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Current State of Health Economic Models In Hereditary Angioedema

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Background

- Hereditary angioedema (HAE) is a rare, genetic disease characterized by debilitating swelling episodes in various parts of the body[1]
- HAE results in substantial burden for patients, caregivers, and health systems[1]
- As new HAE treatments like oral therapies emerge, evaluating whether existing economic models are suitable for assessing their value impact for payers and health technology assessment (HTA) bodies is crucial to facilitating appropriate coverage and access
- This review sought to assess the design and analysis capabilities of currently available HAE economic models

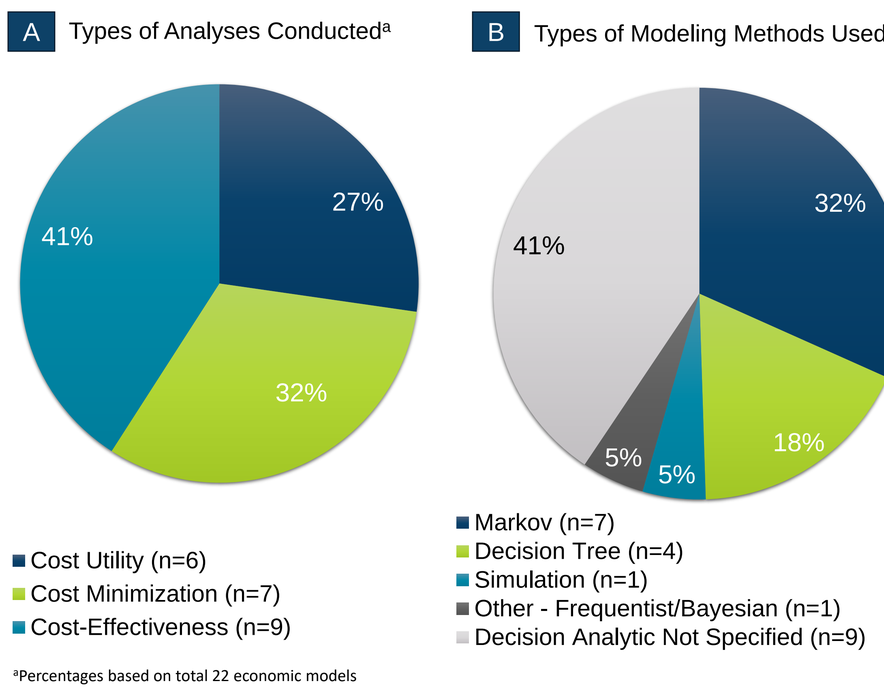
Methods

- A systematic literature review (SLR) of HAE comparative health economic models was conducted (PROSPERO 42022351716)
- We included models described in manuscripts, conference proceedings, and health technology assessment reports published from January 1, 2007 to July 1, 2022
- We abstracted and narratively summarized data on model design, attack characteristics, HAE therapies, scenario analyses, and outcome types reported
- Consolidated Health Economic Evaluation Reporting Standards (CHEERS) guidelines was used to assess quality of reporting for records reporting full details (i.e., abstracts, posters excluded)

Results

- We identified 22 economic models reported in 21 publications; 5 (23%)[6,7,11,15,20] models were reported in peer-reviewed publications, 12 (55%)[2-5,8,9,10,14,17-19] in HTA evaluations, and 5 (23%)[12,13,16,21,22] in congress proceedings
- Fourteen (64%)[2-8,11,13,15,16,19,21,22] models evaluated on-demand therapy only; 4 (18%)[4,10,12,17] evaluated long-term prophylaxis (LTP) only, and 4 (18%)[9,14,18,20] evaluated both LTP and on-demand **(Table 1)**
- The most common type of analysis conducted was cost-effectiveness (9/22, 41%)[6,9,12,14,16,17,18,21,22] **(Figure 1a)**, and the most common modeling methodology was Markov among those specified (7/13, 54%)[8,9,10,14,17,18,21] **(Figure 1b)**
- Among the 18 (82%) models describing health states, the most common states were "during attack/after recovery" and "alive with HAE/dead," each reported in 5 (28%) models[8,9,10,13,14,17,18,19,20,22]

Figure 1. Model Analyses and Methods



[a]Percentages based on total 22 economic models

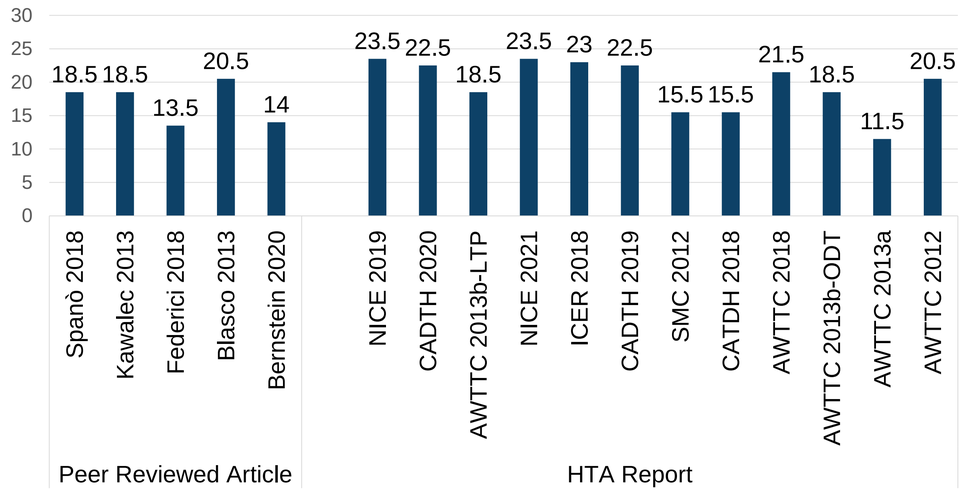
- Five (23%)[9,10,14,17,18] models (all LTP) had time-horizons long enough to sufficiently capture all relevant costs and outcomes associated with this lifetime chronic condition
- Five (23%)[9,11,14,18,19] models included attack location, duration, and severity; five (23%) [6,8,13,18,20] accounted for both direct and indirect costs
- Health-related quality of life (HRQoL) was included in 14 (64%)[2,4,9,10,14-22] models, 7 (32%) of which were on-demand only[2,4,15,16,19,21,22]
- Among models including HRQoL, 2 (9%)[16,17] (LTP only) accounted for the impact of route of treatment administration
- Quality of reporting was higher in HTA reports compared to peer-reviewed publications (average CHEERS score of 19.7 versus 17.0, respectively) **(Figure 2)**

Table 1. Select Model Characteristics and Comparators

	LTP (n=4)	LTP + On-Demand (n=4)	On-Demand (n=14)
Model Perspective, n (%)			
Payer	3 (75.0)	4 (100.0)	10 (71.4)
Society	0 (0.0)	3 (75.0)	1 (7.1)
Time Horizon, n (%)			
≤ 1 year	1 (12.5)	0 (0.0)	12 (85.7)
Lifetime	2 (50.0)	3 (75.0)	0 (0.0)
Other	1 (25.0)	0 (0.0)	1 (7.1)
Attack Characteristics Assessed, n (%)			
Location	0 (0.0)	3 (75.0)	5 (35.7)
Severity	4 (100.0)	4 (100.0)	5 (35.7)
Duration	3 (75.0)	3 (75.0)	9 (64.2)
Medication Factors Assessed, n (%)			
Administration[a]	3 (75.0)	4 (100.0)	11 (78.6)
Doses[b]	1 (25.0)	3 (75.0)	6 (42.9)
Economic Inputs, n (%)			
Direct Costs	4 (100.0)	4 (100.0)	14 (100.0)
Indirect Costs	0 (0.0)	4 (100.0)	1 (7.1)
Health-Related Quality of Life (HRQoL)	3 (75.0)	4 (100.0)	7 (50.0)
Outcomes Evaluated, n (%)			
Costs	1 (25.0)	1 (25.0)	7 (50.0)
Quality-Adjusted Life-Year (QALY)	3 (75.0)	4 (100.0)	6 (42.9)
Incremental Cost-Effectiveness Ratio (ICER)	3 (75.0)	3 (75.0)	2 (14.3)
Uncertainty Analysis Conducted, n (%)			
Deterministic	1 (25.0)	1 (25.0)	4 (29.6)
Probabilistic	1 (25.0)	2 (50.0)	5 (35.7)
Scenario	3 (75.0)	4 (100.0)	7 (50.0)

[a]Refers to Route of Administration
[b]Refers to Redosing/Rescue
Note: Some models assessed multiple perspectives, cost outcomes, and conducted multiple types of uncertainty analyses.

Figure 2. Quality of Reporting Per CHEERS II



Note: CHEERS assessment conducted on 17 (77%) models reporting full details
Abbreviations: AWTTC, All Wales Therapeutics and Toxicology Centre; CADTH, Canadian Agency for Drugs and Technologies in Health; ICER, Institute for Clinical and Economic Review; NICE, National Institute for Health and Care Excellence; SMC, Scottish Medicines Consortium

Conclusions

- **In this first-known systematic review of HAE economic models, we found model designs varied and holistic treatment value was not consistently assessed**
- **Few on-demand models accounted for holistic costs and HRQoL**
- **Consideration of key factors relevant to diverse stakeholders—including patients, caregivers, payers, and society—may be warranted in future HAE models**

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Disclosures

This study was sponsored by KalVista Pharmaceuticals. [a]SC, [a]LG, and VD are employees of KalVista Pharmaceuticals. DF was an employee of Alkemi LLC at the time the study was conducted.

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