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Submitted to: Journal of Medical Internet Research
on: March 17, 2025

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Hyeonjung Park[1, 2*] BOP; Minseol Jang[1, 2*] PharmD; Daehyun Kim[1, 2] PharmD; Chul Kim[3] MD, PhD; Jun Hyeong Song[3] MMSc, MD; Ju Hyun Oh[4] MD; Chin Kook Rhee[5] MD, PhD; Jae Ha Lee[6] MD, PhD; Hee-Eun Choi[7, 8*] MMSc, MD; Hae Sun Suh[1, 2, 9*] MPharm, MA, PhD

[1] Department of Regulatory Science, Graduate School, Kyung Hee University, Seoul, Republic of Korea Seoul KR
[2] Institute of Regulatory Innovation through Science (IRIS), Kyung Hee University Seoul KR
[3]Inje University College of Medicine Department of Rehabilitation Medicine, Inje University Sanggye Paik Hospital Seoul KR
[4]Ajou University School of Medicine Department of Pulmonary and Critical Care Medicine, Ajou University Medical Center Suwon KR
[5]College of Medicine, The Catholic University of Korea Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Seoul St. Mary's Hospital Seoul KR
[6]Inje University College of Medicine Division of Pulmonology and Critical Care Medicine, Department of Internal Medicine, Inje University Haeundae Paik Hospital Busan KR
[7]Inje University College of Medicine Department of Physical Medicine and Rehabilitation,Inje University Haeundae Paik Hospital Busan KR
[8] Share and Service Inc. Busan KR
[9] College of Pharmacy, Kyung Hee University Seoul KR
[*]these authors contributed equally

Corresponding Author:
Hae Sun Suh MPharm, MA, PhD

College of Pharmacy, Kyung Hee University
26, Kyunghee-daero, Dongdaemun-gu, Seoul
Seoul
KR

Abstract

Background: Pulmonary rehabilitation, a non-pharmacological treatment for chronic respiratory diseases (CRD), is underutilized due to limited access and time constraints. In a randomized controlled trial, the digital therapeutic (DTx) EASYBREATH showed superior efficacy to standard treatment. However, evidence on the cost-effectiveness of DTx and appropriate pricing strategies remains limited.

Objective: This study aimed to assess the cost-effectiveness of DTx through cost-utility analysis and to explore value-based pricing.

Methods: This economic evaluation was based on an 8-week rehabilitation trial involving 84 participants randomized into either the DTx group or standard treatment group. Costs were estimated from a healthcare system perspective. Quality-adjusted life years (QALY) were estimated by using mapping algorithms to COPD Assessment Test. Cost-utility analysis was conducted to estimate the incremental cost-utility ratio (ICUR), which represents the additional cost per QALY gained. The willingness-to-pay threshold was set at $19,410 per QALY, the Korean Gross Domestic Product per capita in 2006. Scenario, subgroup, and deterministic analyses were performed, along with probabilistic sensitivity analysis using 1,000 simulations.

Results: Compared to standard treatment, DTx increased QALY by 0.0096 at an additional cost of $85.33, resulting in an ICUR of $8,922 per QALY gained. The maximum value-based price for an 8-week DTx program was estimated at $192. In probabilistic sensitivity analysis, DTx had a 60.2% probability of being cost-effective at the threshold. Subgroup analysis showed that the ICUR remained below the threshold in both elderly (?65 years, $10,486 per QALY) and the non-elderly (<65 years, $6,784 per QALY) groups.

Conclusions: DTx for pulmonary rehabilitation was cost-effective compared to standard treatment. These findings highlight its potential benefits for patients with CRD and support its integration into current healthcare systems.

(JMIR Preprints 17/03/2025:73739)

DOI: https://doi.org/10.2196/preprints.73739

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1 Department of Regulatory Science, Graduate School, Kyung Hee University, Seoul, Republic of Korea

2 Institute of Regulatory Innovation through Science (IRIS), Kyung Hee University, Seoul, Republic of Korea

3 College of Pharmacy, Kyung Hee University, Seoul, Republic of Korea

4 Department of Rehabilitation Medicine, Inje University Sanggye Paik Hospital, Inje University College of Medicine, Seoul, Republic of Korea

5 Department of Pulmonary and Critical Care Medicine, Ajou University Medical Center, Ajou University School of Medicine, Suwon, Republic of Korea

6 Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea

7 Division of Pulmonology and Critical Care Medicine, Department of Internal Medicine, Inje University Haeundae Paik Hospital, Inje University College of Medicine, Busan, Republic of Korea

8 Department of Physical Medicine and Rehabilitation, Haeundae Paik Hospital, Inje University College of Medicine, Busan, Republic of Korea

9 Share and Service Inc., Busan, Republic of Korea

*These authors contributed equally to this study.

†Co-correspondence to:

HeeEun Choi, MD

Email: grace.choi@snsmd.com

Address: 875, Haeundae-ro, Haeundae-gu, Busan (zip code: 48108), Korea (South)

Telephone: +82-70-8888-0780

Hae Sun Suh, PhD

Email: haesun.suh@khu.ac.kr

Address: 26, Kyunghee-daero, Dongdaemun-gu, Seoul (zip code: 02447), Korea (South)

Telephone: +82-2-961-9492

Abstract

Background: Pulmonary rehabilitation, a non-pharmacological treatment for chronic respiratory diseases (CRD), is underutilized due to limited access and time constraints. In a

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Conclusions: DTx for pulmonary rehabilitation was cost-effective compared to standard treatment. These findings highlight its potential benefits for patients with CRD and support its integration into current healthcare systems.

Keywords: economic evaluation; cost-effectiveness; cost-utility; digital therapeutics; DTx; value-based price; respiratory diseases; pulmonary rehabilitation.

Introduction

Chronic respiratory diseases (CRD), such as chronic obstructive pulmonary disease (COPD) and interstitial lung disease (ILD), are noncommunicable diseases worldwide 1. With an increasing trend in prevalence, it is estimated that CRD constituted 4.0 million deaths in 2019 2. There is an increasing burden of disease on individuals and economic impact on healthcare systems driven by emergency department visits and hospitalizations owing to acute exacerbation 3. In Korea, the total costs for patients with COPD, including indirect expenses, amounted to 1.245 billion US dollars (USD) in 2015 4.

Pulmonary rehabilitation is a nonpharmacological treatment strategy aimed at improving the physical and emotional well-being of patients with CRD 5. It has been shown to reduce dyspnea and improve exercise capacity and quality of life (QoL) in these patients 6. However, despite its proven benefits, pulmonary rehabilitation remains underutilized worldwide and is often inaccessible to patients. Lack of caregiver awareness, specialized hospitals and professionals, and insufficient financial support are major hurdles to broader use and treatment adherence 7-9. Consequently, the global need for accessible and effective rehabilitation services has increased 10.

EASYBREATH is a digital therapeutic (DTx) designed for patients with CRD, offering a comprehensive rehabilitation program. This application (app) includes customized aerobic exercise training, breathing retraining, and an educational program prescribed based on the six-minute walk test.

A multicenter, randomized controlled trial (RCT) evaluated the efficacy of EASYBREATH compared to a standard rehabilitation program for patients with CRD in South Korea. The trial found that EASYBREATH significantly improved patients' efficacy outcomes, including 6-minute walk distance (6MWD), and QoL measures such as the modified Medical Research Council (mMRC) score, COPD assessment test (CAT) score, St. George's respiratory questionnaire

(SGRQ) score, and Hospital Anxiety and Depression Scales (HADS) 11.

This home-based DTx program for pulmonary rehabilitation could address the key challenges associated with traditional pulmonary rehabilitation, such as accessibility and time-efficiency 11. To integrate an effective pulmonary rehabilitation approach using DTx into patient care and healthcare systems, economic evaluations are essential to provide evidence for prescription, coverage, and reimbursement decisions 12. Cost-utility analysis (CUA), which evaluates the incremental cost-effectiveness ratio (ICUR) against established willingness-to-pay (WTP) thresholds, is widely used method in health economics. CUA uses standard health gain measures, with quality-adjusted life years (QALYs) being commonly recommended as the preferred metric for measuring benefits 13-15. Within this framework, value-based price (VBP) aligns the rewards for innovation with the magnitude of the benefits delivered 16. By utilizing ICURs derived from CUA, VBP offers a transparent and replicable approach that meets the needs of patients, clinicians, and insurers while accommodating the realities of reimbursement systems 16,17.

Despite growing interest in DTx, research on the economic evaluation of DTx for rehabilitation remains limited. In this study, we aimed to evaluate the cost-effectiveness of a DTx, known as EASYBREATH, and explore a reasonable VBP strategy that reflects its clinical and economic value for application in patient treatment.

Methods

Study Design and Participants

The CUA was based on an RCT conducted in 2023 involving patients with CRD and recruited from three clinical centers in South Korea. The inclusion criteria were as follows: age over 19 years, diagnosis of CRD (such as COPD, ILD, lung cancer, asthma, or bronchiectasis), a need for rehabilitation due to respiratory symptoms or difficulties in daily life, and the ability to use a

mobile app. Exclusion criteria comprised cognitive impairment, prior participation in pulmonary rehabilitation, unstable cardiovascular disease, walking difficulties, and pregnancy. A total of 84 participants met the inclusion criteria and were included in the full analysis set (FAS). Participants were randomly assigned to the DTx group (n = 43) or the control group (n = 41) using a block randomization method. Both groups were followed up for 8-week period after the initiation of treatment.

The trial protocol was approved by the Korean Ministry of Food and Drug Safety (Approval No. 1431). This study was approved by the Institutional Review Boards at each clinical center (Approval No. Catholic University Seoul St. Mary's Hospital, KC23DNDS0031; Inje University Sanggye Paik Hospital, SGPAIK 2024-06-006; Inje University Haeundae Paik Hospital, HPIRB 2024-06-001-004).

Interventions

The DTx group participated in rehabilitation sessions three times a week at home and visited the clinical center once every four weeks for examinations. Participants received an initial training session on using the EASYBREATH app, were equipped with a smartwatch, and installed the app on their mobile phones. Those who failed to meet the predefined minimum participation criteria of attending three consecutive exercise sessions were followed up by medical staff. The control group visited the clinical center every four weeks during the trial to perform aerobic exercise in accordance with the Korean pulmonary rehabilitation guidelines [1].

Cost

Costs were calculated from a healthcare system perspective for the base-case analysis. Two types of costs were included: (1) medical and (2) pharmaceutical costs. Expenses were collected retrospectively after the completion of the RCT and were limited to those directly

related to CRD, as determined by clinical opinions. Medical costs included screening, examination, and physician consultation fees. For the DTx group, the cost of using the EASYBREATH app, priced at $93.17 for the 8-week period, was included. Pharmaceutical costs were calculated by summing drug acquisition costs and pharmacy dispensing fees. Drug acquisition costs were determined by multiplying drug quantities by standard unit prices in the Korean healthcare system.

As the CUA did not estimate costs beyond a 12-month horizon, no discount rate was applied. All costs were initially collected in Korean won (KRW) and converted to USD using a 2023 exchange rate of 1,288 KRW per USD.

Utility

QALY was used to assess the quality of care, as it accounts for both health-related QoL and life expectancy to measure overall health benefits [2]. QoL scores from the trial, including CAT and SGRQ scores, were mapped to European quality of life 5-dimensions, 3-level version (EQ-5D-3L) index utility values to calculate QALY. Following a search for suitable mapping algorithms, three relevant publications were identified [3-5] (Table S1). Among these, we selected one mapping algorithm based on the following criteria: (1) lower root mean squared error (RMSE) and mean absolute error (MAE) and (2) alignment with disease severity in the trial (Table S2, Table S3). The algorithm by Lim et al. [5] exhibited the smallest RMSE and MAE among the identified publications and closely matched the disease severities observed in the trial. Using the selected algorithm (ordinary least squares model 3), CAT scores were mapped to EQ-5D-3L utility values. QALY was then calculated using the trapezoid rule [2].

Statistical analysis

Imputation of missing data

We collected individual patient data of FAS, and missing values of cost and utility measures

were imputed using different methods. For missing cost data, average costs for patients at the same center were imputed. In cases where medical costs were unavailable for one center, average costs from the other two centers were used as imputed values. Missing utility values were addressed using the Last Observation Carried Forward method.

Cost-utility analysis

We conducted the CUA from a healthcare system perspective, including only cost items incurred within the healthcare system, as recommended in South Korea [6]. The result of CUA was ICUR, calculated by dividing the incremental cost by the incremental utility between two groups. A WTP threshold of $19,410 per QALY was applied, reflecting the Korean Gross Domestic Product per capita in 2006, when pharmacoeconomic evaluations were first implemented [7].

Value-based pricing

VBP is the price that reflects the comprehensive value of each intervention. We evaluated the VBP of DTx usage costs over the 8-week period. VBP was defined as the maximum price at which DTx remains cost-effective [8]. Usage costs were varied to calculate corresponding ICUR values, which were then compared to WTP thresholds to evaluate cost-effectiveness at various pricing levels.

Sensitivity analysis

Four sensitivity analyses were conducted to identify uncertainties and heterogeneity. First, a probabilistic sensitivity analysis (PSA) with 1,000 simulations was performed to assess parameter uncertainty, assuming that costs followed a gamma distribution and utilities followed a normal distribution. A cost-effectiveness plane and cost-effectiveness acceptability curve (CEAC) were generated to evaluate the likelihood of cost-effectiveness. Second, scenario analysis was performed to test the robustness of the results under varying conditions. We

evaluated cost-effectiveness from a limited societal perspective, incorporating caregiving and transportation costs, but excluding productivity loss [6]. Data were analyzed after excluding healthcare cost outliers identified using the interquartile range method. Third, a one-way deterministic sensitivity analysis (DSA) was performed by adjusting key parameters, including costs and utilities, within 95% confidence intervals for both groups and by re-estimating utilities using alternative mapping algorithms. Variations in ICUR were presented using a tornado diagram. Fourth, subgroup analysis was conducted to account for potential participant heterogeneity. Subgroups were defined by age (≥65 and <65), CRD type (COPD and ILD), and analysis set (per-protocol set, PPS). Data were analyzed using Microsoft Excel version 365 and SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

Participant characteristics

A total of 84 patients were included in the randomized trial. The baseline characteristics of the patients were comparable, except for age. Table 1 shows the demographic characteristics of the study population. Male participants comprised 79.10% and 87.80% of the DTx and control groups, respectively. The mean age in years was slightly lower in the DTx group (63.4 ± 10.36) compared to the control group (67.78 ± 6.93) ($p < 0.05$). COPD was the most common diagnosis, with 26 patients (60.47%) in the DTx group and 23 patients (56.10%) in the control group. Baseline clinical efficacy measures, including the 6MWD, mMRC, CAT scores, SGRQ subscales, and HADS were well matched across the groups (all $p > 0.05$).

Table 1. Baseline characteristics

	DTx group (N = 43)	Control group (N = 41)	Total (N = 84)	P-value[a]
Male, N (%)	34 (79.07%)	(87.80%)	70 (83.3%)	0.435
Age, mean (SD)	63.40 (10.36)	67.78 (6.93)	65.54 (9.07)	0.026
Diagnosis, N (%)				

COPD	26 (60.47%)	23 (56.10%)	49 (58.3%)	0.854
Interstitial lung disease	13 (30.23%)	12 (29.27%)	25 (29.8%)	0.923
Others	4 (9.30%)	6 (14.63%)	10 (11.90%)	0.696
Clinical efficacy, mean (SD)				
6MWD (in meter)	495.67 (64.15)	474.54 (73.36)	485.36 (69.20)	0.163
mMRC	1.30 (0.71)	1.29 (0.68)	1.30 (0.69)	0.949
CAT total score	17.67 (6.03)	17.63 (7.39)	17.65 (6.69)	0.978
SGRQ-Total	30.06 (12.90)	28.45 (13.99)	29.28 (13.38)	0.584
SGRQ-Symptoms	43.57 (13.08)	47.49 (13.91)	45.49 (13.55)	0.187
SGRQ-Activity	46.72 (21.59)	41.82 (16.89)	44.33 (19.48)	0.251
SGRQ-Impacts	16.32 (12.87)	14.86 (15.55)	15.61 (14.17)	0.639
HADS-Total	9.12 (5.62)	9.98 (5.83)	9.54 (5.71)	0.494
HADS-Anxiety	3.74 (3.40)	3.78 (2.74)	3.76 (3.08)	0.957
HADS-Depression	5.37 (2.95)	6.20 (3.89)	5.77 (3.45)	0.277

Abbreviations: COPD, Chronic obstructive pulmonary disease; mMRC, modified Medical research council dyspnea scale; CAT, COPD assessment test; SGRQ, St. George's respiratory questionnaire; HADS, Hospital anxiety and depression scale.
[a]For continuous variables, an independent samples t-test was used to calculate the p-value, while for categorical variables, a chi-square test was applied. Statistical significance was assessed at a 5% significance level.

Cost

Total costs per patient were $390.39 (SD: $193.09) for the DTx group and $305.06 (SD: $220.18) for the control group. In the DTx group, medical costs were $196.44 (SD: $37.28) and pharmaceutical costs were $194.96 (SD: $190.70), compared to $94.70 (SD: $38.02) and $210.36 (SD: $227.57), respectively, in the control group.

Utility

The mean QALY over the 8-week period was 0.1522 (SD: 0.016) across all patients (Table 2). During the first four weeks, the QALY was 0.0822 (SD: 0.010) in the DTx group and 0.0795 (SD: 0.011) in the control group. In the subsequent four weeks, the DTx group showed significant improvement, with a QALY of 0.0746 (SD: 0.016), compared to 0.0678 (SD: 0.013) in the control group ($p = 0.036$). Over the entire 8-week period, the QALY was 0.1568 (SD: 0.016) in the DTx group and 0.1473 (SD: 0.013) in the control group, showing a notable difference between the groups

(p = 0.005).

Table 2. Quality-adjusted life years (QALYs) between visits, mean (SD)

	DTx group (n=43)	Control group (n=41)	Total (n=84)	P-value[a]
QALY week0~week4	0.0822 (0.010)	0.0795 (0.011)	0.0809 (0.011)	0.250
QALY week4~week8	0.0746 (0.016)	0.0678 (0.013)	0.0713 (0.015)	0.036
QALY week0~week8	0.1568 (0.016)	0.1473 (0.013)	0.1522 (0.016)	0.005

Abbreviation: QALY, Quality adjusted life year.
[a]An independent samples t-test was used to calculate the p-value. Statistical significance was assessed at a 5% significance level.

Cost-utility analysis

Table 3 presents the results of CUA from a healthcare system perspective. ICUR was $8,922 per QALY for 8 weeks. The DTx group incurred a higher cost of approximately $85 but achieved an incremental QALY gain of 0.0096 compared with the control group. The ICUR was below the WTP threshold of $19,410 per QALY.

Table 3. Base case cost-utility analysis results

	DTx group (n=43)	Control group (n=41)	Difference[a]
Total QALY	0.157	0.147	0.0096
Total Costs ($)	390.4	305.1	85.33
ICUR ($/QALY)		8,922	

Abbreviations: DTx, Digital therapeutics; QALY, Quality adjusted life year; ICUR, Incremental cost-utility analysis.
[a]Difference was calculated by subtracting control group value from DTx group value.

Value based pricing approach

We estimated ICUR at different DTx usage costs for 8-week period, which were set at up to $200 (Figure 1). At a base-case usage cost of $97.17, the ICUR was $8,922 per QALY, remaining below the WTP threshold ($19,410). When the DTx usage cost increases to $192, ICUR crossed the WTP threshold. Thus, the maximum cost-effective price for DTx usage appeared to be $192.

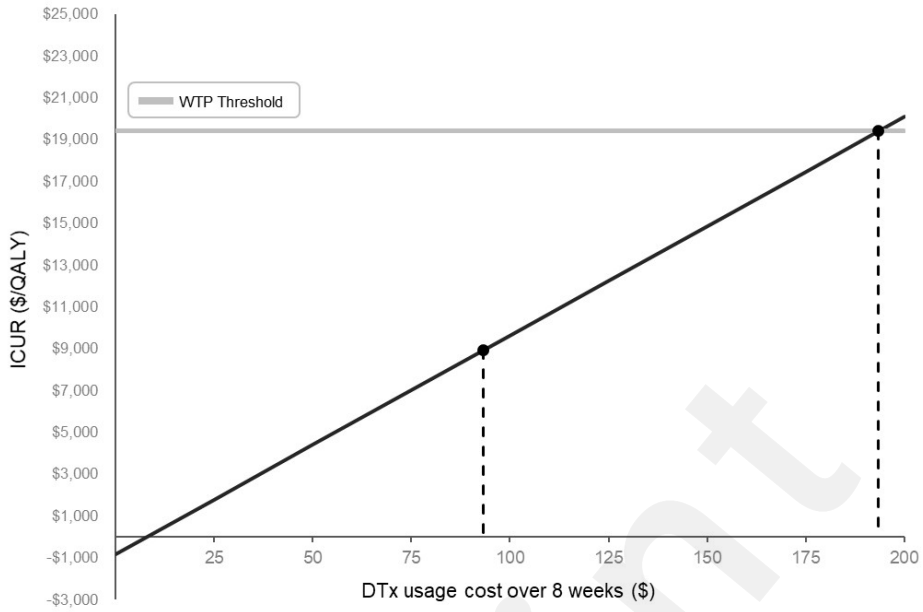

Figure 1. Value-based price analysis

The black line represents the ICUR corresponding to the DTx usage cost over an 8-week period. The gray horizontal line indicates the WTP threshold ($19,410/QALY). The black dot at $97.17 represents the base-case DTx usage cost, whereas the intersection of the black line and WTP threshold marks the maximum cost-effective usage cost ($192).

Sensitivity analysis

In the results of 1,000 simulations, the majority of ICUR (65.6%) were distributed in the northeastern quadrant of the cost-effectiveness plane, indicating that DTx was costlier but potentially cost-effective. Among the northeastern quadrant, 88.6% were below the WTP threshold. Additionally, 1.7% of ICUR were distributed in the southeastern quadrant, indicating that DTx was less costly and more effective (Figure 2a). The CEAC showed that DTx was more cost-effective than standard treatment (Figure 2b). At the specified WTP threshold ($19,410 per QALY), the probability of cost-effectiveness was 60.2% in the DTx group and 39.8% in the control group.

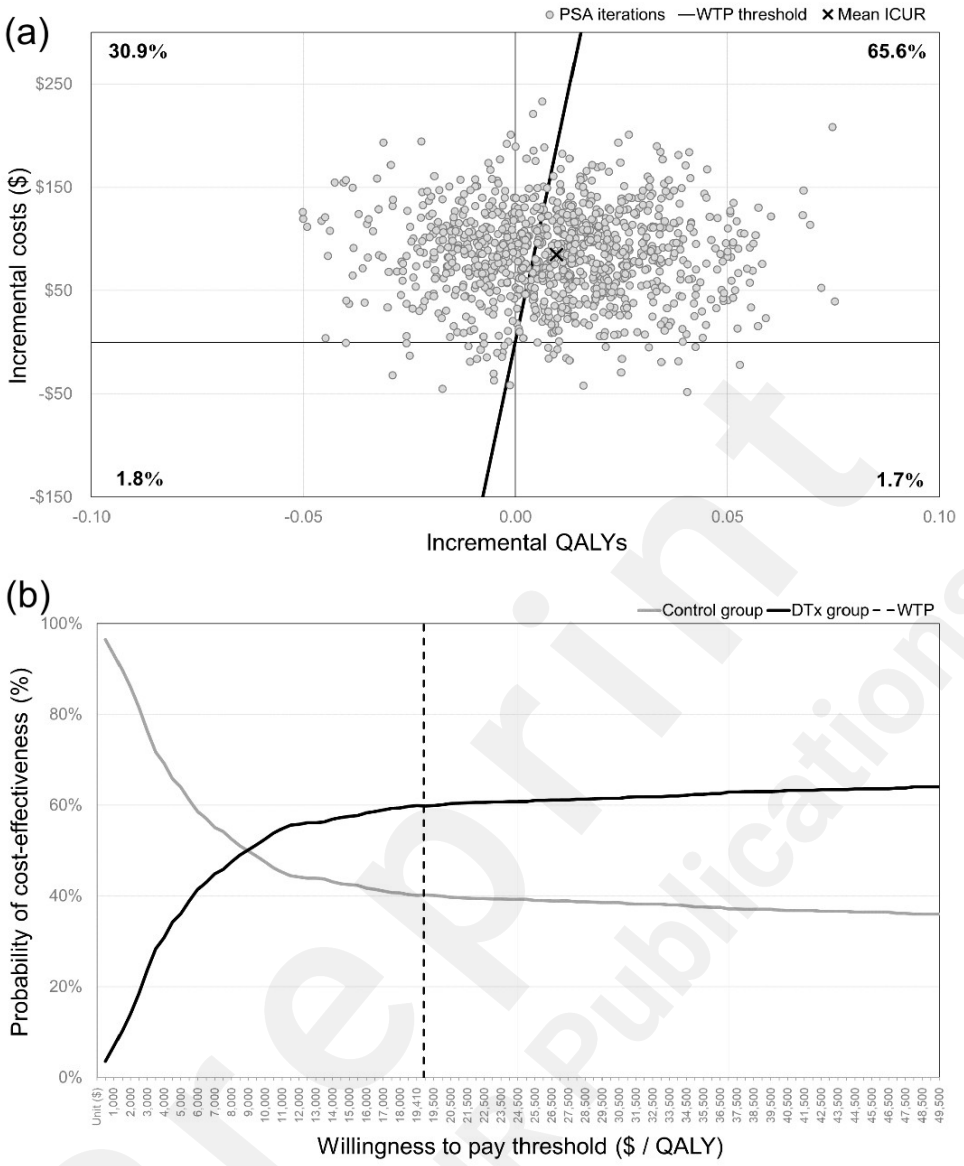

Figure 2. Probabilistic sensitivity analysis.

a Cost-effectiveness plane: The scatter plot represents the results of 1,000 probabilistic sensitivity analysis (PSA) iterations, illustrating the distribution of ICURs. The black line represents the willingness-to-pay (WTP) threshold, while the "X" denotes the mean ICUR. The percentages indicate the proportion of iterations in each quadrant. **b** Cost-effectiveness acceptability curve: The curve shows the probability of cost-effectiveness for the DTx group (black line) and control group (gray line) across various WTP thresholds per QALY. The dashed vertical line indicates the WTP threshold used in the base case analysis.

In the scenario analysis, the ICUR from a limited societal perspective was $9,083 per QALY. Excluding outliers in medical and pharmaceutical costs, reduced ICUR to $6,773 per QALY. One-way DSA showed that the ICUR was most sensitive to the lower limit of the 95% confidence interval for QALY in the DTx group (Figure 3). When the utility was mapped using different algorithms, the ICUR ranged from $6,178 to $14,283 per QALY. The results of the subgroup

analysis are shown in Table 4. The ICUR in the PPS group was $7,275 per QALY. By age, both the under 65 ($6,784 per QALY) and over 65 age groups ($10,486 per QALY) had ICUR values below the WTP threshold. For patients with COPD, ICUR was $19,134 per QALY, whereas that for patients with ILD was $559 per QALY.

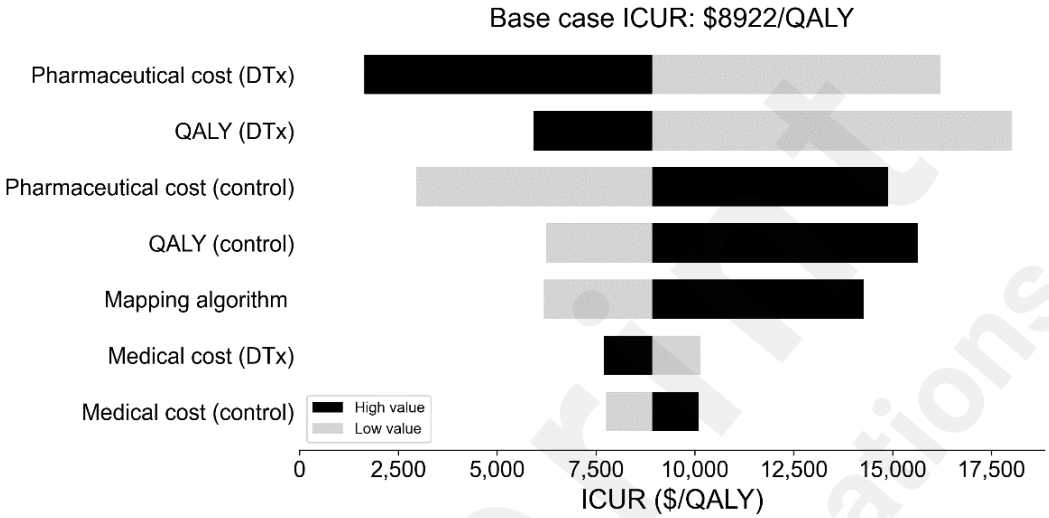

Figure 3. One-way deterministic sensitivity analysis (Tornado diagram)

The bars represent the variation in the ICUR caused by high (black) and low (gray) values of each parameter. The analyzed parameters were included pharmaceutical costs, QALYs, medical costs, and the mapping algorithm for both the DTx and control groups. Longer bars indicate parameters with greater influence on the ICUR, highlighting their importance in the CUA.

Table 4. Subgroup analysis

Subgroup (N)		Total cost	ΔCosts ($)	Total QALY	ΔQALY	ICUR ($/QALY)
Base case		-	85.33	-	0.0096	8,922
PPS	DTx (36)	388.17	80.41	0.159	0.0110	7,275
	Control (33)	307.76		0.148		
Age						
≥65	DTx (21)	402.91	95.16	0.158	0.0091	10,486
	Control (29)	307.75		0.148		
< 65	DTx (22)	378.45	79.88	0.156	0.0118	6,784
	Control (12)	298.56		0.144		
Type of CRD						
COPD	DTx (26)	336.04	122.18	0.160	0.0064	19,134
	Control (23)	213.86		0.153		
ILD	DTx (13)	526.06	9.15	0.156	0.0164	559
	Control (12)	516.91		0.139		

Abbreviation: QALY, Quality-adjusted life year; ICUR, Incremental cost-utility analysis;

PPS, Per-protocol set; DTx, Digital therapeutic; CRD, Chronic respiratory disease; COPD, Chronic obstructive pulmonary disease; ILD, Interstitial lung disease.

Discussion

Principal Results

This economic evaluation demonstrated that DTx improved health-related QoL in patients with CRD over an 8-week period. The ICUR of $8,922 per QALY was within the cost-effectiveness threshold. Sensitivity analyses indicated a high probability of cost-effectiveness compared to a traditional rehabilitation program from a healthcare system perspective. VBP analysis revealed that DTx usage costs remain cost-effective up to $192 based on the QALY gain.

Comparison with Previous Studies

Previous studies have shown that telemedicine-based pulmonary rehabilitation programs are more cost-effective than traditional program [9-12]. Although tele-rehabilitation is a part of digital health technology, it differs from software medical device (DTx), which has clinically proven efficacy and safety [13]. There are economic evaluations of tele-rehabilitation [14], but no study has specifically evaluated the cost-effectiveness of DTx in pulmonary rehabilitation.

Economic evaluation studies of DTx for managing other chronic diseases such as hypertension, chronic heart failure, and type 2 diabetes have demonstrated its superior cost-effectiveness compared with standard care or telehealth interventions [15-17]. Although the characteristics of each condition and DTx vary, mobile software apps such as EASYBREATH have demonstrated their potential as important tools for managing chronic diseases. These findings are consistent with our study on DTx in patients with CRD, further supporting the cost-utility of DTx in managing chronic conditions.

In South Korea, several studies have used cost-benefit analysis (CBA) to evaluate telemedicine, artificial intelligence-based healthcare services, and mobile healthcare program [18,19]. However, CBA is less preferred in healthcare technology assessments because of

financial equity concerns arising from variations in WTP [20]. In contrast, CUA that utilizes the more widely accepted QALY metric, provides acceptable evidence for healthcare decision-making.

Implications

To the best of our knowledge, this is the first study to evaluate the cost-effectiveness of DTx for pulmonary rehabilitation and its pricing, with a focus on value. Value-based assessment is crucial for new medical technologies, as it influences future development [21]. From the perspective of the healthcare system, this analysis focused on healthcare costs aligned with decision-makers' needs. This study provides evidence supporting the feasibility of implementing DTx in the Korean healthcare environment. These results suggest that a DTx-based rehabilitation program is cost effective option for both patients and insurers. Furthermore, the integration of DTx into existing healthcare frameworks allows for more efficient allocation of resources, lessening the occupational burden on healthcare personnel. This study underscores the potential of DTx-based rehabilitation as a sustainable approach for managing CRD within the current system.

Strengths and Limitations

This study has several strengths. To the best of our knowledge, this is the first study in South Korea to evaluate the cost-effectiveness of DTx. Additionally, the analysis utilized outcome data from three clinical centers covering a range of patients with CRDs, including those with COPD and ILD. The robustness of the results was confirmed by four sensitivity analyses.

However, this study also has several limitations, including a lack of long-term data and limited data availability. First, the study period was limited to 8 weeks, which did not capture long-term cost-effectiveness. Further research with an extended follow-up period is needed. Second, non-medical expenses and productivity losses were excluded from the base case

analysis owing to limited data from the clinical trial. However, the mild disease severity of the patients included in the study suggests that the impact of productivity losses is likely to be minimal. A scenario analysis from a limited societal perspective, including non-healthcare costs, was conducted based on consultations with clinical experts and previous literature. Third, utility values were estimated using a mapping algorithm rather than being directly obtained from the EQ-5D-3L. To address the uncertainty in utility values, various mapping algorithms were applied in sensitivity analyses. Finally, the trial design required both groups to attend routine follow-ups every four weeks, potentially inflating medical costs for the DTx group. However, in real-world settings, patients using DTx typically require routine follow-ups only every six to twelve weeks.

Conclusions

This study showed that the EASYBREATH app, a DTx-assisted pulmonary rehabilitation program, is more cost-effective than standard treatment. Cost-effectiveness was maintained up to a usage cost of $192 per 8-week period. These findings support DTx-based pulmonary rehabilitation as an effective treatment option for managing patients with CRD and provide valuable insights for healthcare decision-makers. Further research is necessary to evaluate long-term effectiveness and sustainability.

Acknowledgements

This study was supported by the Korea Medical Device Development Fund grant funded by the Korea government (the Ministry of Science and ICT, the Ministry of Trade, Industry and Energy, the Ministry of Health & Welfare, the Ministry of Food and Drug Safety) (Project Number: 2710000059, RS-2022-00141508) and a grant (21153MFDS601) from Ministry of Food and Drug Safety in 2024 and a grant (RS-2024-00331719) from the Ministry of Food and Drug Safety in 2024. The funder played no role in study design, data collection, analysis and interpretation of data, or the writing of this manuscript.

Data availability

The datasets analyzed in the current study are not publicly available because of participant confidentiality and data privacy regulations. However, they are available from the corresponding author on reasonable request.

Author contributions

HP, MJ, DK, and HSS were responsible for the study concept and design. HP, MJ, and DK processed and statistically analyzed the data. HP and MJ wrote the first draft of the manuscript with the assistance of DK, HC, and HSS. HP and MJ verified and consolidated data. CK, JHS, JHO, CKR, JHL, and HC contributed to the data collection and investigation during the trial. HC contributed to the trial design and funding acquisition. All authors provided professional input for this study and approved the final manuscript. HC and HSS made the decision to submit the manuscript for publication.

Conflicts of Interest

HC is employed by Share and Service Inc., the company that developed the DTx evaluated in this economic analysis. All other authors declare no financial or non-financial competing interests.

Abbreviations

App: application
CAT: COPD assessment test
CBA: cost-benefit analysis
CEAC: cost-effectiveness acceptability curve
COPD: chronic obstructive pulmonary disease
CRD: chronic respiratory diseases
CUA: cost-utility analysis
DSA: deterministic sensitivity analysis
DTx: digital therapeutic
EQ-5D-3L: European quality of life five-dimensions, three-level version
FAS: full analysis set
HADS: Hospital Anxiety and Depression Scales
ICUR: incremental cost-effectiveness ratio
ILD: interstitial lung disease
KRW: Korean won
MAE: mean absolute error
mMRC: modified Medical Research Council
PSA: probabilistic sensitivity analysis
QALY: quality-adjusted life years
QoL: quality of life
RCT: randomized controlled trial
RMSE: root mean squared error
SGRQ: St. George's respiratory questionnaire
USD: US dollars
VBP: value-based price
WTP: willingness-to-pay
6MWD: 6-minute walk distance

Multimedia Appendix 1

Multimedia Appendix 1. Supplementary material related to the study.

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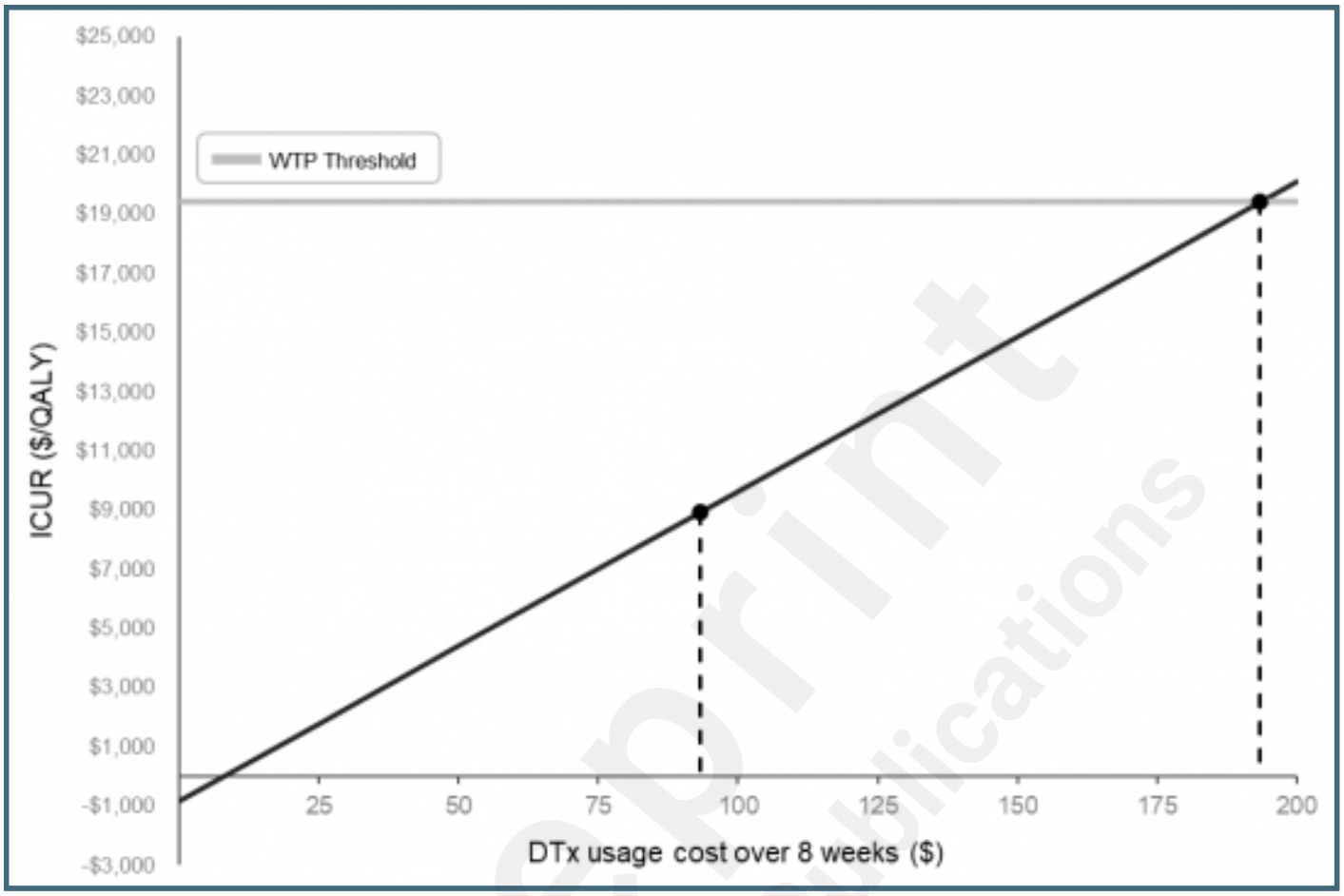
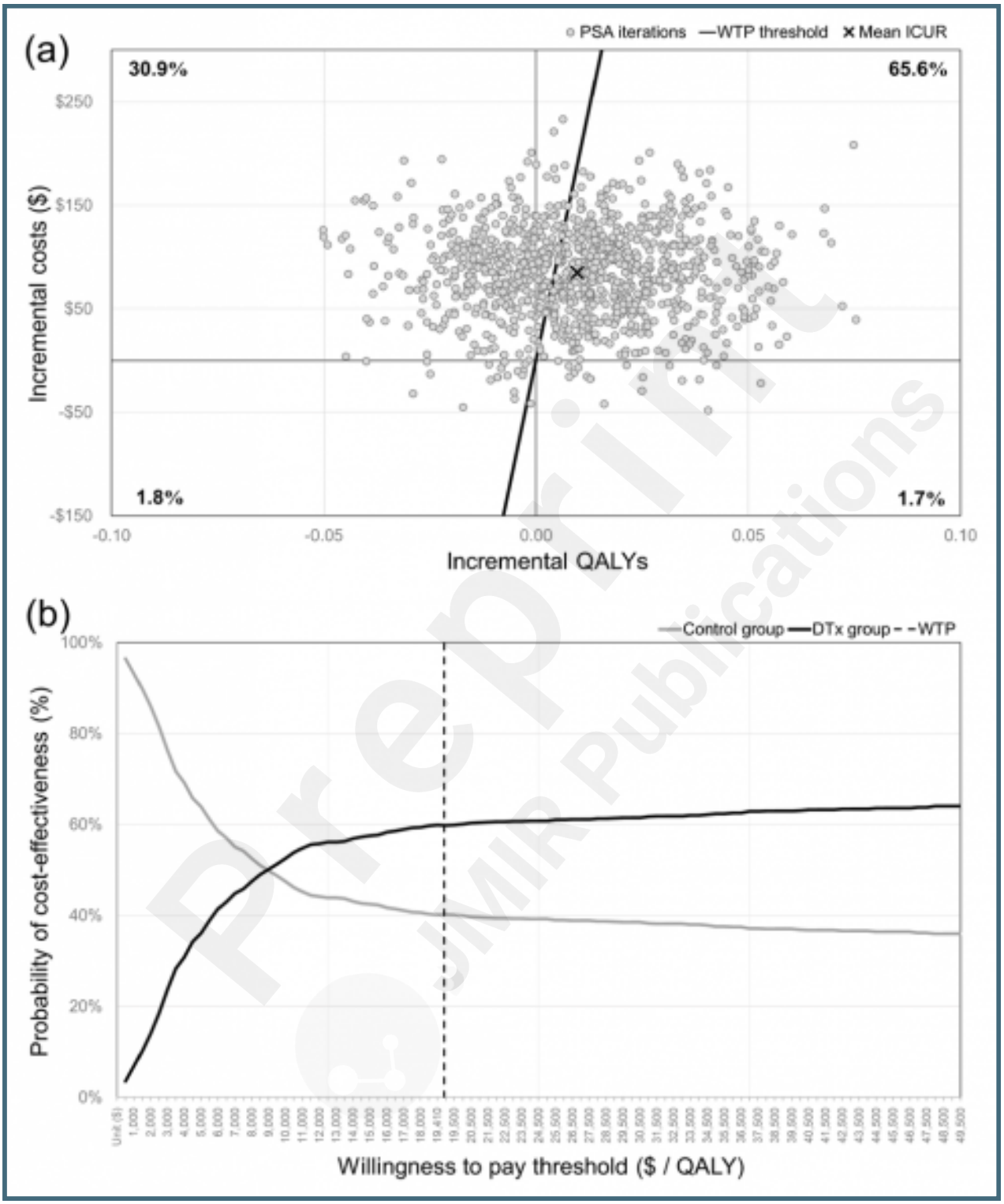
Supplementary Files

Figures

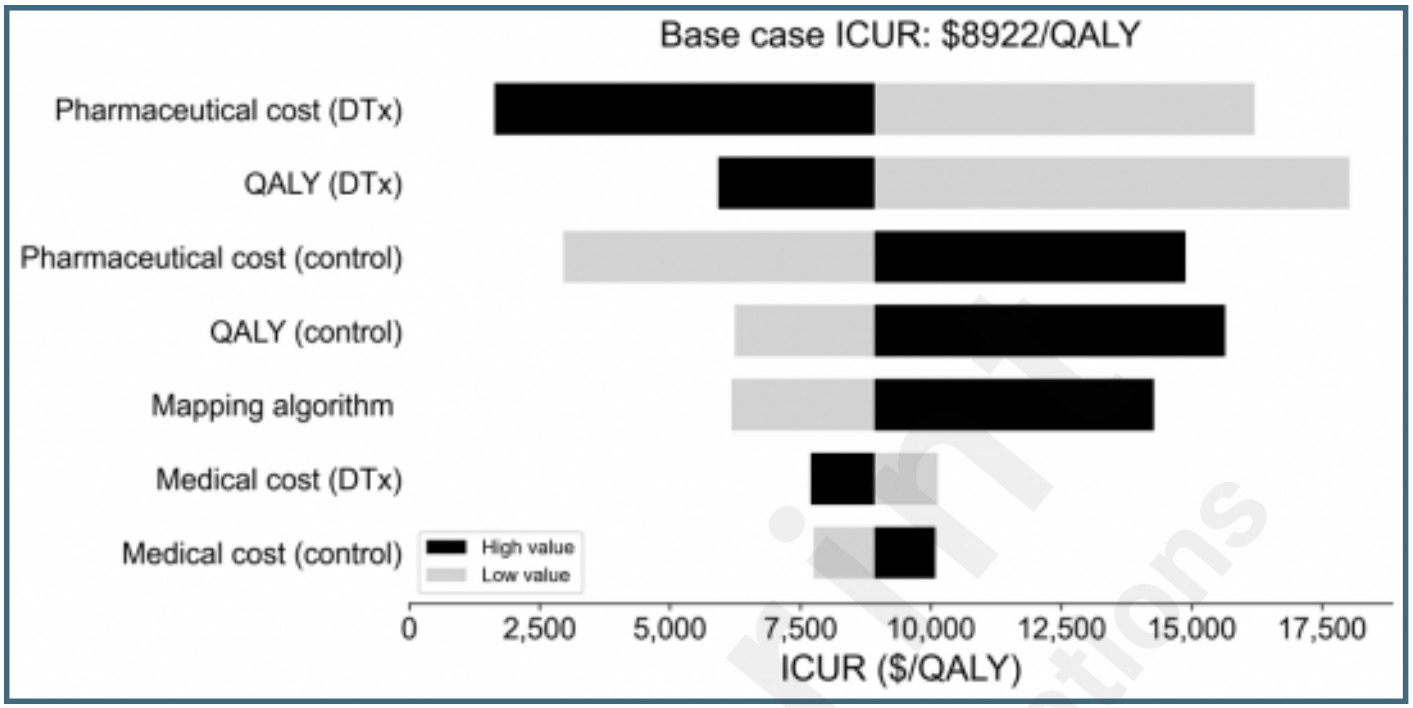
Value-based price analysis.



Probabilistic sensitivity analysis.



One-way deterministic sensitivity analysis (Tornado diagram).



Multimedia Appendixes

Characteristics of studies identified in the mapping algorithm search.
URL: http://asset.jmir.pub/assets/33b997412cb651bb457b09ba74c55c62.docx

Characteristics of patients included in the studies identified in the mapping algorithm search.
URL: http://asset.jmir.pub/assets/92c936e9a05e64a793084bbd53683f50.docx

Evaluation of mapping algorithms reported in the studies.
URL: http://asset.jmir.pub/assets/6c614ed0320e2a88cc91657f53099aaa.docx