

# Economic Evaluations of Digital Health Technologies: Is Existing Guidance Being Used?

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## Background

- Digital Health Technologies (DHT) promise innovative and accessible solutions for healthcare management barriers, but questions remain whether they represent good value for money to healthcare systems
- The United Kingdom's (UK) National Institute for Health and Care Excellence (NICE) published an Evidence Standards Framework to inform evaluations of DHT economic value<sup>1</sup>
- To assess DHT economic impact, NICE recommends a budget impact analysis (BIA) for all DHTs (Standard 17) and a cost-effectiveness analysis (CEA, Standard 18) for DHTs with higher financial risk<sup>1</sup>
- The purpose of this review was to assess alignment of published DHT economic evaluations with NICE's BIA and CEA Standards

## Methods

- Standards 17 and 18 in NICE's DHT Evidence Standards Framework were used to create 7-criteria checklists for both economic evaluation types (BIA, CEA) (Figure 1)
- A targeted literature review was conducted in PubMed using relevant search terms to identify economic evaluations of DHTs published between January 1, 2019, and November 14, 2023 (Table 1)
- Details were abstracted on economic analysis method employed, DHT intervention (e.g., web-based, prescription), study location, and economic analysis results
- Economic evaluations were assessed against applicable Standard checklist items (1=Yes, 0=No/Not Applicable); Total score per evaluation type (BIA/CEA) was calculated

Table 1. Literature Search Terminology and Parameters

Parameter	
Population	Individuals receiving treatment or care management from a digital health technology
Intervention	Digital health technology that utilizes a non-consumable (e.g., pharmacologic) digital product to achieve preferential health outcomes
Comparator	Current standard of care or no comparator
Outcome	Cost-effectiveness; Study details aligned with Standards 17 and 18 in NICE's Digital Health Technology Evidence Standards Framework
Study Design	Cost-effectiveness analysis, budget impact analysis
Sample Search Terms	"economic evaluation digital treatment," "economic evaluation digital health," "budget impact model digital treatment"

Figure 1. Evidence Standards Assessment Checklists

**Budget Impact Analysis (Standard 17)**  
Provide a BIA for all DHTs

- ✓ Target Population
- ✓ Direct Costs (Technology)
- ✓ Direct Costs (Comparators)
- ✓ Indirect Costs
- ✓ Health Resource Utilization
- ✓ Clinical Data
- ✓ Sensitivity Analysis

**Cost-Effectiveness Analysis (Standard 18)**  
Provide a CEA for DHTs with high financial risk

- ✓ Problem
- ✓ Comparators
- ✓ Perspective
- ✓ Time Horizon
- ✓ Synthesis
- ✓ QALY
- ✓ HRQoL

## Results

- Seven articles<sup>2-8</sup> examining economic evaluations for 7 unique DHTs were identified (Table 2)
- Nearly all reviewed articles (n=6) reported CEAs,<sup>2-5,7,8</sup> and 1 reported a BIA;<sup>6</sup> None reported both types of economic evaluations
- All 6 CEAs<sup>2-5,7-8</sup> included at least half of the 7 CEA Evidence Standards criteria, and 1 study included all 7 criteria<sup>2</sup> (Figure 2)
- The 'Synthesis' and 'Problem' criteria were universally reported in all 6 CEA studies,<sup>2-5,7-8</sup> while 'Time Horizon'<sup>2,4,5,7</sup> and 'HRQoL'<sup>2,3,4,7</sup> were most infrequently reported (n=4 each)
- The single BIA reviewed included 6 out of 7 BIA Evidence Standards criteria (indirect costs were not included)<sup>6</sup>
- Four CEAs found the evaluated technology to be cost-effective (Figure 3)<sup>2,4,5,8</sup>

Table 2. Economic Assessments Identified

Author	Year	Country	Intervention	Method
Engel et al.	2024	Australia	Online Social Therapy	CEA
Fatoye et al.	2020	Nigeria	Telerehabilitation for chronic pain	CEA
Liu et al.	2023	China	Hypothetical home-based cardiac rehabilitation	CEA
Paganini et al.	2019	Germany	Internet-based intervention for chronic pain	CEA
Velez et al.	2022	United States	Neurobehavioral therapy	BIA
Zachwieja et al.	2020	United States	Web-based physical therapy	CEA
Zhang et al.	2023	Hong Kong	Web-based sexual education	CEA

Figure 2. Evaluation of NICE Cost-Effectiveness Standard Criteria

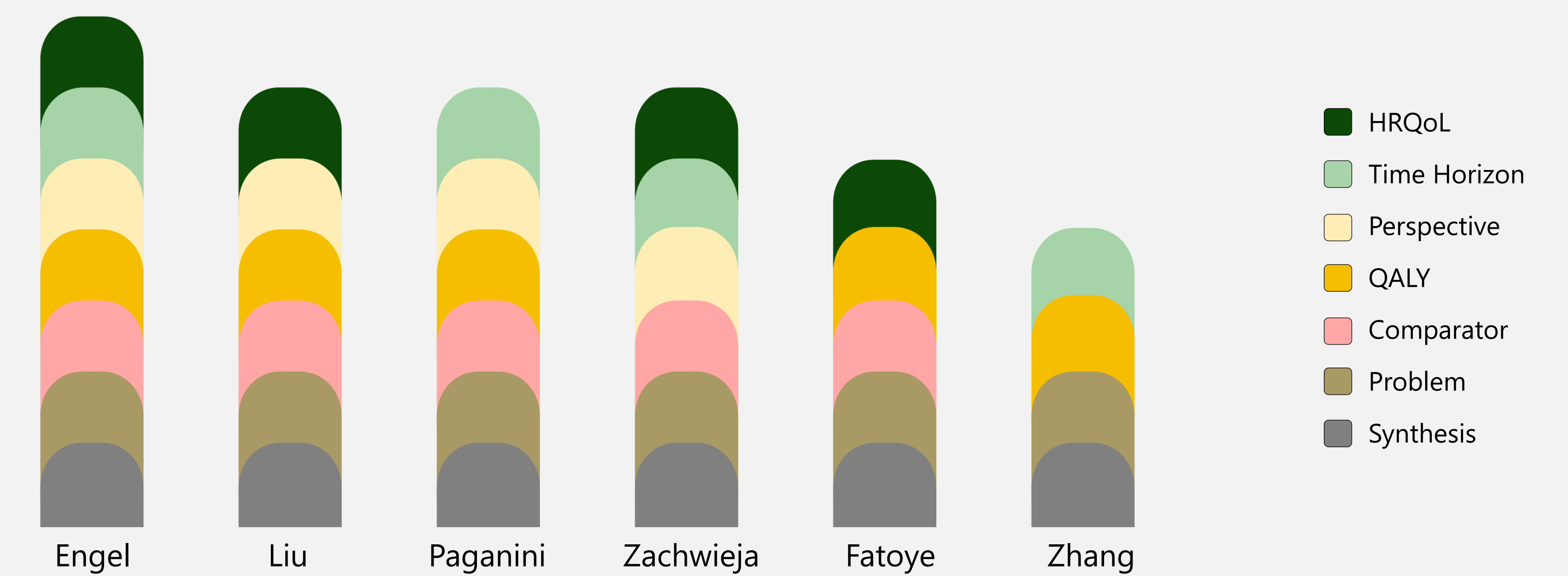
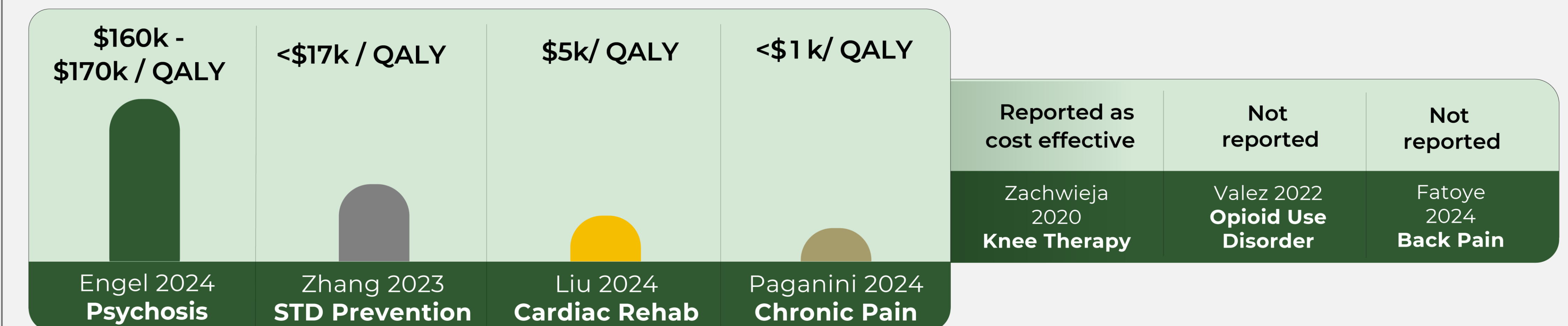


Figure 3. Reported Cost-Effectiveness Findings



## Conclusions

- In this targeted review, we found that digital health technology economic evaluations were largely aligned to Standard 18 (CEA) but not Standard 17 (BIA)
- A systematic review of this issue is warranted to better characterize the scope of DHT economic evaluations

References: 1. NICE. Evidence standards framework for digital health technologies. Dec 2018. Accessed December 1, 2023. <https://www.nice.org.uk/corporate/ecdf> 2. Engel L, Alvarez-Jimenez M, Cagliarini D, et al. The Cost-Effectiveness of a Novel Online Social Therapy to Maintain Treatment Effects From First-Episode Psychosis Services: Results From the Horizons Randomized Controlled Trial. Schizophr Bull. 2024;50(2):427-436. doi:10.1093/schbul/sbad071 3. Fatoye F, Gebrye T, Fatoye C, et al. The Clinical and Cost-Effectiveness of Telerehabilitation for People With Nonspecific Chronic Low Back Pain: Randomized Controlled Trial. JMIR Mhealth Uhealth. 2020;8(6):e15375. Published 2020 Jun 24. doi:10.2196/15375 4. Liu T, Zhan Y, Chen S, Zhang W, Jia J. Cost-effectiveness analysis of digital therapeutics for home-based cardiac rehabilitation for patients with chronic heart failure: model development and data analysis [published correction appears in Cost Eff Resour Alloc. 2024 Feb 26;22(1):16]. Cost Eff Resour Alloc. 2023;21(1):82. Published 2023 Nov 6. doi:10.1186/s12962-023-00489-x 5. Paganini S, Lin J, Kahlke F, et al. A guided and unguided internet- and mobile-based intervention for chronic pain: health economic evaluation alongside a randomised controlled trial. BMJ Open. 2019;9(4):e023390. Published 2019 Apr 9. doi:10.1136/bmjopen-2018-023390 6. Velez FJ, Huang D, Mody L, Malone DC. Five-year budget impact of a prescription digital therapeutic for patients with opioid use disorder. Expert Rev Pharmacoecon Outcomes Res. 2022;22(4):599-607. doi:10.1080/14737167.2022.2016396 7. Zachwieja E, Theosmy EG, Yacovelli SJ, Beatty EW, McGrath ME, Lonner JH. Web-Based Self-Directed Exercise Program Is Cost-Effective Compared to Formal Physical Therapy After Primary Total Knee Arthroplasty. J Arthroplasty. 2020;35(9):2335-2341. doi:10.1016/j.arth.2020.04.061 8. Zhang W, Wong CKH, Xin Y, Fong DYT, Wong JYH. A Web-Based Sexual Health Intervention to Prevent Sexually Transmitted Infections in Hong Kong: Model-Based Cost-Effectiveness Analysis. J Med Internet Res. 2023;25:e45054. Published 2023 Aug 10. doi:10.2196/45054

Abbreviations: DHT, digital health technology; UK, United Kingdom; NICE, National Institute for Health and Care Excellence; BIA, budget impact analysis; CEA, cost-effectiveness analysis; QALY, quality adjusted life-years; HRQoL, health-related quality of life; STD, sexually transmitted disease

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