for economic evaluations among psychiatric patient populations (Bouwmans et al., 2013). The TiC-P has a 4-week recall period, which was linearly extrapolated to cover the full period between the consecutive interviews, in line with Hakkaart-van Roijen et al. (2007). All health-care contacts were estimated using the TiC-P, except MBT-IOP- or MBT-DH-related contacts, which were collected from the patient records. Health-care resource utilization was valued using standard unit cost prices for the Health Care Insurance Board Netherlands (ZorginstituutNederland, 2016; Zwaap et al., 2016). Medication costs were valued based on reported medication use. Unit costs per dose of medication were extracted from https://medicijnkosten.nl.

The Short Form-Health and Labour Questionnaire (Hakkaart-van Roijen & Bouwmans, 2010) was used to assess whether participants had worked in the previous 2 weeks, and whether they had been absent from work (absenteeism) or functioned professionally less well than normal due to illness (presenteeism). Productivity losses in hours were multiplied by the average hourly labor costs of €37.90 for men and €31.60 for women (Zwaap et al., 2016). Productivity losses were valued using the friction cost method, with a maximum friction costs period of 85 days, based on Health Care Insurance Board data (Zwaap et al., 2016) and an elasticity factor of 0.8 (Koopmanschap et al., 1995).

All future costs from the date of randomization were discounted at an annual rate of 4% (Zwaap et al., 2016). Dutch unit prices were converted to Organisation for Economic Co-operation and Development standard purchasing power parities for the study's index year 2018 (106% for the Netherlands) (Organisation for Economic Co-operation and Development, 2019).

Effect measures

The number of QALYs gained between randomization and 36-month follow-up was the outcome measure for the cost-utility analysis. We used the EuroQol 5-dimensional, 3-level quality of life instrument (EQ-5D) (EuroQolGroup, 1990). The EQ-5D is often used as the primary outcome measure in cost-effectiveness analyses, as the EQ-5D is the prescriptive quality-of-life questionnaire in the Dutch national guideline for economic evaluations in health care (ZorginstituutNederland, 2016). Using the Dutch EQ-5D tariff (Lamers et al., 2006), raw scores were converted to health utilities. Using the area under the curve method with linear interpolation, the repeated measures of these health utilities were integrated into the number of QALYs gained or lost over the 36-month follow-up period. Future QALYs were discounted at an annual rate of 1.5% (Zwaap et al., 2016). The outcome measure for the cost-effectiveness analysis was the proportion of patients having a Personality Assessment Inventory-Borderline (PAI-BOR) score <38, multiplied by the number of months when this was the case. Scores on the PAI-BOR range between 0 and 72, with scores of 38 or higher indicating the presence of significant BPD pathology (Morey, 1991).

Statistical Analyses

All analyses were performed on an intention-to-treat basis using R version 3.5+. Baseline differences between MBT-IOP and MBT-DH were tested using two-tailed chi-square tests and independent samples *t*-tests. Missing observations in costs and effects data were handled using multiple imputation using chained equations (mice version 2.30) (van Buuren & Groothuis-Oudshoorn, 2011). Fifty imputations were generated for each missing observation. We used predictive mean matching to impute missing data as this is the preferred method for skewed (cost) data (Marshall et al., 2010). Missing data were assumed to be missing at random (MAR). The analyses on the 50 imputed data sets were combined using Rubin’s rules (Rubin, 1987).

The base case scenario of this economic evaluation was performed from the societal perspective in which all available costs—BPD treatment costs, medication costs, all other health-care costs, and losses or gains in productivity for each patient—were included. Additionally, we performed an analysis from the health-care sector perspective, in which BPD treatment costs, medication costs, and all other health-care costs were included, but productivity costs were omitted.

For all participants, we multiplied units of health care and productivity losses with their associated costs. Differences in costs and effects between MBT-IOP and MBT-DH were calculated as the difference in cumulative costs and effects over 36 months.

Next, we extracted a total of 5000 nonparametric bootstrapped samples from the imputed data (100 samples from each of the 50 imputed data sets), with a number of patients per trial arm equal to the number of patients in the original dataset. For each bootstrapped sample, we calculated the incremental costs, incremental effects, and incremental cost-effectiveness ratio (ICER). The ICER was calculated as follows: ICER = $(Costs_{DH}–Costs_{IOP})/(Effects_{DH}–Effects_{IOP})$, where effects were either QALYs or months in remission based on PAI-BOR scores. These data were also plotted on cost-effectiveness planes, which present the differences in costs and effects between MBT-DH and MBT-IOP on two dimensions by plotting costs against effects. The reference intervention (MBT-IOP) is positioned in the origin of the cost-effectiveness plane. Based on the distribution of the ICERs over the cost-effectiveness plane, cost-effectiveness acceptability curves (CEACs) (Van Hout et al., 1994) were drawn. CEACs show the probability that MBT-DH is more cost-effective than MBT-IOP as a function of the willingness to pay for 1 additional QALY or 1 additional month in remission. Willingness to pay can be up to €50,000 per QALY in the Netherlands for an intermediate burden of disease, such as BPD (Zwaap et al., 2016).

To assess the robustness of findings, one-way sensitivity analyses were performed to evaluate the impact on the ICERs of a misspecification of –20% to +20% in the abovementioned cost categories for the base case scenario. The study was registered in the Netherlands Trial Register, no. NTR2292.

Results

Between March 1, 2009, and June 30, 2014, 243 patients were referred to MBT in the participating treatment centers, of whom 114 patients were randomly assigned to MBT-DH (*n* = 70) or MBT-IOP (*n* = 44) and included in the analysis (see Figure 1 for the CONSORT flow chart). The skewed distribution is due to an adjustment in the randomization algorithm, as during the trial it became clear that there were more available treatment places in the MBT-DH condition as a consequence of insufficient capacity of alternative treatment programs at the treatment sites for patients who refused to participate in the trial or those who were excluded. This resulted in those patients taking up available places in the MBT-IOP treatment program. The trial steering committee suggested and agreed to adjust the randomization algorithm to prevent ethically unacceptable long waiting periods, while still assuring random allocation. Further details of the inclusion and randomization procedures are described elsewhere (Smits et al., 2019). None of the baseline clinical characteristics or costs differed significantly between the treatment groups at baseline (Table 1). The proportion of missing data increased somewhat with each follow-up, ranging from 53% to 58%. No difference between MBT-IOP and MBT-DH was found in terms of the number of patients who completed at least one follow-up assessment: n = 27 (61%) for MBT-IOP and n = 42 (60%) for MBT-DH, $\chi^2(1) = 0.021$, $p = 0.885$. There were no significant baseline differences between patients who completed a follow-up assessment and those who did not (Smits et al., 2020).

Figure 1 about here

Table 1 about here

Costs

Table 2 shows the cumulative societal costs and effects during the trial. Over 36 months of follow-up, the health-care costs were higher for MBT-DH than for MBT-IOP, but not beyond the 95% confidence interval (CI): bootstrapped mean difference €21,109, 95% CI €–323 to €41,328. The productivity costs were not significantly lower for MBT-DH: bootstrapped mean difference €–5913, 95% CI €–20,553 to €7568. The overall societal costs were not significantly higher in MBT-DH: bootstrapped mean difference €15,138, 95% CI €–11,695 to €39,722.

Table 2 about here

Effects

The number of QALYs at 36-month follow-up was not significantly higher in MBT-DH than in MBT-IOP: bootstrapped mean difference 0.14, 95% CI –0.07 to 0.34. However, the cumulative number of months in remission based on the PAI-BOR cut-off criterion from baseline to 36-month follow-up was significantly higher in MBT-DH compared with MBT-IOP: bootstrapped mean difference 4.87, 95% CI 0.78 to 8.91. A plot of the costs and effects between baseline and 36-month follow-up is provided in supplemental figure S1. *[insert link supplemental figure S1]*

Cost-utility

With regard to QALYs as the outcome measure, the high density of dots (77%) in the upper right quadrant of the cost-effectiveness planes indicates the likelihood that MBT-DH produces better effects against higher costs (Figure 2). Whether these additional costs are spent in a cost-effective way depends on the willingness to pay. If one is not willing to incur additional expense, the chance that MBT-DH is a cost-effective intervention compared with MBT-IOP is 13%. When the willingness to pay is defined as the suggested maximum amount of €50,000 per QALY, the likelihood that MBT-DH is a cost-effective intervention compared with MBT-IOP is 33%. The 50% probability of MBT-DH being cost-effective is reached at a willingness to pay of €107,000 per QALY, which is by definition also the ICER of MBT-DH versus MBT-IOP. When only health-care costs are taken into account, the ICER for one additional QALY is almost €150,000 (Table 3).

Figure 2 about here

Table 3 about here

Cost-effectiveness

In terms of costs per remission month the ICER is almost €3000, indicating that an extra month in remission with MBT-DH in comparison to MBT-IOP costs €3000. It is unlikely that MBT-DH produces better effects against lower costs, as the lower right quadrant of the cost per QALY graph contains only 14% of the dots. In the scenario where only health-care costs are taken into account and productivity costs are ignored, the ICER per additional month in remission with MBT-DH is almost €4200 (Table 3). The cost-effectiveness planes and CEACs for this analysis are provided in supplemental figure S2. *[insert link supplemental figure S2]*

Sensitivity analyses assuming misspecification of the cost drivers of the model yielded a similar pattern of findings for both outcomes: if health-care costs were higher or productivity costs were lower than calculated in the base case model, the ICERs would have been higher and MBT-DH would have been less cost-effective. If health-care costs were lower or productivity costs were higher than calculated in the base case model, ICERs would have been lower and MBT-DH would have been more cost-effective (supplemental figure S3). *[insert link supplemental figure S3]*

Discussion

Main Findings and Reflection

From a cost-utility perspective, MBT-DH becomes preferable to MBT-IOP only at a willingness to pay of a minimum of €107,000, which is more than twice the suggested maximum amount of €50,000 per QALY for patients with an intermediate burden of disease, such as BPD patients. From a cost-effectiveness perspective, MBT-DH likely becomes preferable to MBT-IOP at a willingness to pay of €3000 or more for each additional month in remission from BPD.

Willingness to pay for a QALY has been normed in the Netherlands (Zwaap et al., 2016), rendering the cost per QALY value interpretation fairly straightforward. Typically, willingness-to-pay norms do not exist for units of effect, in this case cost per month in remission, as then a normative discussion would have to be repeated for every effect included in a cost-effectiveness study. However, some benchmark numbers may serve to put the present cost-effectiveness data into perspective. For instance, the annualized estimated price for an additional year of remission from BPD from this study (€3000 × 12 months = €36,000) exceeds the annualized average societal costs of patients with BPD of approximately €15,000 per year reported by studies in the Netherlands (Laurenssen et al., 2016; Soeteman et al., 2010) by a factor of more than 2. Moreover, the modal annual income in the Netherlands is approximately €36,000. The normative question then becomes whether it is justifiable to spend the equivalent of a modal annual income for a year in remission from BPD.

No incremental effect of MBT-DH over MBT-IOP was found in terms of QALYs gained and, although MBT-DH outperformed MBT-IOP slightly in terms of months in remission over the 36-month time frame, this incremental effect did not offset the extra costs associated with the more intensive MBT-DH program. The advantage of MBT-DH in terms of months in remission from BPD might partly be a result of different trajectories of change in the two treatments and might indicate an advantage in the rate, rather than the extent, of improvement. The MBT-DH patients showed improvement that was more rapid during the intensive treatment phase and then levelled off during follow-up, whereas patients in MBT-IOP showed a more gradual improvement over time (Smits et al., 2020). Over time, the difference in effects between MBT-DH and MBT-IOP appears to increase, whereas the difference in cumulative societal costs appears to increase mostly in the first year only.

Implications

Treatment for BPD in the Netherlands is included in basic health care that is covered by state-provided health insurance and therefore by law accessible for all citizens. Hence, as BPD and BPD treatment are associated with both direct and indirect costs to society, findings from this study may inform policy decisions with regard to how to distribute resources in mental health care.

The results of this study suggest that from a health economic perspective, MBT-DH cannot be recommended over the less intensive, less costly MBT-IOP program. MBT-IOP is a viable and relatively affordable treatment option for BPD that achieves acceptable clinical outcomes. However, whether MBT-DH could be more (cost-)effective for specific subtypes of patients is a question yet to be answered. MBT-DH may be indicated when MBT-IOP is not appropriate because of problems related to housing, social security, or the patient's social network, all of which are common in BPD patients. As an intensive day-hospital setting may be an inevitable step toward recovery in a subgroup of BPD patients, one can argue from a clinical perspective that it is premature to conclude that intensive treatments such as MBT-DH do not have a place in the treatment of BPD. On the other hand, no consensus exists about the criteria for such intensive treatment, and the current results indicate that given a fixed health-care budget, a greater number of BPD patients could be treated with MBT-IOP than with MBT-DH.

Strengths and Limitations

A particular strength of the study is its generalizability to routine clinical decision making, because we compared two credible treatment conditions in a multicenter clinical trial and took a societal perspective on costs. The study also has limitations. First, there was quite a substantial proportion of missing data, for which we used multiple imputation to mitigate the possible impact. Moreover, although sensitivity analyses showed variation in ICERs when the main cost drivers were adjusted, in all scenarios MBT-DH had a positive but from a societal perspective high ICER compared with MBT-IOP (i.e., a positive health gain effect against additional costs), which supports the robustness of our key findings. Second, we did not perform treatment completer analyses. However, the intention-to-treat principle we used is justifiable, as it aims to maximize the external validity in terms of generalizability to everyday clinical practice. Third, the study was primarily powered as an effectiveness study, which may result in a lack of power to detect significant cost differences. This limitation is mitigated by the fact that the main conclusions are based on the probabilistic comparison of costs and effects, and not on a comparison of sole costs. Fourth, although the study spanned a period of 36 months after the start of treatment, longer-term follow-up may lead to different conclusions. Since it has been shown that BPD is associated with catch-up with normative developmental trajectories over time (Zanarini et al., 2006), MBT-IOP and MBT-DH might affect these trajectories differentially, which could also lead to differences in the subsequent cost-effectiveness with follow-ups longer than 36 months. Fifth, as health-care systems in different countries vary widely, costs associated with BPD and its treatment by MBT could be quite different in other countries, resulting in a different weighing of costs and effects. Moreover, other health-care systems, such as those based on a user-pay system or private health insurance, may lead to different willingness to pay and hence different conclusions regarding the perceived cost-effectiveness.

Future Directions

Replication in other countries is indicated, as the differences in the cost-effectiveness of MBT-DH and MBT-IOP we found in the Netherlands may not be the same in other health-care systems and societies. Future research could also involve clinical subgroups that may benefit notably more from either of the two forms of MBT. Finally, although we investigated the impact of treatment intensity, associated costs and effects, we did not investigate the impact of varying durations of treatment. A current trial of Juul et al. (2019) focuses on the relative effectiveness of short-term and long-term MBT in terms of treatment effects. Similar studies are needed and should contain an economic evaluation, as such studies have the potential to optimize treatment duration in terms of (cost-)effectiveness. Together with the current findings on the impact of intensity, this optimization could significantly promote access to effective treatments for BPD patients in the future.

Conclusion

In sum, this is the first study to provide a comparative health economic evaluation of MBT-DH versus MBT-IOP in the context of a large multicenter RCT. The findings indicate that MBT-DH is most likely not cost-effective when compared with MBT-IOP. MBT-IOP appears to be a relatively affordable treatment associated with significant reductions in health-care costs compared with MBT-DH, and with acceptable clinical outcomes similar to those of MBT-DH. Since health-care resources are scarce, treatment waiting lists are mounting, and only a small minority of BPD patients receives evidence-based treatment as recommended by treatment guidelines, based on the evidence presented here, MBT-IOP should be preferred over MBT-DH in routine clinical practice.

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Figure Legends

Figure 1. CONSORT flow diagram.

Legend. MBT-IOP = intensive outpatient mentalization-based treatment. MBT-DH = day hospital mentalization-based treatment.

Figure 2. Cost-effectiveness planes and cost-effectiveness acceptability curves from the societal perspective

Legend. MBT-IOP = intensive outpatient mentalization-based treatment. MBT-DH = day hospital mentalization-based treatment.

Note. The two graphs on the left are cost-effectiveness planes. The horizontal axis indicates differences in health gains between MBT-DH and MBT-IOP over 36 months, and the vertical axis represents differences in costs. The chart area is divided into quadrants, each with a specific interpretation. ICERs that fall into the upper right ("north-east") quadrant indicate that MBT-DH generated better health at additional costs; the lower left ("south-west") quadrant indicates less health gains for MBT-DH than MBT-IOP at lower costs (also labelled cost-saving). In the upper left ("north-west") quadrant, MBT-DH is dominated by MBT-IOP, as fewer health gains are obtained at higher costs for MBT-DH compared with MBT-IOP. In the lower right ("south-east"') quadrant, MBT-DH dominates IOP, with more health gains against lower costs. The two plots on the right are cost-effectiveness acceptability curves. These curves show the probability that MBT-DH is more cost-effective than MBT-IOP as a function of the willingness to pay (WTP) for one additional unit of effect (one additional QALY or one additional month of BPD remission). The probability 0.50 on the vertical axis indicates the point of indifference. Above this indifference point, MBT-DH has a better likelihood of being preferred over MBT-IOP with regard to cost-effectiveness (with a likelihood equal to the probability on the vertical axis). As the

WTP per unit of effect is generally an unknown quantity, it is presented as a series of increments on the horizontal axis.

Table 1. Baseline characteristics and costs

	MBT-DH (n = 70) Mean (SD)	**MBT-IOP (n = 44) Mean (SD)**
Age	31.4 (10.6)	29.9 (9.2)
PAI-BOR total	46.9 (9.59)	48.7 (9.90)
EQ-5D	0.50 (0.28)	0.44 (0.29)
	n (%)	**n (%)**
Female	59 (84%)	35 (80%)
Educational level		
Low	5 (8%)	1 (3%)
Medium	41 (61%)	21 (53%)
High	21(31%)	18 (45%)
No vocational/volunteer activity	56 (88%)	28 (74%)
Criminal record	53 (82%)	38 (93%)
At least one symptom disorder	57 (81%)	35 (80%)
Mood disorder	40 (57%)	25 (57%)
Substance use disorder	26 (37%)	15 (34%)
Anxiety disorder	35 (50%)	17 (39%)
Eating disorder	11 (16%)	11 (25%)
At least one comorbid personality disorder	23 (33%)	17 (39%)
Cost in 6 months before randomization	**Mean (SD) (€)**	**Mean (SD) (€)**
Productivity costs	4,087 (14,112)	4,415 (12,595)
Health care costs	13,940 (22,547)	15,643 (28,356)

Note. MBT-IOP = intensive outpatient mentalization-based treatment. MBT-DH = day hospital mentalization-based treatment.

Table 2. Cumulative mean costs and effects of MBT-DH and MBT-IOP

Time	Group	Productivity costs Mean (SD) (€)	Health care costs Mean (SD) (€)	Societal costs Mean (SD) (€)	QALY Mean (SD)	Remission months Mean (SD)
Baseline	MBT-DH	3,789 (13,440)	13,691 (24,031)	17,480 (27,687)	0.00 (0.00)	0.00 (0.00)
Baseline	MBT-IOP	5,238 (14,044)	16,293 (29,160)	21,531 (36,084)	0.00 (0.00)	0.00 (0.00)
Start treatment	MBT-DH	5,408 (15,399)	34,272 (36,449)	39,680 (39,901)	0.18 (0.15)	0.61 (1.51)
Start treatment	MBT-IOP	8,052 (18,113)	27,686 (33,324)	35,738 (41,821)	0.19 (0.15)	0.60 (1.54)
6 months	MBT-DH	8,848 (23,966)	52,710 (41,190)	61,557 (47,896)	0.45 (0.23)	1.78 (3.15)
6 months	MBT-IOP	9,886 (20,737)	38,328 (41,007)	48,215 (49,504)	0.45 (0.22)	1.45 (2.86)
12 months	MBT-DH	9,819 (25,186)	66,162 (44,662)	75,982 (51,671)	0.73 (0.31)	3.93 (5.03)
12 months	MBT-IOP	13,333 (27,659)	47,629 (48,844)	60,962 (59,184)	0.72 (0.29)	2.72 (4.35)
18 months	MBT-DH	11,279 (26,822)	72,396 (47,123)	83,675 (55,080)	1.04 (0.39)	6.54 (6.46)
18 months	MBT-IOP	14,843 (29,003)	52,755 (50,231)	67,598 (60,845)	1.00 (0.36)	4.34 (5.79)
24 months	MBT-DH	12,805 (28,567)	78,644 (50,210)	91,449 (59,313)	1.35 (0.45)	9.35 (8.20)
24 months	MBT-IOP	17,803 (33,073)	59,082 (52,702)	76,885 (64,504)	1.27 (0.43)	6.29 (7.34)
30 months	MBT-DH	14,889 (31,050)	83,943 (53,033)	98,832 (63,993)	1.66 (0.51)	12.57 (9.91)
30 months	MBT-IOP	20,182 (36,812)	63,832 (55,466)	84,014 (68,803)	1.54 (0.50)	8.46 (9.05)
36 months	MBT-DH	16,816 (33,544)	89,221 (56,175)	106,038 (68,548)	1.96 (0.58)	16.01 (11.46)
36 months	MBT-IOP	22,991 (39,932)	68,377 (57,003)	91,368 (72,590)	1.83 (0.56)	11.06 (10.71)

Note. MBT-IOP = intensive outpatient mentalization-based treatment. MBT-DH = day hospital mentalization-based treatment.

Table 3. Cost, remission months per patient, QALYs, and ICERs (MBT-DH relative to MBT-IOP) between baseline and 36-month follow-up

	MBT-DH (n=70)			MBT-IOP (n=44)			ICER	
Perspective/analysis	**Costs (€)**	**Months in remission**	**QALYs**	**Costs (€)**	**Months in remission**	**QALYs**	**€ per month in remission**	**€ per QALY**
Health care sector perspective	88,860	16.0	1.97	68,014	11.0	1.83	4,166	149,411
Societal perspective	105,799	16.0	1.97	90,922	11.0	1.83	2,986	107,124

Note. Slight variations appear between this table and Table 2 owing to random bootstrapping error. QALYs = quality adjusted life years. ICERs = incremental cost-effectiveness ratios. MBT-DH = day hospital mentalization-based treatment. MBT-IOP = intensive outpatient mentalization-based treatment.

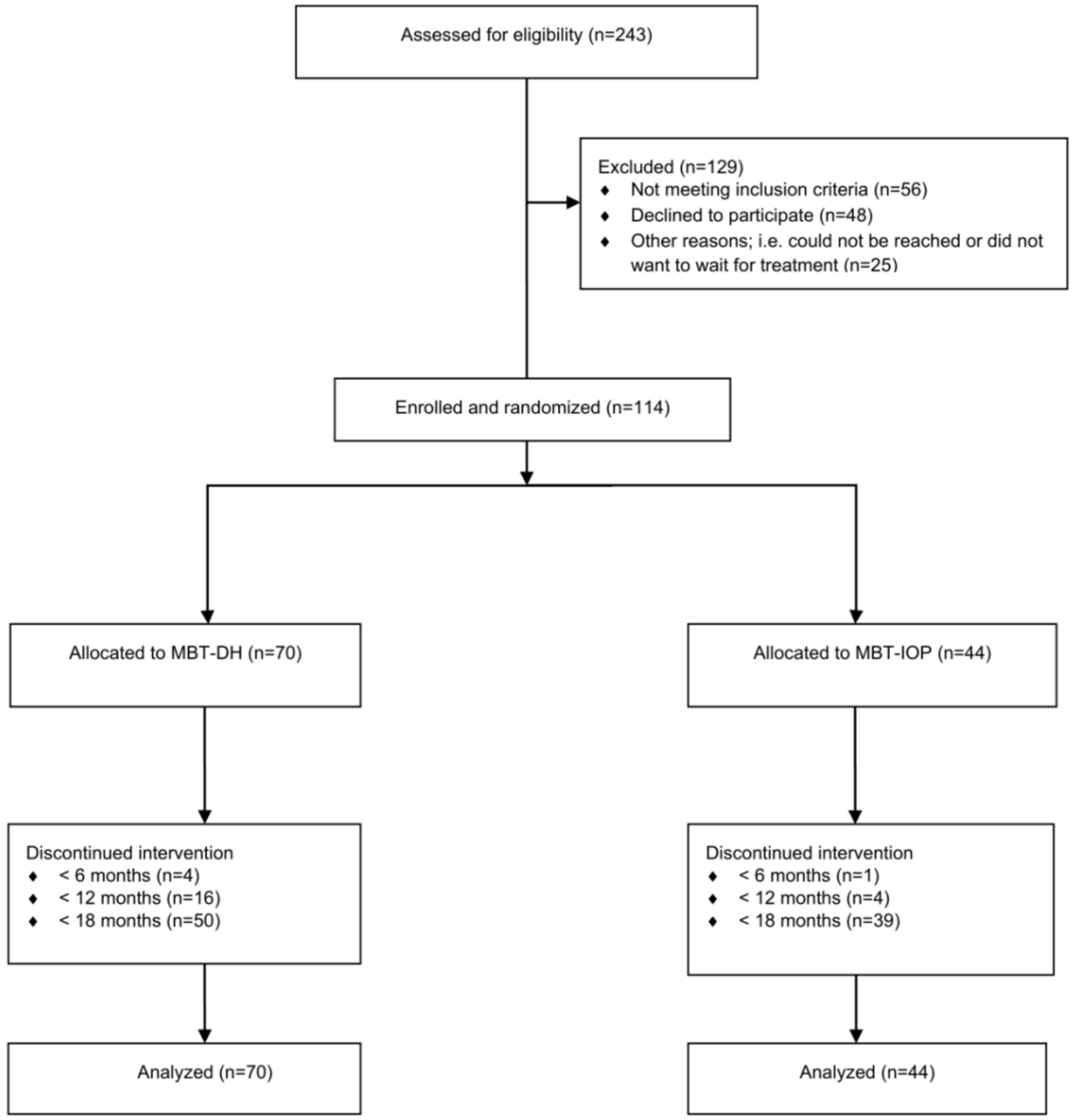

Assessed for eligibility (n=243)
Excluded (n=129)
Not meeting inclusion criteria (n=56)
Declined to participate (n=48)
Other reasons; i.e. could not be reached or did not want to wait for treatment (n=25)
Enrolled and randomized (n=114)
Allocated to MBT-DH (n=70)
Allocated to MBT-IOP (n=44)
Discontinued intervention
< 6 months (n=4)
< 12 months (n=16)
< 18 months (n=50)
Discontinued intervention
< 6 months (n=1)
< 12 months (n=4)
< 18 months (n=39)
Analyzed (n=70)
Analyzed (n=44)

Figure 1

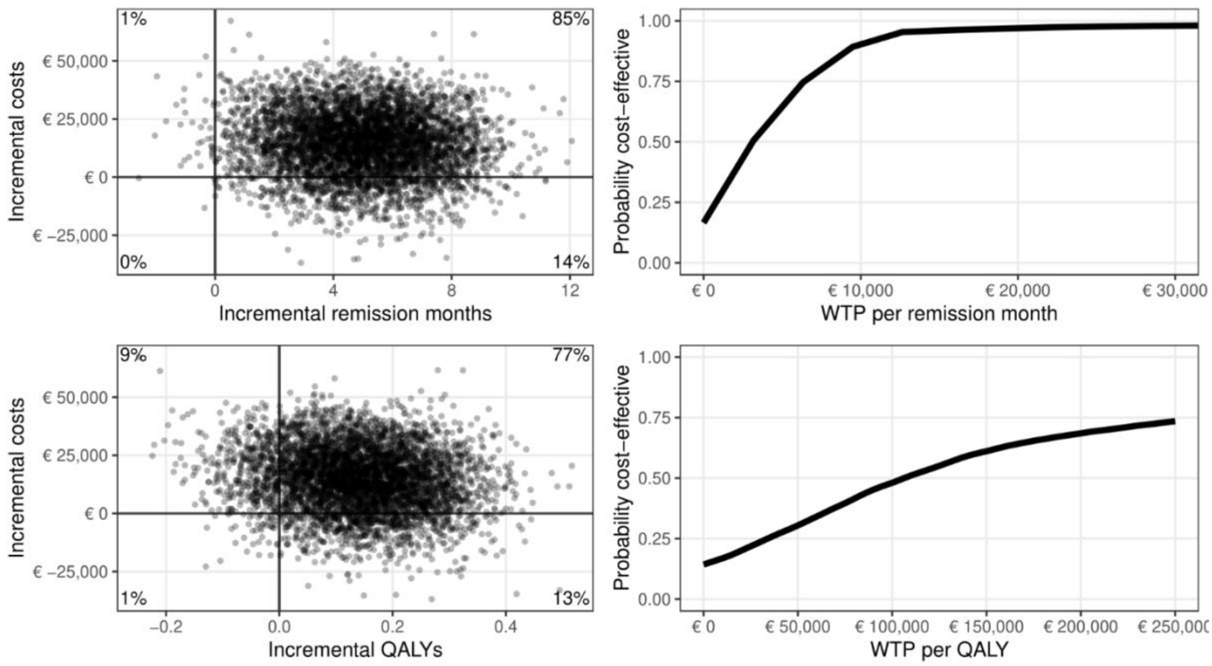

1%
85%
0%
14%
Incremental costs
€ 50,000
€ 25,000
€ 0
€ −25,000
0
4
8
12
Incremental remission months
Probability cost−effective
1.00
0.75
0.50
0.25
0.00
€ 0
€ 10,000
€ 20,000
€ 30,000
WTP per remission month
9%
77%
1%
13%
−0.2
0.0
0.2
0.4
Incremental QALYs
€ 50,000
€ 100,000
€ 150,000
€ 200,000
WTP per QALY

Figure 2

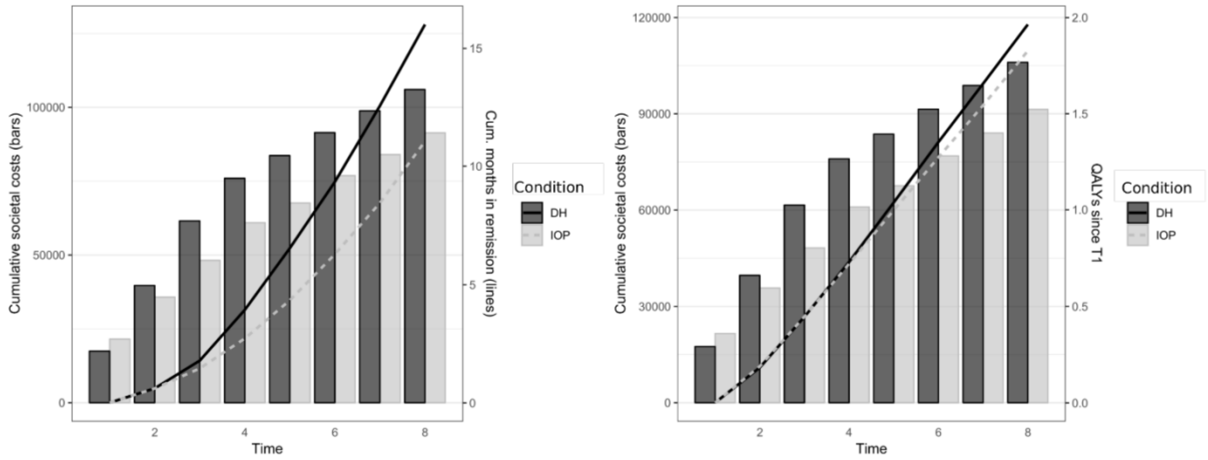

Cumulative societal costs (bars)
Cum. months in remission (lines)
Time
Condition
DH
IOP
Cumulative societal costs (bars)
QALYs since T1
Time
Condition
DH
IOP

Figure S1

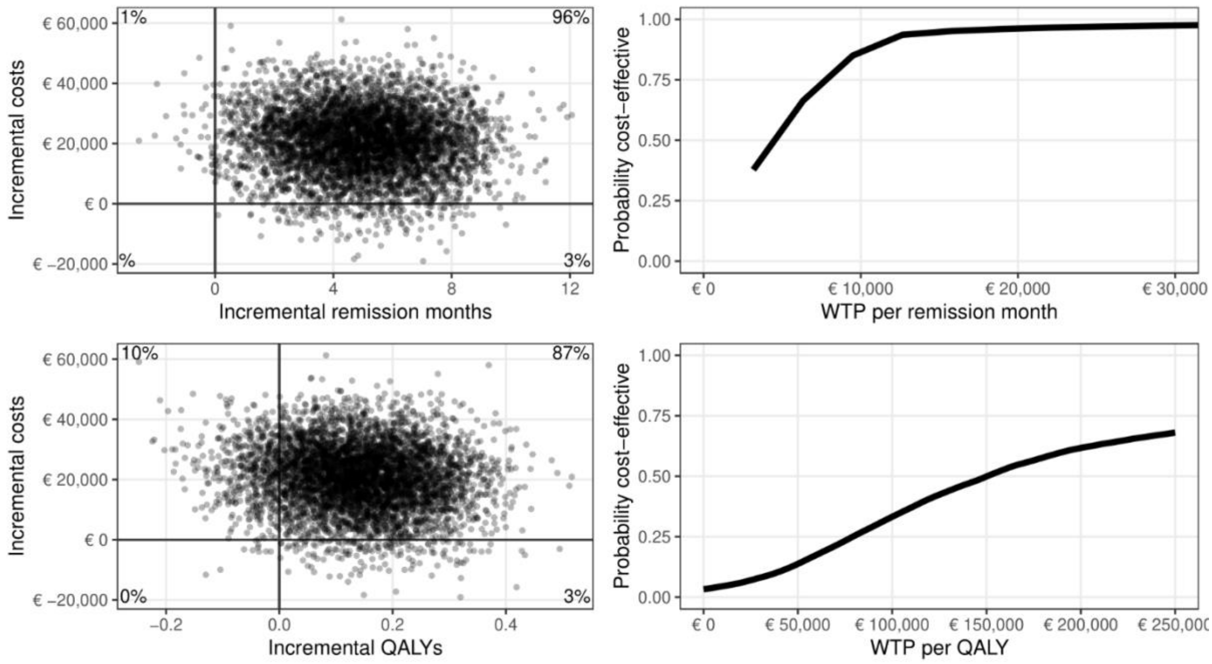
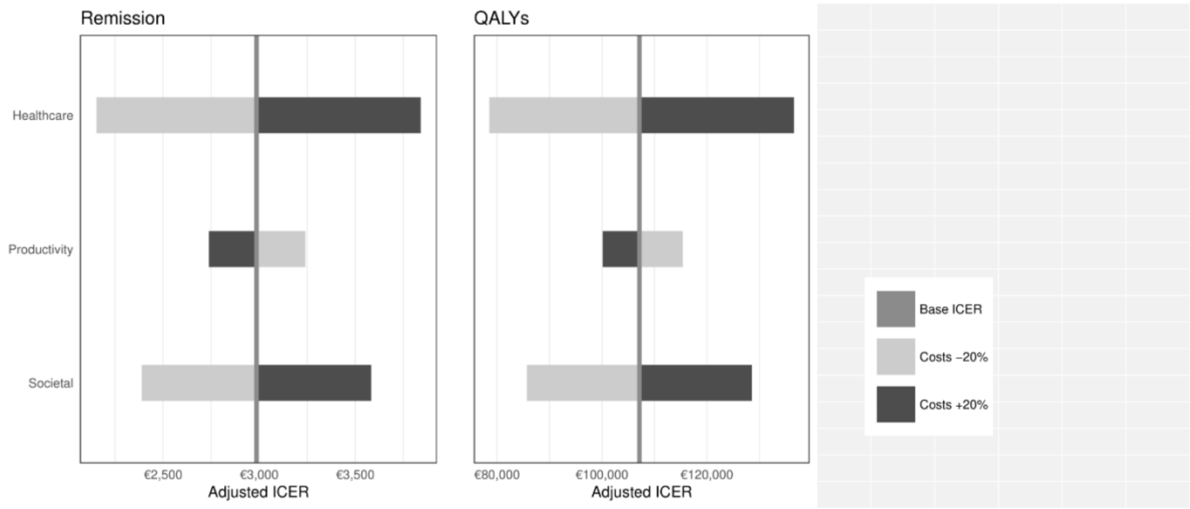

1%
96%
%
3%
€ 60,000
€ 40,000
€ 20,000
€ 0
€ −20,000
Incremental costs
0
4
8
12
Incremental remission months
1.00
0.75
0.50
0.25
0.00
Probability cost−effective
€ 0
€ 10,000
€ 20,000
€ 30,000
WTP per remission month
10%
87%
0%
3%
€ 60,000
€ 40,000
€ 20,000
€ 0
€ −20,000
Incremental costs
−0.2
0.0
0.2
0.4
Incremental QALYs
1.00
0.75
0.50
0.25
0.00
Probability cost−effective
€ 0
€ 50,000
€ 100,000
€ 150,000
€ 200,000
€ 250,000
WTP per QALY

Figure S2


Remission
QALYs
Healthcare
Productivity
Societal
€2,500
€3,000
€3,500
Adjusted ICER
€80,000
€100,000
€120,000
Adjusted ICER
Base ICER
Costs −20%
Costs +20%