

Supplementary Information – Online Resource 15

Evaluating cost-utility of continuous glucose monitoring in individuals with type 1 diabetes: a systematic review of methods and quality of studies using decision models and/or empirical data.

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Table 1. Model validation assessment using the AdViSHE checklist.

	A1: Face validity testing (conceptual model)	A2: Cross validity testing (conceptual model)	B1: Face validity testing (input data)	B2: Model fit testing	C1: External review	C2: Extreme value testing	C3: Testing of traces	C4: Unit testing	D1: Face validity testing (model outcome s)	D2: Cross validation testing (model outcome s)	D3: Validation against outcome s using alternative input data	D4: Validation against empirical data	E: Other validation techniques
Author	1	2	3	4	5	6	7	8	9	10	11	12	13
Roze 2015, Sweden [1]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Roze 2016, France [2]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Roze 2016, UK [3]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Roze 2017, Denmark [4]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Roze 2019, The Netherlands [5]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Roze 2019, Turkey [6]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Roze 2020, UK [7]	NR	NR	NR	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR
Roze 2021, Canada [36]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Roze 2021, UK [9]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Roze 2021, France [10]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Jendle 2017, Sweden [13]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Jendle 2019, Sweden [12]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Jendle 2021, Sweden [19]	YES	NR	NR	NA	YES	NR	NR	YES	NR	NO	YES	YES	YES
Kamble 2012, US [21]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Gomez 2016, Colombia [15]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Riemsma 2016, UK [27]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES
Chaugule 2017, Canada [8]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES

Bilir 2018, Sweden [6]	YES	NR	NR	NA	YES	NR	NR	YES	NR	NO	YES	YES	YES	YES
Conget 2018, Spain [9]	YES	NR	YES	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES	YES
Nicolucci 2018, Italy [25]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES	YES
Zhao 2021, China [41]	YES	NR	YES	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES	YES
Isitt 2022, Australia [12]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES	YES
Lambadiari 2022, Greece [23]	YES	NR	YES	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES	YES
Serné 2022, The Netherlands [40]	YES	NR	NR	NA	YES	NR	NR	YES	NR	YES	YES	YES	YES	YES
Wan 2018, US [4]	YES	YES	NR	YES	YES	NR	YES	NR	NR	YES	YES	NO	NR	
McQueen 2011, US [48]	NO	NR	NR	NA	NR	NR	NR	NR	NR	YES	NO	NO	NR	
Health Quality Ontario 2018, Canada [45]	YES	NR	YES	NR	NR	NR	NR	NR	YES	YES	NO	NO	NR	
Pease 2020, Australia [49]	YES	NR	NR	NR	NR	NR	NR	NR	YES	NR	YES	NO	NR	
Pease 2022, Australia [51]	YES	YES	YES	NA	YES	NO	NR	YES	YES	YES	YES	YES	YES	
Huang 2010, US [46]	NR	NR	NR	NA	NR	NR	Y/N	NR	NR	NO	NO	no	NR	
Garcia-Lorenzo 2018, Spain [31]	NR	NR	NR	NA	NR	NR	NR	NR	NR	NO	Y/N	NO	NR	
Rotondi 2022, Canada [32]	NO	NR	NR	NA	NR	NR	YES	NR	NR	Yes	NO	NO	Nr	
Ly 2014, Australia [33]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Emamipour 2022, The Netherlands [34]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Abbreviations: NA, not applicable; NR, not reported; Y/N, yes/no.

Model validation: Advishe, total scores per item, for 9 models as used by 32 papers*

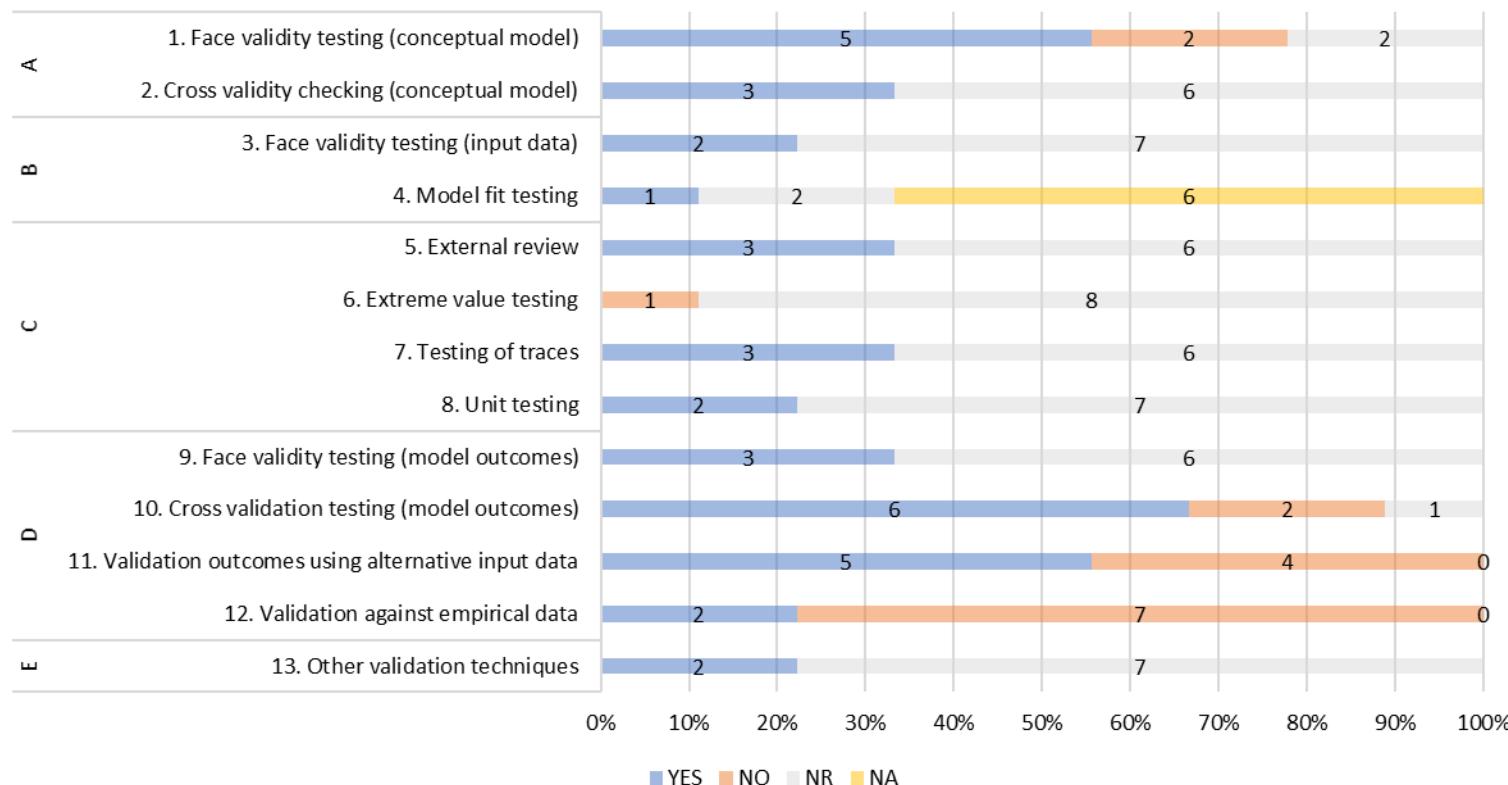


Figure 1 Scores for model validation tests performed and reported in the papers, supplemental information, or direct references for the 9 different models used by 32 model-based economic evaluations, combining all 24 studies using the CORE Diabetes model. Notes: The CORE Diabetes Model was scored as “yes” for cross validation tests (2 and 10), comparing model outcomes to empirical data (12), testing with alternative input data (11), and other tests (13). This is because the model has undergone validation within the Mount Hood Diabetes Challenge Network. The same situation applies to the Sheffield model [56]. Abbreviations: NA=not applicable; NR=not reported. While 4 of the remaining models were variants of the McQueen model, we scored them one by one.

References

1. Roze S, Saunders R, Brandt AS, de Portu S, Papo NL, Jendle J. Health-economic analysis of real-time continuous glucose monitoring in people with Type 1 diabetes. *Diabet Med.* 2015;32:618–26.
2. Roze S, Smith-Palmer J, Valentine W, Payet V, De Portu S, Papo N, et al. Cost-Effectiveness of Sensor-Augmented Pump Therapy with Low Glucose Suspend Versus Standard Insulin Pump Therapy in Two Different Patient Populations with Type 1 Diabetes in France. *Diabetes Technol Ther.* 2016;18:75–84.
3. Roze S, Smith-Palmer J, Valentine WJ, Cook M, Jethwa M, De Portu S, et al. Long-term health economic benefits of sensor-augmented pump therapy vs continuous subcutaneous insulin infusion alone in type 1 diabetes: a U.K. perspective. *J Med Econ.* 2016;19:236–42.
4. Roze S, de Portu S, Smith-Palmer J, Delbaere A, Valentine W, Ridderstråle M. Cost-effectiveness of sensor-augmented pump therapy versus standard insulin pump therapy in patients with type 1 diabetes in Denmark. *Diabetes Res Clin Pract.* 2017;128:6–14.
5. Roze S, Smith-Palmer J, De Portu S, Delbaere A, De Brouwer B, De Valk HW. Cost-effectiveness of sensor-augmented insulin pump therapy vs continuous subcutaneous insulin infusion in patients with type 1 diabetes in the Netherlands. *Clinicoecon Outcomes Res.* 2019;11:73–82.
6. Roze S, Smith-Palmer J, De Portu S, Özdemir Saltik AZ, Akgül T, Deyneli O. Cost-Effectiveness of Sensor-Augmented Insulin Pump Therapy Versus Continuous Insulin Infusion in Patients with Type 1 Diabetes in Turkey. *Diabetes Technol Ther.* 2019;21:727–35.
7. Roze S, Isitt J, Smith-Palmer J, Javanbakht M, Lynch P. Long-term Cost-Effectiveness of Dexcom G6 Real-time Continuous Glucose Monitoring Versus Self-Monitoring of Blood Glucose in Patients With Type 1 Diabetes in the U.K. *Diabetes Care.* 2020;43:2411–7.
8. Roze S, Isitt JJ, Smith-Palmer J, Lynch P. Evaluation of the Long-Term Cost-Effectiveness of the Dexcom G6 Continuous Glucose Monitor versus Self-Monitoring of Blood Glucose in People with Type 1 Diabetes in Canada. *Clinicoecon Outcomes Res.* 2021;13:717–25.
9. Roze S, Buompensiere MI, Ozdemir Z, de Portu S, Cohen O. Cost-effectiveness of a novel hybrid closed-loop system compared with continuous subcutaneous insulin infusion in people with type 1 diabetes in the UK. *J Med Econ.* 2021;24:883–90.
10. Roze S, Isitt JJ, Smith-Palmer J, Lynch P, Klinkenbijl B, Zammit G, et al. Long-Term Cost-Effectiveness the Dexcom G6 Real-Time Continuous Glucose Monitoring System Compared with Self-Monitoring of Blood Glucose in People with Type 1 Diabetes in France. *Diabetes Ther.* 2021;12:235–46.
11. Jendle J, Smith-Palmer J, Delbaere A, de Portu S, Papo N, Valentine W, et al. Cost-Effectiveness Analysis of Sensor-Augmented Insulin Pump Therapy with Automated Insulin Suspension Versus Standard Insulin Pump Therapy in Patients with Type 1 Diabetes in Sweden. *Diabetes Ther.* 2017;8:1015–30.
12. Jendle J, Pöhlmann J, De Portu S, Smith-Palmer J, Roze S. Cost-Effectiveness Analysis of the MiniMed 670G Hybrid Closed-Loop System Versus Continuous Subcutaneous Insulin Infusion for Treatment of Type 1 Diabetes. *Diabetes Technol Ther.* 2019;21:110–8.
13. Jendle J, Buompensiere MI, Holm AL, de Portu S, Malkin SJP, Cohen O. The Cost-Effectiveness of an Advanced Hybrid Closed-Loop System in People with Type 1 Diabetes: a Health Economic Analysis in Sweden. *Diabetes Ther.* 2021;12:2977–91.
14. Kamble S, Schulman KA, Reed SD. Cost-effectiveness of sensor-augmented pump therapy in adults with type 1 diabetes in the United States. *Value Health.* 2012;15:632–8.
15. Gomez AM, Alfonso-Cristancho R, Orozco JJ, Lynch PM, Prieto D, Saunders R, et al. Clinical and economic benefits of integrated pump/CGM technology therapy in patients with type 1 diabetes in Colombia. *Endocrinol Nutr.* 2016;63:466–74.
16. Riemsma R, Ramos IC, Birnie R, Büyükkaramikli N, Armstrong N, Ryder S, et al. Integrated sensor-augmented pump therapy systems [the MiniMed® Paradigm™ Veo system and the Vibe™ and G4® PLATINUM CGM (continuous glucose monitoring) system] for managing blood glucose levels in type 1 diabetes: a systematic review and economic evaluation. *Health Technol Assess.* 2016;20:1–252.

17. Chaugule S, Graham C. Cost-effectiveness of G5 Mobile continuous glucose monitoring device compared to self-monitoring of blood glucose alone for people with type 1 diabetes from the Canadian societal perspective. *J Med Econ.* 2017;20:1128–35.
18. Bilir SP, Hellmund R, Wehler B, Li H, Munakata J, Lamotte M. Cost-effectiveness Analysis of a Flash Glucose Monitoring System for Patients with Type 1 Diabetes Receiving Intensive Insulin Treatment in Sweden. *Eur Endocrinol.* 2018;14:73–9.
19. Conget I, Martín-Vaquero P, Roze S, Elías I, Pineda C, Álvarez M, et al. Cost-effectiveness analysis of sensor-augmented pump therapy with low glucose-suspend in patients with type 1 diabetes mellitus and high risk of hypoglycemia in Spain. *Endocrinol Diabetes Nutr.* 2018;65:380–6.
20. Nicolucci A, Rossi MC, D’Ostilio D, Delbaere A, de Portu S, Roze S. Cost-effectiveness of sensor-augmented pump therapy in two different patient populations with type 1 diabetes in Italy. *Nutr Metab Cardiovasc Dis.* 2018;28:707–15.
21. Zhao X, Ming J, Qu S, Li HJ, Wu J, Ji L, et al. Cost-Effectiveness of Flash Glucose Monitoring for the Management of Patients with Type 1 and Patients with Type 2 Diabetes in China. *Diabetes Ther.* 2021;12:3079–92.
22. Isitt JJ, Roze S. Long-term cost-effectiveness of Dexcom G6 real-time continuous glucose monitoring system in people with type 1 diabetes in Australia: Response to letter from Hellmund, Richard and Welsh, Zoe. *Diabet Med.* 2023;40.
23. Lambadiari V, Ozdemir Saltik AZ, De Portu S, Buompensiere MI, Kountouri A, Korakas E, et al. Cost-Effectiveness Analysis of an Advanced Hybrid Closed-Loop Insulin Delivery System in People with Type 1 Diabetes in Greece. *Diabetes Technol Ther.* 2022;24:316–23.
24. Serné EH, Roze S, Buompensiere MI, Valentine WJ, De Portu S, de Valk HW. Cost-Effectiveness of Hybrid Closed Loop Insulin Pumps Versus Multiple Daily Injections Plus Intermittently Scanned Glucose Monitoring in People With Type 1 Diabetes in The Netherlands. *Adv Ther.* 2022;39:1844–56.
25. Wan W, Skandari MR, Minc A, Nathan AG, Winn A, Zarei P, et al. Cost-effectiveness of Continuous Glucose Monitoring for Adults With Type 1 Diabetes Compared With Self-Monitoring of Blood Glucose: The DIAMOND Randomized Trial. *Diabetes Care.* 2018;41:1227–34.
26. McQueen RB, Ellis SL, Campbell JD, Nair K V, Sullivan PW. Cost-effectiveness of continuous glucose monitoring and intensive insulin therapy for type 1 diabetes. *Cost Eff Resour Alloc.* 2011;9.
27. Continuous Monitoring of Glucose for Type 1 Diabetes: A Health Technology Assessment. *Ont Health Technol Assess Ser.* 2018 Feb 21;18(2):1-160. eCollection 2018.
28. Pease A, Zomer E, Liew D, Earnest A, Soldatos G, Ademi Z, et al. Cost-Effectiveness Analysis of a Hybrid Closed-Loop System Versus Multiple Daily Injections and Capillary Glucose Testing for Adults with Type 1 Diabetes. *Diabetes Technol Ther.* 2020;22:812–21.
29. Pease A, Callander E, Zomer E, Abraham MB, Davis EA, Jones TW, et al. The Cost of Control: Cost-effectiveness Analysis of Hybrid Closed-Loop Therapy in Youth. *Diabetes Care.* 2022;45:1971–80.
30. Huang ES, O’Grady M, Basu A, Winn A, John P, Lee J, et al. The cost-effectiveness of continuous glucose monitoring in type 1 diabetes. *Diabetes Care.* 2010;33:1269–74.
31. García-Lorenzo B, Rivero-Santana A, Vallejo-Torres L, Castilla-Rodríguez I, García-Pérez S, García-Pérez L, et al. Cost-effectiveness analysis of real-time continuous monitoring glucose compared to self-monitoring of blood glucose for diabetes mellitus in Spain. *J Eval Clin Pract.* 2018;24:772–81.
32. Rotondi MA, Wong O, Riddell M, Perkins B. Population-Level Impact and Cost-effectiveness of Continuous Glucose Monitoring and Intermittently Scanned Continuous Glucose Monitoring Technologies for Adults With Type 1 Diabetes in Canada: A Modeling Study. *Diabetes Care.* 2022;45:2012–9.
33. Ly TT, Brnabic AJM, Eggleston A, Kolivos A, McBride ME, Schrover R, et al. A cost-effectiveness analysis of sensor-augmented insulin pump therapy and automated insulin suspension versus standard pump therapy for hypoglycemic unaware patients with type 1 diabetes. *Value Health.* 2014;17:561–9.

34. Emamipour S, van Dijk PR, Bilo HJG, Edens MA, van der Galiën O, Postma MJ, et al. Personalizing the Use of a Intermittently Scanned Continuous Glucose Monitoring (isCGM) Device in Individuals With Type 1 Diabetes: A Cost-Effectiveness Perspective in the Netherlands (FLARE-NL 9). *J Diabetes Sci Technol.* 2022.