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GLP-1 receptor agonist therapy for obesity via direct-to-consumer telemedicine: Clinical characteristics and treatment outcomes

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Abstract

Objective: This study aimed to characterize the patient population using a DTC telemedicine platform for obesity treatment with liraglutide, evaluate treatment success and adherence, and assess the side effect profile using patient-reported outcomes.

Methods: We conducted a retrospective cross-sectional study using anonymized data from 966 patients who received liraglutide prescriptions through a DTC platform between August 2022 and April 2024. Patients completed an initial online questionnaire to assess eligibility, followed by a physician's review. A follow-up questionnaire was administered 50 days after the first prescription to evaluate outcomes, including weight loss, adverse events, and treatment satisfaction.

Results: The majority of patients (70%) had long-standing obesity, with 46.6% having a BMI between 30 and 34.4 kg/m². Most (88.9%) were new to glucagon-like peptide-1 receptor agonists therapy. After 50 days, 85.6% of patients reported a weight loss of more than 2 kg, with an average loss of 4.9 kg. Adverse events were reported by 39.8% of patients, primarily gastrointestinal issues. Treatment adherence was high, with 94.1% following the prescribed regimen. Despite adverse events, 86.4% of patients expressed a desire to continue treatment.

Conclusion: This study demonstrates the potential effectiveness and accessibility of DTC telemedicine for obesity treatment using liraglutide, though gastrointestinal side effects were common. The findings support the use of DTC platforms for weight management, yet further research with longer follow-up and professional evaluation is necessary to confirm long-term safety and efficacy.

Keywords

Direct-to-consumer, GLP-1, liraglutide, telemedicine, general, obesity, telehealth

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Introduction

Obesity is an increasingly prevalent chronic disease and is considered a global epidemic. Currently, 38% of the world's population is either overweight or obese, and this number is expected to increase to 51% by the year 2035.[1] Obesity raises the risk of various other diseases, such as heart disease, diabetes, and certain types of cancer. Consequently, excess weight contributes to nearly 4 million deaths worldwide each year.[2]

In recent years, glucagon-like peptide-1 receptor agonists (GLP-1RAs) such as liraglutide and semaglutide have become promising pharmacological treatment options for obesity and diabetes.[3] Liraglutide slows down the emptying of the stomach and promotes feelings of fullness, resulting in reduced food intake and weight loss.[4]

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Simultaneously, telemedical applications are finding increasing acceptance in the treatment of chronic diseases. While the benefit of asynchronous telemedicine treatment for weight loss through lifestyle and nutritional counseling has already been demonstrated in studies,[5,6] no relevant data are yet available on asynchronous drug treatments with GLP-1RAs for obesity. Direct-to-consumer (DTC) telemedicine, which refers to healthcare services that allow patients to directly access medical care through digital platforms without requiring a referral from another healthcare provider, is becoming an increasingly popular treatment option for patients with obesity.[7,8]

In view of the worldwide increase in the use of GLP-1RAs, it is important to investigate the potential of DTC telemedical treatment of patients with obesity. The aim of the study was the characterization of patients who use an online prescription platform for the treatment of overweight and obesity with the GLP-1RA liraglutide. Furthermore, treatment success, side effect profile, and adherence with telemedical care were investigated using patient-reported outcomes (PROs).

Methods

Study design

We conducted a retrospective cohort study using anonymized data received from liraglutide prescriptions via *golighter.de* (Wellster Healthtech Group) between August 2022 and April 2024. Treatment outcomes such as weight loss, adverse events, and satisfaction were assessed through a follow-up questionnaire administered 50 days after the first prescription.

In addition to this service, golighter.de also offers free digital nutritional advice as an accompaniment. The DTC attracts new users through various advertising strategies, such as search engines and social media marketing. To determine whether patients meet the treatment criteria, they are required to complete an initial online questionnaire on the DTC. All patients underwent a structured medical history, which included risk factors, previous illnesses, medication history, and contraindications. The patient's identity and body habitus are verified using images of the patients with photo and identification document upload (Supplemental Table 1). Subsequently, the questionnaire is reviewed by a qualified physician who assesses the suitability of a prescription for liraglutide. Patients who do not meet the eligibility criteria are advised to seek consultation with a family physician. Following prescription, the medication can be ordered from an affiliated online pharmacy and is delivered to the patient's residence within 48 h.

In order to ensure the efficacy and safety of the treatment, 50 days after the first purchase follow-up questionnaire was sent to patients by e-mail. Patients were able to provide information on side effects and treatment success (self-reported weight-loss in kg, patient satisfaction) (Supplemental Table 2). Treatment Success was defined as weight loss >2 kg, with patients reporting weight changes in kilograms. No objective weight verification or medical supervision was conducted. Additional success measures included patient satisfaction ratings and self-reported changes in eating behavior. All outcome measures relied on subjective patient-reported data without clinical validation. The questionnaires were developed in consultation with two obesity experts and structured around clinical and regulatory contraindications for GLP-1 therapy.

Participants

Informed consent was obtained from all the subjects prior to study initiation. The data examined in this research paper relate to patients who used the platform between August 01, 2022, and April 31, 2024. Only patients who received a prescription through the platform were included in the evaluation.

The following criteria excluded patients from using *golighter.de*: age under 18 years, BMI <27, history of pancreatitis or increased risk of eating disorder, diabetes mellitus, or any other preexisting contraindicated condition.

The exclusion criterion of BMI < 27 kg/m² was applied based on European clinical practice guidelines for obesity management, which recommend pharmacotherapy for individuals with BMI ≥ 30 kg/m² or BMI ≥ 27 kg/m² with obesity-related complications.[9,10] Liraglutide (3.0 mg) is approved by the European Medicines Agency for weight management in adults with an initial BMI ≥ 30 kg/m² or BMI ≥ 27 kg/m² to <30 kg/m² with at least one weight-related comorbidity such as dysglycemia, hypertension, dyslipidemia, or obstructive sleep apnea.[11]

Ethics

The Ethics Committee of the Bavarian Medical Association reviewed the project description and confirmed that the study project did not require advice from the Ethics Committee (Ref. No.: 23084). The study was conducted in accordance with the Declaration of Helsinki.

Data collection and analysis

The data were extracted from the patient treatment success survey. The data were cleaned and duplicate answers, identified as coming from the same patient, were removed. Statistical analyses were conducted using GraphPad Prism. The Mann–Whitney *U* test was employed to assess continuous variables, specifically differences in mean age. For the evaluation of discrete variables with more than two rows and columns, the chi-square test was used. Fisher's exact test was applied to analyze data with two rows and columns. Missing answers were excluded from

Table 1. General characteristics of patients from a German online prescription platform for weight loss.

	All liraglutide prescriptions (P1) $n = 966$	Follow-up survey (P2) $n = 354$	p value*
Sex			
Female	546 (56.5)	211 (59.6)	0.3461
Male	420 (43.5)	143 (40.3)	
Age			
Mean (SD)	44,8 (10,9)	45,5 (11,2)	0.3168
Range	19–79	20–79	
Age group, *n* (%)			0.9051
19–30	91 (9.4)	33 (9.3)	
31–40	271 (28.1)	91 (25.6)	
41–50	285 (29.5)	105 (29.6)	
51–60	246 (25.5)	97 (27.3)	
≥61	73 (7.6)	29 (8.2)	
Duration of overweight, *n* (%)†			0.2313
<1 year	18 (2.0)	9 (2.5)	
1–5 years	249 (27.9)	79 (22.3)	
>5 years	419 (47.0)	178 (50.3)	
Since childhood	205 (23.0)	88 (24.9)	
BMI, *n* (%)			0.7805
27–29.9	277 (28.7)	94 (26.6)	
30–34.4	450 (46.6)	164 (46.3)	
35–39.9	151 (15.6)	59 (16.7)	
>40	88 (9.1)	37 (10.5)	
No previous use of GLP-1 agonists, *n* (%)†	756 (88.9)	305 (89.2)	1.

n, number of patients; SD, standard deviation; BMI, body mass index.
* Differences in general patient characteristics according to Mann-Whitney *U* test, χ^2, or Fisher's exact test. All statistical tests were two-sided, and the α-level was set at 5% ($p \leq 0.05$).
†Missing values result in smaller study cohort for these parameters, as questions were integrated during study period (duration of overweight: 75 missing values in P1; previous GLP-1 use: 116 missing values in P1 and 13 missing values in P2).

the analysis. P1 refers to all patients included in this study, while P2 consists of patients who also completed the follow-up questionnaire. All statistical tests were two-sided, and the α-level was set at 5% ($p \leq 0.05$).

Results

Data of 966 patients who received liraglutide treatment on the DTC platform between August 01, 2022, and April 31, 2024, were included in the analysis (P1). In the P1

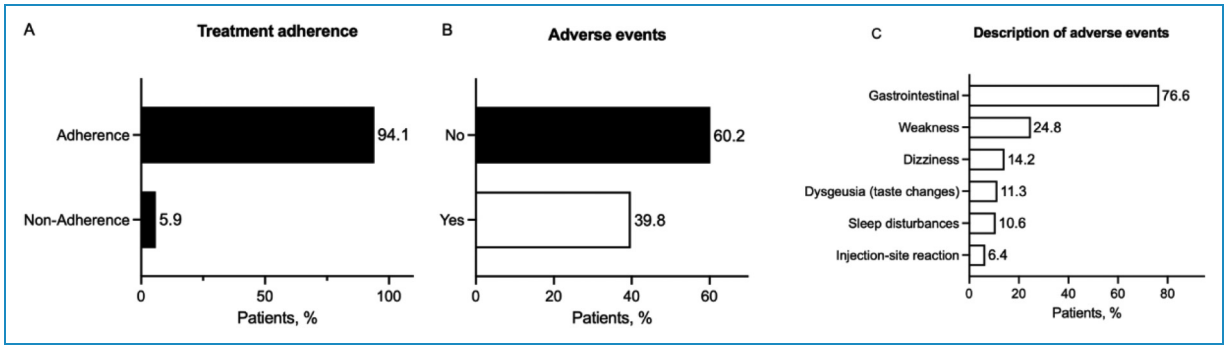

Figure 1. Treatment adherence and adverse events. (A) Patients were asked how they applied the therapy (adherence = 1× daily, non-adherence = less/more frequently). (B) Patients were asked if adverse events occurred with the therapy. (C) All patients who experienced adverse events were selected and asked for detailed information about the adverse events.

group, the mean age was 44.8 (SD 10,9) years, while 29.5% (285/966) of the patients were aged between 41 and 50 years; 70.0% reported that they had been affected by overweight for more than five years or since childhood (624/891). A total of 46.6% (450/966) of the patients had a BMI between 30 and 34.4 kg/m^2; 88.9% (756/850) of patients had not previously received prescription weight loss treatment with a GLP-1RA (Table 1).

Patients were asked about their previous weight loss methods. Dietary modification (57.2%, 486/850) was cited as the most common approach, followed by exercise (31.8%, 270/850), use of weight loss apps (8.0%, 68/850), and nutrition counseling (7.5%, 64/850) (multiple answers were possible); 6.9% (59/850) of patients reported that they had not tried any previous weight loss method.

Further analysis was conducted on a subset of 36.6% (354/966) of all patients (P2) who completed the follow-up questionnaire five weeks after the first liraglutide prescription. The P2 group did not differ significantly from the P1 group in terms of sex, age, distribution according to age group, BMI and duration of overweight, and previous use of GLP-1RAs (Table 1).

According to the patients' response, 94.1% (333/354) applied liraglutide exactly as recommended by the telemedical physician (once daily) (Figure 1A). Of all nonadherent patients, 95.2% (20/21) reported using liraglutide less frequently than recommended. Only one patient reported liraglutide overdose. A total of 39.8% (141/354) of patients reported treatment-related adverse events (Figure 1B), with gastrointestinal adverse events being the most cited (76.6%, 108/141), followed by weakness (24.8%, 35/141), and dizziness (14.2%, 20/141) (Figure 1C). Pancreatitis was reported in two patients.

The mean weight loss after 50 days of liraglutide treatment was −4.9 (SD 6,9) kg. 85.6% (303/354) of patients reported weight loss of more than 2 kg after five weeks (Figure 2A) and 65.0% (230/354) were very or rather satisfied with the treatment success (Figure 2B). The proportion of patients who were either very or rather satisfied with the success of their treatment did not differ between those who had previously used liraglutide and those who initiated treatment via DTC telemedicine (59.5% vs. 65.8%, $p = 0.4681$). No significant differences in self-reported treatment success were found based on the demographic characteristics of age, sex, and BMI at baseline. In 90.7% (321/354) of the patients, positive changes in their eating behavior were reported, whereas in 7.1% (25/354), no change has been recognized to date (Figure 2C); 86.4% (306/354) wished to continue telemedical care on the DTC platform (Figure 2D). Among patients who did not want to continue treatment, 56.3% (27/48) reported that the cost of treatment was too high, while 41.7% (20/48) reported discontinuation due to adverse events. Patients who said they wanted to stop telemedicine treatment reported significantly more adverse events than those who wanted to continue with it (60.4% vs. 36.3%, $p = 0.0023$). For both groups, gastrointestinal adverse events were reported most frequently; 10.4% (5/48) stated that they had reached their desired weight and therefore did not want to continue treatment.

Discussion

Obesity is a major public health challenge, and DTC telemedicine is becoming an increasingly popular treatment option for these patients. To the best of our knowledge, this is the first study worldwide investigating patients with obesity treated with the GLP-1RA liraglutide using DTC telemedicine in Germany.

Patient characteristics play a crucial role in determining the suitability of DTC telemedicine weight loss treatments. In our study population, 70% had been affected by overweight for more than five years or since childhood, and most patients had a BMI between 30 and 35 kg/m^2. Less than 10% of the patients had a BMI > 40 kg/m^2 (severe obesity). These patients with morbid obesity should not be primarily treated telemedically, as such patients may be complex and may require multidisciplinary care and in-person assessment. This is consistent with findings

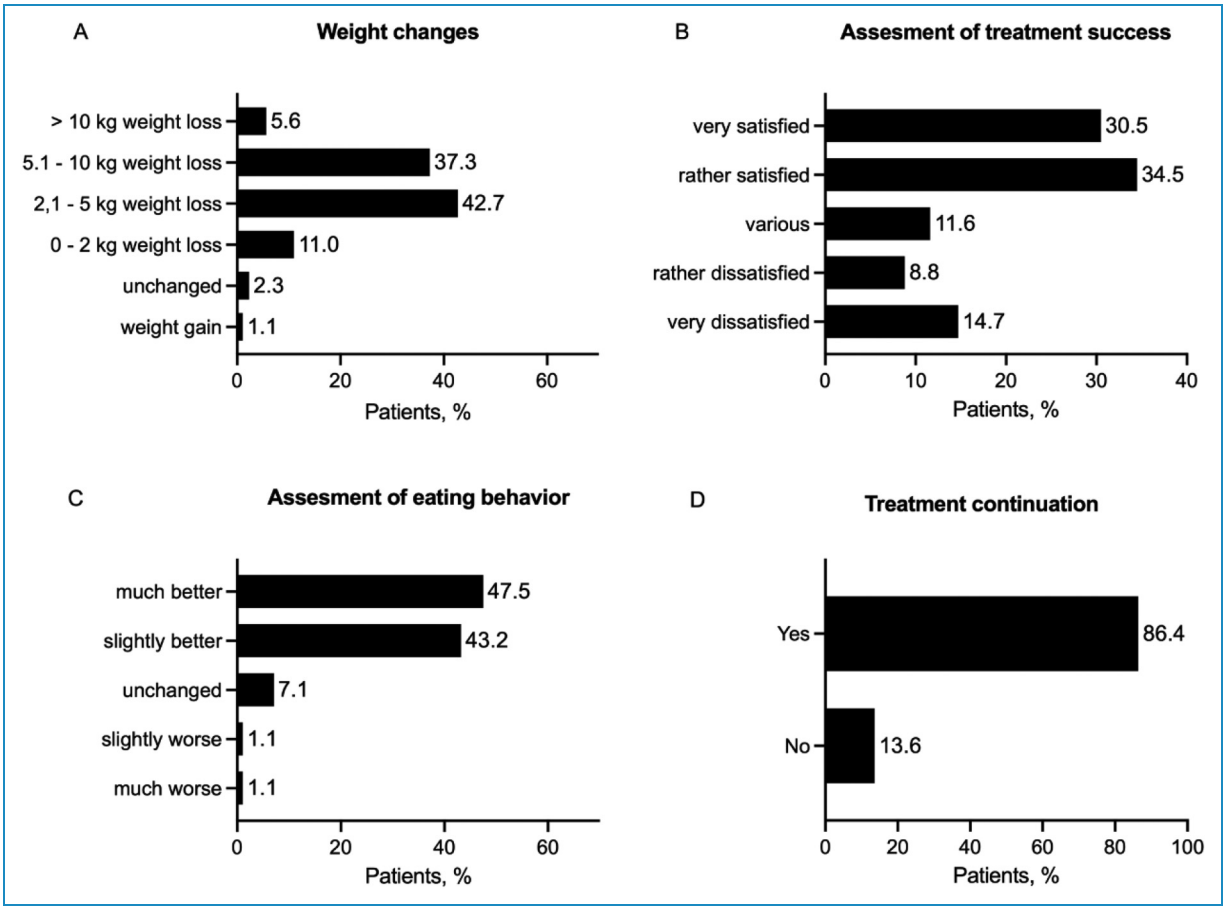

Figure 2. Patient satisfaction and treatment success. (A) Weight changes according to patients' statement (B) patients were asked how satisfied they are with the treatment success. (C) Assessment of eating behavior according to patients' statements. (D) Patients were asked if they want to continue the telemedical care for weight loss.

from a systematic review highlighting the need for diverse and inclusive clinical trial populations to address the complex needs of patients with severe obesity.[12]

In our study, 88.9% of patients reported not having previously used systemic GLP-1RAs for weight loss. The high proportion of therapy-naive patients receiving pharmacological treatment indicates that DTC telemedicine could contribute to encouraging more patients with obesity to commence medical therapy and could lower the barrier to access to care. This aligns with evidence suggesting that broader access to obesity medications through telemedicine can enhance treatment uptake among previously untreated populations.[13] Also, findings from a systematic review highlighted the variability in sex, race, and BMI representation in clinical trials for obesity medications over the past three decades, suggesting that broader accessibility to such treatments is necessary to ensure equitable healthcare delivery.[14] There was no significant difference in self-reported treatment success between patients who had previously used liraglutide and those who initiated treatment via telemedicine. Therefore, we concluded that the DTC delivery method could benefit many patients with obesity, regardless of their prior experience with pharmacological weight loss treatments.

In 6.9% of the cases, no weight loss method prior to liraglutide treatment was tried. Lifestyle modifications such as diet or exercise are the first-line treatment for weight loss, and prescription weight loss drugs should be considered only when other methodologies alone are not successful.

Our dataset revealed a preponderance of female patients compared to male (56.5% vs. 43.5%). As the prevalence of obesity is similar in Germany between men and women,[15] this may reflect women's greater openness to online platforms or a greater stigma associated with female obesity. Alternatively, this may reflect that, just as in face-to-face treatment, women are more likely to request and access medical care, across a broad variety of conditions.[16]

Our study provides evidence that DTC telemedicine can be a safe treatment option for patients with obesity. Only two patients reported pancreatitis, a severe adverse event. In these patients, follow-up video consultation was performed. Safety data from our study demonstrate that while

gastrointestinal adverse events were common, severe complications were rare, echoing findings from comprehensive reviews on the safety of GLP-1RAs.[17]

Patients with questions or who suffered from adverse effects (AEs) could avail of an "ask a doctor" service, which allowed them to correspond with a specialist in order to clarify any uncertainties. The presence of this service served as an additional safety mechanism.

Overall, the data revealed a high level of adherence in DTC telemedicine weight loss treatment, which is crucial for ensuring safety and effectiveness. Similarly, patients using DTC platforms for managing skin diseases have also reported high adherence rates, suggesting that convenience may contribute to patient compliance across the board.[18,19] This observation is supported by real-world data indicating high persistence and adherence to GLP-1RAs among obese adults, even in nondiabetic populations, which underscore the importance of adherence in successful obesity management.[20] In our study, adherence was assessed through patient self-report, the preferred method in clinical settings. However, a limitation is that self-reported adherence may not always correspond to objective adherence.[21]

The results of our study align with previous meta-analyses, which demonstrated the efficacy of GLP-1RAs in promoting weight loss, including liraglutide.[22,23] After 50 days of treatment, 85.6% of patients reported weight loss of >2 kg. Our study showed a high rate of treatment continuation (86.4%), despite a high incidence of AEs (39.8%). This may reflect a strong patient desire to lose weight, despite our study finding that approximately one in four patients were dissatisfied with the treatment success. In cases of discontinuation, the most common reason was cost, a reflection of the self-payer market in Germany.

This study is limited by its retrospective cohort study design, which precludes any definitive causal conclusions. The study was conducted without a sample size calculation. Because participation in the follow-up was voluntary, there is potential for selection bias, although the follow-up rate was relatively high at 36.6% (354/966). Nevertheless, comparison of groups P1 and P2 revealed no significant differences in general patient characteristics. Since follow-up questionnaires were administered 50 days after the initial GLP-1RA prescription, our analysis only captures short-term benefits and patient experience. Future research with longer follow-up periods is warranted. The assessment of treatment efficacy relied on subjective PRO measures. Data on treatment-related AEs and adherence were self-reported, which could lead to recall bias and overestimation of adherence or misinterpretation of AEs. Furthermore, AEs were not evaluated by healthcare professionals. In addition, due to data suggesting a possible "rebound" effect after discontinuing the medication, those who cease the medication after reaching their target weight could be reevaluated to assess whether the weight loss was sustained. While the questionnaires used in this study were not derived from previously validated instruments, they were developed in close consultation with two clinical obesity specialists and grounded in international safety and prescribing guidelines for GLP-1RAs. The anamnesis questions systematically addressed major exclusion criteria and risk factors outlined by regulatory bodies such as the EMA, thereby supporting safe clinical decision-making in the DTC context. Nevertheless, future studies should aim to formally validate these instruments to strengthen their reliability and comparability across clinical settings.

This study highlights the growing potential of DTC telemedicine as a beneficial and accessible treatment option for obesity management, particularly through the use of GLP-1RAs like liraglutide. The findings indicate that DTC platforms can reach a significant population of patients with long-standing obesity who may not have previously engaged in pharmacological treatment. Despite the high incidence of gastrointestinal side effects, the majority of patients adhered to the treatment regimen and experienced meaningful weight loss within 50 days. However, the study's limitations, including its short-term scope and reliance on self-reported data, suggest that further research is needed to fully understand the long-term benefits and risks of this treatment modality. Future studies should focus on extended follow-up periods and incorporate objective measures of treatment adherence and adverse events to provide a more comprehensive evaluation of the safety and effectiveness of DTC telemedicine in obesity care.

Conclusion

This study underscores the potential of DTC telemedicine as an effective and accessible approach for obesity management using GLP-1RAs like liraglutide. It highlights the ability of DTC platforms to engage a significant portion of patients with long-term obesity who has not previously participated in pharmacological treatments. Despite a considerable incidence of gastrointestinal side effects, most patients adhered to the prescribed regimen and achieved meaningful weight loss within 50 days. The study found high treatment continuation rates, reflecting both patient satisfaction and the desire to overcome obesity. However, limitations such as the short-term scope and reliance on self-reported data necessitate further research. Extended follow-up periods and objective measures of adherence and AEs are critical for a comprehensive understanding of the long-term benefits and risks associated with this treatment. The findings suggest that DTC telemedicine can play a crucial role in enhancing access to obesity care, yet caution is advised for patients with severe obesity who may require more complex, multidisciplinary approaches. Future studies should aim to address these gaps to establish

a robust evidence base for the safety and efficacy of DTC telemedicine in managing obesity.

Authors' note

Ethics approval and consent present and complete. *Consent for publication:* Present and complete.

Supplemental Material

Supplemental material for this article is available online.

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Ethics

The Ethics Committee of the Bavarian Medical Association reviewed the project description and confirmed that the study project did not require advice from the Ethics Committee (Ref. No.: 23084). The study was conducted in accordance with the Declaration of Helsinki.

Contributorship

MG contributed to interpretation of data and original draft. JvB contributed to data analysis, interpretation of data, and original draft. BC contributed to data collection and data analyses. EG contributed to critical revision and editing. FA contributed to conception and design, data analysis, interpretation of data, and original draft. CW contributed to conception and design, critical revision, and editing. All the authors have read and approved the final manuscript. All the authors contributed to the conception and design of the study. All authors have read and approved the final manuscript. JvB and CW own stock options of the company but are not owners of the golighter platform.

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Declaration of Conflicting Interests

The authors declare that this is no conflict of interest.

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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