

Article

Patients Taking Glucagon-like Peptide 1 Receptor Agonists (GLP-1s) Presenting to the Emergency Department, 2017–2025

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Abstract

Background/Objectives: Glucagon-like Peptide 1 receptor agonists (GLP-1s) have increased in popularity for obesity management and treatment of various metabolic conditions. The medications, however, have significant side effects and carry a risk for adverse events. The objective of this study was to investigate the prevalence of patients taking these medications presenting to the Emergency Department (ED). **Methods:** We conducted a multi-center retrospective study at two EDs: an urban level 1 trauma center and an academic quaternary medical center (combined annual census approximately 90,000) over a 9-year period (2017–2025). We collected data on all ED encounters involving patients taking GLP-1s, including dual GLP-1/GIP (Glucose-dependent Insulinotropic Polypeptide) agonists, at the time of admission, including demographic information, presenting complaints, comorbidities, and disposition. Descriptive and comparative statistics were used to characterize GLP-1 patient encounters vs. non-GLP-1 patient encounters overall and by diabetes status. The change in encounters over the study period was also assessed. *p*-values < 0.05 were considered statistically significant. **Results:** Over the 9-year study period, the proportion of ED encounters involving patients on GLP-1s increased from 0.4% in 2017 to 5.8% in 2025 (*p* < 0.001). Patients taking GLP-1s were more often female (53.9%), obese (59.4%), and middle-aged, ranging from 35 to 64 years of age (57.3%), and commonly presented with complaints of abdominal or other pain, weakness, or dizziness. Nearly three-quarters of all patients had a Charlson Comorbidity Index (CCI) score of 3 or higher (74.0%). These patients had a higher rate of inpatient admission from the ED (33.5% vs. 23.7%, *p* < 0.001). **Conclusions:** The number of patients presenting to the ED who were taking GLP-1s significantly increased over time as these medications became more widely utilized. Patients taking GLP-1s were more often obese with multiple comorbidities and were more likely to be admitted for inpatient care. Further studies are needed to determine whether GLP-1 use independently influences emergency care utilization and the need for hospitalization.



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Keywords: Glucagon-like Peptide 1 (GLP-1); Emergency Department; medications; obesity; metabolic syndrome

1. Introduction

First introduced in 2005 as a glycemic control drug, Glucagon-like Peptide 1 receptor agonists (GLP-1s) are approved for patients with obesity and weight-related metabolic conditions, in particular diabetes. These medications regulate blood sugar by increasing insulin production and release while also inhibiting glucagon release. GLP-1s also suppress

gastric emptying and appetite, inducing early satiety, which has the potential to reduce overall intake and body weight [1–3].

Multiple studies have shown that use of these medications can result in significant weight loss (approximately 15% reduction over 1–2 years), improved glucose homeostasis and management in patients with type 2 diabetes, and a remarkable risk reduction for patients with cardiovascular disease and other metabolic conditions [4–10]. As a result, use of GLP-1s has increased dramatically in the past few years, particularly in the U.S., where reported rates of obesity are nearing 42% of the population [11].

The medications, however, have significant side effects and risk for adverse events that may precipitate the need for acute or unscheduled medical care [4,12,13]. Concerns regarding the safety profile of GLP-1 therapies have also been reported among healthcare professionals, emphasizing the need for continued evaluation of the potential clinical consequences associated with their increasing use [14]. Accordingly, our objective in this study was to investigate the impact of GLP-1 use among patients presenting to the Emergency Department (ED) for acute care.

2. Materials and Methods

2.1. Study Design and Setting

We conducted a multi-center retrospective study of electronic health record (EHR) data at 2 EDs over a 9-year study period from 1 January 2017 through 31 December 2025. The 2 EDs included a busy urban level 1 trauma center with an annual ED census of approximately 45,000 patient encounters; and an academic quaternary medical center with acute stroke and cardiovascular care accreditation and certification, as well as an NIH-designated cancer center, also with an annual ED census of approximately 45,000 patient encounters. Both EDs are part of the largest academic healthcare system in the region (San Diego, CA, USA).

2.2. Data Sources/Variables/Measurement

Data on all ED encounters in which a patient was currently on a GLP-1 medication or dual GLP-1/GIP (Glucose-dependent Insulinotropic Polypeptide) medication, as noted in the chart, were collected and analyzed for the study. GLP-1 medications included semaglutide (trade name Ozempic, Wegovy, Rybelsus), tirzepatide (Mounjaro, Zepbound), liraglutide (Saxenda, Victoza), dulaglutide (Trulicity), exenatide (Byetta, Bydureon), and lixisenatide (Adlyxin).

Data queried included patient demographics, clinical presentation, and final disposition. Patient-specific data collected included history of comorbidities such as heart disease, diabetes, hypertension and other chronic conditions. Age, weight, height and BMI (calculated from weight and height) were recorded. This study was reviewed by the University of California, San Diego Office of IRB Administration and was found to be exempt from Institutional Review Board requirements.

2.3. Data Analysis

Our primary outcome of interest was the overall trend in ED patients presenting on GLP-1s. Our secondary outcomes were patient characteristics, presentation, and disposition. Age was categorized as 18–34, 35–64 and 65 or older. Complaints were grouped by similar presentations. Disposition was reported as admitted, discharged, or other (left against medical advice, left without being seen, transferred, eloped, and expired). BMI was categorized as underweight (<18.5), healthy weight (18.5–24.9), overweight (25.0–29.9), Class 1 Obesity (30–34.9) and Class 2/3 Obesity (35+) and based on weight and height from the EHR. The Charlson Comorbidity Index (CCI) score was calculated with the enhanced

coding algorithm provided by Quan et al. to assess comorbidities, which were classified as 0, 1–2, 3–4 or 5 or more [15].

Descriptive statistics were used to characterize ED patients who were taking GLP-1s and to assess trends of encounters over time. The GLP-1 encounter rate per 10,000 ED encounters by year is presented, and the absolute and relative increases are reported. We also compared demographics and clinical characteristics between these patient encounters (GLP-1 group) versus those of ED patients who were not taking GLP-1s (non-GLP-1 group) overall and by diabetes status at the time of their encounter. A chi-square test for linear trend was used to assess differences over time, and a chi-square test was used to assess differences between GLP-1 and non-GLP-1 groups. Unknown categories were not included in comparisons. A *p*-value of less than 0.05 was considered statistically significant. All statistical analyses were conducted with IBM SPSS Statistics (version 30.0; SPSS, Inc., Chicago, IL, USA).

3. Results

During the 9-year study period, there were a total of 742,900 ED patient encounters, of which 20,669 (2.8%) involved patients taking GLP-1s at the time of their ED encounter. These encounters were attributable to a total of 7720 unique patients. The number of ED encounters involving these patients increased markedly, from 0.4% in 2017, to 5.8% of all ED patient encounters in 2025 ($p < 0.001$). Year-over-year increases were seen in the rate of these encounters per 10,000 ED encounters, as shown in Figure 1. There was an absolute increase of 548 per 10,000 ED encounters.

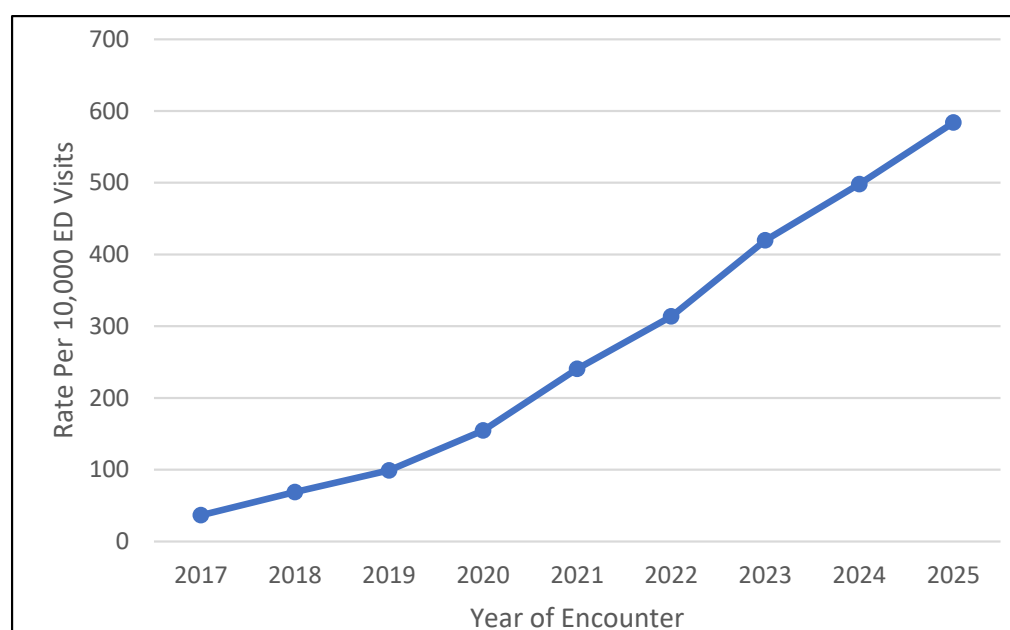


Figure 1. GLP-1 ED encounter rate per 10,000 ED encounters by year.

The medications documented for these encounters are reported in Table 1. Dulaglutide was more commonly used overall (43.0%) and among those with diabetes (52.8%). The most common GLP-1 used among patients without diabetes was semaglutide (54.2%).

Year-over-year changes in the percent of patients with diabetes taking GLP-1s are presented in Figure 2. In 2017, 96.5% of these encounters involved patients with diabetes; this figure decreased to 66.6% in 2025.

Overall, patients taking GLP-1s were more often women (53.9%) and middle-aged individuals from 35 to 64 years old (57.3%) ($ps < 0.001$). Most patients were obese with BMIs greater than 30 kg/m², particularly when compared with patients who were not on

GLP-1s (59.4% vs. 25.9%), though over 14% of patients taking GLP-1s had a BMI less than 25 kg/m². The distribution of GLP-1 use among patients with and without diabetes was generally similar to the overall distributions, with the largest variations seen in BMI (all comparisons $p < 0.001$). Table 2 delineates the breakdown of demographic data and BMI in GLP-1 vs. non-GLP-1 groups overall and by known diabetes status.

Table 1. Medications documented for GLP-1 ED encounters.

Medication	Overall		No Diabetes		Diabetes	
	<i>n</i> = 20,669		<i>n</i> = 4018		<i>n</i> = 16,651	
	Number	(%)	Number	(%)	Number	(%)
Semaglutide	6546	(31.7)	2178	(54.2)	4368	(26.2)
Tirzepatide	3006	(14.5)	1216	(30.3)	1790	(10.8)
Liraglutide	1314	(6.4)	379	(9.4)	935	(5.6)
Dulaglutide	8898	(43.0)	110	(2.7)	8788	(52.8)
Exenatide	446	(2.2)	9	(0.2)	437	(2.6)
Lixisenatide	32	(0.2)	1	(0.0)	31	(0.2)
Multiple GLP-1 medications	427	(2.1)	125	(3.1)	302	(1.8)

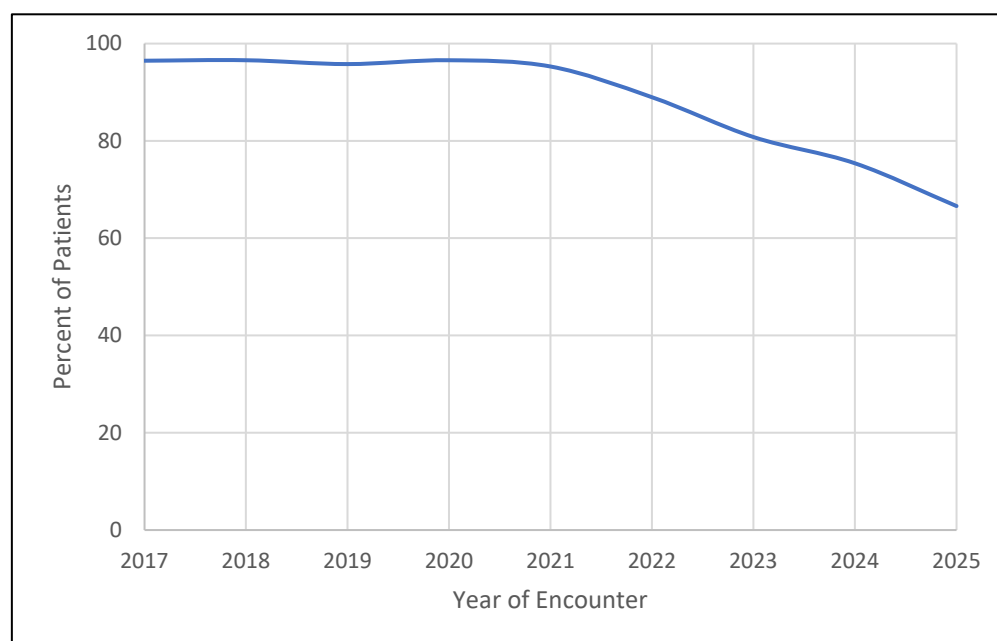


Figure 2. Percent of GLP-1 ED encounters involving patients with diabetes.

Patient complaints were commonly pain (abdominal, chest, leg or back), weakness and dizziness, and other GI-related issues (nausea, vomiting, diarrhea). Comorbidities including diabetes, heart disease, hypertension and other cardiovascular and metabolic conditions were common amongst the patients taking GLP-1s. The majority of patients had five or more comorbidities, as indicated by Charlson Comorbidity Index (CCI) scores (53.7% vs. 20.7%). Overall, patients taking GLP-1s also had higher admission rates for inpatient care following their ED encounter (33.5% vs. 23.7%). Clinical characteristics overall and by diabetes status are reported in Table 3.

Table 2. Demographic comparison of GLP-1 and non-GLP-1 encounters (# = number).

Characteristic	Overall				No Diabetes				Diabetes			
	GLP-1		Non-GLP-1		GLP-1		Non-GLP-1		GLP-1		Non-GLP-1	
	n = 20,669		n = 722,231		n = 4018		n = 586,807		n = 16,651		n = 135,424	
	#	(%)	#	(%)	#	(%)	#	(%)	#	(%)	#	(%)
Age												
18–34	1289	(6.2)	187,999	(26.0)	683	(17.0)	179,158	(30.5)	606	(3.6)	8841	(6.5)
35–64	11,843	(57.3)	351,936	(48.7)	2588	(64.4)	280,968	(47.9)	9255	(55.6)	70,968	(52.4)
≥65	7537	(36.5)	182,296	(25.2)	747	(18.6)	126,681	(21.6)	6790	(40.8)	55,615	(41.1)
Sex												
Female	11,134	(53.9)	351,863	(48.7)	2818	(70.1)	289,827	(49.4)	8316	(49.9)	62,036	(45.8)
Male	9528	(46.1)	370,054	(51.2)	1195	(29.7)	296,682	(50.6)	8333	(50.0)	73,372	(54.2)
Unknown	7	(0.0)	314	(0.0)	5	(0.1)	298	(0.1)	2	(0.0)	16	(0.0)
BMI												
<25.0	2908	(14.1)	282,042	(39.1)	275	(6.8)	239,865	(40.9)	2633	(15.8)	42,177	(31.1)
25.0–29.9	5326	(25.8)	206,862	(28.6)	888	(22.1)	168,240	(28.7)	4438	(26.7)	38,622	(28.5)
30.0–34.9	5406	(26.2)	106,701	(14.8)	1188	(29.6)	81,247	(13.8)	4218	(25.3)	25,454	(18.8)
≥35.0	6876	(33.3)	80,692	(11.2)	1644	(40.9)	56,389	(9.6)	5232	(31.4)	24,303	(17.9)
Unknown	153	(0.7)	45,934	(6.4)	23	(0.6)	41,066	(7.0)	130	(0.8)	4868	(3.6)

Note: All comparisons between GLP-1 and non-GLP-1 groups were statistically significant (<0.001) overall as well as among those with and without diabetes. Unknown categories were not included in the comparisons (# = number).

Table 3. Disposition, CCIs and complaint GLP-1 and non-GLP-1 ED encounters (# = number).

Characteristic	Overall				No Diabetes				Diabetes			
	GLP-1		Non-GLP-1		GLP-1		Non-GLP-1		GLP-1		Non-GLP-1	
	n = 20,669		n = 722,231		n = 4018		n = 586,807		n = 16,651		n = 135,424	
	#	(%)	#	(%)	#	(%)	#	(%)	#	(%)	#	(%)
Disposition												
Admit	6938	(33.6)	171,049	(23.7)	739	(18.4)	119,504	(20.4)	6199	(37.2)	51,545	(38.1)
Discharge	12,602	(61.0)	493,174	(68.3)	3007	(74.8)	417,788	(71.2)	9595	(57.6)	75,386	(55.7)
Other	1129	(5.5)	58,008	(8.0)	272	(6.8)	49,515	(8.4)	857	(5.1)	8493	(6.3)
CCI Score												
0	1202	(5.8)	300,491	(41.6)	1202	(29.9)	300,491	(51.2)	0	(0.0)	0	(0.0)
1 to 2	4182	(20.2)	184,753	(25.6)	1348	(33.5)	146,639	(25.0)	2834	(17.0)	38,114	(28.1)
3 to 4	4166	(20.2)	87,147	(12.1)	580	(14.4)	57,978	(9.9)	3586	(21.5)	29,169	(21.5)
5+	11,119	(53.8)	149,840	(20.7)	888	(22.1)	81,699	(13.9)	10,231	(61.4)	68,141	(50.3)
Complaint												
Abd pain or vomiting	2716	(13.1)	87,413	(12.1)	733	(18.2)	70,719	(12.1)	1983	(11.9)	16,694	(12.3)
Chest, leg or back pain	3122	(15.1)	85,306	(11.8)	647	(16.1)	68,297	(11.6)	2475	(14.9)	17,009	(12.6)
SOB, weakness, dizziness, fall	3997	(19.3)	103,405	(14.3)	525	(13.1)	76,224	(13.0)	3472	(20.9)	27,181	(20.1)
Other complaint	10,834	(52.4)	446,107	(61.8)	2113	(52.6)	371,567	(63.3)	8721	(52.4)	74,540	(55.0)

Note: All comparisons between GLP-1 and non-GLP-1 groups were statistically significant (<0.001) overall as well as among those with and without d (# = number).

4. Discussion

Because of their success in the management of diabetes and obesity, use of GLP-1s has increased markedly in the past several years. Additional benefits have been widespread, including reductions in cardiovascular and other metabolic disease complications and recently reported positive impact on patients with sleep apnea and alcoholic liver disease [1–5,16–18].

GLP-1s mimic the action of endogenous peptide hormones produced by enteroendocrine L-cells in the small intestine and colon. This natural incretin hormone is secreted and released with food intake, inducing insulin release with nutrient ingestion, but it rapidly declines due to its short half-life (approximately 2 min) [19]. These medications activate the same metabolic pathways as the endogenous hormone, but with a significantly longer half-life through chemical structure modifications and protein binding. For example, semaglutide binds to albumin, resulting in a half-life of approximately 1 week [20,21].

As a result, GLP-1s persist longer than the short-lived endogenous peptide, allowing for prolonged action, including regulation of blood sugar by increasing insulin production and release, and suppressing glucagon release. Moreover, GLP-1s also suppress gastric emptying, blunt appetite responses and induce early satiety, with the potential to reduce overall oral intake [22,23].

Multiple clinical trials have demonstrated the significant impact of these medications on obese patients, with remarkable weight loss of up to 16% of body weight [3,5–11,24]. Moreover, GLP-1 weight loss has been associated with additional benefits in reducing obesity-related conditions like sleep apnea [17].

Beyond weight loss, studies now show significant improvements in cardiovascular and metabolic conditions in addition to diabetes. Large clinical trials have demonstrated the beneficial impact GLP-1s on atherosclerotic disease, including lower rates of heart disease and failure, myocardial infarction, and stroke, particularly in patients with diabetes [25,26]. GLP-1s have shown promise in modulating brain pathways for substance use disorders associated with alcohol, opioid, and nicotine addictions, even impacting risk for alcoholic liver disease [18,27].

As a result, the popularity of GLP-1s has skyrocketed. In 2025, nearly one in eight adult Americans and one in ten adults in Great Britain reported using GLP-1s [28,29]. For patients with diabetes in the U.S., the National Center for Health Statistics reports that over one-quarter are taking GLP-1 medications [30]. Despite their initial high cost and limited availability, overwhelming demand has led to widespread efforts to lower costs on a regional and national level, as well as to provide greater access through online medical services and compounding pharmacies [31].

Adverse events occur frequently with GLP-1s. GI side effects, such as nausea, vomiting, diarrhea, abdominal pain, dyspepsia and constipation, are most common, reported in more than half of all patients, particularly with initial drug use and higher doses [28,32]. Reduced gastric emptying, along with other GI side effects, can lead to significant complications including dehydration, gastroparesis, and bowel obstruction. Pancreatitis and biliary disease have also been reported with these medications [4,12,33]. Other significant adverse events include metabolic and electrolyte derangements, including hypoglycemia and acute kidney injury [32]. Hypersensitivity, skin reactions (at injection sites) and even a variety of acute neurologic adverse events have been reported [34–36].

In this study, we report on the frequency of visit encounters at two EDs involving patients taking GLP-1s and GLP-1/GIP agents over the past 9 years. Not surprisingly, the frequency increased dramatically by nearly 15-fold over the decade as these medications became widely available. However, the proportion of these visits compared to all ED encounters (5.8% in 2025) remained lower than was reported in a recent RAND survey, which found an 11.8% use rate among the general U.S. population in 2025 [28].

In our study, the vast majority of the ED encounters were by patients with diabetes. Patients were also typically obese and middle-aged with multiple comorbidities—the patient population most apt to be on these medications. However, it should be noted that one in seven patients had BMIs less than 25 kg/m², and over one-quarter had two or fewer comorbidities.

Many of the clinical presentations could be GLP-1-related, including gastrointestinal complaints and manifestations of hypovolemia (weakness, dizziness). However, these presentations could also be attributable to the patient's underlying comorbidities, such as diabetes or related complications, or other causes unrelated to GLP-1 use.

Regardless of the underlying etiology, the approach to these patients should be similar to that in other ED patients. After assessment and management of any immediate life-threatening conditions, clinicians should evaluate the volume status of the patient and

address dehydration as indicated. Management should include antiemetics, pain medications, intravenous (IV) fluids and other medications as needed. Laboratory evaluation for renal dysfunction, electrolyte abnormalities, and liver or pancreatic abnormalities, as well as imaging, should be obtained where appropriate. Severe dehydration, inability to take oral fluids, intractable severe pain, renal failure, pancreatitis, acute liver disease, or other metabolic derangements may precipitate the need for hospitalization and inpatient care [4].

Compared with encounters involving patients not taking these medications, those involving patients on GLP-1s had a higher rate of inpatient admission for their disposition from the ED. This may be the result of a number of factors, including the initial acuity on presentation and the greater burden of underlying comorbidities and chronic disease in this population.

Over time, it remains to be determined what the actual impact of the growing widespread use of GLP-1s will be on EDs. Patient encounters could be impacted by the myriad of potential adverse side effects and conditions related to the use of GLP-1s, or alternatively as a result of the benefits of these therapies in reducing complications from diabetes, cardiovascular disease, other metabolic conditions, or morbid obesity that often result in the need for acute ED care.

Limitations

This study has several limitations. First, we collected data from two ED sites within a single geographic region, thus limiting the potential generalizability of our findings to other regions or countries.

Second, as a retrospective review, our data relied on accurate entry into the EHR, including an updated and active medication list. It is possible that our review may have either missed patients on GLP-1s who were not documented or that patients were included who were no longer actively taking the medication. In fact, a small number of patients had multiple GLP-1 agents listed as active medications in the EHR, highlighting the intrinsic limitation of our retrospective data collection from the electronic medical record.

We also do not have data on dosing or duration of use, as this information is not recorded on the EHR medication list. In addition, specific information on compounded formulations is also not recorded. We cannot determine if the increase noted over the 9-year study period was due to greater use of the medication by the general public, improved documentation by ED staff with awareness of new GLP-1s, or both.

We studied all ED patient encounters, including repeat visits by patients during the 9-year period. We believe doing so would more accurately represent the impact of this population on the ED, but acknowledge doing so may have biased our results toward a subset of those frequently seeking care in the ED.

Third, there are a number of potential confounding variables in terms of our analysis. As a retrospective study, we cannot attribute a causal relationship between GLP-1 use and ED presentation, particularly since many complaints and diagnoses may be related to the underlying condition (such as diabetes) being treated by the medication. Moreover, we cannot make any causal inferences in comparing GLP-1 and non-GLP-1 encounters given the heterogeneity between these groups in this large dataset collected over 9 years.

Lastly, while this study was conducted over 9 years, the long-term impact of GLP-1s on the ED is yet to be determined, as their use continues to grow and become more widespread.

5. Conclusions

In this retrospective study of two EDs, the number of encounters with patients on GLP-1 medication markedly increased over 9 years. These patients were most often obese

with multiple comorbidities and more likely to be admitted subsequently for inpatient care, suggesting that GLP-1s may be a marker of higher acuity on presentation. Further study including prospective research investigations would be useful to determine any potential causal connection and implications for clinical care.

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Informed Consent Statement: Patient consent was waived because the study used retrospectively collected, non-identifiable data.

Data Availability Statement: The datasets presented in this article are not readily available due to institutional restrictions.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

GLP-1	Glucagon-like Peptide-1 Receptor Agonists
ED	Emergency Department
BMI	Body Mass Index (kg/m ²)
CCI	Charlson Comorbidity Index
NIH	National Institutes of Health

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