Computer-Assisted Cognitive-Behavior Therapy for Depression in Primary Care: A Cost-Effectiveness Analysis

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INTRODUCTION

Computer-assisted cognitive-behavior therapy (CCBT) has goals to improve access, convenience, efficiency, and cost of effective psychotherapy for depression (Thase et al., 2018, 2020 Wright et al., 2019). There has been a rapid expansion of research on CCBT for depression, and multiple meta-analyses have found evidence for effectiveness of this approach if combined with a modest amount of clinician support (Richards and Richardson, 2012; So et al.2013; Wells et al., 2018; Wright et al., 2019). Limited work has been done in socioeconomically deprived populations, a gap this study fills.

This study examined the cost-effectiveness of CCBT vs. treatment as usual (TAU) for depression in a sample of primary care patients with depression symptoms. Cost effectiveness analyses examined quality of life from the physical health and mental health perspective, assessing them relative to intervention cost

METHODS

PARTICIPANTS

175 patients from urban and rural primary care practices at the University of Louisville participated in this study. A score of 10 or above on the PHQ-9 was required for participation. Our sample was selected to include a significant proportion of socioeconomically disadvantaged individuals. Exclusion criteria were: significant suicidal ideation, diagnosis of any psychotic disorder or bipolar disorder, severe medical disorder that would prevent participation, and inability to read English. Patients were randomly assigned to CCBT (N = 95) or treatment as usual (TAU; N = 80). The patients assigned to the TAU condition received standard assessment, clinical care, and referrals by primary care physicians. Antidepressant usage and receipt of other therapies were allowed and notcontrolled. Patients assigned to CCBT also received TAU.

Eighty-four percent of the patients were female. The mean age was 47 (range 18-87). Fifty-seven percent were white, 25% were Black, 8% were multi-ethnic, 2% were Latinx,1% were Native American and 7% did not identify their race/ethnicity. 50.3% of patients reported income below $29,999. Seventy-eight patients had commercial insurance, 21 patients had Medicare insurance,74 patients had Medicaid, and 1 patient had no insurance.

TREATMENT

Patients assigned to CCBT used the computer program ***Good Days Ahead*** (GDA) – a 9-lesson, multimedia program that has been shown to be effective in previous research (Wright et al, 2005; Thase et al., 2018). In addition, patients received support from a social worker by phone and/or email for 20 minutes weekly. Persons without internet access were supplied with a low-cost, loaner laptop that was configured to allow completion of online assessments and work with GDA.

MEASURES AND STATISTICAL ANALYSIS

Cost-effectiveness analyses from the health care payer perspective were conducted from baseline to 6-month post-intervention. Quality of life was measured using the Short-Form 12 (SF-12 v2), yielding a physical component score (PCS) and mental component score (MCS) ranging from 0-100, with higher scores reflecting better health. For the economic analysis, SF-12 scores were converted into quality-of-life values ranging from 0 to 1 (1 implying perfect health and 0 implying death), which were then used to calculate quality-adjusted life years (QALYs) over the study period.

Intervention cost was calculated by multiplying the number of sessions attended by each participant receiving CCBT by the Medicare reimbursement rate for a 16– to 30-minute session delivered by a licensed clinical social worker. Additionally, 17 of 95 CCBT participants elected to borrow a laptop, including MiFi device and 3-month data plan. These costs were calculated, including the cost of 9 laptops that were not returned.

Finally, incremental costs and incremental QALYs were estimated by taking the difference between the CCBT and TAU arms in costs and outcomes. Baseline differences between the two groups were adjusted in a linear regression model that included baseline quality-of-life level and participant age. The incremental cost-effectiveness ratio (ICER) was calculated as the ratio of incremental costs and QALYs. Estimates from the bootstrap samples were plotted on a cost-effectiveness plane and used to estimate the probability of CCBT being cost-effective at willingness-to-pay thresholds of $50,000 and $100,000/QALY.

RESULTS

At baseline, participants were comparable on the SF-12 mental (MCS) and physical (PCS) component scores in the CCBT and TAU groups. The MCS scores at baseline were low in both groups which is indicative of the mental health problems at the time of enrollment. At 12 weeks, CCBT participants had much higher MCS score on average (40.91) compared to the TAU group (33.73). This difference was statistically significant. The gap in MCS scores between the two groups was similar at the 6-month time point. The PCS scores in the two groups remained stable during the follow-up. The SF-12 scores were converted into utility (quality of life) values. The utility values were higher in the CCBT group at most follow-up time points but were only statistically significant at 12-weeks and 6-months.

CCBT participants attended an average of 8.4 sessions and received an average of 3.5 hours of therapy. Computing cost of laptop and MiFi plan was incurred by 17/95 participants; this was averaged over the CCBT group to arrive at $39.3 per participant. The overall incremental cost of CCBT, compared to TAU, was $689.8 (95% CI: $642.1 to $737.6). The incremental QALYs for CCBT, compared to TAU, was estimated to be 0.016 (95% CI: -0.004 to 0.037). The incremental cost-effectiveness ratio for the CCBT arm, compared to the TAU arm, was $41,932 i.e., CCBT was more expensive and more effective.

Table 1. Estimates of Quality-of-Life, Cost and Cost-Effectiveness Analysis, Comparing CCBT and TAU

Quality of life analysis	Baseline		Post-treatment		3-month follow-up		6-month follow-up	
	CCBT	TAU	CCBT	TAU	CCBT	TAU	CCBT	TAU
SF-12 Mental component score*	27.96	29.76	40.91	33.73	38.15	33.96	38.12	31.49
SF-12 Physical component score	41.35	41.65	41.10	41.04	44.01	44.04	40.85	41.77
Utility§	0.489	0.495	0.619	0.563	0.602	0.606	0.610	0.561

Cost analysis	No. of sessions	Time (hours)	Cost per session	Computing cost	Total intervention cost
Number/cost per participant	8.41	3.48	71.10	39.30	637.15

Cost-effectiveness analysis	Inc. costs (CCBT - TAU)		Inc. QALYs (CCBT - TAU)		ICER = (Inc. cost/Inc. QALYs)		
	Mean ($)	95% CI	Mean	95% CI	ICER ($)	Pr(cost-effective at 50k/QALY)	Pr(cost-effective at 100k/QALY)
Incremental estimates	689.8	642.1 to 737.6	0.016	-0.004 to 0.037	41,932	60%	82%

*Mental and Physical Component Scores range from 0 to 100, higher score is better.
§Utility value ranges from 0 to 1, higher is better

Uncertainty in incremental costs and incremental QALYs are represented in Figure 1 which shows the cost-effectiveness plane based on 1,000 bootstrap samples. The probability of CCBT being cost-effective at willingness-to-pay threshold of $50,000/QALY was 60% and at $100,000/QALY was 82% (Figure 2).

Figure 1. Cost-effectiveness plane for incremental costs and QALY for CCBT versus TAU

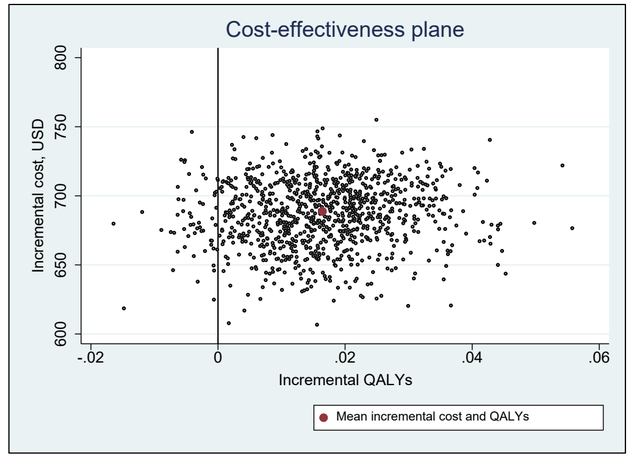
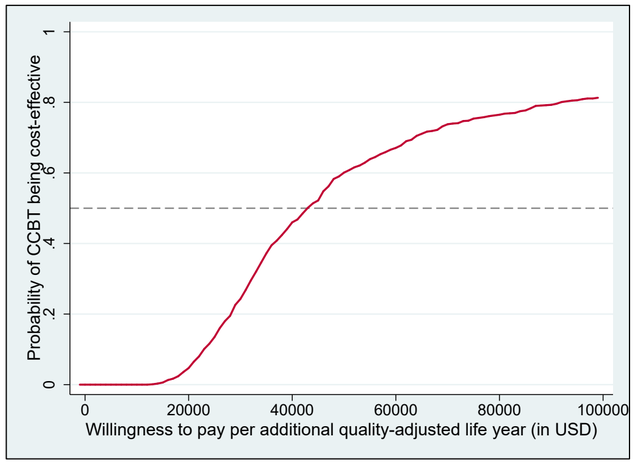


Figure 2. Cost-Effectiveness Plane For Incremental Costs and QALY for CCBT and TAU



CONCLUSIONS

CCBT has a high probability of being cost-effective at the commonly used willingness-to-pay thresholds for health gains.

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