Check for updates

Received: 17 October 2022 | Revised: 1 December 2022 | Accepted: 9 December 2022

DOI: 10.1111/dom.14940

ORIGINAL ARTICLE

WILEY

Tirzepatide versus semaglutide for weight loss in patients with type 2 diabetes mellitus: A value for money analysis

Joseph Azuri MD[1,2] | Ariel Hammerman PhD[3] | Enis Aboalhasan BA[4] | Ben Sluckis MD[5] | Ronen Arbel PhD[3,4]

[1]Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

[2]Maccabi Healthcare Services, Tel Aviv, Israel

[3]Clalit Health Services, Tel Aviv, Israel

[4]Sapir College, Ashkelon, Israel

[5]Meuhedet Health Services, Jerusalem, Israel

Correspondence
Joseph Azuri, MD, Family Medicine Department,Sackler Faculty of Medicine, Tel Aviv University,Tel Aviv Israel.
Email: azuridr@gmail.com

Abstract

Aims: Higher doses of the glucagon-like peptide-1 agonist semaglutide and, more recently, tirzepatide, a dual glucose-dependent insulinotropic polypeptide and glucagon-like peptide-1 agonist showed a significant reduction in body weight in patients with type 2 diabetes mellitus. However, their comparative value for money for this indication is unclear. Therefore, we aimed to establish which provides better value for money.

Materials and Methods: We calculated the cost needed to treat to achieve a 1% reduction in body weight using high-dose tirzepatide (15 mg) versus semaglutide (2.4 mg). The body weight reductions were extracted from published results of SURMOUNT-1 and STEP 1 trials, respectively. In addition, we performed a scenario analysis to mitigate the primary differences between the two study populations. Drug costs were based on US GoodRx prices as of October 2022.

Results: Using tirzepatide resulted in a weight loss of 17.8% (95% CI: 16.3%-19.3%) compared with 12.4% (95% CI: 11.5%-13.4%) for semaglutide. The total cost of 72 weeks of tirzepatide was estimated at $17 527 compared with $22 878 for 68 weeks of semaglutide. Accordingly, the cost needed to treat per 1% of body weight reduction with tirzepatide is estimated at $985 (95% CI: $908-$1075) compared with $1845 (95% CI: $1707-$1989) with semaglutide. Scenario analysis confirmed these findings.

Conclusions: Tirzepatide provides better value for money than semaglutide for weight reduction.

KEYWORDS

cost-effectiveness, obesity therapy, type 2 diabetes, weight control

1 | INTRODUCTION

Obesity, one of today's key global public health challenges, carries a significant disease burden.[1-3] Numerous morbidities are associated with obesity, including hypertension, type 2 diabetes mellitus (T2DM), non-alcoholic fatty liver disease, malignancies and cardiovascular disease.[2-4] Reducing 5%-10% of body weight has been shown to improve health outcomes and quality of life.[5-7] The traditional

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.
© 2022 The Authors. *Diabetes, Obesity and Metabolism* published by John Wiley & Sons Ltd.

mainstay of management is lifestyle modification, but long-term outcomes for sustained weight loss are poor.[1,2,8,9] Novel pharmacological treatments have recently been approved as adjunct therapies for weight reduction.[1,2] High doses of the glucagon-like peptide-1 agonist (GLP-1RA) semaglutide and the dual glucose-dependent insulinotropic polypeptide and GLP-1RA tirzepatide have significantly reduced weight in patients with T2DM in STEP 1 and SURMOUNT-1 trials, with a follow-up of 68 and 72 weeks, respectively.[10,11] Although obesity-associated costs are expected to drop with the pharmacological treatment for obesity, the drug's costs may become a significant burden on health care systems.[12] The cost-effectiveness of the weight reduction indication of each treatment has not previously been shown.

Therefore, our objective was to provide a prompt economic measure to compare the cost of using semaglutide versus tirzepatide for enabling weight loss in patients with T2DM.

2 | MATERIALS AND METHODS

2.1 | Data sources for drug efficacy

Efficacy data were extracted from the published results of STEP 1 and SURMOUNT-1 trials for semaglutide 2.4 mg/week and tirzepatide 15 mg/week, respectively. All patients from STEP 1 and SURMOUNT-1 trials were included in our analysis.

2.2 | Primary outcome measures

The primary outcome of this study was the cost needed to treat (CNT) to achieve a 1% reduction in body weight using either semaglutide or tirzepatide. The analysis was performed from the US health care payer perspective.

2.3 | Cost needed to treat analysis

The CNT was calculated by multiplying the drug costs by the follow-up time and dividing it by the mean percentage weight reduction for each drug compared with the placebo. Drug costs were based on US GoodRx prices as of October 2022 as a transparent approach to assessing outpatient drug costs in the United States. We assumed that the price of the higher doses of both drugs would be similar to the current price of the lower doses. The calculations were also based on the assumption of a linear relationship of weight reduction during the treatment period.

2.4 | Scenario analysis

To evaluate the robustness of CNT results and mitigate differences between the randomized controlled trial (RCT) population's baseline risks, we performed a scenario analysis that simulated each drug's effect while using the event rate in the other drug trial's control arm.

TABLE 1 Baseline characteristics

Trial	STEP 1	SURMOUNT-1
Intervention	Semaglutide	Tirzepatide
Dosage weekly (mg)	2.4	15
Number of participants in the intervention arm	1306	630
Age (median)	46 ± 13	44.9 ± 12.3
Female sex (%)	955 (73.1)	425 (67.5)
White (%)	973 (74.5)	443 (70.3)
Body weight (kg)	105.4 ± 21.5	105.6 ± 22.92
Body mass index (kg/m^2)	37.8 ± 6.7	38.1 ± 6.69
Follow-up (weeks)	68	72

Data are n (%) or mean ± SD.

TABLE 2 Step-by-step calculations of the cost needed to treat (CNT)

Parameter	Semaglutide	Tirzepatide
Patients in the intervention arm	1306	630
Follow-up (weeks)	68	72
Annual drug cost ($)	17 495	12 658
Weekly drug cost ($)	336	243
Cost of therapy (weekly cost multiplied by the number of weeks followed up) ($)	336 × 68 = 22 878	243 × 72 = 17 527
Average weight loss (%)	12.4	17.8
CNT for 1% weight loss ($)	22 878/12.4 = **1845**	17 527/17.8 = **985**

The final numbers are in bold, for clarification.

3 | RESULTS

3.1 | Patient populations

The STEP 1 trial included 1306 patients in the intervention arm, whereas SURMOUNT-1 had 630 patients in the 15 mg intervention arm. However, the baseline characteristics of the participants in both trials (Table 1) were similar. Most of the patients included in both trials were female. In addition, the average age, body weight and body mass index were all similar.

3.2 | Cost needed to treat

The step-by-step calculations of the CNT are detailed in Table 2. The CNT was calculated by multiplying the weekly drug cost by the

14631326, 2023, 4, Downloaded from https://dom-pubs.onlinelibrary.wiley.com/doi/10.1111/dom.14940, Wiley Online Library on [02/02/2024]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

TABLE 3 Scenario analysis

	Semaglutide in SURMOUNT-1	Tirzepatide in STEP-1
Baseline SoC (%)	3.1	2.41
Effect of treatment group in original trial	Semaglutide in STEP-1: 14.41%/2.41% = 6.17%	Tirzepatide in SURMOUNT-1: 20.9%/3.1% = 6.74%
Simulated therapy group weight reduction (%)	3.1 × 6.17 = 19.13 (18.20-20.10)	2.41 × 6.74 = 16.24 (14.74-17.74)
Difference (%)	19.13-3.1 = 16.03 (15.10-17.00)	16.24-2.41 = 13.83 (12.33-15.33)
Cost of therapy	$24 224	$16 553.07
Cost per 1% of body weight reduction		
Simulated drug (95% CI)	$24 224/16.03 = $1511.17 ($1424.79-$1604.05)	$16 553.07/13.83 = $1196.90 ($1079.22-$1341.63)
Treatment arm in the study	Tirzepatide: $984.66	Semaglutide: $1845.01

Abbreviation: SoC, Standard of Care weight reduction, as in the trial's control group.

follow-up time and dividing it by the added percentage weight loss for each drug in the intervention arm compared with the placebo. In SURMOUNT-1, tirzepatide resulted in a weight loss of 17.8% more than placebo (95% CI: 16.3%-19.3%), while semaglutide resulted in a weight loss of 12.4% more than placebo (95% CI: 11.5%-13.4%) in STEP1.

In total, the cost of therapy with tirzepatide was estimated at $17 527 compared with $22 878 for semaglutide. Accordingly, the CNT per 1% of body weight reduction with tirzepatide is estimated at $985 (95% CI: $908-$1075) compared with $1845 (95% CI: $1707-$1989) with semaglutide.

3.3 | One-year analysis

We also calculated the CNT for 1% body weight reduction over 52 weeks to compare the effects of both drugs further. Using the published weight reduction graphs, we extracted the 52-week weight reduction for both drugs. The estimated weight reduction with tirzepatide was 21.1% of body weight and 2.5% in the control arm, compared with 16.2% versus 3.3% weight loss with semaglutide, respectively. Therefore, the weight reduction for tirzepatide was 18.52% versus 12.95% with semaglutide. Accordingly, the calculated CNT for 1% body weight reduction during 52 weeks was $683.49 for tirzepatide, compared with $1350.97 for semaglutide.

3.4 | Scenario analysis

The scenario analysis results are found in Table 3 and confirm the findings.

4 | DISCUSSION

Over recent years, several pharmacological agents have been used as adjuncts for enabling weight loss, such as orlistat and naltrexone/bupropion combination, among others.[13,14] In addition, several GLP-1RA, in particular semaglutide, have proven to be effective with relatively few side effects.[3,15] A recent study attempted to calculate quality-adjusted life years indirectly for glucagon-like peptide-1 agonists based on existing data and found that semaglutide was the most cost-effective of the drugs tested.[16] Tirzepatide is first in a new drug class that also induces clinically relevant weight reduction.

The two large-scale RCTs that investigated semaglutide and tirzepatide for weight loss in patients with T2DM showed significant benefits. Our analysis shows that the CNT for therapy with tirzepatide ($985) is much lower than with semaglutide ($1845) to achieve 1% weight loss. In this analysis, we focused only on the CNT; however, other factors beyond cost influence physicians and patients when choosing the appropriate drug for them. These include method and frequency of administration, long-term weight loss, safety profile and side effects.

Recent real-world data studies have replicated the findings of previous GLP-1RA trials, with significant weight loss achieved, and the weight loss is similar across different doses.[17,18] This reinforces the importance of GLP-1RAs as an effective treatment for weight loss. However, the data for tirzepatide is less well-established and will require further correlation. Furthermore, tirzepatide is not yet approved for weight loss intervention. Nevertheless, our study shows a strong economic impact of choosing tirzepatide over semaglutide, which may have immediate practical implications for decision-makers.

Our analysis has several limitations. The first is that both drugs were not tested in a head-to-head trial. Moreover, the subgroup of tirzepatide 15 mg from SURMOUNT-1 analysed here is a much smaller cohort of patients than in STEP 1. However, the baseline age, weight and body mass index characteristics of the trials were similar.

Second, the CNT per 1% weight reduction was calculated by the total cost divided by the total weight reduction, which assumes a linear correlation. However, this reflects the average cost per weight reduction unit.

Third, our analysis cannot replace a comprehensive cost-effectiveness analysis regarding achieved quality-adjusted life years

14631326, 2023, 4, Downloaded from https://dom-pubs.onlinelibrary.wiley.com/doi/10.1111/dom.14940, Wiley Online Library on [02/02/2024]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

and cost savings from reduced morbidity. However, direct, complete, economic comparisons of these interventions are still unavailable. CNT measures have previously correlated with later published cost-effectiveness analysis results.[19] Nevertheless, we suggest using the CNT analysis as a preliminary comparative measure that should be used cautiously until comprehensive cost-effectiveness results become available.

Fourth, our analysis is limited to the US health care setting. However, the CNT results should be validated according to local drug tariffs, as the relative annual price of the two drugs significantly impacts the comparative CNT.

Finally, our results are based on the published results of only two RCTs. Therefore, more data are required to confirm the findings and validate the data for specific subgroups of patients other than the populations described in both RCTs. Nevertheless, the professional societies' guidelines and statements stem from the same data.

In conclusion, tirzepatide provides better value for money for weight reduction than semaglutide in the United States. Our results support the economic advantage of using tirzepatide as a pharmacological adjunct to weight loss.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

PEER REVIEW

The peer review history for this article is available at https://publons.com/publon/10.1111/dom.14940.

DATA AVAILABILITY STATEMENT

Data calculations available on request from the authors

ORCID

Joseph Azuri https://orcid.org/0000-0003-1049-9848
Ariel Hammerman https://orcid.org/0000-0002-4396-5246
Enis Aboalhasan https://orcid.org/0000-0001-7763-566X
Ronen Arbel https://orcid.org/0000-0002-6058-8665

REFERENCES

1. Garvey WT, Mechanick JI, Brett EM, et al. American Association of Clinical Endocrinologists and American College of endocrinology comprehensive clinical practice guidelines for medical care of patients with obesity. *Endocr Pract*. 2016;22:1-203.
2. Yumuk V, Tsigos C, Fried M, et al. European guidelines for obesity management in adults. *Obes Facts*. 2015;8:402-424.
3. Wharton S, Lau DCW, Vallis M, et al. Obesity in adults: a clinical practice guideline. *CMAJ*. 2020;192:E875-E891.
4. Neeland IJ, Poirier P, Després J-P. Cardiovascular and metabolic heterogeneity of obesity. *Circulation*. 2018;137:1391-1406.
5. Mertens IL, van Gaal LF. Overweight, obesity, and blood pressure: the effects of modest weight reduction. *Obes Res*. 2000;8:270-278.
6. Li G, Zhang P, Wang J, et al. Cardiovascular mortality, all-cause mortality, and diabetes incidence after lifestyle intervention for people with impaired glucose tolerance in the Da Qing diabetes prevention study: a 23-year follow-up study. *Lancet Diabetes Endocrinol*. 2014;2:474-480.
7. Warkentin LM, Das D, Majumdar SR, et al. The effect of weight loss on health-related quality of life: systematic review and meta-analysis of randomized trials. *Obes Rev*. 2014;15:169-182.
8. Sumithran P, Prendergast LA, Delbridge E, et al. Long-term persistence of hormonal adaptations to weight loss. *N Engl J Med*. 2011;365:1597-1604.
9. Dombrowski SU, Knittle K, Avenell A, Araujo-Soares V, Sniehotta FF. Long term maintenance of weight loss with non-surgical interventions in obese adults: systematic review and meta-analyses of randomised controlled trials. *BMJ*. 2014;348:g2646.
10. Wilding JPH, Batterham RL, Calanna S, et al. Once-weekly semaglutide in adults with overweight or obesity. *N Engl J Med*. 2021;384:989-1002.
11. Jastreboff AM, Aronne LJ, Ahmad NN, et al. Tirzepatide once weekly for the treatment of obesity. *N Engl J Med*. 2022;387(3):205-216. doi: 10.1056/NEJMoa2206038
12. Watkins S, Toliver JC, Kim N, Whitmire S, Garvey T. Economic outcomes of antiobesity medication use among adults in the United States: a retrospective cohort study. *J Manag Care Spec Pharm*. 2022;28(10):1066-1079.
13. Ballinger A. Orlistat in the treatment of obesity. *Expert Opin Pharmacother*. 2000;1:841-847.
14. Christou GA, Kiortsis DN. The efficacy and safety of the naltrexone/bupropion combination for the treatment of obesity: an update. *Horm Athens Greece*. 2015;14:370-375.
15. Bradley CL, McMillin SM, Hwang AY, et al. High-dose once-weekly Semaglutide: a new option for obesity management. *Ann Pharmacother*. 2022;56:941-950. doi: 10.1177/10600280211053867.
16. Hu Y, Zheng S-L, Ye X-L, et al. Cost-effectiveness analysis of 4 GLP-1RAs in the treatment of obesity in a US setting. *Ann Transl Med*. 2022;10:152.
17. Trenson L, Trenson S, van Nes F, et al. Liraglutide for weight Management in the Real World: significant weight loss even if the maximal daily dose is not achieved. *Obes Facts*. 2022;15:83-89.
18. Haase CL, Serratore Achenbach MG, Lucrezi G, Jeswani N, Maurer S, Egermann U. Use of Liraglutide 3.0 mg for weight Management in a Real-World Setting in Switzerland. *Obes Facts*. 2021;14:568-576.
19. Cavallari I, Maddaloni E, Nusca A, et al. SGLT-2 inhibitors on top of current pharmacological treatments for heart failure: a comparative review on outcomes and cost effectiveness. *Am J Cardiovasc Drugs Drugs Devices Interv*. 2022;22:263-270.

How to cite this article: Azuri J, Hammerman A, Aboalhasan E, Sluckis B, Arbel R. Tirzepatide versus semaglutide for weight loss in patients with type 2 diabetes mellitus: A value for money analysis. *Diabetes Obes Metab*. 2023;25(4):961-964. doi:10.1111/dom.14940

14631326, 2023, 4, Downloaded from https://dom-pubs.onlinelibrary.wiley.com/doi/10.1111/dom.14940, Wiley Online Library on [02/02/2024]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License