Semaglutide (Ozempic®, Wegovy®)

Classification

- Antidiabetic agent (Ozempic)
- Weight loss agent (Wegovy)

Pharmacology

Semaglutide is a human glucagon-like peptide 1 (GLP-1) receptor agonist (incretin mimetic). Semaglutide activates the GLP-1 receptor in pancreatic beta cells leading to glucose-dependent insulin release. It also decreases glucagon secretion, slows gastric emptying, and promotes satiety.

Indication

- **Ozempic:**
  - Adjunct to diet and exercise to improve glycemic control in adults with type 2 diabetes mellitus
  - Reduce the risk of major adverse cardiovascular events (cardiovascular death, non-fatal myocardial infarction or non-fatal stroke) in adults with type 2 diabetes mellitus and established cardiovascular disease

- **Wegovy:**
  - Chronic weight management in adults with BMI \( \geq 30 \text{ kg/m}^2 \) or \( \geq 27 \text{ kg/m}^2 \) with hypertension, type 2 diabetes, or dyslipidemia

Black Box Warning

WARNING: RISK OF THYROID C-CELL TUMORS

In rodents, semaglutide causes dose-dependent and treatment-duration-dependent thyroid C-cell tumors at clinically relevant exposures. It is unknown whether semaglutide causes thyroid C-cell tumors, including medullary thyroid carcinoma (MTC), in humans as human relevance of semaglutide-induced rodent thyroid C-cell tumors has not been determined.

Semaglutide is contraindicated in patients with a personal or family history of MTC or in patients with Multiple Endocrine Neoplasia syndrome type 2 (MEN 2). Counsel patients regarding the potential risk for MTC with the use of semaglutide and inform...
them of symptoms of thyroid tumors (e.g., a mass in the neck, dysphagia, dyspnea, persistent hoarseness). Routine monitoring of serum calcitonin or using thyroid ultrasound is of uncertain value for early detection of MTC in patients treated with semaglutide.

**Pharmacokinetics**

<table>
<thead>
<tr>
<th>Pharmacokinetic Parameter</th>
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<tbody>
<tr>
<td><strong>Absorption</strong></td>
<td>Bioavailability = 89%; max concentration reached 1-3 days post dose; similar exposure with subcutaneous administration in abdomen, thigh, or upper arm</td>
</tr>
<tr>
<td><strong>Distribution</strong></td>
<td>Extensively bound to plasma albumin (&gt; 99%)</td>
</tr>
<tr>
<td><strong>Metabolism</strong></td>
<td>Proteolytic cleavage of peptide backbone, beta-oxidation of the fatty acid sidechain</td>
</tr>
<tr>
<td><strong>Excretion</strong></td>
<td>Half-life ≈ 1 week; Urine (3% unchanged drug), feces</td>
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</table>

**Dosage/Administration**

Administer subcutaneously in the abdomen, thigh, or upper arm. Instruct patients to use a different injection site each week when injecting in the same body region.

Administer once weekly, on the same day each week, at any time of day, with or without meals.

Ozempic: Start with 0.25 mg once weekly for 4 weeks. The 0.25 mg dosage is intended for treatment initiation and is not effective for glycemic control. Weeks 5 through 8 = 0.5 mg once weekly. If additional glycemic control is needed, Weeks 9 through 12 = 1 mg once weekly. If additional glycemic control is needed, Week 13 and onward = 2 mg once weekly (maximum recommended dosage).

Wegovy: Start with 0.25 mg once weekly for 4 weeks. Weeks 5 through 8 = 0.5 mg once weekly. Weeks 9 through 12 = 1 mg once weekly. Weeks 13 through 16 = 1.7 mg once weekly. Week 17 and onward = 2.4 mg once weekly.

If patients do not tolerate the maintenance 2.4 mg once-weekly dose, the dose can be temporarily decreased to 1.7 mg once-weekly, for a maximum of 4 weeks. After 4 weeks, increase back to 2.4 mg once-weekly. Discontinue if the patient cannot tolerate the 2.4 mg dose.
Use in Special Population

**Pregnancy:** There are limited data with semaglutide use in pregnant women to inform a drug-associated risk for adverse developmental outcomes. There are clinical considerations regarding the risks of poorly controlled diabetes in pregnancy. Based on animal reproduction studies, there may be potential risks to the fetus from exposure to semaglutide during pregnancy. OZEMPIC should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Based on animal reproduction studies, there may be potential risks to the fetus from exposure to semaglutide during pregnancy. Additionally, weight loss offers no benefit to a pregnant patient and may cause fetal harm. When a pregnancy is recognized, advise the pregnant patient of the risk to a fetus and discontinue WEGOVY.

**Lactation:** There are no data on the presence of semaglutide in human milk, the effects on the breastfed infant, or the effects on milk production. Semaglutide was present in the milk of lactating rats, however, due to species-specific differences in lactation physiology, the clinical relevance of these data are not clear. The developmental and health benefits of breastfeeding should be considered along with the mother’s clinical need for semaglutide and any potential adverse effects on the breastfed infant from semaglutide or from the underlying maternal condition.

**Females and Males of Reproductive Potential:** Discontinue at least 2 months before a planned pregnancy because of the long half-life of semaglutide.

**Pediatric Use:** Safety and efficacy of semaglutide have not been established in pediatric patients.

**Geriatric Use:** In the pool of placebo- and active-controlled glycemic control trials, 744 (23.6%) of OZEMPIC-treated patients were 65 years of age and over and 102 OZEMPIC-treated patients (3.2%) were 75 years of age and over. In Sustain 6, the cardiovascular outcome trial, 788 (48.0%) of OZEMPIC-treated patients were 65 years of age and over and 157 OZEMPIC-treated patients (9.6%) were 75 years of age and over.

No overall differences in safety or efficacy were detected between these patients and younger patients, but greater sensitivity of some older individuals cannot be ruled out.

**Renal Impairment:** No dose adjustment of semaglutide is recommended for patients with renal impairment. In subjects with renal impairment including end-
stage renal disease (ESRD), no clinically relevant change in semaglutide pharmacokinetics (PK) was observed.

**Hepatic Impairment:** No dose adjustment of semaglutide is recommended for patients with hepatic impairment. In a study in subjects with different degrees of hepatic impairment, no clinically relevant change in semaglutide pharmacokinetics (PK) was observed.

**Contraindication**
- A personal or family history of medullary thyroid carcinoma (MTC) or in patients with Multiple Endocrine Neoplasia syndrome type 2 (MEN 2).
- A prior serious hypersensitivity reaction to semaglutide or to any of the excipients in Ozempic or Wegovy. Serious hypersensitivity reactions, including anaphylaxis and angioedema, have been reported with semaglutide.

**Precautions**

**Risk of Thyroid C-Cell Tumors:** In mice and rats, semaglutide caused a dose-dependent and treatment-duration dependent increase in the incidence of thyroid C-cell tumors (adenomas and carcinomas) after lifetime exposure at clinically relevant plasma exposures. It is unknown whether semaglutide causes thyroid C-cell tumors, including medullary thyroid carcinoma (MTC), in humans, as human relevance of semaglutide-induced rodent thyroid C-cell tumors has not been determined.

Cases of MTC in patients treated with liraglutide, another GLP-1 receptor agonist, have been reported in the postmarketing period; the data in these reports are insufficient to establish or exclude a causal relationship between MTC and GLP-1 receptor agonist use in humans.

Semaglutide is contraindicated in patients with a personal or family history of MTC or in patients with MEN 2. Counsel patients regarding the potential risk for MTC with the use of semaglutide and inform them of symptoms of thyroid tumors (e.g., a mass in the neck, dysphagia, dyspnea, persistent hoarseness).

Routine monitoring of serum calcitonin or using thyroid ultrasound is of uncertain value for early detection of MTC in patients treated with semaglutide. Such monitoring may increase the risk of unnecessary procedures, due to the low test specificity for serum calcitonin and a high background incidence of thyroid disease. Significantly elevated serum calcitonin value may indicate MTC and patients with MTC usually have calcitonin values greater than 50 ng/L. If serum calcitonin is
measured and found to be elevated, the patient should be further evaluated. Patients with thyroid nodules noted on physical examination or neck imaging should also be further evaluated.

**Acute Pancreatitis:** Acute pancreatitis, including fatal and non-fatal hemorrhagic or necrotizing pancreatitis, has been observed in patients treated with GLP-1 receptor agonists, including semaglutide. Acute pancreatitis was observed in patients treated with semaglutide in clinical trials. After initiation of semaglutide, observe patients carefully for signs and symptoms of acute pancreatitis (including persistent severe abdominal pain, sometimes radiating to the back, and which may or may not be accompanied by vomiting). If acute pancreatitis is suspected, semaglutide should promptly be discontinued and appropriate management should be initiated. If acute pancreatitis is confirmed, semaglutide should not be restarted.

Semaglutide has not been studied in patients with a history of pancreatitis. It is unknown if patients with a history of pancreatitis are at higher risk for development of pancreatitis on semaglutide.

**Acute Gallbladder Disease:** In WEGOVY randomized clinical trials, cholelithiasis was reported by 1.6% of WEGOVY-treated patients and 0.7% of placebo-treated patients. Cholecystitis was reported by 0.6% of WEGOVY-treated patients and 0.2% of placebo-treated patients. Substantial or rapid weight loss can increase the risk of cholelithiasis; however, the incidence of acute gallbladder disease was greater in WEGOVY-treated patients than in placebo-treated patients, even after accounting for the degree of weight loss. If cholelithiasis is suspected, gallbladder studies and appropriate clinical follow-up are indicated.

**Hypoglycemia:** Semaglutide lowers blood glucose and can cause hypoglycemia.

In a trial of patients with type 2 diabetes and BMI greater than or equal to 27 kg/m2, hypoglycemia (defined as a plasma glucose less than 54 mg/dL) was reported in 6.2% of WEGOVY-treated patients versus 2.5% of placebo-treated patients. One episode of severe hypoglycemia (requiring the assistance of another person) was reported in one WEGOVY-treated patient versus no placebo-treated patients.

Patients with type 2 diabetes mellitus taking semaglutide in combination with an insulin secretagogue (e.g., sulfonylurea) or insulin may have an increased risk of hypoglycemia, including severe hypoglycemia. Hypoglycemia has been observed in patients treated with semaglutide (OZEMPIC) at doses of 0.5 and 1 mg in combination with insulin. The addition of WEGOVY in patients treated with insulin has not been evaluated.
Inform patients of the risk of hypoglycemia and educate them on the signs and symptoms of hypoglycemia. When initiating semaglutide, consider reducing the dose of concomitantly administered insulin secretagogue (such as sulfonylureas) or insulin to reduce the risk of hypoglycemia.

**Acute Kidney Injury:** There have been postmarketing reports of acute kidney injury and worsening of chronic renal failure, which have in some cases required hemodialysis, in patients treated with semaglutide. Patients with renal impairment may be at greater risk of acute kidney injury, but some of these events have been reported in patients without known underlying renal disease. A majority of the reported events occurred in patients who had experienced nausea, vomiting, or diarrhea, leading to volume depletion.

Monitor renal function when initiating or escalating doses of semaglutide in patients reporting severe adverse gastrointestinal reactions. Monitor renal function in patients with renal impairment reporting any adverse reactions that could lead to volume depletion.

**Hypersensitivity:** Serious hypersensitivity reactions (e.g., anaphylaxis, angioedema) have been reported with semaglutide. If hypersensitivity reactions occur, discontinue use of semaglutide, treat promptly per standard of care, and monitor until signs and symptoms resolve. Do not use in patients with a previous hypersensitivity to semaglutide or any of the excipients in WEGOVY or OZEMPIC.

Anaphylaxis and angioedema have been reported with other GLP-1 receptor agonists. Use caution in a patient with a history of anaphylaxis or angioedema with another GLP-1 receptor agonist because it is unknown whether such patients will be predisposed to these reactions with semaglutide.

**Diabetic Retinopathy Complications in Patients with Type 2 Diabetes:** In a trial of patients with type 2 diabetes and BMI greater than or equal to 27 kg/m², diabetic retinopathy was reported by 4.0% of WEGOVY-treated patients and 2.7% placebo-treated patients.

In a 2-year trial with OZEMPIC 0.5 mg and 1 mg once-weekly injection in patients with type 2 diabetes and high cardiovascular risk, diabetic retinopathy complications (which was a 4-component adjudicated endpoint) occurred in patients treated with OZEMPIC (3.0%) compared to placebo (1.8%). The absolute risk increase for diabetic retinopathy complications was larger among patients with a history of diabetic 2 retinopathy at baseline (OZEMPIC 8.2%, placebo 5.2%) than among patients without a known history of diabetic retinopathy (OZEMPIC 0.7%, placebo 0.4%).
Rapid improvement in glucose control has been associated with a temporary worsening of diabetic retinopathy. The effect of long-term glycemic control with semaglutide on diabetic retinopathy complications has not been studied. Patients with a history of diabetic retinopathy should be monitored for progression of diabetic retinopathy.

**Heart rate increase:** Mean increases in resting heart rate of 1 to 4 beats per minute (bpm) were observed in WEGOVY-treated patients compared to placebo in clinical trials. More patients treated with WEGOVY compared with placebo had maximum changes from baseline at any visit of 10 to 19 bpm (41% versus 34%, respectively) and 20 bpm or more (26% versus 16%, respectively).

Monitor heart rate at regular intervals consistent with usual clinical practice. Instruct patients to inform their healthcare providers of palpitations or feelings of a racing heartbeat while at rest during WEGOVY treatment. If patients experience a sustained increase in resting heart rate, discontinue WEGOVY.

**Suicidal Behavior and Ideation:** Suicidal behavior and ideation have been reported in clinical trials with other weight management products. Monitor patients treated with WEGOVY for the emergence or worsening of depression, suicidal thoughts or behavior, and/or any unusual changes in mood or behavior. Discontinue WEGOVY in patients who experience suicidal thoughts or behaviors. Avoid WEGOVY in patients with a history of suicidal attempts or active suicidal ideation.

### Adverse Effects

<table>
<thead>
<tr>
<th>Adverse Reaction</th>
<th>Placebo n = 1261 %</th>
<th>Wegovy 2.4 mg n = 2116 %</th>
<th>Placebo n = 262 %</th>
<th>Ozempic 0.5 mg n = 260 %</th>
<th>Ozempic 1 mg n = 261 %</th>
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</thead>
<tbody>
<tr>
<td>Nausea</td>
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<td>1.9</td>
<td>8.5</td>
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<tr>
<td>Vomiting</td>
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<td>Constipation</td>
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<td>24</td>
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<tr>
<td>Adverse Reaction</td>
<td>Placebo n = 1261</td>
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</tr>
<tr>
<td>Abdominal Pain</td>
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<td>5.7 %</td>
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</tbody>
</table>

**Injection site reactions:** In placebo-controlled trials, injection site reactions were reported in 0.2% of OZEMPIC treated patients. 1.4% of WEGOVY treated patients and 1.0% of patients receiving placebo experienced injection site reactions.

**Increases in amylase and lipase:** In placebo-controlled trials, patients exposed to OZEMPIC had a mean increase from baseline in amylase of 13% and lipase of 22%. Patients treated with WEGOVY had a mean increase from baseline in amylase of 16% and lipase of 39%. These changes were not observed in the placebo group (with either OZEMPIC or WEGOVY). The clinical significance of elevations in lipase or amylase with semaglutide is unknown in the absence of other signs and symptoms of pancreatitis.

**Monitoring**
Monitor plasma glucose, HbA1c, renal function, signs/symptoms of pancreatitis, triglycerides, and signs/symptoms of gallbladder disease.

**Interactions**
- **Concomitant Use with an Insulin Secretagogue (e.g., Sulfonylurea) or with Insulin:** When initiating semaglutide, consider reducing the dose of concomitantly administered insulin secretagogue (such as sulfonylureas) or insulin to reduce the risk of hypoglycemia.
- **Oral Medications:** Semaglutide causes a delay of gastric emptying, and thereby has the potential to impact the absorption of concomitantly administered oral medications. In clinical pharmacology trials, semaglutide did not affect the absorption of orally administered medications to any clinically relevant degree. Nonetheless, caution should be exercised when oral medications are concomitantly administered with semaglutide.
Efficacy

OZEMPIC: To establish the cardiovascular safety of semaglutide (OZEMPIC), Marso and colleagues conducted a randomized, double-blind, placebo-controlled trial (SUSTAIN-6) at 230 sites in 20 countries.

3297 patients with type 2 diabetes (A1c > 7%) were randomized to receive either 0.5 mg or 1.0 mg of once-weekly OZEMPIC or volume-matched placebo along with guideline-based cardiovascular risk management (antihypertensives, lipid-lowering agents, anti-platelet medications). Eligible patients had been treated with no more than two oral antihyperglycemic agents, with or without basal or premixed insulin. Patients > 50 years old were required to have established cardiovascular disease, chronic heart failure (NYHA class II or III), or CKD of stage 3 or higher. Patients > 60 years old were required to have at least one cardiovascular risk factor.

Exclusion criteria included the following: treatment with a dipeptidyl-peptidase 4 inhibitor within 30 days before screening; treatment with a GLP-1 receptor agonist or insulin other than basal or premixed within 90 days before screening; history of an acute coronary or cerebrovascular event within 90 days before randomization; planned revascularization of a coronary, carotid, or peripheral artery; long-term dialysis.

Of the 3297 patients, 2735 (83.0%) had established cardiovascular disease (including CKD stage 3 or higher). Median observation time was 2.1 years. The primary composite outcome was the first occurrence of death from cardiovascular causes, nonfatal myocardial infarction, or nonfatal stroke. The composite primary outcome occurred in 108 of 1648 patients (6.6%) in the OZEMPIC group and 146 of 1649 (8.9%) in the placebo group (hazard ratio, 0.74; 95% CI 0.58 to 0.95, p <0.001 for noninferiority; p = 0.02 for superiority. Similar risk reductions for the primary outcome were seen for both doses of OZEMPIC.

At week 104, in patients receiving OZEMPIC, mean glycated hemoglobin level decreased from 8.7% at baseline to 7.6% in the 0.5 mg group and to 7.3% in the 1.0 mg group (changes of -1.1% and -1.4%). In the placebo group, the mean level decreased to 8.3% (change of - 0.4%). Compared with the placebo group, average body weight was 2.9 kg lower in patients taking OZEMPIC 0.5 mg and 4.3 kg lower in patients taking OZEMPIC 1.0 mg.

Diabetic retinopathy complications occurred in 50 patients (3.0%) in the OZEMPIC group versus 29 (1.8%) in the placebo group (hazard ratio, 1.76; 95% CI, 1.11 to 2.78; p = 0.02). Of the patients who experienced retinopathy complications, 83.5% had retinopathy at baseline. Rates of new or worsening nephropathy were lower in the OZEMPIC group (3.8% in the semaglutide group versus 6.1% in the
placebo group, HR = 0.64; 95% CI, 0.46 to 0.88; p = 0.005). Approximately 13% of patients taking OZEMPIC stopped treatment because of adverse events (mainly gastrointestinal) versus 6.7% of patients taking placebo.

**WEGOVY:** In a double-blind, randomized, mult-center trial (STEP 1), Wilding and colleagues enrolled 1961 obese or overweight adults to 68 weeks of treatment with WEGOVY 2.4 mg SC once weekly (1306) or placebo (655); participants also received lifestyle intervention. Inclusion criteria included BMI > 30 or BMI > 27 plus at least one treated or untreated coexisting condition (hypertension, dyslipidemia, obstructive sleep apnea, or cardiovascular disease). Exclusion criteria included diabetes (HgA1c > 6.5%), a history of chronic pancreatitis, acute pancreatitis within 180 days before enrollment, previous surgical obesity treatment, and use of anti-obesity medication within 90 days before enrollment.

For the first four weeks, WEGOVY was started at a weekly dose of 0.25 mg SC. The dose was increased every four weeks until a maintenance dose of 2.4 mg weekly was reached at week 16. Lower maintenance doses were permitted if an individual could not tolerate the 2.4 mg weekly dose. Lifestyle interventions included monthly counseling sessions to help them adhere to a reduced calorie diet (500 kcal-deficit per day relative to their estimated energy expenditure at randomization) and increased physical activity (150 minutes per week encouraged). Participants made daily recordings of diet and activity in a diary or smart-phone app and these were reviewed during the counseling sessions.

The majority of participants were female (74.1%) and white (75.1%) and the average age was 46 yo. Mean baseline weight was 105.3 kg, BMI = 37.9. 44% had pre-diabetes and 75% had at least one coexisting condition.

In total, 91.2% of participants had a bodyweight assessment at week 68 and 81.1% adhered to treatment. In the WEGOVY group, weight loss was seen at the first assessment (week 4) and continued through week 60. Estimated mean weight change at week 68 was -14.9% with 2.4 mg WEGOVY and -2.4% with placebo (estimated difference = -12.4 percentage points, 95% CI = -13.4 to -11.5; p < 0.001). Compared to the placebo group, more individuals who took WEGOVY achieved weight reductions of 5% or more (86.4% vs 31.5%), 10% or more (69.1% vs 12.0%), and 15% or more (50.5% vs 4.9%) at week 68. Average weight loss (at 68 weeks) was -15.3 kg in the WEGOVY group versus -2.6 kg in the placebo group (estimated treatment difference = -12.7 kg; 95% CI, -13.7 to -11.7).

Compared to placebo, WEGOVY was associated with greater reductions from baseline in systolic and diastolic blood pressure, glycated hemoglobin, fasting plasma glucose, C-reactive protein and fasting lipids.
GI disorders (nausea, diarrhea, vomiting, constipation) were the most frequently reported adverse event. They occurred in 74.2% of patients taking WEGOVY versus 47.9% of those taking placebo. Most GI events were mild-moderate in severity and resolved without the need for treatment discontinuation. Serious GI disorders occurred in 1.4% of patients taking WEGOVY versus 0% of those taking placebo. Gallbladder-related disorders (mostly cholelithiasis) were reported in 2.6% of patients taking WEGOVY versus 1.2% of those taking placebo.

**Dosage Forms/Cost (GoodRX)**

**OZEMPIC**

$884.82 per single-patient-use pen

- 2 mg/1.5 ml, delivers 0.25 mg or 0.5 mg per injection
- 4 mg/3 ml, delivers 1 mg per injection
- 8 mg/3 ml, delivers 2 mg per injection

**WEGOVY**

$1333.91 per carton (4 pre-filled single dose pens)

- 0.25 mg/0.5 ml
- 0.5 mg/0.5 ml
- 1 mg/0.5 ml
- 1.7 mg/0.75 ml
- 2.4 mg/0.75 ml

**Special Considerations**

Morris-Dickson SH-SSLC purchases, 3/1/22-10/2/22

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<th>Pkg Size</th>
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**Summary/Conclusion**

Along with SGLT2i with proven CVD benefit, ADA 2022 recommends GLP-1 receptor agonists with proven CVD benefit (with or without metformin) as appropriate initial therapy for individuals with type 2 diabetes with or at high risk for ASCVD. These agents include liraglutide (Victoza), dulaglutide (Trulicity), and subcutaneous semaglutide (Ozempic, Wegovy). GLP-1 receptor agonists are also a first line choice for CV risk reduction in diabetics patients with CKD without albuminuria. If injectable therapy is needed to reduce A1c, ADA 2022 also recommends GLP-1 RA over insulin, when possible.

In 2019, liraglutide (Victoza) was added to the formulary because, at the time, it was the most widely used glp-1 receptor agonist in the state system and the only glp-1 approved to reduce CV risk in patients with established CV disease. It had also shown efficacy in the treatment of metabolic disturbances in patients treated with antipsychotics. In July 2022, dulaglutide (Trulicity) was added to the formulary. Dulaglutide is approved to reduce MACE in adults with type 2 diabetes who have established cardiovascular disease or multiple cardiovascular risk factors.

Compared to the short-acting GLP-1 RA’s (exenatide IR [Byetta], lixisenatide [Adlyxin]), long acting GLP-1RA’s are better at glucose-lowering and weight reduction and semaglutide is considered the most effective agent in the class. In
the SUSTAIN-7 study, semaglutide (Ozempic) showed superiority over dulaglutide (Trulicity) in improving glycemic control and weight loss>5%. Compared to liraglutide’s (Saxenda) placebo-controlled weight management trial (SCALE), semaglutide’s (Wegovy) placebo-controlled trials (STEP program) showed greater mean weight loss and a greater percentage of patients who lost at least 5% of their body weight.

Recommendation

OZEMPIC and WEGOVY should be added to the formulary.

References


Catherine Hall, PharmD, BCPP, BCACP
Clinical Pharmacist, San Antonio State Hospital
October 28, 2022