Replication of Liraglutide and Cardiovascular Outcomes in Type 2 Diabetes (LEADER trial)

NCT03936049

May 27, 2021

1. **RCT Details**
    This section provides a high-level overview of the RCT that the described real-world evidence study is trying to replicate as closely as possible given the remaining limitations inherent in the healthcare databases.

    1.1 <u>Title</u>
    Liraglutide and Cardiovascular Outcomes in Type 2 Diabetes (LEADER trial)

    1.2 <u>Intended aim(s)</u>
    The primary hypothesis was that liraglutide would be noninferior to placebo (plus standard of care) with regard to the primary outcome, with a margin of 1.30 for the upper boundary of the 95% confidence interval of the hazard ratio.

    1.3 <u>Primary endpoint for replication and RCT finding</u>
    Composite of Cardiovascular Death, Non-fatal Myocardial Infarction, or Non-fatal Stroke

    1.4 <u>Required power for primary endpoint and noninferiority margin (if applicable)</u>
    90% power and noninferiority margin of hazard ratio of 1.30

    1.5 <u>Primary trial estimate targeted for replication</u>
    HR = 0.87 (95% CI 0.78-0.97) comparing liraglutide to placebo (Marso et al.)

2. **Person responsible for implementation of replication in Aetion**
    Ajinkya Pawar, Ph.D. implemented the study design in the Aetion Evidence Platform. S/he is not responsible for the validity of the design and analytic choices. All implementation steps are recorded and the implementation history is archived in the platform.

3. **Data Source(s)**
    United/Optum, MarketScan, Medicare

4. Study Design Diagram

The study design diagram visualizes key aspects of the longitudinal study design for expedited review.

Design Diagram – LEADER TRIAL REPLICATION

Cohort Entry Date (Day 0)
[Dispensation of Liraglutide OR Sulfonylurea (SU)]

INCLUSION criteria window (INCL)
Diagnosis of T2DM
Days [-180, 0]

Washout Window
(No Liraglutide or SU use)
Days [-180, -1]

Enrollment assessment window
Days [-180, 0]

INCL: Age≥ 50 + [MI, Stroke, TIA, PTCA, CABG, Stenting, Peripheral vascular disease, HF, CKD stage 3-6]
Days [-180, 0]

INCL: Age≥ 60 + [HTN, Proteinuria, Albumin abnormality]
Days [-180, 0]

Exclusion assessment window (EXCL)
Days [-180, 0]

EXCL: MI, Stroke, PTCA, CABG, Stenting, Transmyocardial Revascularization
Days [-14, 0]

EXCL: HF, Oxygen use → **EXCL Days [-60, 0]**

EXCL: Rx for GLP-1 RA, Pramlintide, DPP-4 inhibitors, Long-term Insulin → **EXCL Days [-90, 0]**

EXCL: Organ transplant, Malignant Neoplasm
Days [-1825, 0]

Covariate Assessment Window
Days [-180, 0]

PRIMARY OUTCOME(S):
- Inpatient Mortality
- MI
- Stroke

Follow Up Window
Days [1, censor[a]]

Day 0   **Time**

[a] **Censoring criteria**
- Occurrence of outcome
- Death
- Start of additional Exposure
- End of index exposure
- Disenrollment
- Specified Date reached
- Switch (within comparison grp)
- Nursing home admission

5. Cohort Identification

5.1 <u>Cohort Summary</u>

This study will involve a new user, parallel group, cohort study design comparing liraglutide to the DPP4 inhibitor (DPP4i) antidiabetic class as a proxy for placebo. Both 2nd generation sulfonylureas (SUs) and DPP4is are not known to have an impact on the outcome of interest. The comparison against DPP4i is the **primary comparison**. Initiators of 2nd generation SUs are used as a secondary comparator group. The patients will be required to have continuous enrollment during the baseline period of 180 days before initiation of liraglutide or a comparator drug (cohort entry date). Follow-up for the outcome (3P-MACE), begins the day after drug initiation. As in the trial, patients are allowed to take other antidiabetic medications during the study.

5.2 <u>Important steps for cohort formation</u>

5.2.1 Eligible cohort entry dates

Market availability of liraglutide in the U.S. started on January 20, 2010.
- For Marketscan: January 20, 2010-Dec 31, 2017 (end of data availability).
- For Medicare: Jan 1, 2012-Dec 31, 2017 (start- end of data availability).
- For Optum: January 20, 2010-March 31, 2019 (end of data availability).

5.2.2 Specify <u>inclusion/exclusion</u> criteria for cohort entry and define the index date

Inclusion and exclusion criteria were adapted from the trial as closely as possible. Definitions for all inclusion/exclusion are provided in **Appendix A** and are summarized in the flowcharts below.

5.3 <u>Flowchart of the study cohort assembly</u>

- <u>For Liraglutide vs DPP4i</u>

	Optum		Marketscan		Medicare*	
	Less Excluded Patients	Remaining Patients	Less Excluded Patients	Remaining Patients	Less Excluded Patients	Remaining Patients

All patients in the database		74,864,884		191,990,035		23,466,175
Patients who used exposure or a reference between **20 January 2010** to Dec 2017 (for Marketscan)/March 2019 (for Optum) and 01 January 2012-December 2017 for Medicare	-74,012,464	852,420	-190,638,745	1,351,290	-21,492,649	1,973,526
Patients who have continuous 6 months registration in the database	-111,929	740,491	-134,586	1,216,704	-516,146	1,457,380
Patients without prior use of reference	-394,596	345,895	-710,577	506,127	-754,558	702,822
Patients without prior use of exposure	-112,350	233,545	-193,164	312,963	-102,088	600,734
Excluded because patient qualified in >1 exposure category	-75	233,470	-138	312,825	-48	600,686
Patients who did not have missing age information	-10	233,460	0	312,825	0	600,686
Patients who did not have missing gender information	-16	233,444	0	312,825	0	600,686
Excluded based on Inclusion 1- DM Type 2	-10,665	222,779	-29,308	283,517	-4,803	595,883
Excluded based on Inclusion 3- Either Prior cardiovascular disease cohort or No Prior cardiovascular disease group	-42,768	180,011	-98,418	185,099	-17,351	578,532
Excluded based on Exclusion 1- Type 1 diabetes	-3,952	176,059	-4,538	180,561	-14,315	564,217
Excluded based on Exclusion 2- Use of GLP1 or Pramlintide or DPP4i within 3 months prior to index	-953	175,106	-963	179,598	-1,652	562,565
Excluded based on Exclusion 3-Long Acting Insulin in prior 90 days	-7,143	167,963	-5,629	173,969	-21,421	541,144
Excluded based on Exclusion 4-Diabetic ketoacidosis in prior 90 days	-112	167,851	-84	173,885	-359	540,785
Excluded based on Exclusion 5- An acute coronary or cerebrovascular event in the previous 14 days	-546	167,305	-720	173,165	-1,764	539,021
Excluded based on Exclusion 7- Oxygen canister use as a proxy for NYHA class IV	-286	167,019	-297	172,868	-1,919	537,102
Excluded based on Exclusion 8- Current continuous renal replacement therapy/ESRD	-437	166,582	-333	172,535	-2,110	534,992
Excluded based on Exclusion 10- Liver disease	-2,572	164,010	-1,845	170,690	-7,745	527,247
Excluded based on Exclusion 11- Organ Transplant	-83	163,927	-107	170,583	-188	527,059
Excluded based on Exclusion 12- History of Malignant Neoplasm in previous 5 years and Exclusion 13- Family or personal history of multiple endocrine neoplasia type 2 (MEN2) or familial medullary thyroid carcinoma (FMTC)	-5,878	158,049	-5,403	165,180	-24,286	502,773
Excluded based on Exclusion 14- Personal history of non-familial medullary thyroid carcinoma	0	158,049	0	165,180	0	502,773
Excluded based on Exclusion 17- Drug abuse or dependence	-450	157,599	-164	165,016	-878	501,895
Excluded based on Exclusion 20- Contraception or pregnancy	-357	157,242	-511	164,505	-1002	500,893

	Final cohort		157,242		164,505		500,893

* Medicare database includes only patients with at least one diagnosis for diabetes, heart failure, or cerebrovascular disease.

- For Liraglutide vs 2nd Gen. SUs

	Optum		Marketscan		Medicare*	
	Less Excluded Patients	Remaining Patients	Less Excluded Patients	Remaining Patients	Less Excluded Patients	Remaining Patients
All patients in the database		74,864,884		191,990,035		23,466,175
Patients who used exposure or a reference between **20 January 2010** to Dec 2017 (for Marketscan)/March 2019 (for Optum) and 01 January 2012- December 2017 for Medicare	-73,337,305	1,527,579	-189,889,741	2,100,294	-19,968,954	3,497,221
Patients who have continuous 6 months registration in the database	-204,156	1,323,423	-233,189	1,867,105	-952,050	2,545,171
Patients without prior use of reference	-888,112	435,311	-1,294,078	573,027	-1,703,970	841,201
Patients without prior use of exposure	-103,834	331,477	-177,643	395,384	-95,982	745,219
Excluded because patient qualified in >1 exposure category	-138	331,339	-236	395,148	-85	745,134
Patients who did not have missing age information	-14	331,325	0	395,148	0	745,134
Patients who did not have missing gender information	-26	331,299	0	395,148	0	745,134
Excluded based on Inclusion 1- DM Type 2	-24,242	307,057	-58,280	336,868	-10,070	735,064
Excluded based on Inclusion 3- Either Prior cardiovascular disease cohort or No Prior cardiovascular disease group	-62,008	245,049	-130,017	206,851	-24,553	710,511
Excluded based on Exclusion 1- Type 1 diabetes	-4,763	240,286	-5,243	201,608	-15,909	694,602
Excluded based on Exclusion 2- Use of GLP1 or Pramlintide or DPP4i within 3 months prior to index	-7,666	232,620	-8,727	192,881	-23,001	671,601
Excluded based on Exclusion 3-Long Acting Insulin in prior 90 days	-6,604	226,016	-5,151	187,730	-19,399	652,202
Excluded based on Exclusion 4-Diabetic ketoacidosis in prior 90 days	-169	225,847	-151	187,579	-442	651,760
Excluded based on Exclusion 5- An acute coronary or cerebrovascular event in the previous 14 days	-806	225,041	-1,218	186,361	-2,112	649,648
Excluded based on Exclusion 7- Oxygen canister use as a proxy for NYHA class IV	-3,508	221,533	-2,257	184,104	-3,451	646,197

Excluded based on Exclusion 8- Current continuous renal replacement therapy/ESRD	-710	220,823	-674	183,430	-3,666	642,531
Excluded based on Exclusion 10- Liver disease	-3,303	217,520	-2,124	181,306	-9,653	632,878
Excluded based on Exclusion 11- Organ Transplant	-105	217,415	-143	181,163	-263	632,615
Excluded based on Exclusion 12- History of Malignant Neoplasm in previous 5 years and Exclusion 13- Family or personal history of multiple endocrine neoplasia type 2 (MEN2) or familial medullary thyroid carcinoma (FMTC)	-7,050	210,365	-6,342	174,821	-28,690	603,925
Excluded based on Exclusion 14- Personal history of non-familial medullary thyroid carcinoma	0	210,365	0	174,821	0	603,925
Excluded based on Exclusion 17- Drug abuse or dependence	-638	209,727	-226	174,595	-1119	602,806
Excluded based on Exclusion 20- Contraception or pregnancy	-371	209,356	-453	174,142	-967	601,839
Final cohort		**209,356**		**174,142**		**601,839**

* Medicare database includes only patients with at least one diagnosis for diabetes, heart failure, or cerebrovascular disease.

6. Variables

6.1 Exposure-related variables:

Study drug:
The study exposure of interest is initiation of liraglutide. Initiation will be defined by no use of liraglutide or a comparator in the prior 6 months before treatment initiation (washout period).

Comparator agents:
- Initiators of liraglutide will be compared to initiators of-
    o DPP4i (**primary**)
    o 2nd generation sulfonylureas

Because liraglutide and comparators are frequently used as second or third line treatments of T2DM, we expect it to be unlikely that liraglutide and comparators are initiated in patients with substantially different baseline risk for proposed outcomes.

6.2 Preliminary covariates:

- Age
- Sex
- Combined Comorbidity Index (CCI), measured over the default baseline covariate assessment period, defined as 180 days prior to and including index date

Covariates listed above represent only a small subset of covariates that will ultimately be controlled for in the design and analysis. We use the covariates above only for initial feasibility analyses to judge whether there is likely to be sufficient overlap between treatment groups to proceed with the study. Remaining covariates are defined only after the study has passed the initial feasibility analysis and the initial power assessment and are listed in Table 1 (**Appendix B**). These covariates are based on those used by Patorno et al. (2019).

6.3 <u>Outcome variables and study follow-up:</u>

6.3.1   Outcome variables

Effectiveness outcomes of interest (definitions provided in **Appendix A**):

- **Primary outcome**: 3-point major adverse cardiovascular events (MACE), i.e., non-fatal myocardial infarction, non-fatal stroke, or CV mortality
- Secondary outcomes: Individual MACE components:
  - Hospital admission for MI (for purposes of individual component, fatal MI is included)
  - Hospital admission for stroke (for purposes of individual component, fatal stroke is included)
  - All-cause mortality/CV mortality:
    - All-cause inpatient mortality identified using discharge status codes will be used as a proxy for "CV mortality" in commercial databases
    - Information on CV mortality through data linkage with the National Death Index (NDI) will only become available at a later date for Medicare and will be used in secondary analyses.

Control outcomes of interest (control outcomes only serve to assess aspects of study validity but are not further interpreted):
1. For comparison with 2nd Gen. SUs: Severe hypoglycemia (we expect to see protective effect; American Diabetes Association, 2018)

- o A dosage change on the index treatment does not fulfill this criterion
- o An added treatment that is not part of the exposure or comparator group does not fulfill this criterion (e.g. if a liraglutide user adds insulin, he or she does not get censored at the time of insulin augmentation)

For the ITT analyses, the censoring based on the augmentation/switching and treatment discontinuation will be replaced with a maximum allowed follow-up time of 365 days.

7. Initial Feasibility Analysis

Aetion report links:
- For Liraglutide vs 2nd generation SUs

Optum: https://bwh-dope.aetion.com/#/projects/details/632/results/30594/result/0
Marketscan: https://bwh-dope.aetion.com/#/projects/details/633/results/30595/result/0
Medicare: https://bwh-dope.aetion.com/#/projects/details/634/results/30593/result/0

- For Liraglutide vs DPP4i

Optum: https://bwh-dope.aetion.com/#/projects/details/632/results/30606/result/0
Marketscan: https://bwh-dope.aetion.com/#/projects/details/633/results/30607/result/0
Medicare: https://bwh-dope.aetion.com/#/projects/details/634/results/30605/result/0

Date conducted: rerun on Jan 27, 2019

Complete Aetion feasibility analysis using age, sex, and CCI as the only covariates and the primary endpoint (Section 6.3.1) as the outcome. No measures of association will be computed nor will incidence rates stratified by treatment group.

- Report patient characteristics by treatment group
- Report summary parameters of the overall study population
- Report median follow-up time by treatment group
- Report reasons for censoring in the overall study population

8. Initial Power Assessment

Aetion report name:
- For Liraglutide vs 2nd SUs

Optum: https://bwh-dope.aetion.com/#/projects/details/632/results/30597/result/1
Marketscan: https://bwh-dope.aetion.com/#/projects/details/633/results/30596/result/1
Medicare: https://bwh-dope.aetion.com/#/projects/details/634/results/30598/result/1

- For Liraglutide vs DPP4i

Optum: https://bwh-dope.aetion.com/#/projects/details/632/results/30608/result/1
Marketscan: https://bwh-dope.aetion.com/#/projects/details/633/results/30609/result/1
Medicare: https://bwh-dope.aetion.com/#/projects/details/634/results/30610/result/1

Date conducted: rerun on Jan 27, 2019

In order to complete the initial power analysis, the dummy outcome of a 90-day gap in database enrollment will be used. This outcome is used to ensure that no information on the comparative risks of the outcomes of interest are available at this stage. Complete a 1:1 PS-matched comparative analysis using this outcome. PS should include only 3 covariates: age, sex, and combined comorbidity index. Power calculations are based on the formulas from Chow et al. (2008).

- Stop analyses until feasibility and power are reviewed by primary investigators and FDA. Reviewers evaluate the results of the analyses described above in Sections 7 and 8, including numbers of patients, patient characteristics, follow-up time, and reasons for censoring by treatment group, as well as overall rates of outcomes and study power. These parameters are re-evaluated and reported in the subsequent sections, after incorporating feedback and refining the protocol.

Reviewed by PI:	Jessica M. Franklin	Date reviewed:	10/26/18
Reviewed by FDA:	David Martin	Date reviewed:	1/10/19
Reasons for stopping analysis (if required):			

9. Balance Assessment after PS matching

Aetion report name:
- For Liraglutide vs 2nd Gen. SUs

Optum: https://bwh-dope.aetion.com/projects/details/632/results/44783/result/0
Marketscan: https://bwh-dope.aetion.com/projects/details/633/results/45436/result/0
Medicare: https://bwh-dope.aetion.com/projects/details/634/results/45432/result/0

- For Liraglutide vs DPP4i

Optum: https://bwh-dope.aetion.com/projects/details/632/results/44786/result/0
Marketscan: https://bwh-dope.aetion.com/projects/details/633/results/44787/result/0
Medicare: https://bwh-dope.aetion.com/projects/details/634/results/45433/result/0

Date conducted: 11/18/2019 (Medicare 11/30/2019)

After review of initial feasibility and power analyses, complete creation of the remaining covariates (see Table 1 below for list of covariates). Again, using the dummy outcome of a 90-day gap in database enrollment, complete a 1:1 PS-matched analysis. The PS should include the complete list of covariates (excluding laboratory values, which are missing in some patients).

- Provide plot of PS distributions stratified by treatment group.

Note- Please refer to **Appendix B**.

- Report covariate balance after matching.

Note- For Table 1, please refer to **Appendix B**.

- Report reasons for censoring by treatment group.
  - For Liraglutide vs DPP4i

	Overall	Referent	Exposure
Dummy Outcome	0 (0.00%)	0 (0.00%)	0 (0.00%)
Death	1,271 (0.75%)	827 (0.98%)	444 (0.53%)
Start of an additional exposure	4,700 (2.79%)	1,913 (2.27%)	2,787 (3.30%)

End of index exposure	99,981 (59.27%)	45,078 (53.44%)	54,903 (65.09%)
Specified date reached	29,951 (17.76%)	16,708 (19.81%)	13,243 (15.70%)
End of patient enrollment	22,798 (13.51%)	12,483 (14.80%)	10,315 (12.23%)
Switch to other SUs (for censoring) + nursing home admission	9,989 (5.92%)	7,336 (8.70%)	2,653 (3.15%)

- o For Liraglutide vs 2nd Gen. SUs

	Overall	Referent	Exposure
Dummy Outcome	0 (0.00%)	0 (0.00%)	0 (0.00%)
Death	858 (0.79%)	595 (1.10%)	263 (0.49%)
Start of an additional exposure	4,294 (3.96%)	967 (1.78%)	3,327 (6.14%)
End of index exposure	61,038 (56.33%)	27,098 (50.01%)	33,940 (62.64%)
Specified date reached	21,830 (20.15%)	13,222 (24.40%)	8,608 (15.89%)
End of patient enrollment	14,181 (13.09%)	7,902 (14.58%)	6,279 (11.59%)
Switch to other SUs (for censoring) + nursing home admission	6,163 (5.69%)	4,398 (8.12%)	1,765 (3.26%)

- Report follow-up time by treatment group.
  - o For Liraglutide vs DPP4i

Patient Group	Median Follow-Up Time (Days) [IQR]		
	Optum	Marketscan	Medicare
Overall Patient Population	157 [88-334]	185 [91-413]	179 [92-381]
Referent	173 [88-368]	209 [112-437]	209 [112-437]
Exposure	148 [88-302]	159 [88-331]	159 [88-331]

  - o For Liraglutide vs 2nd Gen. SUs

Patient Group	Median Follow-Up Time (Days) [IQR]		
	Optum	Marketscan	Medicare
Overall Patient Population	154 [88-339]	168 [88-379]	179 [98-397]
Referent	181 [100-407]	231 [128-500]	231 [128-500]
Exposure	148 [88-279]	148 [88-307]	148 [88-307]

- Report risk per 1,000 patients
  - For Liraglutide vs DPP4i

	Optum	Marketscan	Medicare
Risk per 1,000 patients	14.30	12.11	38.60

  - For Liraglutide vs 2nd Gen. SUs

	Optum	Marketscan	Medicare
Risk per 1,000 patients	18.97	22.54	48.79

Aetion report name:
- For Liraglutide vs 2nd Gen. SUs

Optum: https://bwh-dope.aetion.com/#/projects/details/632/results/34412/result/0
Marketscan: https://bwh-dope.aetion.com/#/projects/details/633/results/34413/result/0
Medicare: https://bwh-dope.aetion.com/#/projects/details/634/results/34414/result/0

- For Liraglutide vs DPP4i

Optum: https://bwh-dope.aetion.com/#/projects/details/632/results/34415/result/0
Marketscan: https://bwh-dope.aetion.com/#/projects/details/633/results/34416/result/0
Medicare: https://bwh-dope.aetion.com/#/projects/details/634/results/34417/result/0

Date conducted: 04/25/2019

10. Final Power Assessment

Date conducted: 12/01/2019

- Re-calculate power in the appropriate excel table, using the revised number of matched patients from the PS-match in Section 9. All other parameters in the table should be the same as in Section 8. If the study is to be implemented in more than one database, copy and paste excel sheet to report power for each database separately and for the pooled analysis that uses data

from all databases together. Power calculations are based on the formulas from Chow et al. (2008).

- o <u>For Liraglutide vs DPP4i</u>
  - ▪ <u>Pooled</u>

Superiority Analysis		Non-inferiority Analysis	
Number of patients matched		Number of patients matched	
Reference	84,345	Reference	84,345
Exposed	84,345	Exposed	84,345
Risk per 1,000 patients	21.67	Risk per 1,000 patients	21.67
Desired HR from RCT	0.87	Assumed HR from RCT	1
Alpha (2-sided)	0.05	Alpha (2-sided)	0.05
		Non-inferiority margin	1.3
Number of events expected	3655.5123	Number of events expected	3655.5123
Power	0.987775093	Power	0.999999999

  - ▪ <u>Optum</u>

Superiority Analysis		Non-inferiority Analysis	
Number of patients matched		Number of patients matched	
Reference	19,187	Reference	19,187
Exposed	19,187	Exposed	19,187
Risk per 1,000 patients	14.30	Risk per 1,000 patients	14.30
Desired HR from RCT	0.87	Assumed HR from RCT	1
Alpha (2-sided)	0.05	Alpha (2-sided)	0.05
		Non-inferiority margin	1.3
Number of events expected	548.7482	Number of events expected	548.7482
Power	0.371306397	Power	0.867151513

- Marketscan

Superiority Analysis		Non-inferiority Analysis	
Number of patients matched		Number of patients matched	
Reference	20,777	Reference	20,777
Exposed	20,777	Exposed	20,777
Risk per 1,000 patients	12.11	Risk per 1,000 patients	12.11
Desired HR from RCT	0.87	Assumed HR from RCT	1
Alpha (2-sided)	0.05	Alpha (2-sided)	0.05
		Non-inferiority margin	1.3
Number of events expected	503.21894	Number of events expected	503.21894
Power	0.345542948	Power	0.837143294

- Medicare

Superiority Analysis		Non-inferiority Analysis	
Number of patients matched		Number of patients matched	
Reference	44,381	Reference	44,381
Exposed	44,381	Exposed	44,381
Risk per 1,000 patients	38.60	Risk per 1,000 patients	38.60
Desired HR from RCT	0.87	Assumed HR from RCT	1
Alpha (2-sided)	0.05	Alpha (2-sided)	0.05
		Non-inferiority margin	1.3
Number of events expected	3426.2132	Number of events expected	3426.2132
Power	0.982819492	Power	0.999999995

- For Liraglutide vs 2nd Gen. SUs
  - Pooled

Superiority Analysis		Non-inferiority Analysis	
Number of patients matched		Number of patients matched	
Reference	54,182	Reference	54,182
Exposed	54,182	Exposed	54,182
Risk per 1,000 patients	30.10	Risk per 1,000 patients	30.1
Desired HR from RCT	0.87	Assumed HR from RCT	1
Alpha (2-sided)	0.05	Alpha (2-sided)	0.05
		Non-inferiority margin	1.3
Number of events expected	3261.7564	Number of events expected	3261.7564
Power	0.978141227	Power	0.999999984

  - Optum

Effectiveness research with Real World Data to support FDA's regulatory decision making

Superiority Analysis		Non-inferiority Analysis	
Number of patients matched		Number of patients matched	
Reference	12,253	Reference	12,253
Exposed	12,253	Exposed	12,253
Risk per 1,000 patients	18.97	Risk per 1,000 patients	18.97
Desired HR from RCT	0.87	Assumed HR from RCT	1
Alpha (2-sided)	0.05	Alpha (2-sided)	0.05
		Non-inferiority margin	1.3
Number of events expected	464.87882	Number of events expected	464.87882
Power	0.323513047	Power	0.807428816

- Marketscan

Superiority Analysis		Non-inferiority Analysis	
Number of patients matched		Number of patients matched	
Reference	13,591	Reference	13,591
Exposed	13,591	Exposed	13,591
Risk per 1,000 patients	22.54	Risk per 1,000 patients	22.54
Desired HR from RCT	0.87	Assumed HR from RCT	1
Alpha (2-sided)	0.05	Alpha (2-sided)	0.05
		Non-inferiority margin	1.3
Number of events expected	612.68228	Number of events expected	612.68228
Power	0.406665538	Power	0.900972235

- Medicare

Superiority Analysis		Non-inferiority Analysis	
Number of patients matched		Number of patients matched	
Reference	28,338	Reference	28,338
Exposed	28,338	Exposed	28,338
Risk per 1,000 patients	48.79	Risk per 1,000 patients	48.79
Desired HR from RCT	0.87	Assumed HR from RCT	1
Alpha (2-sided)	0.05	Alpha (2-sided)	0.05
		Non-inferiority margin	1.3
Number of events expected	2765.22204	Number of events expected	2765.22204
Power	0.955585785	Power	0.999999606

- Stop analyses until balance and final power assessment are reviewed by primary investigators, FDA, and assigned members of advisory board. Reviewers evaluate the results of the analyses described above in Sections 9 and 10, including numbers of patients, balance in patient characteristics, follow-up time, and reasons for censoring by treatment group, as well as overall rates of outcomes and study power.

Reviewed by PI:	Jessica Franklin	Date reviewed:	12/9/19
Reviewed by FDA:	David Martin	Date reviewed:	12/20/19
Reasons for stopping analysis (if required):			

11. Study Confidence and Concerns

Deadline for voting on study confidence and listing concerns: 12/20/19

- If final feasibility and power analyses are reviewed and approved, proceed to the remaining protocol steps.
- All study team and advisory board members that review this protocol should at this stage provide their level of confidence for the success of the RWD study in the Google Form. This form also provides space for reviewers to list any concerns that they feel may contribute to a failure to replicate the findings of the RCT, including differences in study populations, poor measurement of study

variables, or residual confounding. All responses will be kept confidential and individual-level results will only be shared with the individual respondent.

12. Register study protocol on clinicalTrials.gov

Date conducted:

- Register the study on clinicalTrials.gov and upload this document.

13. Comparative Analyses

Aetion report name:
Date conducted:

13.1   For **primary analysis**:

- In the PS-matched cohort from Section 9, calculate the HR for each outcome for liraglutide versus 2nd generation SU patients using a Cox proportional hazards model.

13.2   For secondary analyses:

- In the PS-matched cohort from Section 9, calculate the HR for each outcome for liraglutide versus DPP4i patients using a Cox proportional hazards model.
- In both pre-matched cohorts, perform asymmetrical trimming to remove patients with PS values below the 2.5th percentile of treated patients and above the 97.5th percentile of untreated patients. In the trimmed cohort, calculate the HR for canagliflozin versus referent patients using a Cox proportional hazards model, adjusting for deciles of the PS.

14. Requested Results

14.1   Results from primary and secondary analyses:

Separately for each endpoint and each comparator group:

Analysis	No. exposed events	No. referent events	Exposed rate	Referent rate	HR (95% CI)
Crude					
Primary analysis					
Analysis 2					
...					

HR, Hazard Ratio; CI, Confidence Interval.

15. References

American Diabetes Association. 8. Pharmacologic Approaches to Glycemic Treatment: Standards of Medical Care in Diabetes-2018. Diabetes Care. 2018;41(Suppl 1):S73-S85. doi:10.2337/dc18-S008.

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Patorno E, Pawar A, Franklin JM, et al. Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study. Circulation. 2019; in press. (https://www.ahajournals.org/doi/pdf/10.1161/CIRCULATIONAHA.118.039177)

Appendix A

#	LEADER trial definitions	Implementation in routine care	Please see the following Google Drive for further details or any missing information: https://drive.google.com/drive/folders/1WD618wrvwYjEaXzfLTcuK-VCcnb6b-gV?usp=sharing
	Trial details- Secondary indication, 4a- unintended superiority with label change		ICD-10 codes are not listed in this document because of excel cell size limitations and excessive number of ICD-10 codes. Full ICD-10 code lists will be available in the above Google Drive Folder (link above). ICD-9 to ICD-10 code conversions were completed using a SAS macro that implements forward/ backward mapping based on the CMS ICD-9 to ICD-10 mapping: https://www.nber.org/data/icd9-icd-10-cm-and-pcs-crosswalk-general-equivalence-mapping.html
	EXPOSURE vs. COMPARISON		References/Rationale	Color coding
	Liraglutide versus placebo	Liraglutide vs. DPP4i or 2nd generation sulfonylurea		Criteria
	PRIMARY OUTCOME			Adequate mapping in claims
	The primary composite outcome in the time-to-event analysis was the first occurrence of death from cardiovascular causes, nonfatal myocardial infarction, or nonfatal stroke. **HR = 0.87 (95% CI 0.78-0.97)**	Measured 1 days after drug initiation in diagnosis position specified below and inpatient care setting: Inpatient mortality/MI/Stroke -- **For MI** Any diagnosis position in inpatient care setting ICD-9 Dx 410.X (acute myocardial infarction) excluding 410.x2 (subsequent episode of care), as the principal (primary) or the next (secondary) diagnosis **For stroke** Primary diagnosis position in inpatient care setting ICD-9 discharge diagnosis: 430.xx Subarachnoid hemorrhage (SAH) 431.xx Intracerebral hemorrhage (ICH) 433.x1 Occlusion and stenosis of precerebral arteries with cerebral infarction 434.xx (excluding 434.x0) Occlusion and stenosis of cerebral arteries with cerebral infarction 436.x Acute, but ill-defined cerebrovascular events **Mortality- See Mortality Sheet.**	For MI: ➔PPV 94% in Medicare claims data [Kiyota Y, Schneeweiss S, Glynn RJ, Cannuscio CC, Avorn J, Solomon DH. Accuracy of Medicare claims-based diagnosis of acute myocardial infarction: estimating positive predictive value on the basis of review of hospital records. American heart journal 2004;148:99-104.] ➔PPV 88.4% in commercially-insured population [Wahl PM, Rodgers K, Schneeweiss S, et al. Validation of claims-based diagnostic and procedure codes for cardiovascular and gastrointestinal serious adverse events in a commercially-insured population. Pharmacoepidemiology and Drug Safety 2010;19:596-603.] For stroke: PPV of 85% or higher for ischemic stroke PPV ranging from 80% to 98% for hemorrhagic stroke ➔[Andrade SE, Harrold LR, Tjia J, et al. A systematic review of validated methods for identifying cerebrovascular accident or transient ischemic attack using administrative data. Pharmacoepidemiology and Drug Safety 2012;21 Suppl 1:100-28.] ➔[Tirschwell DL, Longstreth WT, Jr. Validating administrative data in stroke research. Stroke; a journal of cerebral circulation 2002;33:2465-70.] ➔[Roumie CL, Mitchel E, Gideon PS, Varas-Lorenzo C, Castellsague J, Griffin MR. Validation of ICD-9 codes with a high positive predictive value for incident strokes resulting in hospitalization using Medicaid health data. Pharmacoepidemiology and drug safety 2008;17:20-6.]	Intermediate mapping in claims
	INCLUSION CRITERIA			Poor mapping or cannot be measured in claims
1	Men or women with type 2 diabetes	Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting T2DM (ICD-9 Dx code of 250.x0 or 250.x2; ICD-10 Dx code of E11.x)	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119 Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177	Can't be measured in claims but not important for the analysis
2	Anti-diabetic drug naïve or treated with one or more oral anti-diabetic drugs or treated with human NPH insulin or long-acting insulin analogue or premixed insulin, alone or in combination with OAD(s)	N/A (this is basically anyone)		
3	Either of the following:			
	• Prior cardiovascular disease: Age ≥ 50 years at screening, AND at least one of the following: o Prior MI o Prior stroke or TIA	Age ≥ 50 at drug initiation AND Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting Acute MI: 410.xx, Old MI: 412.xx Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting Stroke or TIA ICD-9 Dx: 430.xx, 431.xx, 433.xx, 434.xx, 435.xx, 436.xx		

Appendix A

	Criteria	Definition	Reference
3a	o Prior coronary, carotid or peripheral arterial revascularization	**Measured 180 days prior to drug initiation in any diagnosis position and care setting as defined below:** Coronary revascularization (PTCA, stenting, CABG) PTCA: Inpatient CPT-4: 92973, 92982, 92984, 92995, 92996, 92920 – 92921, 92924 – 92925, 92937, 92938, 92941, 92943, 92944 OR – Inpatient or outpatient ICD-9 procedure: 00.66, 36.01, 36.02, 36.03, 36.05, 36.09 Stenting: Inpatient CPT-4: 92980, 92981, 92928 – 92929, 92933 - 92934 OR – Inpatient or outpatient ICD-9 procedure: 36.06, 36.07 CABG: Inpatient CPT-4: 33510 – 33536, 33545, 33572. OR – Inpatient or outpatient ICD-9 procedure: 36.1x, 36.2x Transmyocardial revascularization: Inpatient CPT-4: 33140, 33141 OR - Inpatient ICD-9 procedure: 36.31-36.34	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119 Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177
	o >50% stenosis of coronary, carotid, or lower extremity arteries	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** 414.x , Peripheral vascular disease ICD9 diagnosis: 440.20 – 440.24, 440.29 – 440.32, 440.3, 440.4, 443.9	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119
	o History of symptomatic CHD documented by positive exercise stress test or any cardiac imaging or unstable angina with ECG changes	N/A	
	o Asymptomatic cardiac ischemia documented by positive nuclear imaging test, exercise test or dobutamine stress echo	N/A	Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177
	o Chronic heart failure NYHA class II-III	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** ICD-9 diagnosis 428.x, 398.91, 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 404.03, 404.13, 404.93	
	o Chronic renal failure: −eGFR <60 mL/min/1.73m2 (Modification of Diet in Renal Disease formula) −eGFR <60 mL/min (Cockcroft-Gault formula)	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** CKD stage 3-6 585.3x-585.6x	
3b	• No Prior cardiovascular disease: Age ≥ 60 years at screening, AND at least one of the following:	Age ≥ 60 at drug initiation AND	
	o Microalbuminuria or proteinuria	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** **Proteinuria** ICD 9 DX 791.0 ICD10 DX R80.X **Albumin abnormality** ICD9 Dx- 790.99 ICD10 Dx - R77.0	
	o Hypertension and left ventricular hypertrophy by ECG or imaging	**Measured 180 days prior to drug initiation in any diagnosis position and with 1 inpatient care setting claim AND 2 outpatient care setting claims:** **Hypertension** any ICD-9 code from 401.x – 405.x	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119
	o Left ventricular systolic or diastolic dysfunction by imaging	N/A	Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177
	o Ankle-brachial index <0.9	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** ICD-9 440.21	
4	HbA1c ≥ 7.0% at screening	N/A	
	EXCLUSION CRITERIA		
1	Type 1 diabetes	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** **DM type 1-** At least 1 inpatient or outpatient ICD-9 Dx code of 250.x1 or 250.x3 or ICD-10 Dx code of E10.x in the 6 months prior to drug initiation.	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119 Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177
2	Use of a GLP-1 receptor agonist (exenatide, liraglutide or other) or pramlintide or any (dipeptidyl peptidase 4 (DPP-4) inhibitor within the 3 months prior to screening	Dispensing of at least one of the following medications in the 90 days prior to drug initiation: Use of a GLP-1 receptor agonist (exenatide, liraglutide or other) or pramlintide or any (dipeptidyl peptidase 4 (DPP-4) inhibitor within the 3 months prior to index date (Please see **AHA therapy sheet**.)	

Appendix A

#	Criterion	Definition	Reference
3	Use of insulin other than human neutral protamine hagedorn (NPH) insulin or long-acting insulin analogue within 3 months prior to screening. Short-term use of other insulin during this period in connection with intercurrent illness is allowed at Investigator's discretion	Use of **long-term insulin** in **90 days prior to drug initiation** defined as a claim for dispensing of insulin (Please see AHA therapy sheet for insulin).	
4	Acute decompensation of glycemic control requiring immediate intensification of treatment to prevent acute complications of diabetes (e.g., diabetic ketoacidosis) in the previous 3 months	**Measured 90 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** **Diabetic ketoacidosis** ICD-9 Diagnosis 250.1x	Bobo WV, Cooper WO, Epstein RA, Jr., Arbogast PG, Mounsey J, Ray WA. Positive predictive value of automated database records for diabetic ketoacidosis (DKA) in children and youth exposed to antipsychotic drugs or control medications: a Tennessee Medicaid Study. BMC medical research methodology 2011;11:157 Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119 Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177
5	An acute coronary or cerebrovascular event in the previous 14 days	**Measured 14 days prior to drug initiation in any diagnosis/procedure position and inpatient care setting** **MI, stroke, revascularization, PTCA, CABG:** **Acute MI** ICD-9 diagnosis 410.xx **Coronary revascularization- PTCA:** Inpatient CPT-4: 92973, 92982, 92984, 92995, 92996, 92920 − 92921, 92924 − 92925, 92937, 92938, 92941, 92943, 92944 − *OR* − Inpatient ICD-9 procedure: 00.66, 36.01, 36.02, 36.03, 36.05, 36.09 **Stenting:** Inpatient CPT-4: 92980, 92981, 92928 − 92929, 92933 - 92934 − *OR* − Inpatient ICD-9 procedure: 36.06, 36.07 **Transmyocardial revascularization** CPT-4: 33140, 33141 − *OR* − Inpatient ICD-9 procedure: 36.31-36.34 **CABG:** Inpatient CPT-4: 33510 − 33536, 33545, 33572 − *OR* − Inpatient ICD-9 procedure: 36.1x, 36.2x **Stroke** ICD-9 diagnosis : 430.xx Subarachnoid hemorrhage (SAH) 431.xx Intracerebral hemorrhage (ICH) 433.x1 Occlusion and stenosis of precerebral arteries with cerebral infarction 434.x1 Occlusion and stenosis of cerebral arteries with cerebral infarction 436.x Acute, but ill-defined cerebrovascular events	
6	Currently planned coronary, carotid or peripheral artery revascularization	N/A	
7	Chronic heart failure NYHA class IV	**Measured 180 days prior to drug initiation in any diagnosis/procedure position and inpatient or outpatient care setting** **Oxygen use codes:** HCPCS: E0424 E0425 E0430 E0431 E0433 E0434 E0435 E0439 E0440 E0441 E0442 E0443 E0444 E0447 E1390 E1391 E1392 E1405 E1406 K0738 S8120 S8121 or ICD-10 : Dependence on Supplemental oxygen Z99.81 ICD-9: Other dependence on machines, supplemental oxygen V46.2	**ORIGINAL DEFINITION:** Inpatient Heart failure (CHF) in prior 60 days Any of ICD-9 codes : 428.x, 398.91, 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 404.03, 404.13, 404.93 **NEW DEFINITION 4/22/2019:** Inpatient diagnosis may not be specific enough for including severe symptomatic class IV patients. Therefore, we decided to incorporate the use of oxygen therapy (not limited to inpatient setting).
8	Current continuous renal replacement therapy	**Measured 180 days prior to drug initiation in any procedure position and inpatient or outpatient care setting:** **ESRD** (Please see ESRD codes tab for codes and algorithm used to define ESRD and Renal Transplant)	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119 Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177
9	Estimated glomerular filtration rate (eGFR) (as per MDRD) < 30 mL/min/1.73m2 at screening. The criterion is applicable after a target number of 220 subjects with eGFR < 30 mL/min are randomized	N/A	
10	End stage liver disease, defined as the presence of acute or chronic liver disease and recent history of one or more of the following: ascites, encephalopathy, variceal bleeding, bilirubin ≥ 2.0 mg/dL, albumin level ≤ 3.5 g/dL, prothrombin time ≥ 4 seconds prolonged, international normalized ratio (INR) ≥1.7 or prior liver transplant	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** **Liver disease-** ICD-9 diagnosis: 070.xx, 570.xx- 573.xx 456.0x-456.2x, 576.8x, 782.4x, 789.5x ICD-9 procedure codes: 39.1x, 42.91	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119 Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177

Appendix A

#	Criterion	Measurement	Reference
11	A prior solid organ transplant or awaiting solid organ transplant	**Measured 180 days prior to drug initiation in any diagnosis/procedure position and inpatient or outpatient care setting** **Please see Organ transplant sheet for ICD-9 Diagnosis codes and ICD-9 and CPT procedure codes.**	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119 Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177
12	Malignant neoplasm requiring chemotherapy, surgery, radiation or palliative therapy in the previous 5 years. Subjects with intraepithelial squamous cell carcinoma of the skin (Bowen's disease) treated with topical 5-fluorouracil (5FU) and subjects with basal cell skin cancer are allowed to enter the trial	**Measured 1825 days prior to drug initiation in any procedure position and inpatient or outpatient care setting** **History of malignant neoplasm in previous 5 years** 140.xx-208.xx (except 173.xx, non-melanoma skin cancer)	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119 Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177
13	Family or personal history of multiple endocrine neoplasia type 2 (MEN2) or familial medullary thyroid carcinoma (FMTC)	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** **ICD-9:** MEN Type I: 258.01 MEN Type IIA: 258.02 MEN Type IIB: 258.03 **ICD-10:** MEN, unspecified: E31.20 MEN, Type I: E31.21 MEN Type IIA: E31.22 MEN, Type IIB: E31.23	
14	Personal history of non-familial medullary thyroid carcinoma	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting:** ICD9: 193 - MALIGNANT NEOPLASM OF THYROID GLAND 194.1 - MALIGNANT NEOPLASM OF PARATHYROID GLAND ICD10: C73	(This is already covered in exclusion criteria #12, but measured and applied again)
15	Any acute condition or exacerbation of chronic condition that would in the Investigator's opinion interfere with the initial trial visit schedule and procedures	N/A	
16	Known or suspected hypersensitivity to trial product(s) or related products	N/A	
17	Known use of non prescribed narcotics or illicit drugs	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting** **Drug abuse or dependence** ICD-9: 292.xx, 304.xx, 305.2x-305.9x, 648.3x	Patorno, Elisabetta et al. "Cardiovascular outcomes associated with canagliflozin versus other non-gliflozin antidiabetic drugs: population based cohort study." BMJ 2018;360:k119 http://dx.doi.org/10.1136/bmj.k119 Patorno, Elisabetta et al. "Empagliflozin and the Risk of Heart Failure Hospitalization in Routine Clinical Care: A First Analysis from the Empagliflozin Comparative Effectiveness and Safety (EMPRISE) Study." Circulation. 2019 Apr 8. doi: 10.1161/CIRCULATIONAHA.118.039177
18	Simultaneous participation in any other clinical trial of an investigational agent. Participation in a clinical trial with investigational stent(s) is allowed	N/A	
19	Previous participation in this trial. Participation is defined as randomized	N/A	
20	Females of childbearing potential who are pregnant, breast-feeding or intend to become pregnant or are not using adequate contraceptive methods (adequate contraceptive measures as required by local law or practice)	**Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting or any drug dispensing prior to drug initiation:** **i) Encounter for contraceptive management** V25 **OR** Non-oral contraceptives (brand names)- Depo-subQ Provera 104 Depo-Provera, generic Mirena Ortho Evra NuvaRing Implanon Oral contraceptives (generic names)- See "oral contraceptives - generic" sheet. Oral contraceptives (brand names)- See "oral contraceptives iii) plus pregnancy **Measured 180 days prior to drug initiation in any diagnosis position and inpatient or outpatient care setting-** **Refer to Pregnancy Sheet.**	Krumme, Alexis A, et. al. "Study protocol for the dabigatran, apixaban, rivaroxaban, edoxaban, warfarin comparative effectiveness research study." J. Comp. Eff. Res. (2018):7(1), 57–66. doi: 10.2217/cer-2017-0053. We excluded patients using contraceptives because this trial includes non-pregnant women, patients without childbearing potential, and patients who have childbearing potential but are taking precautions such as oral contraceptives (among many other ways) to avoid pregnancy during the trial period. It is impossible to implement such inclusion in real-world data, as childbearing potential is not recorded in claims. In this trials setting, this limitation to implement as an inclusion criteria is due to the following: i) lack of recording of contraceptives and other precautions to avoid pregnancy and ii) patients with diabetes and baseline CV tend to be older and are not likely to be at childbearing age. Therefore, we assumed that patients taking oral contraceptives have childbearing potential, so if they were to stop contraceptive use during follow-up, they could then become pregnant. Also, just to note, this exclusion of contraceptives use excludes very few patients (typically less than 0.1% of patients).
21	Receipt of any investigational medicinal product (IMP) within 30 days prior to this trial.	N/A	

Appendix A

Trial ID	
Trial Name (with web links)	LEADER
Trial Name (with pdf links)	
NCT	NCT01179048
Trial category	Secondary indication
Therapeutic Area	Endocrinology
RCT Category	4a- Unintended S with label change
Brand Name	
Generic Name	Liraglutide
Sponsor	Novo Nordisk A/S
Year	2016
Measurable endpoint	Composite of Cardiovascular Death, Non-fatal Myocardial Infarction, or Non-fatal Stroke
Exposure	Liraglutide
Comparator	Placebo
Population	
Trial finding	HR = 0.87 (95% CI 0.78-0.97)
Notes	
No. of Patients	
Non-inferiority margin	HR = 1.30
Assay Sens. Endpoint	
Assay Sens. Finding	
Power	90% power to detect non-inferiority
Blinding	
Statistical Method	
Approval indication	

Appendix A

Mortality- Dependent on data source.

1. All-cause mortality / inpatient mortality
Identified using the vital status file-

Medicare
Identified using the discharge status codes-

Optum-
• 20 = EXPIRED
• 21 = EXPIRED TO BE DEFINED AT STATE LEVEL
• 22 = EXPIRED TO BE DEFINED AT STATE LEVEL
• 23 = EXPIRED TO BE DEFINED AT STATE LEVEL
• 24 = EXPIRED TO BE DEFINED AT STATE LEVEL
• 25 = EXPIRED TO BE DEFINED AT STATE LEVEL
• 26 = EXPIRED TO BE DEFINED AT STATE LEVEL
• 27 = EXPIRED TO BE DEFINED AT STATE LEVEL
• 28 = EXPIRED TO BE DEFINED AT STATE LEVEL
• 29 = EXPIRED TO BE DEFINED AT STATE LEVEL
• 40 = EXPIRED AT HOME (HOSPICE)
• 41 = EXPIRED IN A MEDICAL FACILITY (HOSPICE)
• 42 = EXPIRED - PLACE UNKNOWN (HOSPICE)

Truven-
• 20 - Died
• 22 - Died
• 23 - Died
• 24 - Died
• 25 - Died
• 26 - Died
• 27 - Died
• 28 - Died
• 29 - Died
• 40 - Other died status or Expired at home (Hospice claims only) (depends on year)

Appendix A

- 41 - Other died status or Expired in medical facility (Hospice claims only) (depends on year)
- 42 - Other died status or Expired - place unknown (Hospice claims only) (depends on year)
- 21 - Died or Disch./Transf. to court/law enforcement (depends on year)

2. CV mortality
Information on CV mortality through data linkage with the National Death Index (NDI) will be available for Medicare at a later date. We will conduct secondary analyses using CV mortality at that time.

Appendix A

Antidiabetic class	Specific agent	Notes
SGLT2-inhibitors	Canagliflozin	Approved 3/29/2013
	Dapagliflozin	
	Empagliflozin	
	Ertugliflozin	Approved Dec 21, 2017
2nd generation sulfonylureas	Glimepiride	
	Glipizide	
	Glyburide	
DPP-4 inhibitors	Alogliptin	
	Linagliptin	
	Saxagliptin	
	Sitagliptin	
GLP-1 receptor agonist (GLP1-RA)	Exenatide	
	Liraglutide	
	Albiglutide	Approved April 15, 2014 and discontinued July 26, 2017
	Dulaglutide	Approved Sep 18, 2014
	Lixisenatide	Approved July 28, 2016
	Semaglutide	Approved Dec 5, 2017
Insulin	Insulin Aspart	
	Insulin Aspart/Insulin Aspart Protamine	
	Insulin Degludec	
	Insulin Detemir	
	Insulin Glargine	
	Insulin Glulisine	
	Insulin human isophane (NPH)	
	Insulin human regular *(search with NPH, don't want bf-pk)*	
	Insulin human regular/ Insulin human isophane (NPH)	
	Insulin Lispro	
	Insulin Lispro/Insulin Lispro Protamine	
Glitazones	Pioglitazone	
	Rosiglitazone	

Appendix A

Meglitinides	Nateglinide	
	Repaglinide	
Alpha-glucosidase inhibitors	Acarbose	
	Miglitol	
Pramlintide	Pramlintide	
1st generation sulfonylureas	Acetohexamide	
	Chlorpropamide	
	Tolazamide	
	Tolbutamide	

Appendix A

ESRD, defined as 2 codes (either inpatient or outpatient), separated by at least 30 days

ESRD, defined as 2 codes (either inpatient or outpatient), separated by at least 30 days
Codes include:
- ICD9 prox codes:
39.95, Hemodialysis
54.98, Peritoneal dialysis
- ICD9 dx codes:
585.5x, Chronic kidney disease, Stage V (for ESRD with no mention of dialysis)
585.6x, End stage renal disease (for ESRD with dialysis)
V56.0x, encounter for dialysis NOS
V56.8x, encounter for peritoneal dialysis
V45.1x, renal dialysis status
- CPT4 codes:
90957, 90960, ESRD related services monthly, for patients 12-19 and 20 years of age and older; with 4 or more face-to-face physician visits per month
90958, 90961, ESRD related services monthly, for patients 12-19 and 20 years of age and older; with 2-3 face-to-face physician visits per month
90959, 90962, ESRD related services monthly, for patients 12-19 and 20 years of age and older; with 1 face-to-face physician visit per month
90920, 90921, ESRD related services per full month; for patients 12-19 and twenty years of age and over
90924, 90925, ESRD related services (less than full month), per day; for patients 12-19 and twenty years of age and over
90935, Hemodialysis procedure with single physician evaluation
90937, Hemodialysis procedure requiring repeated evaluation(s) with or without substantial revision of dialysis prescription
90945, Dialysis procedure other than hemodialysis (eg, peritoneal dialysis, hemofiltration, or other continuous renal replacement therapies), with single physician evaluation
90947, Dialysis procedure other than hemodialysis (eg, peritoneal dialysis, hemofiltration, or other continuous renal replacement therapies) requiring repeated physician evaluations, with or without substantial revision of dialysis prescription
90965, 90966, ESRD related services for home dialysis per full month, for patients 12-19 and 20 years of age and older
90969, 90970, ESRD related services for dialysis less than a full month of service, per day; for patients 12-19 and 20 years of age and older
90989, Dialysis training, patient, including helper where applicable, any mode, completed course
90993, Dialysis training, patient, including helper where applicable, any mode, course not completed, per training session
90999, Unlisted dialysis procedure, inpatient or outpatient
99512, Home visit for hemodialysis
- HCPCS codes:
G0257, Unscheduled or emergency dialysis treatment for ESRD patient in a hospital outpatient dept. that is not certified as an ESRD facility
G0314, G0317, ESRD related services during the course of treatment, for patients 12-19 and 20 yrs of age an over to include monitoring for the adequacy of nutrition, etc. w/4 or more physician visit per month

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G0315, G0318, ESRD related services during the course of treatment, for patients 12-19 and 20yrs of age and over to include monitoring for the adequacy of nutrition, etc. w/2 or 3 physician visit per month
G0316, G0319, ESRD related services during the course of treatment, for patients 12-19 and 20 yrs of age and over to include monitoring for the adequacy of nutrition, etc. w/1 physician visit per month
G0322, G0323, ESRD related services for home dialysis patients per full month: for patients 12-19 and 20 yrs of age and over to include monitoring for adequacy of nutrition and etc.
G0326, G0327, ESRD related services for home dialysis (less than full month), per day; for patients 12-19 and 20 yrs of age and over
S9335, Home therapy, hemodialysis; administrative services, professional pharmacy services, care coordination, and all necessary supplies and equipment (drugs and nursing services coded separately), per diem
S9339, Home therapy, peritoneal dialysis, administrative services, care coordination and all necessary supplies and equipment, per diem

OR

Kidney transplant, defined as either 1 inpatient or 1 outpatient code
Codes include:
-ICD9 dx codes:
V42.0x, Kidney transplant status
996.81 Complications of transplanted kidney
-ICD9 prox codes:
55.6x, Transplant of kidney (Exclude 55.61)
- CPT4 codes:
50360, Renal allotransplantation, implantation, graft, w/o donor & recipient nephrectomy
50365, Renal allotransplantation, implantation, graft, w/ donor & recipient nephrectomy

Appendix A

Organ Transplant

ICD-9 diagnoses:
V42.0 Kidney
V42.1 Heart
V42.6 Lung
V42.7 Liver
V42.8x Other specified organ or tissue
V42.81 Bone marrow
V42.83 Pancreas
V42.84 Intestines
V42.89 Other
V42.9x Unspecified organ or tissue
V58.44 Aftercare following organ transplant
E878.0x Surgical operation with transplant of whole organ
996.8x Complications of transplanted organ
ICD-9 procedures:
33.5x Lung transplant
33.6x Combined heart-lung transplantation
37.51 Heart transplantation
41.0x Bone marrow
46.97 Transplant of intestine
50.5x Liver transplant
52.8x Transplant of pancreas
55.6x Transplant of kidney
CPT4 codes
32851 LUNG TRANSPLANT, SINGLE; W/O CARDIOPULMONARY BYPASS
32852 LUNG TRANSPLANT, SINGLE; W/CARDIOPULMONARY BYPASS
32853 LUNG TRANSPLANT, DOUBLE (BILAT SEQUENTIAL/EN BLOC); W/O CARDIOPULMONARY BYPASS
32854 LUNG TRANSPLANT, DOUBLE (BILAT SEQUENTIAL/EN BLOC); W/CARDIOPULMONARY BYPASS
33935 HEART-LUNG TRANSPLANT W/RECIPIENT CARDIECTOMY-PNEUMONECTOMY
33945 HEART TRANSPLANT, W/WO RECIPIENT CARDIECTOMY
38240 BONE MARROW/BLOOD-DERIVED PERIPHERAL STEM CELL TRANSPLANTATION; ALLOGENIC
38241 BONE MARROW/BLOOD-DERIVED PERIPHERAL STEM CELL TRANSPLANTATION; AUTOLOGOUS
44135 INTESTINAL ALLOTRANSPLANTATION; FROM CADAVER DONOR

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44136 INTESTINAL ALLOTRANSPLANTATION; FROM LIVING DONOR
47135 LIVER ALLOTRANSPLANTATION; ORTHOTOPIC, PARTIAL/WHOLE, FROM CADAVER/LIVING DONOR, ANY AGE
47136 LIVER ALLOTRANSPLANTATION; HETEROTOPIC, PARTIAL/WHOLE, FROM CADAVER/LIVING DONOR, ANY AGE
48554 TRANSPLANTATION, PANCREATIC ALLOGRAFT
48556 REMOVAL, TRANSPLANTED PANCREATIC ALLOGRAFT
50360 RENAL ALLOTRANSPLANTATION, IMPLANTATION, GRAFT; W/O DONOR & RECIPIENT NEPHRECTOMY
50365 RENAL ALLOTRANSPLANTATION, IMPLANTATION, GRAFT; W/RECIPIENT NEPHRECTOMY
50370 REMOVAL, TRANSPLANTED RENAL ALLOGRAFT
50380 RENAL AUTOTRANSPLANTATION, REIMPLANTATION, KIDNEY

Appendix A

drug_class	Brand Name
oral contraceptive	Apri;
oral contraceptive	Desogen;
oral contraceptive	Ortho-Cept;
oral contraceptive	Reclipsen
oral contraceptive	Kariva;
oral contraceptive	Mircette
oral contraceptive	Cyclessa;
oral contraceptive	Velivet
oral contraceptive	Yasmin
oral contraceptive	Yaz
oral contraceptive	Demulen 1/35;
oral contraceptive	Kelnor;
oral contraceptive	Zovia 1/25
oral contraceptive	Demulen 1/50;
oral contraceptive	Zovia 1/50
oral contraceptive	Alesse;
oral contraceptive	Aviane;
oral contraceptive	Lessina;
oral contraceptive	Lutera
oral contraceptive	Nordette;
oral contraceptive	Portia;
oral contraceptive	Levora
oral contraceptive	Lybrel
oral contraceptive	Seasonale;
oral contraceptive	Quasense;
oral contraceptive	Jolessa
oral contraceptive	Seasonique
oral contraceptive	Empresse;
oral contraceptive	Triphasil;
oral contraceptive	Trivora
oral contraceptive	Ovcon 35
oral contraceptive	Balziva;

Appendix A

oral contraceptive	Femcon Fe
oral contraceptive	Brevicon;
oral contraceptive	Nortrel 0.5/35;
oral contraceptive	Modicon;
oral contraceptive	Necon 0.5/35
oral contraceptive	Norinyl 1/35;
oral contraceptive	Nortrel 1/35;
oral contraceptive	Ortho-Novum 1/35;
oral contraceptive	Necon 1/35
oral contraceptive	Ovcon 50;
oral contraceptive	Necon 1/50
oral contraceptive	Ortho-Novum 10/11
oral contraceptive	Aranelle;
oral contraceptive	Tri-Norinyl
oral contraceptive	Ortho-Novum 7/7/7;
oral contraceptive	Necon
oral contraceptive	Micronor;
oral contraceptive	Nor-QD;
oral contraceptive	Camila;
oral contraceptive	Errin;
oral contraceptive	Jolivette
oral contraceptive	Junel 21 1/20;
oral contraceptive	Junel 21 Fe 1/20;
oral contraceptive	Loestrin 21 1/20;
oral contraceptive	Loestrin 21 Fe 1/20;
oral contraceptive	Loestrin 24 Fe;
oral contraceptive	Microgestin 1/20
oral contraceptive	Microgestin Fe 1/20
oral contraceptive	Junel 21 1.5/30;
oral contraceptive	Junel 21 Fe 1.5/30;
oral contraceptive	Loestrin 1.5/30;
oral contraceptive	Loestrin Fe 1.5/30
oral contraceptive	Microgestin 1.5/30

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oral contraceptive	Microgestin Fe 1.5/30
oral contraceptive	Estrostep Fe;
oral contraceptive	Tilia Fe;
oral contraceptive	TriLegest Fe
oral contraceptive	Ortho-Cyclen;
oral contraceptive	Sprintec;
oral contraceptive	MonoNessa;
oral contraceptive	Previfem
oral contraceptive	Ortho Tri-Cyclen Lo;
oral contraceptive	Tri-Previfem;
oral contraceptive	TriNessa
oral contraceptive	Ortho Tri-Cyclen;
oral contraceptive	Tri-Sprintec
oral contraceptive	Cryselle;
oral contraceptive	Lo/Ovral;
oral contraceptive	Low-Ogestrel
oral contraceptive	Ovral;
oral contraceptive	Ogestrel
oral contraceptive	Zovia 1/50
oral contraceptive	Alesse;
oral contraceptive	Aviane;
oral contraceptive	Lessina;
oral contraceptive	Lutera
oral contraceptive	Nordette;
oral contraceptive	Portia;
oral contraceptive	Levora
oral contraceptive	Lybrel
oral contraceptive	Seasonale;
oral contraceptive	Quasense;
oral contraceptive	Jolessa
oral contraceptive	Seasonique
oral contraceptive	Empresse;
oral contraceptive	Triphasil;

oral contraceptive	Trivora
oral contraceptive	Ovcon 35
oral contraceptive	Balziva;
oral contraceptive	Femcon Fe
oral contraceptive	Brevicon;
oral contraceptive	Nortrel 0.5/35;
oral contraceptive	Modicon;
oral contraceptive	Necon 0.5/35
oral contraceptive	Norinyl 1/35;
oral contraceptive	Nortrel 1/35;
oral contraceptive	Ortho-Novum 1/35;
oral contraceptive	Necon 1/35
oral contraceptive	Ovcon 50;
oral contraceptive	Necon 1/50
oral contraceptive	Ortho-Novum 10/11
oral contraceptive	Aranelle;
oral contraceptive	Tri-Norinyl
oral contraceptive	Ortho-Novum 7/7/7;
oral contraceptive	Necon
oral contraceptive	Micronor;
oral contraceptive	Nor-QD;
oral contraceptive	Camila;
oral contraceptive	Errin;
oral contraceptive	Jolivette
oral contraceptive	Junel 21 1/20;
oral contraceptive	Junel 21 Fe 1/20;
oral contraceptive	Loestrin 21 1/20;
oral contraceptive	Loestrin 21 Fe 1/20;
oral contraceptive	Loestrin 24 Fe;
oral contraceptive	Microgestin 1/20
oral contraceptive	Microgestin Fe 1/20
oral contraceptive	Junel 21 1.5/30;
oral contraceptive	Junel 21 Fe 1.5/30;

Appendix A

oral contraceptive	Loestrin 1.5/30;
oral contraceptive	Loestrin Fe 1.5/30
oral contraceptive	Microgestin 1.5/30
oral contraceptive	Microgestin Fe 1.5/30
oral contraceptive	Estrostep Fe;
oral contraceptive	Tilia Fe;
oral contraceptive	TriLegest Fe
oral contraceptive	Ortho-Cyclen;
oral contraceptive	Sprintec;
oral contraceptive	MonoNessa;
oral contraceptive	Previfem
oral contraceptive	Ortho Tri-Cyclen Lo;
oral contraceptive	Tri-Previfem;
oral contraceptive	TriNessa
oral contraceptive	Ortho Tri-Cyclen;
oral contraceptive	Tri-Sprintec
oral contraceptive	Cryselle;
oral contraceptive	Lo/Ovral;
oral contraceptive	Low-Ogestrel
oral contraceptive	Ovral;
oral contraceptive	Ogestrel

Appendix A

drug_class	generic	generic_ndc
oral contraceptive	estradiol	desogestrel-ethinyl estradiol
oral contraceptive	estradiol	desogestrel-ethinyl estradiol/ethinyl estradiol
oral contraceptive	estradiol	drospirenone/estradiol
oral contraceptive	estradiol	drospirenone/ethinyl estradiol/levomefolate calcium
oral contraceptive	estradiol	estradiol
oral contraceptive	estradiol	estradiol acetate
oral contraceptive	estradiol	estradiol benzoate
oral contraceptive	estradiol	estradiol cypionate
oral contraceptive	estradiol	estradiol cypionate/medroxyprogesterone acet
oral contraceptive	estradiol	estradiol hemihydrate, micronized
oral contraceptive	estradiol	estradiol micronized
oral contraceptive	estradiol	estradiol valerate
oral contraceptive	estradiol	estradiol valerate/dienogest
oral contraceptive	estradiol	estradiol valerate/sesame oil
oral contraceptive	estradiol	estradiol/estrone
oral contraceptive	estradiol	estradiol/estrone/vit b12
oral contraceptive	estradiol	estradiol/levonorgestrel
oral contraceptive	estradiol	estradiol/norethindrone acetate
oral contraceptive	estradiol	estradiol/norgestimate
oral contraceptive	estradiol	estradiol/progesterone
oral contraceptive	estradiol	ethinyl estradiol
oral contraceptive	estradiol	ethinyl estradiol/drospirenone
oral contraceptive	estradiol	ethinyl estradiol/norethindrone acetate
oral contraceptive	estradiol	ethynodiol d-ethinyl estradiol
oral contraceptive	estradiol	ethynodiol diacetate-ethinyl estradiol
oral contraceptive	estradiol	etonogestrel/ethinyl estradiol
oral contraceptive	estradiol	levonorgestrel-ethinyl estradiol
oral contraceptive	estradiol	levonorgestrel/ethinyl estradiol and ethinyl estradiol
oral contraceptive	estradiol	me-testosterone/eth estradiol
oral contraceptive	estradiol	metttrn/estradiol/multivits
oral contraceptive	estradiol	norelgestromin/ethinyl estradiol
oral contraceptive	estradiol	norethindrone a-e estradiol

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oral contraceptive	estradiol	norethindrone a-e estradiol/fe
oral contraceptive	estradiol	norethindrone a-e estradiol/ferrous fumarate
oral contraceptive	estradiol	norethindrone acetate-ethinyl estradiol
oral contraceptive	estradiol	norethindrone acetate-ethinyl estradiol/ferrous fumarate
oral contraceptive	estradiol	norethindrone-ethin estradiol
oral contraceptive	estradiol	norethindrone-ethinyl estradiol
oral contraceptive	estradiol	norethindrone-ethinyl estradiol/ferrous fumarate
oral contraceptive	estradiol	norgestimate-ethinyl estradiol
oral contraceptive	estradiol	norgestrel-ethinyl estradiol
oral contraceptive	estradiol	testosterone cypionate/estradiol cypionate
oral contraceptive	estradiol	testosterone enanthate/estradiol valerate
oral contraceptive	estradiol	testosterone/estradiol
oral contraceptive	levonorgestrel	estradiol/levonorgestrel
oral contraceptive	levonorgestrel	levonorgestrel
oral contraceptive	levonorgestrel	levonorgestrel-eth estra
oral contraceptive	levonorgestrel	levonorgestrel-eth estra/pregnancy test kit
oral contraceptive	levonorgestrel	levonorgestrel-ethinyl estradiol
oral contraceptive	levonorgestrel	levonorgestrel/ethinyl estradiol and ethinyl estradiol
oral contraceptive	norethindrone	estradiol/norethindrone acetate
oral contraceptive	norethindrone	ethinyl estradiol/norethindrone acetate
oral contraceptive	norethindrone	leuprolide acetate/norethindrone acetate
oral contraceptive	norethindrone	norethindrone
oral contraceptive	norethindrone	norethindrone a-e estradiol
oral contraceptive	norethindrone	norethindrone a-e estradiol/fe
oral contraceptive	norethindrone	norethindrone a-e estradiol/ferrous fumarate
oral contraceptive	norethindrone	norethindrone acetate
oral contraceptive	norethindrone	norethindrone acetate-ethinyl estradiol
oral contraceptive	norethindrone	norethindrone acetate-ethinyl estradiol/ferrous fumarate
oral contraceptive	norethindrone	norethindrone-ethin estradiol
oral contraceptive	norethindrone	norethindrone-ethinyl estrad
oral contraceptive	norethindrone	norethindrone-ethinyl estradiol
oral contraceptive	norethindrone	norethindrone-ethinyl estradiol/ferrous fumarate

Appendix A

oral contraceptive	norethindrone	norethindrone-mestranol
oral contraceptive	norgestrel	norgestrel
oral contraceptive	norgestrel	norgestrel-ethinyl estradiol
oral contraceptive	polyestradiol phosphate	polyestradiol phosphate

Appendix A

Pregnancy

Dx codes
650   NORMAL DELIVERY
660   OBSTRUCTED LABOR
661   ABNORMALITY OF FORCES OF LABOR
662   LONG LABOR
663   UMBILICAL CORD COMPLICATIONS DURING LABOR AND DELIVERY
664   TRAUMA TO PERINEUM AND VULVA DURING DELIVERY
665   OTHER OBSTETRICAL TRAUMA
667   RETAINED PLACENTA OR MEMBRANES WITHOUT HEMORRHAGE
668   COMPLICATIONS OF THE ADMINISTRATION OF ANESTHETIC OR OTHER SEDATION IN LABOR AND DELIVERY
669.94   UNSPECIFIED COMPLICATION OF LABOR AND DELIVERY POSTPARTUM CONDITION OR COMPLICATION
V24   POSTPARTUM CARE AND EXAMINATION
V24.0   POSTPARTUM CARE AND EXAMINATION IMMEDIATELY AFTER DELIVERY
V24.1   POSTPARTUM CARE AND EXAMINATION OF LACTATING MOTHER
V24.2   ROUTINE POSTPARTUM FOLLOW
V27   OUTCOME OF DELIVERY
V27.0   MOTHER WITH SINGLE LIVEBORN
V27.1   MOTHER WITH SINGLE STILLBORN
V27.2   MOTHER WITH TWINS BOTH LIVEBORN
V27.3   MOTHER WITH TWINS ONE LIVEBORN AND ONE STILLBORN
V27.4   MOTHER WITH TWINS BOTH STILLBORN
V27.5   MOTHER WITH OTHER MULTIPLE BIRTH ALL LIVEBORN
V27.6   MOTHER WITH OTHER MULTIPLE BIRTH SOME LIVEBORN
V27.7   MOTHER WITH OTHER MULTIPLE BIRTH ALL STILLBORN
V27.9   MOTHER WITH UNSPECIFIED OUTCOME OF DELIVERY
Procedure codes
72.0   LOW FORCEPS OPERATION
72.1   LOW FORCEPS OPERATION WITH EPISIOTOMY
72.2   MID FORCEPS OPERATION
72.21   MID FORCEPS OPERATION WITH EPISIOTOMY
72.29   OTHER MID FORCEPS OPERATION
72.3   HIGH FORCEPS OPERATION
72.31   HIGH FORCEPS OPERATION WITH EPISIOTOMY
72.39   OTHER HIGH FORCEPS OPERATION

Appendix A

Appendix A

74.2 EXTRAPERITONEAL CESAREAN SECTION
74.3 REMOVAL OF EXTRATUBAL ECTOPIC PREGNANCY
74.4 CESAREAN SECTION OF OTHER SPECIFIED TYPE
74.9 CESAREAN SECTION OF UNSPECIFIED TYPE
74.91 HYSTEROTOMY TO TERMINATE PREGNANCY
74.99 OTHER CESAREAN SECTION OF UNSPECIFIED TYPE
75.4 MANUAL REMOVAL OF RETAINED PLACENTA
75.5 REPAIR OF CURRENT OBSTETRIC LACERATION OF UTERUS
75.6 REPAIR OF OTHER CURRENT OBSTETRIC LACERATION
75.7 MANUAL EXPLORATION OF UTERINE CAVITY, POSTPARTUM
75.9 OTHER OBSTETRIC OPERATIONS

Appendix B: Liraglutide vs DPP4i
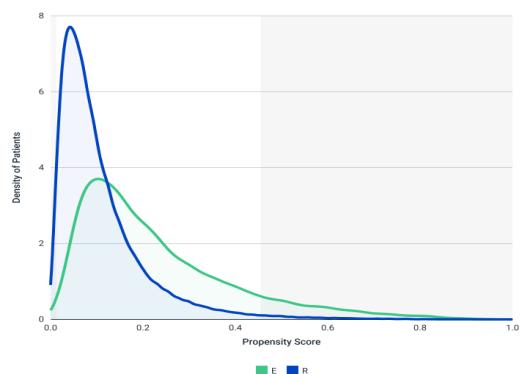
Optum	MarketScan	Medicare

BEFORE PS MATCHING

Figure 49: Pre-matching propensity score overlap

Figure 49: Pre-matching propensity score overlap

Figure 25: Pre-matching propensity score overlap

The c-statistics for the propensity score model, pre-matching was 0.763. The post-matching c-statistic was 0.528.	The c-statistics for the propensity score model, pre-matching was 0.749. The post-matching c-statistic was 0.523.	The c-statistics for the propensity score model, pre-matching was 0.788. The post-matching c-statistic was 0.52.
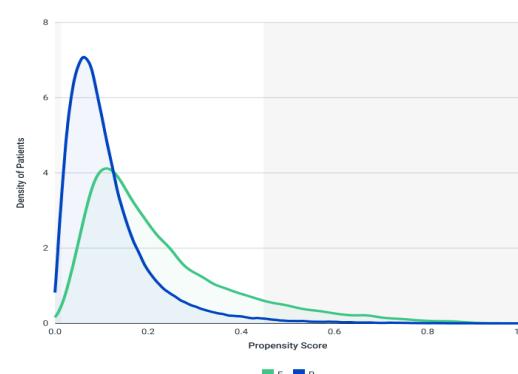
| AFTER PS MATCHING |
|---|
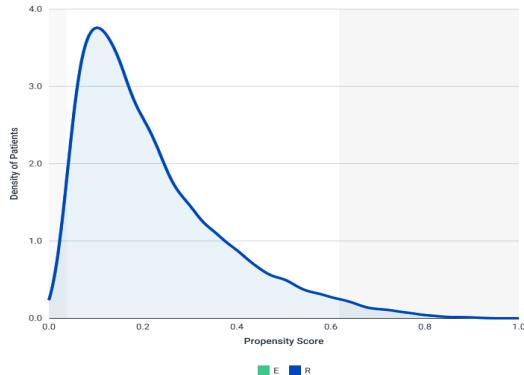


Figure 50: Post-matching propensity score overlap
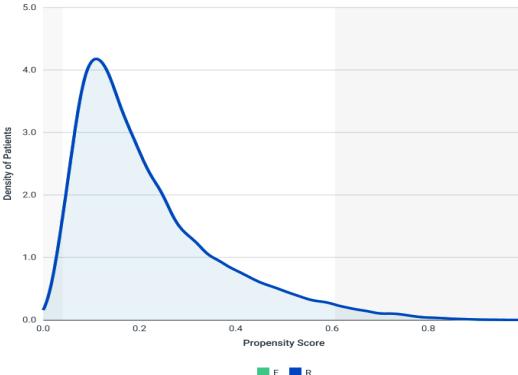
Figure 50: Post-matching propensity score overlap
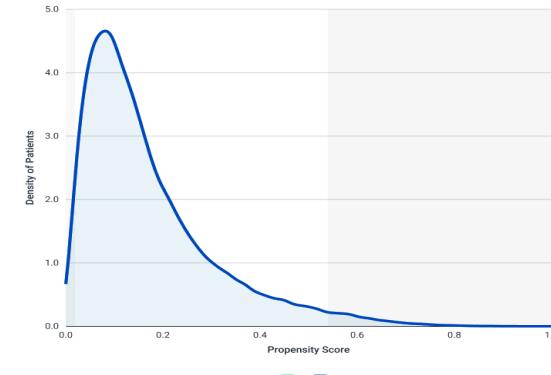
Figure 26: Post-matching propensity score overlap

Table 1: Liraglutide vs DPP4i

	Optum			MarketScan			Medicare			POOLED		
										Unmatched		
Variable	Reference- DPP4i	Exposure- Liraglutide	St. Diff.	Reference- DPP4i	Exposure- Liraglutide	St. Diff.	Reference- DPP4i	Exposure- Liraglutide	St. Diff.	Reference- DPP4i	Exposure- Liraglutide	St. Diff.
Number of patients	137,649	19,460		143,337	21,041		454,700	44,778		735,686	85,279	
Age												
…mean (sd)	70.07 (8.03)	66.00 (6.84)	0.55	66.74 (8.79)	63.07 (6.32)	0.48	74.48 (7.29)	70.59 (5.00)	0.62	72.15 (7.74)	67.69 (5.80)	0.65
…median [IQR]	69.00 [65.00, 76.00]	66.00 [61.00, 70.00]	0.40	64.00 [61.00, 72.00]	62.00 [60.00, 66.00]	0.26	73.00 [69.00, 79.00]	73.00 [67.00, 73.00]	0.64	70.50 (7.74)	66.59 (5.80)	0.57
Age categories												
…18 - 54 ; n (%)	3,645 (2.6%)	1,088 (5.6%)	-0.15	7,490 (5.2%)	1,773 (8.4%)	-0.13	0 (0.0%)	0 (0.0%)	#DIV/0!	11,135 (1.5%)	2,861 (3.4%)	-0.12
…55 - 64 ; n (%)	30,092 (21.9%)	6,913 (35.5%)	-0.30	68,184 (47.6%)	12,865 (61.1%)	-0.27	7,142 (1.6%)	1,114 (2.5%)	-0.06	105,418 (14.3%)	20,892 (24.5%)	-0.26
…65 - 74 ; n (%)	64,422 (46.8%)	9,363 (48.1%)	-0.03	39,328 (27.4%)	5,193 (24.7%)	0.06	250,319 (55.1%)	34,945 (78.0%)	-0.50	354,069 (48.1%)	49,501 (58.0%)	-0.20
…>= 75 ; n (%)	39,490 (28.7%)	2,096 (10.8%)	0.46	28,335 (19.8%)	1,210 (5.8%)	0.43	197,239 (43.4%)	8,719 (19.5%)	0.53	265,064 (36.0%)	12,025 (14.1%)	0.52
Gender - United												
…Males; n (%)	68,305 (49.6%)	9,191 (47.2%)	0.05	80,527 (56.2%)	10,789 (51.3%)	0.10	197,449 (43.4%)	19,778 (44.2%)	-0.02	346,281 (47.1%)	39,758 (46.6%)	0.01
…Females; n (%)	69,344 (50.4%)	10,269 (52.8%)	-0.05	62,810 (43.8%)	10,252 (48.7%)	-0.10	257,251 (56.6%)	25,000 (55.8%)	0.02	389,405 (52.9%)	45,521 (53.4%)	-0.01
Race												
…White; n (%)	N/A	N/A		N/A	N/A		337,843 (74.3%)	38,225 (85.4%)	-0.28	337,843 (74.3%)	38,225 (85.4%)	-0.28
…Black; n (%)	N/A	N/A		N/A	N/A		52,880 (11.6%)	3,806 (8.5%)	0.10	52,880 (11.6%)	3,806 (8.5%)	0.10
…Asian; n (%)	N/A	N/A		N/A	N/A		23,337 (5.1%)	531 (1.2%)	0.22	23,337 (5.1%)	531 (1.2%)	0.22
…Hispanic; n (%)	N/A	N/A		N/A	N/A		21,402 (4.7%)	801 (1.8%)	0.16	21,402 (4.7%)	801 (1.8%)	0.16
…North American Native; n (%)	N/A	N/A		N/A	N/A		2,392 (0.5%)	177 (0.4%)	0.01	2,392 (0.5%)	177 (0.4%)	0.01
…Other/Unknown; n (%)	N/A	N/A		N/A	N/A		16,846 (3.7%)	1,238 (2.8%)	0.05	16,846 (3.7%)	1,238 (2.8%)	0.05
Region - United (lumping missing&other category with West)												
…Northeast; n (%)	17,444 (12.7%)	1,756 (9.0%)	0.12	32,182 (22.5%)	3,998 (19.0%)	0.09	90,962 (20.0%)	7,000 (15.6%)	0.12	140,588 (19.1%)	12,754 (15.0%)	0.11
…South; n (%)	67,640 (49.1%)	10,375 (53.3%)	-0.08	34,576 (24.1%)	4,549 (21.6%)	0.06	193,181 (42.5%)	20,663 (46.1%)	-0.07	295,397 (40.2%)	35,587 (41.7%)	-0.03
…Midwest; n (%)	23,768 (17.3%)	3,839 (19.7%)	-0.06	59,121 (41.2%)	9,927 (47.2%)	-0.12	92,885 (20.4%)	10,345 (23.1%)	-0.07	175,774 (23.9%)	24,111 (28.3%)	-0.10
…West; n (%)	28,797 (20.9%)	3,490 (17.9%)	0.08	16,027 (11.2%)	2,339 (11.1%)	0.00	77,672 (17.1%)	6,770 (15.1%)	0.05	122,496 (16.7%)	12,599 (14.8%)	0.05
…Unknown+missing; n (%)	N/A	N/A	#VALUE!	1,431 (1.0%)	228 (1.1%)	-0.01	N/A	N/A	#VALUE!	1,431 (1.0%)	228 (1.1%)	-0.01
CV Covariates												
Ischemic heart disease; n (%)	39,052 (28.4%)	5,847 (30.0%)		46,475 (32.4%)	6,900 (32.8%)		148,750 (32.7%)	13,938 (31.1%)		234,277 (31.8%)	26,685 (31.3%)	0.01
Acute MI; n (%)	2,315 (1.7%)	293 (1.5%)		2,658 (1.9%)	311 (1.5%)		8,356 (1.8%)	541 (1.2%)		13,329 (1.8%)	1,145 (1.3%)	0.04
ACS/unstable angina; n (%)	2,694 (2.0%)	397 (2.0%)		3,152 (2.2%)	438 (2.1%)		9,368 (2.1%)	748 (1.7%)		15,214 (2.1%)	1,583 (1.9%)	0.01
Old MI; n (%)	5,390 (3.9%)	786 (4.0%)		3,482 (2.4%)	438 (2.1%)		19,366 (4.3%)	1,616 (3.6%)		28,238 (3.8%)	2,840 (3.3%)	0.03
Stable angina; n (%)	5,780 (4.2%)	956 (4.9%)		4,996 (3.5%)	757 (3.6%)		18,469 (4.1%)	1,724 (3.9%)		29,245 (4.0%)	3,437 (4.0%)	0.00
Coronary atherosclerosis and other forms of chronic ischemic heart disease; n (%)	36,533 (26.5%)	5,496 (28.2%)		44,110 (30.8%)	6,595 (31.3%)		141,426 (31.1%)	13,340 (29.8%)		222,069 (30.2%)	25,431 (29.8%)	0.01
Other atherosclerosis with ICD10 ; n (%)	1,696 (1.2%)	203 (1.0%)		2,017 (1.4%)	241 (1.1%)		9,310 (2.0%)	763 (1.7%)		13,023 (1.8%)	1,207 (1.4%)	0.03
Previous cardiac procedure (CABG or PTCA or Stent) ; n (%)	1,201 (0.9%)	173 (0.9%)		1,786 (1.2%)	215 (1.0%)		3,709 (0.8%)	238 (0.5%)		6,696 (0.9%)	626 (0.7%)	0.02
History of CABG or PTCA; n (%)	9,173 (6.7%)	1,426 (7.3%)		5,910 (4.1%)	847 (4.0%)		40,580 (8.9%)	3,742 (8.4%)		55,663 (7.6%)	6,015 (7.1%)	0.02
Any stroke; n (%)	11,660 (8.5%)	1,418 (7.3%)		13,094 (9.1%)	1,523 (7.2%)		50,128 (11.0%)	3,815 (8.5%)		74,882 (10.2%)	6,756 (7.9%)	0.08
Ischemic stroke (w and w/o mention of cerebral infarction); n (%)	11,493 (8.3%)	1,407 (7.2%)		12,931 (9.0%)	1,502 (7.1%)		49,540 (10.9%)	3,782 (8.4%)		73,964 (10.1%)	6,691 (7.8%)	0.08
Hemorrhagic stroke; n (%)	380 (0.3%)	31 (0.2%)		374 (0.3%)	36 (0.2%)		1,464 (0.3%)	62 (0.1%)		2,218 (0.3%)	129 (0.2%)	0.02
TIA; n (%)	2,932 (2.1%)	331 (1.7%)		3,274 (2.3%)	368 (1.7%)		11,914 (2.6%)	775 (1.7%)		18,120 (2.5%)	1,474 (1.7%)	0.06
Other cerebrovascular disease; n (%)	3,355 (2.4%)	336 (1.7%)		2,664 (1.9%)	239 (1.1%)		15,532 (3.4%)	900 (2.0%)		21,551 (2.9%)	1,475 (1.7%)	0.08
Late effects of cerebrovascular disease; n (%)	3,094 (2.2%)	249 (1.3%)		2,107 (1.5%)	151 (0.7%)		13,901 (3.1%)	635 (1.4%)		19,102 (2.6%)	1,035 (1.2%)	0.10
Cerebrovascular procedure; n (%)	152 (0.1%)	21 (0.1%)		223 (0.2%)	24 (0.1%)		649 (0.1%)	45 (0.1%)		1,024 (0.1%)	90 (0.1%)	0.00
Heart failure (CHF); n (%)	15,587 (11.3%)	2,094 (10.8%)		13,361 (9.3%)	1,604 (7.6%)		66,067 (14.5%)	4,972 (11.1%)		95,015 (12.9%)	8,670 (10.2%)	0.08
Peripheral Vascular Disease (PVD) or PVD Surgery ; n (%)	13,999 (10.2%)	1,740 (8.9%)		12,644 (8.8%)	1,696 (8.1%)		61,829 (13.6%)	4,595 (10.3%)		88,472 (12.0%)	8,031 (9.4%)	0.08
Atrial fibrillation; n (%)	12,890 (9.4%)	1,576 (8.1%)		11,832 (8.3%)	1,252 (6.0%)		61,761 (13.6%)	4,822 (10.8%)		86,483 (11.8%)	7,650 (9.0%)	0.09
Other cardiac dysrhythmia; n (%)	15,067 (10.9%)	2,040 (10.5%)		12,311 (8.6%)	1,494 (7.1%)		65,098 (14.3%)	5,160 (11.5%)		92,476 (12.6%)	8,694 (10.2%)	0.08
Cardiac conduction disorders; n (%)	4,626 (3.4%)	552 (2.8%)		3,820 (2.7%)	436 (2.1%)		21,875 (4.8%)	1,645 (3.7%)		30,321 (4.1%)	2,633 (3.1%)	0.05
Other CVD; n (%)	18,872 (13.7%)	2,321 (11.9%)		18,649 (13.0%)	2,291 (10.9%)		80,263 (17.7%)	6,364 (14.2%)		117,784 (16.0%)	10,976 (12.9%)	0.09
Diabetes-related complications												
Diabetic retinopathy; n (%)	9,042 (6.6%)	1,525 (7.8%)		6,336 (4.4%)	1,047 (5.0%)		31,125 (6.8%)	3,764 (8.4%)		46,503 (6.3%)	6,336 (7.4%)	-0.04
Diabetes with other ophthalmic manifestations; n (%)	1,130 (0.8%)	141 (0.7%)		4,518 (3.2%)	737 (3.5%)		12,856 (2.8%)	1,482 (3.3%)		18,504 (2.5%)	2,360 (2.8%)	-0.02
Retinal detachment, vitreous hemorrhage, vitrectomy; n (%)	545 (0.4%)	86 (0.4%)		493 (0.3%)	72 (0.3%)		1,742 (0.4%)	199 (0.4%)		2,780 (0.4%)	357 (0.4%)	0.00
Retinal laser coagulation therapy; n (%)	788 (0.6%)	123 (0.6%)		860 (0.6%)	140 (0.7%)		2,635 (0.6%)	299 (0.7%)		4,283 (0.6%)	562 (0.7%)	-0.01
Occurrence of Diabetic Neuropathy ; n (%)	26,233 (19.1%)	4,774 (24.5%)		16,101 (11.2%)	3,065 (14.6%)		85,054 (18.7%)	10,489 (23.4%)		127,388 (17.3%)	18,328 (21.5%)	-0.11
Occurrence of diabetic nephropathy with ICD10 ; n (%)	24,423 (17.7%)	3,525 (18.1%)		10,351 (7.2%)	1,700 (8.1%)		51,602 (11.3%)	5,673 (12.7%)		86,376 (11.7%)	10,898 (12.8%)	-0.03
Hypoglycemia ; n (%)	4,226 (3.1%)	479 (2.5%)		4,131 (2.9%)	640 (3.0%)		16,613 (3.7%)	1,391 (3.1%)		24,970 (3.4%)	2,510 (2.9%)	0.03
Hyperglycemia; n (%)	5,948 (4.3%)	763 (3.9%)		4,259 (3.0%)	551 (2.6%)		22,441 (4.9%)	1,684 (3.8%)		32,648 (4.4%)	2,998 (3.5%)	0.05
Disorders of fluid electrolyte and acid-base balance; n (%)	13,161 (9.6%)	1,370 (7.0%)		9,325 (6.5%)	966 (4.6%)		54,745 (12.0%)	3,370 (7.5%)		77,231 (10.5%)	5,706 (6.7%)	0.14
Diabetic ketoacidosis; n (%)	154 (0.1%)	21 (0.1%)		131 (0.1%)	23 (0.1%)		600 (0.1%)	53 (0.1%)		885 (0.1%)	97 (0.1%)	0.00
Hyperosmolar hyperglycemic nonketotic syndrome (HONK); n (%)	771 (0.6%)	97 (0.5%)		554 (0.4%)	74 (0.4%)		2,583 (0.6%)	198 (0.4%)		3,908 (0.5%)	369 (0.4%)	0.01
Diabetes with peripheral circulatory disorders with ICD-10 ; n (%)	11,656 (8.5%)	1,552 (8.0%)		6,329 (4.4%)	895 (4.3%)		37,479 (8.2%)	3,252 (7.3%)		55,464 (7.5%)	5,699 (6.7%)	0.03
Diabetic Foot; n (%)	3,308 (2.4%)	511 (2.6%)		3,247 (2.3%)	499 (2.4%)		14,118 (3.1%)	1,392 (3.1%)		20,673 (2.8%)	2,402 (2.8%)	0.00
Gangrene ; n (%)	454 (0.3%)	52 (0.3%)		349 (0.2%)	34 (0.2%)		1,484 (0.3%)	86 (0.2%)		2,287 (0.3%)	172 (0.2%)	0.02

Table 1: Liraglutide vs DPP4i

Characteristic									
Lower extremity amputation; n (%)	902 (0.7%)	151 (0.8%)	457 (0.3%)	72 (0.3%)	3,083 (0.7%)	234 (0.5%)	4,442 (0.6%)	457 (0.5%)	0.01
Osteomyelitis; n (%)	868 (0.6%)	113 (0.6%)	820 (0.6%)	123 (0.6%)	3,123 (0.7%)	230 (0.5%)	4,811 (0.7%)	466 (0.5%)	0.03
Skin infections ; n (%)	7,852 (5.7%)	1,189 (6.1%)	8,388 (5.9%)	1,314 (6.2%)	34,416 (7.6%)	3,405 (7.6%)	50,656 (6.9%)	5,908 (6.9%)	0.00
Erectile dysfunction; n (%)	3,529 (2.6%)	598 (3.1%)	3,240 (2.3%)	533 (2.5%)	9,341 (2.1%)	1,329 (3.0%)	16,110 (2.2%)	2,460 (2.9%)	-0.04
Diabetes with unspecified complication; n (%)	7,318 (5.3%)	1,250 (6.4%)	5,581 (3.9%)	1,021 (4.9%)	22,683 (5.0%)	2,517 (5.6%)	35,582 (4.8%)	4,788 (5.6%)	-0.04
Diabetes mellitus without mention of complications; n (%)	123,499 (89.7%)	16,933 (87.0%)	135,666 (94.6%)	19,693 (93.6%)	431,062 (94.8%)	41,725 (93.2%)	690,227 (93.8%)	78,351 (91.9%)	0.07
Hypertension: 1 inpatient or 2 outpatient claims within 365 days; n (%)	131,194 (95.3%)	18,548 (95.3%)	126,524 (88.3%)	18,623 (88.5%)	440,639 (96.9%)	43,436 (97.0%)	698,357 (94.9%)	80,607 (94.5%)	0.02
Hyperlipidemia ; n (%)	107,176 (77.9%)	15,367 (79.0%)	96,564 (67.4%)	14,951 (71.1%)	366,495 (80.6%)	37,204 (83.1%)	570,235 (77.5%)	67,522 (79.2%)	-0.04
Edema; n (%)	11,564 (8.4%)	1,754 (9.0%)	8,574 (6.0%)	1,320 (6.3%)	51,918 (11.4%)	4,855 (10.8%)	72,056 (9.8%)	7,929 (9.3%)	0.02
Renal Dysfunction (non-diabetic) ; n (%)	38,064 (27.7%)	4,698 (24.1%)	25,130 (17.5%)	3,050 (14.5%)	122,954 (27.0%)	10,060 (22.5%)	186,148 (25.3%)	17,808 (20.9%)	0.10
Occurrence of acute renal disease ; n (%)	7,144 (5.2%)	626 (3.2%)	5,405 (3.8%)	390 (1.9%)	29,118 (6.4%)	1,432 (3.2%)	41,667 (5.7%)	2,448 (2.9%)	0.14
Occurrence of chronic renal insufficiency; n (%)	32,496 (23.6%)	4,049 (20.8%)	18,932 (13.2%)	2,380 (11.3%)	103,426 (22.7%)	8,660 (19.3%)	154,854 (21.0%)	15,089 (17.7%)	0.08
Chronic kidney disease ; n (%)	31,532 (22.9%)	3,938 (20.2%)	18,355 (12.8%)	2,295 (10.9%)	98,398 (21.6%)	8,194 (18.3%)	148,285 (20.2%)	14,427 (16.9%)	0.08
CKD Stage 3-4; n (%)	22,711 (16.5%)	2,899 (14.9%)	13,419 (9.4%)	1,727 (8.2%)	69,048 (15.2%)	5,916 (13.2%)	105,178 (14.3%)	10,542 (12.4%)	0.06
Occurrence of hypertensive nephropathy; n (%)	14,200 (10.3%)	1,746 (9.0%)	7,062 (4.9%)	877 (4.2%)	48,654 (10.7%)	3,522 (7.9%)	69,916 (9.5%)	6,145 (7.2%)	0.08
Occurrence of miscellaneous renal insufficiency ; n (%)	9,326 (6.8%)	1,025 (5.3%)	7,297 (5.1%)	794 (3.8%)	39,407 (8.7%)	2,911 (6.5%)	56,030 (7.6%)	4,730 (5.5%)	0.08
Glaucoma or cataracts ; n (%)	31,519 (22.9%)	4,099 (21.1%)	27,054 (18.9%)	3,736 (17.8%)	125,334 (27.6%)	12,591 (28.1%)	183,907 (25.0%)	20,426 (24.0%)	0.02
Cellulitis or abscess of toe; n (%)	1,938 (1.4%)	309 (1.6%)	1,442 (1.0%)	215 (1.0%)	7,035 (1.5%)	672 (1.5%)	10,415 (1.4%)	1,196 (1.4%)	0.00
Foot ulcer; n (%)	3,246 (2.4%)	492 (2.5%)	3,305 (2.3%)	501 (2.4%)	14,168 (3.1%)	1,370 (3.1%)	20,719 (2.8%)	2,363 (2.8%)	0.00
Bladder stones; n (%)	206 (0.1%)	14 (0.1%)	179 (0.1%)	22 (0.1%)	782 (0.2%)	73 (0.2%)	1,167 (0.2%)	109 (0.1%)	0.03
Kidney stones; n (%)	3,106 (2.3%)	470 (2.4%)	3,373 (2.4%)	521 (2.5%)	12,208 (2.7%)	1,306 (2.9%)	18,687 (2.5%)	2,297 (2.7%)	-0.01
Urinary tract infections (UTIs); n (%)	14,737 (10.7%)	1,747 (9.0%)	10,494 (7.3%)	1,378 (6.5%)	72,585 (16.0%)	5,522 (12.3%)	97,816 (13.3%)	8,647 (10.1%)	0.10
Dipstick urinalysis; n (%)	53,139 (38.6%)	7,035 (36.2%)	46,136 (32.2%)	6,828 (32.5%)	195,617 (43.0%)	17,919 (40.0%)	294,892 (40.1%)	31,782 (37.3%)	0.06
Non-dipstick urinalysis; n (%)	59,310 (43.1%)	8,756 (45.0%)	43,231 (30.2%)	7,574 (36.0%)	186,851 (41.1%)	20,869 (46.6%)	289,392 (39.3%)	37,199 (43.6%)	-0.09
Urine function test; n (%)	3,515 (2.6%)	470 (2.4%)	3,953 (2.8%)	508 (2.4%)	15,791 (3.5%)	1,537 (3.4%)	23,259 (3.2%)	2,515 (2.9%)	0.02
Cytology; n (%)	1,262 (0.9%)	129 (0.7%)	1,590 (1.1%)	181 (0.9%)	5,167 (1.1%)	408 (0.9%)	8,019 (1.1%)	718 (0.8%)	0.03
Cystos; n (%)	1,614 (1.2%)	241 (1.2%)	1,968 (1.4%)	261 (1.2%)	6,557 (1.4%)	662 (1.5%)	10,139 (1.4%)	1,164 (1.4%)	0.00
Other Covariates									
Liver disease; n (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	#VALUE!	000 (0.0%)	#VALUE!
Osteoarthritis; n (%)	24,718 (18.0%)	3,864 (19.9%)	19,572 (13.7%)	3,249 (15.4%)	113,591 (25.0%)	11,128 (24.9%)	157,881 (21.5%)	18,241 (21.4%)	0.00
Other arthritis, arthropathies and musculoskeletal pain; n (%)	51,843 (37.7%)	7,843 (40.3%)	48,371 (33.7%)	7,762 (36.9%)	213,921 (47.0%)	21,204 (47.4%)	314,135 (42.7%)	36,809 (43.2%)	-0.01
Dorsopathies; n (%)	29,810 (21.7%)	5,119 (26.3%)	26,948 (18.8%)	4,549 (21.6%)	122,994 (27.0%)	13,499 (30.1%)	179,752 (24.4%)	23,167 (27.2%)	-0.06
Fractures; n (%)	4,494 (3.3%)	551 (2.8%)	4,287 (3.0%)	536 (2.5%)	20,423 (4.5%)	1,579 (3.5%)	29,204 (4.0%)	2,666 (3.1%)	0.05
Falls ; n (%)	5,598 (4.1%)	619 (3.2%)	1,915 (1.3%)	186 (0.9%)	24,100 (5.3%)	1,497 (3.3%)	31,613 (4.3%)	2,302 (2.7%)	0.09
Osteoporosis; n (%)	8,985 (6.5%)	791 (4.1%)	5,336 (3.7%)	613 (2.9%)	45,290 (10.0%)	2,896 (6.5%)	59,611 (8.1%)	4,300 (5.0%)	0.13
Hyperthyroidism; n (%)	1,099 (0.8%)	129 (0.7%)	819 (0.6%)	109 (0.5%)	4,909 (1.1%)	417 (0.9%)	6,827 (0.9%)	655 (0.8%)	0.01
Hypothyroidism ; n (%)	22,924 (16.7%)	3,807 (19.6%)	16,633 (11.6%)	3,024 (14.4%)	73,337 (16.1%)	7,801 (17.4%)	112,894 (15.3%)	14,632 (17.2%)	-0.05
Other disorders of thyroid gland ; n (%)	5,049 (3.7%)	994 (5.1%)	4,703 (3.3%)	1,015 (4.8%)	20,113 (4.4%)	2,618 (5.8%)	29,865 (4.1%)	4,627 (5.4%)	-0.06
Depression; n (%)	11,373 (8.3%)	2,024 (10.4%)	8,745 (6.1%)	1,648 (7.8%)	52,459 (11.5%)	5,355 (12.0%)	72,577 (9.9%)	9,027 (10.6%)	-0.02
Anxiety; n (%)	9,539 (6.9%)	1,739 (8.9%)	6,316 (4.4%)	1,089 (5.2%)	40,669 (8.9%)	3,761 (8.4%)	56,524 (7.7%)	6,589 (7.7%)	0.00
Sleep_Disorder; n (%)	9,838 (7.1%)	2,106 (10.8%)	14,014 (9.8%)	3,538 (16.8%)	39,861 (8.8%)	5,970 (13.3%)	63,713 (8.7%)	11,614 (13.6%)	-0.16
Dementia; n (%)	7,136 (5.2%)	406 (2.1%)	4,259 (3.0%)	213 (1.0%)	43,046 (9.5%)	1,485 (3.3%)	54,441 (7.4%)	2,104 (2.5%)	0.23
Delirium; n (%)	2,267 (1.6%)	146 (0.8%)	1,699 (1.2%)	93 (0.4%)	13,093 (2.9%)	487 (1.1%)	17,059 (2.3%)	726 (0.9%)	0.11
Psychosis; n (%)	1,770 (1.3%)	132 (0.7%)	1,328 (0.9%)	80 (0.4%)	12,498 (2.7%)	410 (0.9%)	15,596 (2.1%)	622 (0.7%)	0.12
Obesity; n (%)	24,341 (17.7%)	6,527 (33.5%)	16,530 (11.5%)	4,589 (21.8%)	63,951 (14.0%)	11,795 (26.3%)	104,462 (14.2%)	22,911 (26.9%)	-0.32
Overweight; n (%)	7,251 (5.3%)	839 (4.3%)	2,562 (1.8%)	362 (1.7%)	15,407 (3.4%)	1,228 (2.7%)	25,220 (3.4%)	2,429 (2.8%)	0.03
Smoking; n (%)	14,135 (10.3%)	2,261 (11.6%)	7,307 (5.1%)	980 (4.7%)	55,934 (12.3%)	5,420 (12.1%)	77,376 (10.5%)	8,661 (10.2%)	0.01
Alcohol abuse or dependence; n (%)	870 (0.6%)	86 (0.4%)	555 (0.4%)	59 (0.3%)	2,506 (0.6%)	159 (0.4%)	3,931 (0.5%)	304 (0.4%)	0.01
Drug abuse or dependence; n (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	#VALUE!	00 (0.0%)	#VALUE!
COPD; n (%)	14,198 (10.3%)	1,973 (10.1%)	10,318 (7.2%)	1,275 (6.1%)	56,882 (12.5%)	4,948 (11.1%)	81,398 (11.1%)	8,196 (9.6%)	0.05
Asthma; n (%)	7,979 (5.8%)	1,423 (7.3%)	6,641 (4.6%)	1,245 (5.9%)	30,514 (6.7%)	3,532 (7.9%)	45,134 (6.1%)	6,200 (7.3%)	-0.05
Obstructive sleep apnea; n (%)	11,663 (8.5%)	3,609 (18.5%)	13,366 (9.3%)	3,712 (17.6%)	29,991 (6.6%)	6,268 (14.0%)	55,020 (7.5%)	13,589 (15.9%)	-0.26
Pneumonia; n (%)	4,591 (3.3%)	441 (2.3%)	4,180 (2.9%)	411 (2.0%)	20,756 (4.6%)	1,181 (2.6%)	29,527 (4.0%)	2,033 (2.4%)	0.09
Imaging; n (%)	241 (0.2%)	26 (0.1%)	159 (0.1%)	15 (0.1%)	1,166 (0.3%)	50 (0.1%)	1,566 (0.2%)	91 (0.1%)	0.03
Diabetes Medications									
DM Medications - AGIs; n (%)	786 (0.6%)	99 (0.5%)	633 (0.4%)	81 (0.4%)	2,985 (0.7%)	256 (0.6%)	4,404 (0.6%)	436 (0.5%)	0.01
DM Medications - Glitazones; n (%)	16,871 (12.3%)	2,269 (11.7%)	22,209 (15.5%)	3,302 (15.7%)	45,631 (10.0%)	4,744 (10.6%)	84,711 (11.5%)	10,315 (12.1%)	-0.02
DM Medications - Insulin; n (%)	8,831 (6.4%)	3,535 (18.2%)	8,235 (5.7%)	3,628 (17.2%)	34,893 (7.7%)	8,976 (20.0%)	51,959 (7.1%)	16,139 (18.9%)	-0.36
DM Medications - Meglitinides; n (%)	1,810 (1.3%)	216 (1.1%)	2,892 (2.0%)	362 (1.7%)	9,363 (2.1%)	694 (1.5%)	14,065 (1.9%)	1,272 (1.5%)	0.03
DM Medications - Metformin; n (%)	96,324 (70.0%)	12,338 (63.4%)	102,745 (71.7%)	13,977 (66.4%)	309,951 (68.2%)	29,057 (64.9%)	509,020 (69.2%)	55,372 (64.9%)	0.09
Concomitant initiation or current use of SGLT2i; n (%)	3,835 (2.8%)	1,082 (5.6%)	3,828 (2.7%)	1,012 (4.8%)	7,655 (1.7%)	1,707 (3.8%)	15,318 (2.1%)	3,801 (4.5%)	-0.13
Concomitant initiation or current use of AGIs; n (%)	545 (0.4%)	67 (0.3%)	447 (0.3%)	48 (0.2%)	2,115 (0.5%)	174 (0.4%)	3,107 (0.4%)	289 (0.3%)	0.02
Concomitant initiation or current use of Glitazones; n (%)	10,920 (7.9%)	1,656 (8.5%)	14,399 (10.0%)	2,407 (11.4%)	30,752 (6.8%)	3,542 (7.9%)	56,071 (7.6%)	7,605 (8.9%)	-0.05
Concomitant initiation or current use of 2nd Generation SUs; n (%)	51,739 (37.6%)	5,743 (29.5%)	49,362 (34.4%)	6,207 (29.5%)	174,253 (38.3%)	14,795 (33.0%)	275,354 (37.4%)	26,745 (31.4%)	0.13
Concomitant initiation or current use of Insulin; n (%)	4,972 (3.6%)	2,133 (11.0%)	4,622 (3.2%)	2,182 (10.4%)	19,944 (4.4%)	5,427 (12.1%)	29,538 (4.0%)	9,742 (11.4%)	-0.28
Concomitant initiation or current use of Meglitinides; n (%)	1,297 (0.9%)	137 (0.7%)	2,114 (1.5%)	252 (1.2%)	6,897 (1.5%)	472 (1.1%)	10,308 (1.4%)	861 (1.0%)	0.04
Concomitant initiation or current use of Metformin; n (%)	81,351 (59.1%)	10,014 (51.5%)	87,805 (61.3%)	11,257 (53.5%)	260,323 (57.3%)	23,718 (53.0%)	429,479 (58.4%)	44,989 (52.8%)	0.11
Past use of SGLT2i ; n (%)	1,518 (1.1%)	416 (2.1%)	1,114 (0.8%)	357 (1.7%)	3,164 (0.7%)	758 (1.7%)	5,796 (0.8%)	1,531 (1.8%)	-0.09
Past use of AGIs ; n (%)	241 (0.2%)	32 (0.2%)	186 (0.1%)	33 (0.2%)	870 (0.2%)	82 (0.2%)	1,297 (0.2%)	147 (0.2%)	0.00
Past use of Glitazones ; n (%)	5,951 (4.3%)	613 (3.2%)	7,810 (5.4%)	895 (4.3%)	14,879 (3.3%)	1,202 (2.7%)	28,640 (3.9%)	2,710 (3.2%)	0.04

Table 1: Liraglutide vs DPP4i

Past use of 2nd Generation SUs; n (%)	11,899 (8.6%)	1,526 (7.8%)		11,721 (8.2%)	1,708 (8.1%)		39,000 (8.6%)	3,849 (8.6%)		62,620 (8.5%)	7,083 (8.3%)	0.01
Past use of Insulin ; n (%)	3,859 (2.8%)	1,402 (7.2%)		3,613 (2.5%)	1,446 (6.9%)		14,951 (3.3%)	3,549 (7.9%)		22,423 (3.0%)	6,397 (7.5%)	-0.20
Past use of Meglitinides ; n (%)	513 (0.4%)	79 (0.4%)		778 (0.5%)	110 (0.5%)		2,466 (0.5%)	222 (0.5%)		3,757 (0.5%)	411 (0.5%)	0.00
Past use of metformin (final) ; n (%)	14,973 (10.9%)	2,324 (11.9%)		14,940 (10.4%)	2,720 (12.9%)		49,628 (10.9%)	5,339 (11.9%)		79,541 (10.8%)	10,383 (12.2%)	-0.04
Other Medications												
Use of ACE inhibitors; n (%)	64,855 (47.1%)	8,724 (44.8%)		66,162 (46.2%)	9,336 (44.4%)		205,264 (45.1%)	19,889 (44.4%)		336,281 (45.7%)	37,949 (44.5%)	0.02
Use of ARBs; n (%)	43,355 (31.5%)	6,562 (33.7%)		47,088 (32.9%)	7,639 (36.3%)		151,976 (33.4%)	15,859 (35.4%)		242,419 (33.0%)	30,060 (35.2%)	-0.05
Use of Loop Diuretics - United; n (%)	22,407 (16.3%)	3,599 (18.5%)		22,391 (15.6%)	3,594 (17.1%)		98,566 (21.7%)	9,891 (22.1%)		143,364 (19.5%)	17,084 (20.0%)	-0.01
Use of other diuretics- United; n (%)	4,749 (3.5%)	912 (4.7%)		5,277 (3.7%)	970 (4.6%)		18,328 (4.0%)	2,185 (4.9%)		28,354 (3.9%)	4,067 (4.8%)	-0.04
Use of nitrates-United; n (%)	9,362 (6.8%)	1,414 (7.3%)		11,234 (7.8%)	1,585 (7.5%)		40,868 (9.0%)	3,563 (8.0%)		61,464 (8.4%)	6,562 (7.7%)	0.03
Use of other hypertension drugs; n (%)	12,044 (8.7%)	1,520 (7.8%)		11,547 (8.1%)	1,498 (7.1%)		44,046 (9.7%)	3,845 (8.6%)		67,637 (9.2%)	6,863 (8.0%)	0.04
Use of digoxin- United; n (%)	3,440 (2.5%)	325 (1.7%)		4,412 (3.1%)	397 (1.9%)		17,606 (3.9%)	1,026 (2.3%)		25,458 (3.5%)	1,748 (2.0%)	0.09
Use of Anti-arrhythmics; n (%)	2,573 (1.9%)	343 (1.8%)		3,016 (2.1%)	359 (1.7%)		11,844 (2.6%)	978 (2.2%)		17,433 (2.4%)	1,680 (2.0%)	0.03
Use of COPD/asthma meds- United; n (%)	21,727 (15.8%)	3,388 (17.4%)		22,229 (15.5%)	3,787 (18.0%)		83,884 (18.4%)	8,641 (19.3%)		127,840 (17.4%)	15,816 (18.5%)	-0.03
Use of statins; n (%)	98,588 (71.6%)	14,035 (72.1%)		100,854 (70.4%)	15,110 (71.8%)		328,079 (72.2%)	32,658 (72.9%)		527,521 (71.7%)	61,803 (72.5%)	-0.02
Use of other lipid-lowering drugs; n (%)	17,895 (13.0%)	2,774 (14.3%)		23,475 (16.4%)	3,929 (18.7%)		60,974 (13.4%)	6,846 (15.3%)		102,344 (13.9%)	13,549 (15.9%)	-0.06
Use of antiplatelet agents; n (%)	20,986 (15.2%)	3,009 (15.5%)		27,448 (19.1%)	4,060 (19.3%)		79,242 (17.4%)	7,048 (15.7%)		127,676 (17.4%)	14,117 (16.6%)	0.02
Use of oral anticoagulants (Dabigatran, Rivaroxaban, Apixaban, Warfarin); n (%)	10,989 (8.0%)	1,483 (7.6%)		11,524 (8.0%)	1,393 (6.6%)		49,547 (10.9%)	4,301 (9.6%)		72,060 (9.8%)	7,177 (8.4%)	0.05
Use of heparin and other low-molecular weight heparins; n (%)	670 (0.5%)	109 (0.6%)		47 (0.0%)	1 (0.0%)		2,464 (0.5%)	208 (0.5%)		3,181 (0.4%)	318 (0.4%)	0.00
Use of NSAIDs; n (%)	21,041 (15.3%)	3,463 (17.8%)		21,453 (15.0%)	3,650 (17.3%)		78,824 (17.3%)	8,045 (18.0%)		121,318 (16.5%)	15,158 (17.8%)	-0.03
Use of oral corticosteroids; n (%)	21,735 (15.8%)	3,298 (16.9%)		22,026 (15.4%)	3,318 (15.8%)		83,442 (18.4%)	8,085 (18.1%)		127,203 (17.3%)	14,701 (17.2%)	0.00
Use of bisphosphonate (United); n (%)	4,679 (3.4%)	350 (1.8%)		3,102 (2.2%)	310 (1.5%)		20,383 (4.5%)	1,052 (2.3%)		28,164 (3.8%)	1,712 (2.0%)	0.11
Use of opioids- United; n (%)	32,642 (23.7%)	5,647 (29.0%)		35,653 (24.9%)	6,129 (29.1%)		117,214 (25.8%)	13,198 (29.5%)		185,509 (25.2%)	24,974 (29.3%)	-0.09
Use of antidepressants; n (%)	30,300 (22.0%)	6,060 (31.1%)		29,496 (20.6%)	6,202 (29.5%)		116,636 (25.7%)	14,399 (32.2%)		176,432 (24.0%)	26,661 (31.3%)	-0.16
Use of antipsychotics; n (%)	3,211 (2.3%)	453 (2.3%)		2,529 (1.8%)	370 (1.8%)		17,910 (3.9%)	1,052 (2.3%)		23,650 (3.2%)	1,875 (2.2%)	0.06
Use of anticonvulsants; n (%)	20,811 (15.1%)	4,095 (21.0%)		16,587 (11.6%)	3,194 (15.2%)		78,878 (17.3%)	8,935 (20.0%)		116,276 (15.8%)	16,224 (19.0%)	-0.08
Use of lithium- United; n (%)	152 (0.1%)	22 (0.1%)		153 (0.1%)	27 (0.1%)		574 (0.1%)	55 (0.1%)		879 (0.1%)	104 (0.1%)	0.00
Use of Benzos- United; n (%)	11,760 (8.5%)	2,281 (11.7%)		14,941 (10.4%)	2,594 (12.3%)		45,770 (10.1%)	4,990 (11.1%)		72,471 (9.9%)	9,865 (11.6%)	-0.05
Use of anxiolytics/hypnotics- United; n (%)	7,916 (5.8%)	1,425 (7.3%)		9,470 (6.6%)	1,735 (8.2%)		31,510 (6.9%)	3,415 (7.6%)		48,896 (6.6%)	6,575 (7.7%)	-0.04
Use of dementia meds- United; n (%)	4,155 (3.0%)	205 (1.1%)		3,015 (2.1%)	147 (0.7%)		27,566 (6.1%)	918 (2.1%)		34,736 (4.7%)	1,270 (1.5%)	0.19
Use of antiparkinsonian meds- United; n (%)	3,405 (2.5%)	689 (3.5%)		3,131 (2.2%)	651 (3.1%)		15,911 (3.5%)	1,828 (4.1%)		22,447 (3.1%)	3,168 (3.7%)	-0.03
Any use of pramlintide; n (%)	5 (0.0%)	5 (0.0%)		17 (0.0%)	30 (0.1%)		18 (0.0%)	19 (0.0%)		040 (0.0%)	054 (0.1%)	-0.04
Any use of 1st generation sulfonylureas; n (%)	26 (0.0%)	0 (0.0%)		35 (0.0%)	1 (0.0%)		**	**		**	**	**
Entresto (sacubitril/valsartan); n (%)	216 (0.2%)	49 (0.3%)		65 (0.0%)	13 (0.1%)		267 (0.1%)	27 (0.1%)		548 (0.1%)	089 (0.1%)	0.00
Initiation as monotherapy ; n (%)	15,454 (11.2%)	0 (0.0%)		15,217 (10.6%)	0 (0.0%)		42,437 (9.3%)	0 (0.0%)		73,108 (9.9%)	#VALUE!	#VALUE!
Labs												
Lab values-HbA1c (%) ; n (%)	50,437 (36.6%)	7,316 (37.6%)		8,493 (5.9%)	1,188 (5.6%)		N/A	N/A		58,930 (21.0%)	8,504 (21.0%)	0.00
Lab values-HbA1c (%) (within 3 months) ; n (%)	39,878 (29.0%)	5,615 (28.9%)		6,736 (4.7%)	933 (4.4%)		N/A	N/A		46,614 (16.6%)	6,548 (16.2%)	0.01
Lab values-HbA1c (%) (within 6 months) ; n (%)	50,437 (36.6%)	7,316 (37.6%)		8,493 (5.9%)	1,188 (5.6%)		N/A	N/A		58,930 (21.0%)	8,504 (21.0%)	0.00
Lab values-BNP; n (%)	1,367 (1.0%)	208 (1.1%)		207 (0.1%)	35 (0.2%)		N/A	N/A		1,574 (0.6%)	243 (0.6%)	0.00
Lab values-BNP (within 3 months); n (%)	859 (0.6%)	122 (0.6%)		133 (0.1%)	28 (0.1%)		N/A	N/A		992 (0.4%)	150 (0.4%)	0.00
Lab values-BNP (within 6 months); n (%)	1,367 (1.0%)	208 (1.1%)		207 (0.1%)	35 (0.2%)		N/A	N/A		1,574 (0.6%)	243 (0.6%)	0.00
Lab values-BUN (mg/dl); n (%)	51,823 (37.6%)	7,494 (38.5%)		8,517 (5.9%)	1,204 (5.7%)		N/A	N/A		60,340 (21.5%)	8,698 (21.5%)	0.00
Lab values-BUN (mg/dl) (within 3 months); n (%)	40,495 (29.4%)	5,663 (29.1%)		6,596 (4.6%)	918 (4.4%)		N/A	N/A		47,091 (16.8%)	6,581 (16.2%)	0.02
Lab values-BUN (mg/dl) (within 6 months); n (%)	51,823 (37.6%)	7,494 (38.5%)		8,517 (5.9%)	1,204 (5.7%)		N/A	N/A		60,340 (21.5%)	8,698 (21.5%)	0.00
Lab values- Creatinine (mg/dl) ; n (%)	53,070 (38.6%)	7,701 (39.6%)		8,888 (6.2%)	1,253 (6.0%)		N/A	N/A		61,958 (22.1%)	8,954 (22.1%)	0.00
Lab values- Creatinine (mg/dl) (within 3 months) ; n (%)	41,526 (30.2%)	5,821 (29.9%)		6,892 (4.8%)	950 (4.5%)		N/A	N/A		48,418 (17.2%)	6,771 (16.7%)	0.01
Lab values- Creatinine (mg/dl) (within 6 months) ; n (%)	53,070 (38.6%)	7,701 (39.6%)		8,888 (6.2%)	1,253 (6.0%)		N/A	N/A		61,958 (22.1%)	8,954 (22.1%)	0.00
Lab values- HDL level (mg/dl); n (%)	43,367 (31.5%)	6,185 (31.8%)		7,438 (5.2%)	1,046 (5.0%)		N/A	N/A		50,805 (18.1%)	7,231 (17.9%)	0.01
Lab values- HDL level (mg/dl) (within 3 months); n (%)	31,824 (23.1%)	4,395 (22.6%)		5,475 (3.8%)	765 (3.6%)		N/A	N/A		37,299 (13.3%)	5,160 (12.7%)	0.02
Lab values- HDL level (mg/dl) (within 6 months); n (%)	43,367 (31.5%)	6,185 (31.8%)		7,438 (5.2%)	1,046 (5.0%)		N/A	N/A		50,805 (18.1%)	7,231 (17.9%)	0.01
Lab values- LDL level (mg/dl) ; n (%)	44,416 (32.3%)	6,396 (32.9%)		7,816 (5.5%)	1,106 (5.3%)		N/A	N/A		52,232 (18.6%)	7,502 (18.5%)	0.00
Lab values- LDL level (mg/dl) (within 3 months) ; n (%)	32,596 (23.7%)	4,554 (23.4%)		5,755 (4.0%)	803 (3.8%)		N/A	N/A		38,351 (13.6%)	5,357 (13.2%)	0.01
Lab values- LDL level (mg/dl) (within 6 months) ; n (%)	44,416 (32.3%)	6,396 (32.9%)		7,816 (5.5%)	1,106 (5.3%)		N/A	N/A		52,232 (18.6%)	7,502 (18.5%)	0.00
Lab values- NT-proBNP; n (%)	203 (0.1%)	36 (0.2%)		20 (0.0%)	3 (0.0%)		N/A	N/A		223 (0.1%)	39 (0.1%)	0.00
Lab values- NT-proBNP (within 3 months); n (%)	125 (0.1%)	23 (0.1%)		14 (0.0%)	1 (0.0%)		N/A	N/A		139 (0.0%)	24 (0.1%)	-
Lab values- NT-proBNP (within 6 months); n (%)	203 (0.1%)	36 (0.2%)		20 (0.0%)	3 (0.0%)		N/A	N/A		223 (0.1%)	39 (0.1%)	-
Lab values- Total cholesterol (mg/dl) ; n (%)	43,827 (31.8%)	6,311 (32.4%)		7,593 (5.3%)	1,060 (5.0%)		N/A	N/A		51,420 (18.3%)	7,371 (18.2%)	0.00
Lab values- Total cholesterol (mg/dl) (within 3 months) ; n (%)	32,199 (23.4%)	4,492 (23.1%)		5,597 (3.9%)	775 (3.7%)		N/A	N/A		37,796 (13.5%)	5,267 (13.0%)	0.01
Lab values- Total cholesterol (mg/dl) (within 6 months) ; n (%)	43,827 (31.8%)	6,311 (32.4%)		7,593 (5.3%)	1,060 (5.0%)		N/A	N/A		51,420 (18.3%)	7,371 (18.2%)	0.00
Lab values- Triglyceride level (mg/dl); n (%)	43,538 (31.6%)	6,253 (32.1%)		7,502 (5.2%)	1,041 (4.9%)		N/A	N/A		51,040 (18.2%)	7,294 (18.0%)	0.01
Lab values- Triglyceride level (mg/dl) (within 3 months); n (%)	31,997 (23.2%)	4,455 (22.9%)		5,533 (3.9%)	761 (3.6%)		N/A	N/A		37,530 (13.4%)	5,216 (12.9%)	0.01
Lab values- Triglyceride level (mg/dl) (within 6 months); n (%)	43,538 (31.6%)	6,253 (32.1%)		7,502 (5.2%)	1,041 (4.9%)		N/A	N/A		51,040 (18.2%)	7,294 (18.0%)	0.01
Lab result number- HbA1c (%) mean (only 2 to 20 included)	50,233	7,279		8,105	1,124		N/A	N/A		58,338	8,403	
…mean (sd)	7.95 (1.60)	8.04 (1.73)	-0.05	7.97 (1.62)	8.03 (1.73)	-0.04	N/A	N/A	#VALUE!	7.95 (1.60)	8.04 (1.73)	-0.05
…median [IQR]	7.60 [6.90, 8.65]	7.70 [6.80, 8.95]	-0.06	7.60 [6.90, 8.70]	7.75 [6.80, 8.95]	-0.09	N/A	N/A	#VALUE!	7.60 (1.60)	7.71 (1.73)	-0.07
…Missing; n (%)	87,416 (63.5%)	12,181 (62.6%)	0.02	135,232 (94.3%)	19,917 (94.7%)	-0.02	N/A	N/A	#VALUE!	222,648 (79.2%)	32,098 (79.3%)	0.00

Table 1: Liraglutide vs DPP4i

Lab result number- BNP mean	1,367	208		207	35		N/A	N/A		1,574	243	
...mean (sd)	202.08 (359.17)	111.51 (209.59)	0.31	1,686.84 (19,478.97)	103.76 (169.94)	0.11	N/A	N/A	#VALUE!	397.34 (7061.56)	110.39 (204.89)	0.06
...median [IQR]	88.65 [33.40, 217.10]	43.85 [20.85, 111.38]	0.15	93.00 [34.00, 253.00]	45.70 [17.00, 124.00]	0.00	N/A	N/A	#VALUE!	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	136,282 (99.0%)	19,252 (98.9%)	0.01	143,130 (99.9%)	21,006 (99.8%)	0.03	N/A	N/A	#VALUE!	279,412 (99.4%)	40,258 (99.4%)	0.00
Lab result number- BUN (mg/dl) mean	51,823	7,494		8,517	1,204		N/A	N/A		60,340	8,698	
...mean (sd)	19.96 (8.65)	19.56 (8.25)	0.05	296.19 (6,635.25)	675.16 (11,808.66)	-0.04	N/A	N/A	#VALUE!	58.95 (2492.79)	110.31 (4392.37)	-0.01
...median [IQR]	18.00 [14.00, 23.00]	18.00 [14.00, 23.00]	0.00	17.50 [14.00, 22.00]	18.00 [14.31, 22.00]	0.00	N/A	N/A	#VALUE!	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	85,826 (62.4%)	11,966 (61.5%)	0.02	134,820 (94.1%)	19,837 (94.3%)	-0.01	N/A	N/A	#VALUE!	220,646 (78.5%)	31,803 (78.5%)	0.00
Lab result number- Creatinine (mg/dl) mean (only 0.1 to 15 included)	52,715	7,656		8,281	1,142		N/A	N/A		60,996	8,798	
...mean (sd)	1.08 (0.42)	1.04 (0.37)	0.10	1.06 (0.41)	1.01 (0.32)	0.14	N/A	N/A	#VALUE!	1.08 (0.42)	1.04 (0.36)	0.10
...median [IQR]	0.99 [0.82, 1.25]	0.97 [0.80, 1.20]	0.05	0.99 [0.82, 1.18]	0.97 [0.80, 1.14]	0.05	N/A	N/A	#VALUE!	0.99 (0.42)	0.97 (0.36)	0.05
...Missing; n (%)	84,934 (61.7%)	11,804 (60.7%)	0.02	135,056 (94.2%)	19,899 (94.6%)	-0.02	N/A	N/A	#VALUE!	219,990 (78.3%)	31,703 (78.3%)	0.05
Lab result number- HDL level (mg/dl) mean (only =<5000 included)	43,367	6,185		7,424	1,042		N/A	N/A		50,791	7,227	
...mean (sd)	47.10 (13.82)	45.86 (13.11)	0.09	45.00 (14.90)	44.44 (13.95)	0.04	N/A	N/A	#VALUE!	46.79 (13.98)	45.66 (13.24)	0.08
...median [IQR]	45.00 [38.00, 54.00]	44.00 [37.00, 53.00]	0.07	43.50 [36.00, 52.00]	43.00 [36.00, 52.00]	0.03	N/A	N/A	#VALUE!	44.78 (13.98)	43.86 (13.24)	0.07
...Missing; n (%)	94,282 (68.5%)	13,275 (68.2%)	0.01	135,913 (94.8%)	19,999 (95.0%)	-0.01	N/A	N/A	#VALUE!	230,195 (81.9%)	33,274 (82.2%)	-0.01
Lab result number- LDL level (mg/dl) mean (only =<5000 included)	43,555	6,264		7,261	970		N/A	N/A		50,816	7,234	
...mean (sd)	84.65 (36.88)	82.02 (37.07)	0.07	85.59 (39.45)	83.80 (40.29)	0.04	N/A	N/A	#VALUE!	84.78 (37.26)	82.26 (37.52)	0.07
...median [IQR]	81.00 [62.00, 105.00]	79.00 [60.00, 102.00]	0.05	83.00 [63.00, 108.00]	83.83 [62.00, 106.00]	-0.02	N/A	N/A	#VALUE!	81.29 (37.26)	79.65 (37.52)	0.04
...Missing; n (%)	94,094 (68.4%)	13,196 (67.8%)	0.01	136,076 (94.9%)	20,071 (95.4%)	-0.02	N/A	N/A	#VALUE!	230,170 (81.9%)	33,267 (82.1%)	-0.01
Lab result number- Total cholesterol (mg/dl) mean (only =<5000 included)	43,788	6,307		7,574	1,055		N/A	N/A		51,362	7,362	
...mean (sd)	168.90 (43.18)	167.72 (42.61)	0.03	169.13 (49.20)	170.60 (48.43)	-0.03	N/A	N/A	#VALUE!	168.93 (44.12)	168.13 (43.49)	0.02
...median [IQR]	163.00 [140.00, 192.00]	162.00 [139.00, 191.00]	0.02	165.50 [141.00, 195.00]	166.00 [143.00, 196.00]	-0.01	N/A	N/A	#VALUE!	163.37 (44.12)	162.57 (43.49)	0.02
...Missing; n (%)	93,861 (68.2%)	13,153 (67.6%)	0.01	135,763 (94.7%)	19,986 (95.0%)	-0.01	N/A	N/A	#VALUE!	229,624 (81.7%)	33,139 (81.8%)	0.00
Lab result number- Triglyceride level (mg/dl) mean (only =<5000 included)	43,537	6,253		7,487	1,037		N/A	N/A		51,024	7,290	
...mean (sd)	174.08 (126.30)	184.98 (134.65)	-0.08	177.97 (145.09)	188.26 (149.15)	-0.07	N/A	N/A	#VALUE!	174.65 (129.23)	185.45 (136.81)	-0.08
...median [IQR]	147.00 [106.00, 207.00]	155.00 [112.00, 218.25]	-0.06	147.00 [104.00, 211.00]	155.00 [108.75, 222.50]	-0.05	N/A	N/A	#VALUE!	147.00 (129.23)	155.00 (136.81)	-0.06
...Missing; n (%)	94,112 (68.4%)	13,207 (67.9%)	0.01	135,850 (94.8%)	20,004 (95.1%)	-0.01	N/A	N/A	#VALUE!	229,962 (81.8%)	33,211 (82.0%)	-0.01
Lab result number- Hemoglobin mean (only >0 included)	37,026	5,160		5,743	800		N/A	N/A		42,769	5,960	
...mean (sd)	13.23 (1.68)	13.43 (1.61)	-0.12	6,480.13 (237,920.16)	13.29 (2.45)	0.04	N/A	N/A	#VALUE!	881.60 (87179.33)	13.41 (1.75)	0.01
...median [IQR]	13.30 [12.10, 14.40]	13.40 [12.40, 14.50]	-0.06	13.43 [12.30, 14.60]	13.45 [12.40, 14.70]	0.00	N/A	N/A	#VALUE!	#VALUE!	13.41 (1.75)	#VALUE!
...Missing; n (%)	100,623 (73.1%)	14,300 (73.5%)	-0.01	137,594 (96.0%)	20,241 (96.2%)	-0.01	N/A	N/A	#VALUE!	238,217 (84.8%)	34,541 (85.3%)	-0.01
Lab result number- Serum sodium mean (only > 90 and < 190 included)	51,647	7,503		8,075	1,118		N/A	N/A		59,722	8,621	
...mean (sd)	139.46 (2.75)	139.63 (2.63)	-0.06	139.06 (2.61)	139.07 (2.53)	0.00	N/A	N/A	#VALUE!	139.41 (2.73)	139.56 (2.62)	-0.06
...median [IQR]	139.67 [138.00, 141.00]	140.00 [138.00, 141.33]	-0.12	139.00 [137.50, 141.00]	139.00 [137.50, 141.00]	0.00	N/A	N/A	#VALUE!	139.58 (2.73)	139.87 (2.62)	-0.11
...Missing; n (%)	86,002 (62.5%)	11,957 (61.4%)	0.02	135,262 (94.4%)	19,923 (94.7%)	-0.01	N/A	N/A	#VALUE!	221,264 (78.7%)	31,880 (78.7%)	0.00
Lab result number- Albumin mean (only >0 and <=10 included)	48,037	6,977		7,159	1,043		N/A	N/A		55,196	8,020	
...mean (sd)	4.23 (0.32)	4.22 (0.31)	0.03	4.15 (0.61)	4.10 (0.69)	0.08	N/A	N/A	#VALUE!	4.22 (0.37)	4.20 (0.38)	0.05
...median [IQR]	4.25 [4.03, 4.40]	4.20 [4.00, 4.40]	0.16	4.20 [4.00, 4.43]	4.20 [4.00, 4.40]	0.00	N/A	N/A	#VALUE!	4.24 (0.37)	4.20 (0.38)	0.11
...Missing; n (%)	89,612 (65.1%)	12,483 (64.1%)	0.02	136,178 (95.0%)	19,998 (95.0%)	0.00	N/A	N/A	#VALUE!	225,790 (80.4%)	32,481 (80.2%)	0.01
Lab result number- Glucose (fasting or random) mean (only 10-1000 included)	51,675	7,479		7,923	1,101		N/A	N/A		59,598	8,580	
...mean (sd)	165.49 (64.13)	166.85 (68.45)	-0.02	166.86 (64.34)	167.95 (68.62)	-0.02	N/A	N/A	#VALUE!	165.67 (64.16)	166.99 (68.48)	-0.02
...median [IQR]	151.00 [123.00, 191.00]	151.33 [119.00, 196.50]	0.00	152.00 [123.50, 193.00]	152.00 [119.00, 197.50]	0.00	N/A	N/A	#VALUE!	151.13 (64.16)	151.42 (68.48)	0.00
...Missing; n (%)	85,974 (62.5%)	11,981 (61.6%)	0.02	135,414 (94.5%)	19,940 (94.8%)	-0.01	N/A	N/A	#VALUE!	221,388 (78.8%)	31,921 (78.8%)	0.00
Lab result number- Potassium mean (only 1-7 included)	52,631	7,654		8,344	1,170		N/A	N/A		60,975	8,824	
...mean (sd)	4.46 (0.45)	4.46 (0.43)	0.00	4.38 (0.45)	4.36 (0.46)	0.04	N/A	N/A	#VALUE!	4.45 (0.45)	4.45 (0.43)	0.00
...median [IQR]	4.45 [4.20, 4.70]	4.45 [4.20, 4.70]	0.00	4.40 [4.10, 4.65]	4.35 [4.00, 4.60]	0.11	N/A	N/A	#VALUE!	4.44 (0.45)	4.44 (0.43)	0.00
...Missing; n (%)	85,018 (61.8%)	11,806 (60.7%)	0.02	134,993 (94.2%)	19,871 (94.4%)	-0.01	N/A	N/A	#VALUE!	220,011 (78.3%)	31,677 (78.2%)	0.00
Comorbidity Scores												
CCI (180 days)- ICD9 and ICD10												
...mean (sd)	2.97 (2.15)	2.83 (1.89)	0.07	2.25 (1.79)	2.11 (1.55)	0.08	3.28 (2.42)	2.88 (1.99)	0.18	3.02 (2.26)	2.68 (1.87)	0.16
...median [IQR]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	0.00	2.00 [1.00, 3.00]	2.00 [1.00, 3.00]	0.00	3.00 [1.00, 4.00]	2.00 [1.00, 4.00]	0.45	2.62 (2.26)	2.00 (1.87)	0.30
Frailty Score: Qualitative Version 365 days as Categories, v1												
...0; n (%)	58,642 (42.6%)	9,778 (50.2%)	-0.15	42,071 (29.4%)	6,451 (30.7%)	-0.03	124,218 (27.3%)	15,058 (33.6%)	-0.14	224,931 (30.6%)	31,287 (36.7%)	-0.13
...1 to 2; n (%)	48,415 (35.2%)	6,258 (32.2%)	0.06	62,110 (43.3%)	9,391 (44.6%)	-0.03	154,631 (34.0%)	15,118 (33.8%)	0.00	265,156 (36.0%)	30,767 (36.1%)	0.00
...3 or more; n (%)	30,592 (22.2%)	3,424 (17.6%)	0.12	39,156 (27.3%)	5,199 (24.7%)	0.06	175,851 (38.7%)	14,602 (32.6%)	0.13	245,599 (33.4%)	23,225 (27.2%)	0.14
Frailty Score: Empirical Version 365 days as Categories,												
...<0.12908; n (%)	26,302 (19.1%)	3,419 (17.6%)	0.04	25,022 (17.5%)	3,502 (16.6%)	0.02	40,499 (8.9%)	4,069 (9.1%)	-0.01	91,823 (12.5%)	10,990 (12.9%)	-0.01
...0.12908 - 0.1631167; n (%)	43,259 (31.4%)	6,091 (31.3%)	0.00	45,778 (31.9%)	6,848 (32.5%)	-0.01	100,081 (22.0%)	10,744 (24.0%)	-0.05	189,118 (25.7%)	23,683 (27.8%)	-0.05
...>= 0.1631167; n (%)	68,088 (49.5%)	9,950 (51.1%)	-0.03	72,537 (50.6%)	10,691 (50.8%)	0.00	314,120 (69.1%)	29,965 (66.9%)	0.05	454,745 (61.8%)	50,606 (59.3%)	0.05
Non-Frailty; n (%)	82,389 (59.9%)	12,060 (62.0%)	-0.04	77,838 (54.3%)	11,838 (56.3%)	-0.04	18,822 (4.1%)	1,899 (4.2%)	-0.01	179,049 (24.3%)	25,797 (30.3%)	-0.13
Frailty Score (mean): Qualitative Version 365 days, v1												
...mean (sd)	1.52 (2.04)	1.19 (1.72)	0.17	1.82 (1.97)	1.65 (1.71)	0.09	2.43 (2.56)	1.96 (2.17)	0.20	2.14 (2.36)	1.71 (1.97)	0.20
...median [IQR]	1.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.53	1.00 [0.00, 3.00]	1.00 [0.00, 2.00]	0.00	2.00 [0.00, 4.00]	1.00 [0.00, 3.00]	0.42	1.62 (2.36)	0.77 (1.97)	0.39
Frailty Score (mean): Empirical Version 365 days,												
...mean (sd)	0.18 (0.06)	0.18 (0.05)	0.00	0.17 (0.05)	0.17 (0.05)	0.00	0.21 (0.07)	0.20 (0.06)	0.15	0.20 (0.06)	0.19 (0.06)	0.17
...median [IQR]	0.16 [0.14, 0.20]	0.16 [0.14, 0.20]	0.00	0.16 [0.13, 0.19]	0.16 [0.13, 0.19]	0.00	0.19 [0.15, 0.24]	0.18 [0.15, 0.23]	0.15	0.18 (0.06)	0.17 (0.06)	0.17

Table 1: Liraglutide vs DPP4i

Healthcare Utilization

Any hospitalization; n (%)	15,411 (11.2%)	1,572 (8.1%)		17,629 (12.3%)	1,789 (8.5%)		69,335 (15.2%)	3,966 (8.9%)		102,375 (13.9%)	7,327 (8.6%)	0.17
Any hospitalization within prior 30 days; n (%)	5,707 (4.1%)	323 (1.7%)		5,387 (3.8%)	318 (1.5%)		25,040 (5.5%)	770 (1.7%)		36,134 (4.9%)	1,411 (1.7%)	0.18
Any hospitalization during prior 31-180 days; n (%)	10,885 (7.9%)	1,314 (6.8%)		13,146 (9.2%)	1,527 (7.3%)		51,026 (11.2%)	3,341 (7.5%)		75,057 (10.2%)	6,182 (7.2%)	0.11
Endocrinologist Visit; n (%)	12,664 (9.2%)	4,174 (21.4%)		14,144 (9.9%)	4,761 (22.6%)		50,811 (11.2%)	11,071 (24.7%)		77,619 (10.6%)	20,006 (23.5%)	-0.35
Endocrinologist Visit (30 days prior); n (%)	8,050 (5.8%)	2,703 (13.9%)		9,334 (6.5%)	3,309 (15.7%)		32,372 (7.1%)	7,011 (15.7%)		49,756 (6.8%)	13,023 (15.3%)	-0.27
Endocrinologist Visit (31 to 180 days prior); n (%)	8,644 (6.3%)	2,970 (15.3%)		9,648 (6.7%)	3,342 (15.9%)		35,496 (7.8%)	8,312 (18.6%)		53,788 (7.3%)	14,624 (17.1%)	-0.30
Internal medicine/family medicine visits; n (%)	121,361 (88.2%)	16,269 (83.6%)		124,756 (87.0%)	18,034 (85.7%)		387,047 (85.1%)	37,552 (83.9%)		633,164 (86.1%)	71,855 (84.3%)	0.05
Internal medicine/family medicine visits (30 days prior) ; n (%)	94,520 (68.7%)	11,561 (59.4%)		94,848 (66.2%)	12,851 (61.1%)		290,265 (63.8%)	25,156 (56.2%)		479,633 (65.2%)	49,568 (58.1%)	0.15
Internal medicine/family medicine visits (31 to 180 days prior) ; n (%)	110,003 (79.9%)	14,957 (76.9%)		111,872 (78.0%)	16,418 (78.0%)		347,879 (76.5%)	34,444 (76.9%)		569,754 (77.4%)	65,819 (77.2%)	0.00
Cardiologist visit; n (%)	45,210 (32.8%)	6,781 (34.8%)		45,236 (31.6%)	7,080 (33.6%)		177,196 (39.0%)	16,264 (36.3%)		267,642 (36.4%)	30,125 (35.3%)	0.02
Number of Cardiologist visits (30 days prior); n (%)	17,032 (12.4%)	2,281 (11.7%)		16,404 (11.4%)	2,355 (11.2%)		67,756 (14.9%)	5,177 (11.6%)		101,192 (13.8%)	9,813 (11.5%)	0.07
Number of Cardiologist visits (31 to 180 days prior); n (%)	38,027 (27.6%)	5,824 (29.9%)		38,469 (26.8%)	6,074 (28.9%)		152,067 (33.4%)	14,293 (31.9%)		228,563 (31.1%)	26,191 (30.7%)	0.01
Electrocardiogram ; n (%)	49,482 (35.9%)	6,621 (34.0%)		54,504 (38.0%)	7,572 (36.0%)		181,062 (39.8%)	15,773 (35.2%)		285,048 (38.7%)	29,966 (35.1%)	0.07
Use of glucose test strips; n (%)	6,117 (4.4%)	808 (4.2%)		5,867 (4.1%)	1,004 (4.8%)		17,314 (3.8%)	1,728 (3.9%)		29,298 (4.0%)	3,540 (4.2%)	-0.01
Dialysis; n (%)	82 (0.1%)	11 (0.1%)		136 (0.1%)	9 (0.0%)		560 (0.1%)	18 (0.0%)		778 (0.1%)	038 (0.0%)	0.04
Naive new user v8 ; n (%)	23,724 (17.2%)	2,950 (15.2%)		23,744 (16.6%)	2,590 (12.3%)		66,532 (14.6%)	4,828 (10.8%)		114,000 (15.5%)	10,368 (12.2%)	0.10
N antidiabetic drugs at index date											
…mean (sd)	2.12 (0.81)	2.07 (0.88)	0.06	2.14 (0.81)	2.10 (0.90)	0.05	2.10 (0.79)	2.11 (0.85)	-0.01	2.11 (0.80)	2.10 (0.87)	0.01
…median [IQR]	2.00 [2.00, 3.00]	2.00 [1.00, 3.00]	0.00	2.00 [2.00, 3.00]	2.00 [1.00, 3.00]	0.00	2.00 [2.00, 3.00]	2.00 [1.00, 3.00]	0.00	2.00 (0.80)	2.00 (0.87)	0.00
number of different/distinct medication prescriptions											
…mean (sd)	10.45 (4.75)	11.70 (5.14)	-0.25	10.12 (4.59)	11.57 (4.91)	-0.31	10.69 (4.75)	11.32 (4.71)	-0.13	10.53 (4.72)	11.47 (4.86)	-0.20
…median [IQR]	10.00 [7.00, 13.00]	11.00 [8.00, 15.00]	-0.20	9.00 [7.00, 13.00]	11.00 [8.00, 14.00]	-0.42	10.00 [7.00, 13.00]	11.00 [8.00, 14.00]	-0.21	9.81 (4.72)	11.00 (4.86)	-0.25
Number of Hospitalizations											
…mean (sd)	0.14 (0.46)	0.10 (0.36)	0.10	0.15 (0.43)	0.10 (0.35)	0.13	0.22 (0.61)	0.11 (0.40)	0.21	0.19 (0.55)	0.11 (0.38)	0.17
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (0.55)	0.00 (0.38)	0.00
Number of hospital days											
…mean (sd)	0.89 (4.08)	0.49 (2.57)	0.12	0.88 (4.03)	0.47 (2.29)	0.13	1.51 (5.72)	0.63 (2.98)	0.19	1.27 (5.15)	0.56 (2.73)	0.17
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (5.15)	0.00 (2.73)	0.00
Number of Emergency Department (ED) visits											
…mean (sd)	0.47 (1.31)	0.41 (1.20)	0.05	0.23 (1.55)	0.16 (1.24)	0.05	0.64 (1.56)	0.45 (1.22)	0.14	0.53 (1.51)	0.37 (1.22)	0.12
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (1.51)	0.00 (1.22)	0.00
Number of Office visits											
…mean (sd)	5.26 (3.96)	5.84 (4.12)	-0.14	5.47 (4.09)	6.07 (4.31)	-0.14	5.82 (4.49)	6.47 (4.62)	-0.14	5.65 (4.32)	6.23 (4.43)	-0.13
…median [IQR]	4.00 [3.00, 7.00]	5.00 [3.00, 8.00]	-0.25	4.00 [3.00, 7.00]	5.00 [3.00, 8.00]	-0.24	5.00 [3.00, 8.00]	5.00 [3.00, 8.00]	0.00	4.62 (4.32)	5.00 (4.43)	-0.09
Number of Endocrinologist visits											
…mean (sd)	0.43 (2.15)	1.12 (3.61)	-0.23	0.46 (2.24)	1.18 (3.69)	-0.24	0.64 (3.15)	1.63 (5.11)	-0.23	0.57 (2.82)	1.40 (4.48)	-0.22
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (2.82)	0.00 (4.48)	0.00
Number of internal medicine/family medicine visits											
…mean (sd)	11.36 (14.86)	10.41 (14.29)	0.07	8.00 (10.30)	7.77 (9.67)	0.02	9.44 (12.00)	8.75 (11.42)	0.06	9.52 (12.29)	8.89 (11.75)	0.05
…median [IQR]	7.00 [3.00, 15.00]	6.00 [2.00, 13.00]	0.07	5.00 [2.00, 10.00]	5.00 [2.00, 10.00]	0.00	6.00 [2.00, 13.00]	5.00 [2.00, 12.00]	0.09	5.99 (12.29)	5.23 (11.75)	0.06
Number of Cardiologist visits											
…mean (sd)	1.74 (4.43)	1.71 (4.03)	0.01	1.49 (3.77)	1.54 (3.73)	-0.01	2.31 (5.55)	1.97 (4.90)	0.06	2.04 (5.05)	1.80 (4.44)	0.05
…median [IQR]	0.00 [0.00, 1.00]	0.00 [0.00, 2.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 2.00]	0.00	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00	0.00 (5.05)	0.00 (4.44)	0.00
Number electrocardiograms received											
…mean (sd)	0.76 (1.64)	0.67 (1.47)	0.06	0.71 (1.34)	0.64 (1.21)	0.05	0.89 (1.66)	0.70 (1.34)	0.13	0.83 (1.60)	0.68 (1.34)	0.10
…median [IQR]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 (1.60)	0.00 (1.34)	0.00
Number of HbA1c tests ordered											
…mean (sd)	1.35 (0.93)	1.40 (0.92)	-0.05	0.98 (0.94)	1.15 (0.95)	-0.18	1.44 (0.91)	1.53 (0.88)	-0.10	1.33 (0.92)	1.41 (0.91)	-0.09
…median [IQR]	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	0.00	1.00 [0.00, 2.00]	1.00 [1.00, 2.00]	0.00	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	0.00	1.00 (0.92)	1.00 (0.91)	0.00
Number of glucose tests ordered											
…mean (sd)	0.60 (2.85)	0.57 (1.41)	0.01	0.43 (1.50)	0.50 (1.20)	-0.05	0.49 (1.20)	0.51 (1.13)	-0.02	0.50 (1.69)	0.52 (1.22)	-0.01
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 (1.69)	0.00 (1.22)	0.00
Number of lipid tests ordered											
…mean (sd)	1.08 (1.01)	1.08 (1.01)	0.00	0.86 (1.31)	1.00 (1.31)	-0.11	1.07 (0.86)	1.11 (0.88)	-0.05	1.03 (0.99)	1.08 (1.03)	-0.05
…median [IQR]	1.00 [0.00, 2.00]	1.00 [0.00, 2.00]	0.00	1.00 [0.00, 1.00]	1.00 [0.00, 1.00]	0.00	1.00 [0.00, 2.00]	1.00 [1.00, 2.00]	0.00	1.00 (0.99)	1.00 (1.03)	0.00
Number of creatinine tests ordered											
…mean (sd)	0.06 (0.35)	0.06 (0.30)	0.00	0.06 (0.35)	0.06 (0.34)	0.00	0.09 (0.39)	0.10 (0.41)	-0.02	0.08 (0.38)	0.08 (0.37)	0.00
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (0.38)	0.00 (0.37)	0.00
Number of BUN tests ordered											
…mean (sd)	0.04 (0.28)	0.03 (0.23)	0.04	0.04 (0.29)	0.04 (0.27)	0.00	0.06 (0.32)	0.06 (0.32)	0.00	0.05 (0.31)	0.05 (0.29)	0.00
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (0.31)	0.00 (0.29)	0.00
Number of tests for microalbuminuria											
…mean (sd)	0.82 (1.23)	0.87 (1.25)	-0.04	0.52 (0.99)	0.64 (1.07)	-0.12	0.49 (0.73)	0.56 (0.77)	-0.09	0.56 (0.90)	0.65 (0.97)	-0.10
…median [IQR]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 (0.90)	0.00 (0.97)	0.00
Total N distinct ICD9/ICD10 diagnoses at the 3rd digit level											
…mean (sd)	5.98 (8.59)	7.00 (8.44)	-0.12	2.59 (5.59)	2.39 (4.66)	0.04	6.46 (9.71)	6.21 (8.58)	0.03	5.62 (8.84)	5.45 (7.76)	0.02
…median [IQR]	4.00 [0.00, 9.00]	5.00 [0.00, 10.00]	-0.12	0.00 [0.00, 4.00]	0.00 [0.00, 4.00]	0.00	3.00 [0.00, 9.00]	3.00 [0.00, 10.00]	0.00	2.60 (8.84)	2.72 (7.76)	-0.01
Use of thiazide; n (%)	19,082 (13.9%)	2,749 (14.1%)	-0.005763928	18,570 (13.0%)	2,811 (13.4%)	-0.01181737	66,785 (14.7%)	6,981 (15.6%)	-0.02510409	104,437 (14.2%)	12,541 (14.7%)	-0.01
Use of beta blockers; n (%)	62,221 (45.2%)	8,804 (45.2%)	0.00	67,518 (47.1%)	9,653 (45.9%)	0.02	233,117 (51.3%)	21,826 (48.7%)	0.05	362,856 (49.3%)	40,283 (47.2%)	0.04
Use of calcium channel blockers; n (%)	46,524 (33.8%)	5,822 (29.9%)	0.08	46,777 (32.6%)	6,355 (30.2%)	0.05	167,449 (36.8%)	14,468 (32.3%)	0.09	260,750 (35.4%)	26,645 (31.2%)	0.09

Table 1: Liraglutide vs DPP4i

	PS-matched											
	Optum			**MarketScan**			**Medicare**			**POOLED**		
Variable	Reference-DPP4i	Exposure- Liraglutide	St. Diff.	Reference-DPP4i	Exposure- Liraglutide	St. Diff.	Reference-DPP4i	Exposure- Liraglutide	St. Diff.	Reference-DPP4i	Exposure- Liraglutide	St. Diff.
Number of patients	19187	19187		20777	20777		44381	44381		84,345	84,345	
Age												
...mean (sd)	65.88 (7.35)	66.08 (6.82)	-0.03	62.98 (6.89)	63.12 (6.32)	-0.02	70.54 (5.22)	70.62 (5.01)	-0.02	67.62 (6.19)	67.74 (5.80)	-0.02
...median [IQR]	66.00 [61.00, 70.00]	66.00 [61.00, 70.00]	0.00	62.00 [60.00, 66.00]	62.00 [60.00, 66.00]	0.00	69.00 [67.00, 73.00]	69.00 [67.00, 73.00]	0.00	66.59 (6.19)	66.59 (5.80)	0.00
Age categories												
...18 - 54; n (%)	1,284 (6.7%)	1,036 (5.4%)	0.05	2,089 (10.1%)	1,724 (8.3%)	0.06	0 (0.0%)	0 (0.0%)	#DIV/0!	3,373 (4.0%)	2,760 (3.3%)	0.04
...55 - 64; n (%)	6,997 (36.5%)	6,760 (35.2%)	0.03	12,548 (60.4%)	12,685 (61.1%)	-0.01	1,434 (3.2%)	1,078 (2.4%)	0.05	20,979 (24.9%)	20,523 (24.3%)	0.01
...65 - 74; n (%)	8,588 (44.8%)	9,298 (48.5%)	-0.07	4,672 (22.5%)	5,162 (24.8%)	-0.05	34,293 (77.3%)	34,597 (78.0%)	-0.02	47,553 (56.4%)	49,057 (58.2%)	-0.04
...>= 75; n (%)	2,318 (12.1%)	2,093 (10.9%)	0.04	1,468 (7.1%)	1,206 (5.8%)	0.05	8,654 (19.5%)	8,706 (19.6%)	0.00	12,440 (14.7%)	12,005 (14.2%)	0.01
Gender - United												
...Males; n (%)	9,107 (47.5%)	9,089 (47.4%)	0.00	10,509 (50.6%)	10,673 (51.4%)	-0.02	19,489 (43.9%)	19,600 (44.2%)	-0.01	39,105 (46.4%)	39,362 (46.7%)	-0.01
...Females; n (%)	10,080 (52.5%)	10,098 (52.6%)	0.00	10,268 (49.4%)	10,104 (48.6%)	0.02	24,892 (56.1%)	24,781 (55.8%)	0.01	45,240 (53.6%)	44,983 (53.3%)	0.01
Race												
...White; n (%)	N/A	N/A		N/A	N/A		38,069 (85.8%)	37,846 (85.3%)	0.01	38,069 (85.8%)	37,846 (85.3%)	0.01
...Black; n (%)	N/A	N/A		N/A	N/A		3,578 (8.1%)	3,789 (8.5%)	-0.01	3,578 (8.1%)	3,789 (8.5%)	-0.01
...Asian; n (%)	N/A	N/A		N/A	N/A		464 (1.0%)	531 (1.2%)	-0.02	464 (1.0%)	531 (1.2%)	-0.02
...Hispanic; n (%)	N/A	N/A		N/A	N/A		837 (1.9%)	801 (1.8%)	0.01	837 (1.9%)	801 (1.8%)	0.01
...North American Native; n (%)	N/A	N/A		N/A	N/A		179 (0.4%)	177 (0.4%)	0.00	179 (0.4%)	177 (0.4%)	0.00
...Other/Unknown; n (%)	N/A	N/A		N/A	N/A		1,254 (2.8%)	1,237 (2.8%)	0.00	1,254 (2.8%)	1,237 (2.8%)	0.00
Region - United (lumping missing&other category with West)												
...Northeast; n (%)	1,677 (8.7%)	1,736 (9.0%)	-0.01	3,838 (18.5%)	3,945 (19.0%)	-0.01	6,816 (15.4%)	6,961 (15.7%)	-0.01	12,331 (14.6%)	12,642 (15.0%)	-0.01
...South; n (%)	10,357 (54.0%)	10,229 (53.3%)	0.01	4,513 (21.7%)	4,504 (21.7%)	0.00	20,540 (46.3%)	20,477 (46.1%)	0.00	35,410 (42.0%)	35,210 (41.7%)	0.01
...Midwest; n (%)	3,728 (19.4%)	3,773 (19.7%)	-0.01	9,878 (47.5%)	9,791 (47.1%)	0.01	10,234 (23.1%)	10,227 (23.0%)	0.00	23,840 (28.3%)	23,791 (28.2%)	0.00
...West; n (%)	3,425 (17.9%)	3,449 (18.0%)	0.00	2,326 (11.2%)	2,314 (11.1%)	0.00	6,791 (15.3%)	6,716 (15.1%)	0.01	12,542 (14.9%)	12,479 (14.8%)	0.00
...Unknown+missing; n (%)	N/A	N/A	#VALUE!	222 (1.1%)	223 (1.1%)	0.00	N/A	N/A	#VALUE!	222 (1.1%)	223 (1.1%)	0.00
CV Covariates												
Ischemic heart disease; n (%)	5,701 (29.7%)	5,722 (29.8%)		6,791 (32.7%)	6,767 (32.6%)		13,769 (31.0%)	13,776 (31.0%)		26,261 (31.1%)	26,265 (31.1%)	0.00
Acute MI; n (%)	291 (1.5%)	290 (1.5%)		311 (1.5%)	306 (1.5%)		554 (1.2%)	535 (1.2%)		1,156 (1.4%)	1,131 (1.3%)	0.01
ACS/unstable angina; n (%)	370 (1.9%)	389 (2.0%)		429 (2.1%)	429 (2.1%)		814 (1.8%)	739 (1.7%)		1,613 (1.9%)	1,557 (1.8%)	0.01
Old MI; n (%)	794 (4.1%)	770 (4.0%)		403 (1.9%)	428 (2.1%)		1,598 (3.6%)	1,594 (3.6%)		2,795 (3.3%)	2,792 (3.3%)	0.00
Stable angina; n (%)	912 (4.8%)	931 (4.9%)		730 (3.5%)	742 (3.6%)		1,771 (4.0%)	1,708 (3.8%)		3,413 (4.0%)	3,381 (4.0%)	0.00
Coronary atherosclerosis and other forms of chronic ischemic heart disease; n (%)	5,358 (27.9%)	5,377 (28.0%)		6,498 (31.3%)	6,468 (31.1%)		13,175 (29.7%)	13,182 (29.7%)		25,031 (29.7%)	25,027 (29.7%)	0.00
Other atherosclerosis with ICD10 ; n (%)	184 (1.0%)	201 (1.0%)		240 (1.2%)	238 (1.1%)		683 (1.5%)	756 (1.7%)		1,107 (1.3%)	1,195 (1.4%)	-0.01
Previous cardiac procedure (CABG or PTCA or Stent) ; n (%)	168 (0.9%)	173 (0.9%)		221 (1.1%)	211 (1.0%)		300 (0.7%)	233 (0.5%)		689 (0.8%)	617 (0.7%)	0.01
History of CABG or PTCA; n (%)	1,375 (7.2%)	1,387 (7.2%)		840 (4.0%)	825 (4.0%)		3,726 (8.4%)	3,698 (8.3%)		5,941 (7.0%)	5,910 (7.0%)	0.00
Any stroke; n (%)	1,414 (7.4%)	1,401 (7.3%)		1,494 (7.2%)	1,500 (7.2%)		3,852 (8.7%)	3,786 (8.5%)		6,760 (8.0%)	6,687 (7.9%)	0.00
Ischemic stroke (w and w/o mention of cerebral infarction); n (%)	1,392 (7.3%)	1,390 (7.2%)		1,476 (7.1%)	1,479 (7.1%)		3,816 (8.6%)	3,753 (8.5%)		6,684 (7.9%)	6,622 (7.9%)	0.00
Hemorrhagic stroke; n (%)	38 (0.2%)	31 (0.2%)		37 (0.2%)	36 (0.2%)		80 (0.2%)	62 (0.1%)		155 (0.2%)	129 (0.2%)	0.00
TIA; n (%)	328 (1.7%)	326 (1.7%)		379 (1.8%)	363 (1.7%)		848 (1.9%)	769 (1.7%)		1,555 (1.8%)	1,458 (1.7%)	0.01
Other cerebrovascular disease; n (%)	355 (1.9%)	330 (1.7%)		255 (1.2%)	237 (1.1%)		883 (2.0%)	895 (2.0%)		1,493 (1.8%)	1,462 (1.7%)	0.01
Late effects of cerebrovascular disease; n (%)	261 (1.4%)	244 (1.3%)		142 (0.7%)	150 (0.7%)		598 (1.3%)	634 (1.4%)		1,001 (1.2%)	1,028 (1.2%)	0.00
Cerebrovascular procedure; n (%)	9 (0.0%)	21 (0.1%)		24 (0.1%)	24 (0.1%)		61 (0.1%)	45 (0.1%)		094 (0.1%)	090 (0.1%)	0.00
Heart failure (CHF); n (%)	2,017 (10.5%)	2,032 (10.6%)		1,594 (7.7%)	1,572 (7.6%)		4,950 (11.2%)	4,901 (11.0%)		8,561 (10.1%)	8,505 (10.1%)	0.00
Peripheral Vascular Disease (PVD) or PVD Surgery ; n (%)	1,696 (8.8%)	1,705 (8.9%)		1,697 (8.2%)	1,671 (8.0%)		4,485 (10.1%)	4,556 (10.3%)		7,878 (9.3%)	7,932 (9.4%)	0.00
Atrial fibrillation; n (%)	1,491 (7.8%)	1,541 (8.0%)		1,240 (6.0%)	1,237 (6.0%)		4,728 (10.7%)	4,771 (10.8%)		7,459 (8.8%)	7,549 (9.0%)	-0.01
Other cardiac dysrhythmia; n (%)	2,008 (10.5%)	1,993 (10.4%)		1,498 (7.2%)	1,470 (7.1%)		5,142 (11.6%)	5,106 (11.5%)		8,648 (10.3%)	8,569 (10.2%)	0.01
Cardiac conduction disorders; n (%)	538 (2.8%)	543 (2.8%)		411 (2.0%)	425 (2.0%)		1,563 (3.5%)	1,628 (3.7%)		2,512 (3.0%)	2,596 (3.1%)	-0.01
Other CVD; n (%)	2,256 (11.8%)	2,274 (11.9%)		2,290 (11.0%)	2,252 (10.8%)		6,456 (14.5%)	6,303 (14.2%)		11,002 (13.0%)	10,829 (12.8%)	0.01
Diabetes-related complications												
Diabetic retinopathy; n (%)	1,444 (7.5%)	1,474 (7.7%)		989 (4.8%)	1,022 (4.9%)		3,663 (8.3%)	3,676 (8.3%)		6,096 (7.2%)	6,172 (7.3%)	0.00
Diabetes with other ophthalmic manifestations; n (%)	143 (0.7%)	140 (0.7%)		678 (3.3%)	726 (3.5%)		1,377 (3.1%)	1,449 (3.3%)		2,198 (2.6%)	2,315 (2.7%)	-0.01
Retinal detachment, vitreous hemorrhage, vitrectomy; n (%)	104 (0.5%)	83 (0.4%)		102 (0.5%)	71 (0.3%)		219 (0.5%)	192 (0.4%)		425 (0.5%)	346 (0.4%)	0.01
Retinal laser coagulation therapy; n (%)	128 (0.7%)	120 (0.6%)		149 (0.7%)	137 (0.7%)		350 (0.8%)	289 (0.7%)		627 (0.7%)	546 (0.6%)	0.01
Occurrence of Diabetic Neuropathy ; n (%)	4,593 (23.9%)	4,623 (24.1%)		2,969 (14.3%)	2,964 (14.3%)		10,346 (23.3%)	10,291 (23.2%)		17,908 (21.2%)	17,878 (21.2%)	0.00
Occurrence of diabetic nephropathy with ICD10 ; n (%)	3,404 (17.7%)	3,439 (17.9%)		1,655 (8.0%)	1,662 (8.0%)		5,588 (12.6%)	5,562 (12.5%)		10,647 (12.6%)	10,663 (12.6%)	0.00
Hypoglycemia ; n (%)	476 (2.5%)	476 (2.5%)		606 (2.9%)	625 (3.0%)		1,381 (3.1%)	1,358 (3.1%)		2,463 (2.9%)	2,459 (2.9%)	0.00
Hyperglycemia; n (%)	754 (3.9%)	747 (3.9%)		547 (2.6%)	546 (2.6%)		1,711 (3.9%)	1,673 (3.8%)		3,012 (3.6%)	2,966 (3.5%)	0.01
Disorders of fluid electrolyte and acid-base balance; n (%)	1,297 (6.8%)	1,346 (7.0%)		986 (4.7%)	950 (4.6%)		3,358 (7.6%)	3,341 (7.5%)		5,641 (6.7%)	5,637 (6.7%)	0.00
Diabetic ketoacidosis; n (%)	25 (0.1%)	21 (0.1%)		29 (0.1%)	20 (0.1%)		61 (0.1%)	53 (0.1%)		115 (0.1%)	094 (0.1%)	0.00
Hyperosmolar hyperglycemic nonketotic syndrome (HONK); n (%)	94 (0.5%)	95 (0.5%)		80 (0.4%)	73 (0.4%)		194 (0.4%)	193 (0.4%)		368 (0.4%)	361 (0.4%)	0.00
Diabetes with peripheral circulatory disorders with ICD-10 ; n (%)	1,565 (8.2%)	1,519 (7.9%)		831 (4.0%)	871 (4.2%)		3,179 (7.2%)	3,210 (7.2%)		5,575 (6.6%)	5,600 (6.6%)	0.00
Diabetic Foot; n (%)	499 (2.6%)	494 (2.6%)		490 (2.4%)	483 (2.3%)		1,340 (3.0%)	1,361 (3.1%)		2,329 (2.8%)	2,338 (2.8%)	0.00
Gangrene ; n (%)	61 (0.3%)	48 (0.3%)		39 (0.2%)	33 (0.2%)		80 (0.2%)	83 (0.2%)		180 (0.2%)	164 (0.2%)	0.00

Table 1: Liraglutide vs DPP4i

Lower extremity amputation; n (%)	173 (0.9%)	146 (0.8%)	75 (0.4%)	69 (0.3%)	230 (0.5%)	228 (0.5%)	478 (0.6%)	443 (0.5%)	0.01
Osteomyelitis; n (%)	136 (0.7%)	110 (0.6%)	127 (0.6%)	119 (0.6%)	259 (0.6%)	225 (0.5%)	522 (0.6%)	454 (0.5%)	0.01
Skin infections ; n (%)	1,175 (6.1%)	1,153 (6.0%)	1,262 (6.1%)	1,283 (6.2%)	3,424 (7.7%)	3,359 (7.6%)	5,861 (6.9%)	5,795 (6.9%)	0.00
Erectile dysfunction; n (%)	561 (2.9%)	589 (3.1%)	532 (2.6%)	525 (2.5%)	1,286 (2.9%)	1,306 (2.9%)	2,379 (2.8%)	2,420 (2.9%)	-0.01
Diabetes with unspecified complication; n (%)	1,183 (6.2%)	1,212 (6.3%)	1,013 (4.9%)	998 (4.8%)	2,448 (5.5%)	2,456 (5.5%)	4,644 (5.5%)	4,666 (5.5%)	0.00
Diabetes mellitus without mention of complications; n (%)	16,719 (87.1%)	16,712 (87.1%)	19,433 (93.5%)	19,456 (93.6%)	41,391 (93.3%)	41,385 (93.2%)	77,543 (91.9%)	77,553 (91.9%)	0.00
Hypertension: 1 inpatient or 2 outpatient claims within 365 days; n (%)	18,326 (95.5%)	18,285 (95.3%)	18,379 (88.5%)	18,392 (88.5%)	43,029 (97.0%)	43,046 (97.0%)	79,734 (94.5%)	79,723 (94.5%)	0.00
Hyperlipidemia ; n (%)	15,189 (79.2%)	15,133 (78.9%)	14,678 (70.6%)	14,741 (70.9%)	36,860 (83.1%)	36,848 (83.0%)	66,727 (79.1%)	66,722 (79.1%)	0.00
Edema; n (%)	1,701 (8.9%)	1,712 (8.9%)	1,292 (6.2%)	1,286 (6.2%)	4,774 (10.8%)	4,790 (10.8%)	7,767 (9.2%)	7,788 (9.2%)	0.00
Renal Dysfunction (non-diabetic) ; n (%)	4,574 (23.8%)	4,607 (24.0%)	2,981 (14.3%)	2,999 (14.4%)	9,976 (22.5%)	9,939 (22.4%)	17,531 (20.8%)	17,545 (20.8%)	0.00
Occurrence of acute renal disease ; n (%)	618 (3.2%)	618 (3.2%)	389 (1.9%)	387 (1.9%)	1,410 (3.2%)	1,420 (3.2%)	2,417 (2.9%)	2,425 (2.9%)	0.00
Occurrence of chronic renal insufficiency; n (%)	3,958 (20.6%)	3,966 (20.7%)	2,293 (11.0%)	2,341 (11.3%)	8,564 (19.3%)	8,551 (19.3%)	14,815 (17.6%)	14,858 (17.6%)	0.00
Chronic kidney disease ; n (%)	3,820 (19.9%)	3,855 (20.1%)	2,212 (10.6%)	2,256 (10.9%)	8,088 (18.2%)	8,088 (18.2%)	14,120 (16.7%)	14,199 (16.8%)	0.00
CKD Stage 3-4; n (%)	2,841 (14.8%)	2,830 (14.7%)	1,649 (7.9%)	1,698 (8.2%)	5,873 (13.2%)	5,830 (13.1%)	10,363 (12.3%)	10,358 (12.3%)	0.00
Occurrence of hypertensive nephropathy; n (%)	1,663 (8.7%)	1,699 (8.9%)	836 (4.0%)	857 (4.1%)	3,487 (7.9%)	3,481 (7.8%)	5,986 (7.1%)	6,037 (7.2%)	0.00
Occurrence of miscellaneous renal insufficiency ; n (%)	1,009 (5.3%)	1,008 (5.3%)	779 (3.7%)	783 (3.8%)	3,026 (6.8%)	2,878 (6.5%)	4,814 (5.7%)	4,669 (5.5%)	0.01
Glaucoma or cataracts ; n (%)	4,154 (21.7%)	4,031 (21.0%)	3,827 (18.4%)	3,680 (17.7%)	12,558 (28.3%)	12,492 (28.1%)	20,539 (24.4%)	20,203 (24.0%)	0.01
Cellulitis or abscess of toe; n (%)	330 (1.7%)	296 (1.5%)	221 (1.1%)	210 (1.0%)	682 (1.5%)	667 (1.5%)	1,233 (1.5%)	1,173 (1.4%)	0.01
Foot ulcer; n (%)	475 (2.5%)	475 (2.5%)	494 (2.4%)	484 (2.3%)	1,332 (3.0%)	1,339 (3.0%)	2,301 (2.7%)	2,298 (2.7%)	0.00
Bladder stones; n (%)	28 (0.1%)	14 (0.1%)	21 (0.1%)	22 (0.1%)	77 (0.2%)	73 (0.2%)	126 (0.1%)	109 (0.1%)	0.00
Kidney stones; n (%)	473 (2.5%)	461 (2.4%)	528 (2.5%)	512 (2.5%)	1,276 (2.9%)	1,295 (2.9%)	2,277 (2.7%)	2,268 (2.7%)	0.00
Urinary tract infections (UTIs); n (%)	1,744 (9.1%)	1,711 (8.9%)	1,375 (6.6%)	1,356 (6.5%)	5,473 (12.3%)	5,479 (12.3%)	8,592 (10.2%)	8,546 (10.1%)	0.00
Dipstick urinalysis; n (%)	7,240 (37.7%)	6,927 (36.1%)	7,253 (34.9%)	6,731 (32.4%)	18,427 (41.5%)	17,759 (40.0%)	32,920 (39.0%)	31,417 (37.2%)	0.04
Non-dipstick urinalysis; n (%)	8,574 (44.7%)	8,615 (44.9%)	7,423 (35.7%)	7,462 (35.9%)	20,541 (46.3%)	20,649 (46.5%)	36,538 (43.3%)	36,726 (43.5%)	0.00
Urine function test; n (%)	478 (2.5%)	464 (2.4%)	532 (2.6%)	503 (2.4%)	1,674 (3.8%)	1,519 (3.4%)	2,684 (3.2%)	2,486 (2.9%)	0.02
Cytology; n (%)	131 (0.7%)	127 (0.7%)	201 (1.0%)	179 (0.9%)	443 (1.0%)	401 (0.9%)	775 (0.9%)	707 (0.8%)	0.01
Cystos; n (%)	230 (1.2%)	238 (1.2%)	267 (1.3%)	253 (1.2%)	726 (1.6%)	653 (1.5%)	1,223 (1.4%)	1,144 (1.4%)	0.00
Other Covariates									
Liver disease; n (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	000 (0.0%)	000 (0.0%)	#DIV/0!
Osteoarthritis; n (%)	3,745 (19.5%)	3,782 (19.7%)	3,160 (15.2%)	3,192 (15.4%)	10,957 (24.7%)	10,991 (24.8%)	17,862 (21.2%)	17,965 (21.3%)	0.00
Other arthritis, arthropathies and musculoskeletal pain; n (%)	7,765 (40.5%)	7,671 (40.0%)	7,650 (36.8%)	7,628 (36.7%)	21,066 (47.5%)	20,955 (47.2%)	36,481 (43.3%)	36,254 (43.0%)	0.01
Dorsopathies; n (%)	5,026 (26.2%)	5,009 (26.1%)	4,446 (21.4%)	4,472 (21.5%)	13,404 (30.2%)	13,332 (30.0%)	22,876 (27.1%)	22,813 (27.0%)	0.00
Fractures; n (%)	523 (2.7%)	543 (2.8%)	528 (2.5%)	524 (2.5%)	1,530 (3.4%)	1,562 (3.5%)	2,581 (3.1%)	2,629 (3.1%)	0.00
Falls ; n (%)	600 (3.1%)	605 (3.2%)	182 (0.9%)	183 (0.9%)	1,506 (3.4%)	1,482 (3.3%)	2,288 (2.7%)	2,270 (2.7%)	0.00
Osteoporosis; n (%)	737 (3.8%)	786 (4.1%)	624 (3.0%)	607 (2.9%)	2,931 (6.6%)	2,880 (6.5%)	4,292 (5.1%)	4,273 (5.1%)	0.00
Hyperthyroidism; n (%)	191 (1.0%)	125 (0.7%)	157 (0.8%)	104 (0.5%)	523 (1.2%)	412 (0.9%)	871 (1.0%)	641 (0.8%)	0.02
Hypothyroidism ; n (%)	3,602 (18.8%)	3,737 (19.5%)	2,944 (14.2%)	2,959 (14.2%)	7,649 (17.2%)	7,701 (17.4%)	14,195 (16.8%)	14,397 (17.1%)	-0.01
Other disorders of thyroid gland ; n (%)	1,019 (5.3%)	969 (5.1%)	999 (4.8%)	991 (4.8%)	2,714 (6.1%)	2,573 (5.8%)	4,732 (5.6%)	4,533 (5.4%)	0.01
Depression; n (%)	2,008 (10.5%)	1,965 (10.2%)	1,630 (7.8%)	1,611 (7.8%)	5,365 (12.1%)	5,264 (11.9%)	9,003 (10.7%)	8,840 (10.5%)	0.01
Anxiety; n (%)	1,752 (9.1%)	1,698 (8.8%)	1,109 (5.3%)	1,066 (5.1%)	3,825 (8.6%)	3,722 (8.4%)	6,686 (7.9%)	6,486 (7.7%)	0.01
Sleep_Disorder; n (%)	2,068 (10.8%)	2,062 (10.7%)	3,430 (16.5%)	3,424 (16.5%)	5,922 (13.3%)	5,843 (13.2%)	11,420 (13.5%)	11,329 (13.4%)	0.00
Dementia; n (%)	389 (2.0%)	405 (2.1%)	209 (1.0%)	211 (1.0%)	1,458 (3.3%)	1,482 (3.3%)	2,056 (2.4%)	2,098 (2.5%)	-0.01
Delirium; n (%)	141 (0.7%)	145 (0.8%)	89 (0.4%)	91 (0.4%)	470 (1.1%)	482 (1.1%)	700 (0.8%)	718 (0.9%)	-0.01
Psychosis; n (%)	140 (0.7%)	131 (0.7%)	82 (0.4%)	80 (0.4%)	430 (1.0%)	410 (0.9%)	652 (0.8%)	621 (0.7%)	0.01
Obesity; n (%)	6,359 (33.1%)	6,321 (32.9%)	4,461 (21.5%)	4,453 (21.4%)	11,476 (25.9%)	11,510 (25.9%)	22,296 (26.4%)	22,284 (26.4%)	0.00
Overweight; n (%)	860 (4.5%)	830 (4.3%)	356 (1.7%)	357 (1.7%)	1,167 (2.6%)	1,226 (2.8%)	2,383 (2.8%)	2,413 (2.9%)	-0.01
Smoking; n (%)	2,270 (11.8%)	2,211 (11.5%)	979 (4.7%)	971 (4.7%)	5,447 (12.3%)	5,371 (12.1%)	8,696 (10.3%)	8,553 (10.1%)	0.01
Alcohol abuse or dependence; n (%)	88 (0.5%)	85 (0.4%)	53 (0.3%)	57 (0.3%)	167 (0.4%)	157 (0.4%)	308 (0.4%)	299 (0.4%)	0.00
Drug abuse or dependence; n (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	000 (0.0%)	000 (0.0%)	#DIV/0!
COPD; n (%)	1,967 (10.3%)	1,937 (10.1%)	1,281 (6.2%)	1,259 (6.1%)	5,022 (11.3%)	4,898 (11.0%)	8,270 (9.8%)	8,094 (9.6%)	0.01
Asthma; n (%)	1,425 (7.4%)	1,397 (7.3%)	1,264 (6.1%)	1,216 (5.9%)	3,583 (8.1%)	3,478 (7.8%)	6,272 (7.4%)	6,091 (7.2%)	0.01
Obstructive sleep apnea; n (%)	3,445 (18.0%)	3,467 (18.1%)	3,570 (17.2%)	3,587 (17.3%)	6,167 (13.9%)	6,100 (13.7%)	13,182 (15.6%)	13,154 (15.6%)	0.00
Pneumonia; n (%)	431 (2.2%)	430 (2.2%)	407 (2.0%)	407 (2.0%)	1,192 (2.7%)	1,168 (2.6%)	2,030 (2.4%)	2,005 (2.4%)	0.00
Imaging; n (%)	20 (0.1%)	26 (0.1%)	11 (0.1%)	14 (0.1%)	46 (0.1%)	50 (0.1%)	77 (0.1%)	90 (0.1%)	0.00
Diabetes Medications									
DM Medications - AGIs; n (%)	94 (0.5%)	99 (0.5%)	78 (0.4%)	81 (0.4%)	273 (0.6%)	253 (0.6%)	445 (0.5%)	433 (0.5%)	0.00
DM Medications - Glitazones; n (%)	2,266 (11.8%)	2,253 (11.7%)	3,295 (15.9%)	3,271 (15.7%)	4,782 (10.8%)	4,697 (10.6%)	10,343 (12.3%)	10,221 (12.1%)	0.01
DM Medications - Insulin; n (%)	3,103 (16.2%)	3,311 (17.3%)	3,209 (15.4%)	3,403 (16.4%)	8,242 (18.6%)	8,597 (19.4%)	14,554 (17.3%)	15,311 (18.2%)	-0.02
DM Medications - Meglitinides; n (%)	243 (1.3%)	216 (1.1%)	373 (1.8%)	360 (1.7%)	688 (1.6%)	693 (1.6%)	1,304 (1.5%)	1,269 (1.5%)	0.00
DM Medications - Metformin; n (%)	12,397 (64.6%)	12,229 (63.7%)	14,006 (67.4%)	13,878 (66.8%)	28,993 (65.3%)	28,918 (65.2%)	55,396 (65.7%)	55,025 (65.2%)	0.01
Concomitant initiation or current use of SGLT2i; n (%)	1,051 (5.5%)	1,051 (5.5%)	956 (4.6%)	991 (4.8%)	1,726 (3.9%)	1,657 (3.7%)	3,733 (4.4%)	3,699 (4.4%)	0.00
Concomitant initiation or current use of AGIs; n (%)	63 (0.3%)	67 (0.3%)	49 (0.2%)	48 (0.2%)	176 (0.4%)	171 (0.4%)	288 (0.3%)	286 (0.3%)	0.00
Concomitant initiation or current use of Glitazones; n (%)	1,682 (8.8%)	1,642 (8.6%)	2,421 (11.7%)	2,382 (11.5%)	3,540 (8.0%)	3,503 (7.9%)	7,643 (9.1%)	7,527 (8.9%)	0.01
Concomitant initiation or current use of 2nd Generation SUs; n (%)	5,856 (30.5%)	5,716 (29.8%)	6,217 (29.9%)	6,177 (29.7%)	14,954 (33.7%)	14,751 (33.2%)	27,027 (32.0%)	26,644 (31.6%)	0.01
Concomitant initiation or current use of Insulin; n (%)	1,846 (9.6%)	1,981 (10.3%)	1,893 (9.1%)	2,025 (9.7%)	4,918 (11.1%)	5,173 (11.7%)	8,657 (10.3%)	9,179 (10.9%)	-0.02
Concomitant initiation or current use of Meglitinides; n (%)	164 (0.9%)	137 (0.7%)	268 (1.3%)	251 (1.2%)	485 (1.1%)	472 (1.1%)	917 (1.1%)	860 (1.0%)	0.01
Concomitant initiation or current use of Metformin; n (%)	10,067 (52.5%)	9,937 (51.8%)	11,259 (54.2%)	11,194 (53.9%)	23,633 (53.3%)	23,628 (53.2%)	44,959 (53.3%)	44,759 (53.1%)	0.00
Past use of SGLT2i ; n (%)	425 (2.2%)	406 (2.1%)	357 (1.7%)	347 (1.7%)	788 (1.8%)	740 (1.7%)	1,570 (1.9%)	1,493 (1.8%)	0.01
Past use of AGIs ; n (%)	31 (0.2%)	32 (0.2%)	29 (0.1%)	33 (0.2%)	97 (0.2%)	82 (0.2%)	157 (0.2%)	147 (0.2%)	0.00
Past use of Glitazones ; n (%)	584 (3.0%)	611 (3.2%)	874 (4.2%)	889 (4.3%)	1,242 (2.8%)	1,194 (2.7%)	2,700 (3.2%)	2,694 (3.2%)	0.00

Table 1: Liraglutide vs DPP4i

Past use of 2nd Generation SUs; n (%)	1,529 (8.0%)	1,517 (7.9%)		1,708 (8.2%)	1,699 (8.2%)		3,958 (8.9%)	3,827 (8.6%)		7,195 (8.5%)	7,043 (8.4%)	0.00
Past use of Insulin ; n (%)	1,257 (6.6%)	1,330 (6.9%)		1,316 (6.3%)	1,378 (6.6%)		3,325 (7.5%)	3,424 (7.7%)		5,898 (7.0%)	6,132 (7.3%)	-0.01
Past use of Meglitinides ; n (%)	79 (0.4%)	79 (0.4%)		105 (0.5%)	109 (0.5%)		203 (0.5%)	221 (0.5%)		387 (0.5%)	409 (0.5%)	0.00
Past use of metformin (final) ; n (%)	2,330 (12.1%)	2,292 (11.9%)		2,747 (13.2%)	2,684 (12.9%)		5,360 (12.1%)	5,290 (11.9%)		10,437 (12.4%)	10,266 (12.2%)	0.01
Other Medications												
Use of ACE inhibitors; n (%)	8,661 (45.1%)	8,617 (44.9%)		9,287 (44.7%)	9,226 (44.4%)		19,748 (44.5%)	19,720 (44.4%)		37,696 (44.7%)	37,563 (44.5%)	0.00
Use of ARBs; n (%)	6,420 (33.5%)	6,450 (33.6%)		7,474 (36.0%)	7,522 (36.2%)		15,578 (35.1%)	15,693 (35.4%)		29,472 (34.9%)	29,665 (35.2%)	-0.01
Use of Loop Diuretics - United; n (%)	3,398 (17.7%)	3,483 (18.2%)		3,539 (17.0%)	3,497 (16.8%)		9,714 (21.9%)	9,727 (21.9%)		16,651 (19.7%)	16,707 (19.8%)	0.00
Use of other diuretics- United; n (%)	863 (4.5%)	886 (4.6%)		968 (4.7%)	942 (4.5%)		2,181 (4.9%)	2,151 (4.8%)		4,012 (4.8%)	3,979 (4.7%)	0.00
Use of nitrates-United; n (%)	1,373 (7.2%)	1,383 (7.2%)		1,513 (7.3%)	1,556 (7.5%)		3,530 (8.0%)	3,518 (7.9%)		6,416 (7.6%)	6,457 (7.7%)	0.00
Use of other hypertension drugs; n (%)	1,516 (7.9%)	1,494 (7.8%)		1,480 (7.1%)	1,479 (7.1%)		3,871 (8.7%)	3,814 (8.6%)		6,867 (8.1%)	6,787 (8.0%)	0.00
Use of digoxin- United; n (%)	310 (1.6%)	320 (1.7%)		388 (1.9%)	392 (1.9%)		1,018 (2.3%)	1,020 (2.3%)		1,716 (2.0%)	1,732 (2.1%)	-0.01
Use of Anti-arrhythmics; n (%)	345 (1.8%)	337 (1.8%)		339 (1.6%)	355 (1.7%)		954 (2.1%)	969 (2.2%)		1,638 (1.9%)	1,661 (2.0%)	-0.01
Use of COPD/asthma meds- United; n (%)	3,408 (17.8%)	3,324 (17.3%)		3,810 (18.3%)	3,727 (17.9%)		8,701 (19.6%)	8,565 (19.3%)		15,919 (18.9%)	15,616 (18.5%)	0.01
Use of statins; n (%)	13,833 (72.1%)	13,840 (72.1%)		14,918 (71.8%)	14,906 (71.7%)		32,249 (72.7%)	32,353 (72.9%)		61,000 (72.3%)	61,099 (72.4%)	0.00
Use of other lipid-lowering drugs; n (%)	2,758 (14.4%)	2,721 (14.2%)		3,849 (18.5%)	3,863 (18.6%)		6,812 (15.3%)	6,760 (15.2%)		13,419 (15.9%)	13,344 (15.8%)	0.00
Use of antiplatelet agents; n (%)	2,967 (15.5%)	2,944 (15.3%)		4,046 (19.5%)	3,989 (19.2%)		6,933 (15.6%)	6,970 (15.7%)		13,946 (16.5%)	13,903 (16.5%)	0.00
Use of oral anticoagulants (Dabigatran, Rivaroxaban, Apixaban, Warfarin); n (%)	1,430 (7.5%)	1,453 (7.6%)		1,380 (6.6%)	1,370 (6.6%)		4,150 (9.4%)	4,252 (9.6%)		6,960 (8.3%)	7,075 (8.4%)	0.00
Use of heparin and other low-molecular weight heparins; n (%)	103 (0.5%)	103 (0.5%)		0 (0.0%)	1 (0.0%)		207 (0.5%)	206 (0.5%)		310 (0.4%)	310 (0.4%)	0.00
Use of NSAIDs; n (%)	3,375 (17.6%)	3,404 (17.7%)		3,669 (17.7%)	3,588 (17.3%)		7,998 (18.0%)	7,985 (18.0%)		15,042 (17.8%)	14,977 (17.8%)	0.00
Use of oral corticosteroids; n (%)	3,235 (16.9%)	3,239 (16.9%)		3,346 (16.1%)	3,257 (15.7%)		8,099 (18.2%)	7,995 (18.0%)		14,680 (17.4%)	14,491 (17.2%)	0.01
Use of bisphosphonate (United); n (%)	303 (1.6%)	349 (1.8%)		324 (1.6%)	308 (1.5%)		1,096 (2.5%)	1,047 (2.4%)		1,723 (2.0%)	1,704 (2.0%)	0.00
Use of opioids- United; n (%)	5,625 (29.3%)	5,525 (28.8%)		6,002 (28.9%)	6,018 (29.0%)		13,107 (29.5%)	13,033 (29.4%)		24,734 (29.3%)	24,576 (29.1%)	0.00
Use of antidepressants; n (%)	6,011 (31.3%)	5,924 (30.9%)		6,205 (29.9%)	6,074 (29.2%)		14,221 (32.0%)	14,173 (31.9%)		26,437 (31.3%)	26,171 (31.0%)	0.01
Use of antipsychotics; n (%)	460 (2.4%)	443 (2.3%)		366 (1.8%)	365 (1.8%)		1,104 (2.5%)	1,044 (2.4%)		1,930 (2.3%)	1,852 (2.2%)	0.01
Use of anticonvulsants; n (%)	4,060 (21.2%)	3,973 (20.7%)		3,106 (14.9%)	3,129 (15.1%)		8,847 (19.9%)	8,786 (19.8%)		16,013 (19.0%)	15,888 (18.8%)	0.01
Use of lithium- United; n (%)	24 (0.1%)	22 (0.1%)		37 (0.2%)	27 (0.1%)		66 (0.1%)	55 (0.1%)		127 (0.2%)	104 (0.1%)	0.03
Use of Benzos- United; n (%)	2,251 (11.7%)	2,238 (11.7%)		2,514 (12.1%)	2,553 (12.3%)		4,924 (11.1%)	4,945 (11.1%)		9,689 (11.5%)	9,736 (11.5%)	0.00
Use of anxiolytics/hypnotics- United; n (%)	1,429 (7.4%)	1,386 (7.2%)		1,747 (8.4%)	1,702 (8.2%)		3,365 (7.6%)	3,365 (7.6%)		6,541 (7.8%)	6,453 (7.7%)	0.00
Use of dementia meds- United; n (%)	186 (1.0%)	205 (1.1%)		153 (0.7%)	146 (0.7%)		895 (2.0%)	917 (2.1%)		1,234 (1.5%)	1,268 (1.5%)	0.00
Use of antiparkinsonian meds- United; n (%)	664 (3.5%)	666 (3.5%)		630 (3.0%)	638 (3.1%)		1,810 (4.1%)	1,794 (4.0%)		3,104 (3.7%)	3,098 (3.7%)	0.00
Any use of pramlintide; n (%)	2 (0.0%)	5 (0.0%)		8 (0.0%)	25 (0.0%)		**	**	**	**	**	**
Any use of 1st generation sulfonylureas; n (%)	4 (0.0%)	0 (0.0%)		1 (0.0%)	1 (0.0%)		**	**	**	**	**	**
Entresto (sacubitril/valsartan); n (%)	50 (0.3%)	47 (0.2%)		18 (0.1%)	13 (0.1%)		44 (0.1%)	27 (0.1%)		112 (0.1%)	087 (0.1%)	0.00
Initiation as monotherapy ; n (%)	1,829 (9.5%)	0 (0.0%)		1,585 (7.6%)	0 (0.0%)		3,010 (6.8%)	0 (0.0%)		6,424 (7.6%)	#VALUE!	#VALUE!
Labs										39,964	39,964	
Lab values- HbA1c (%) ; n (%)	7,630 (39.8%)	7,216 (37.6%)		1,331 (6.4%)	1,167 (5.6%)		N/A	N/A		8,961 (22.4%)	8,383 (21.0%)	0.03
Lab values- HbA1c (%) (within 3 months) ; n (%)	6,032 (31.4%)	5,538 (28.9%)		1,052 (5.1%)	916 (4.4%)		N/A	N/A		7,084 (17.7%)	6,454 (16.1%)	0.04
Lab values- HbA1c (%) (within 6 months) ; n (%)	7,630 (39.8%)	7,216 (37.6%)		1,331 (6.4%)	1,167 (5.6%)		N/A	N/A		8,961 (22.4%)	8,383 (21.0%)	0.03
Lab values- BNP; n (%)	211 (1.1%)	206 (1.1%)		25 (0.1%)	34 (0.2%)		N/A	N/A		236 (0.6%)	240 (0.6%)	0.00
Lab values- BNP (within 3 months); n (%)	117 (0.6%)	121 (0.6%)		14 (0.1%)	28 (0.1%)		N/A	N/A		131 (0.3%)	149 (0.4%)	-0.02
Lab values- BNP (within 6 months); n (%)	211 (1.1%)	206 (1.1%)		25 (0.1%)	34 (0.2%)		N/A	N/A		236 (0.6%)	240 (0.6%)	0.00
Lab values- BUN (mg/dl); n (%)	7,901 (41.2%)	7,376 (38.4%)		1,341 (6.5%)	1,179 (5.7%)		N/A	N/A		9,242 (23.1%)	8,555 (21.4%)	0.04
Lab values- BUN (mg/dl) (within 3 months); n (%)	6,155 (32.1%)	5,577 (29.1%)		1,038 (5.0%)	901 (4.3%)		N/A	N/A		7,193 (18.0%)	6,478 (16.2%)	0.05
Lab values- BUN (mg/dl) (within 6 months); n (%)	7,901 (41.2%)	7,376 (38.4%)		1,341 (6.5%)	1,179 (5.7%)		N/A	N/A		9,242 (23.1%)	8,555 (21.4%)	0.04
Lab values- Creatinine (mg/dl) ; n (%)	8,092 (42.2%)	7,583 (39.5%)		1,405 (6.8%)	1,228 (5.9%)		N/A	N/A		9,497 (23.8%)	8,811 (22.0%)	0.04
Lab values- Creatinine (mg/dl) (within 3 months) ; n (%)	6,325 (33.0%)	5,734 (29.9%)		1,089 (5.2%)	933 (4.5%)		N/A	N/A		7,414 (18.6%)	6,667 (16.7%)	0.05
Lab values- Creatinine (mg/dl) (within 6 months) ; n (%)	8,092 (42.2%)	7,583 (39.5%)		1,405 (6.8%)	1,228 (5.9%)		N/A	N/A		9,497 (23.8%)	8,811 (22.0%)	0.04
Lab values- HDL level (mg/dl); n (%)	6,566 (34.2%)	6,095 (31.8%)		1,190 (5.7%)	1,025 (4.9%)		N/A	N/A		7,756 (19.4%)	7,120 (17.8%)	0.04
Lab values- HDL level (mg/dl) (within 3 months); n (%)	4,811 (25.1%)	4,342 (22.6%)		876 (4.2%)	751 (3.6%)		N/A	N/A		5,687 (14.2%)	5,093 (12.7%)	0.04
Lab values- HDL level (mg/dl) (within 6 months); n (%)	6,566 (34.2%)	6,095 (31.8%)		1,190 (5.7%)	1,025 (4.9%)		N/A	N/A		7,756 (19.4%)	7,120 (17.8%)	0.04
Lab values- LDL level (mg/dl); n (%)	6,757 (35.2%)	6,299 (32.8%)		1,235 (5.9%)	1,085 (5.2%)		N/A	N/A		7,992 (20.0%)	7,384 (18.5%)	0.04
Lab values- LDL level (mg/dl) (within 3 months); n (%)	4,956 (25.8%)	4,495 (23.4%)		911 (4.4%)	789 (3.8%)		N/A	N/A		5,867 (14.7%)	5,284 (13.2%)	0.04
Lab values- LDL level (mg/dl) (within 6 months); n (%)	6,757 (35.2%)	6,299 (32.8%)		1,235 (5.9%)	1,085 (5.2%)		N/A	N/A		7,992 (20.0%)	7,384 (18.5%)	0.04
Lab values- NT-proBNP; n (%)	36 (0.2%)	35 (0.2%)		3 (0.0%)	2 (0.0%)		N/A	N/A		39 (0.1%)	0 (0.1%)	-
Lab values- NT-proBNP (within 3 months); n (%)	21 (0.1%)	22 (0.1%)		3 (0.0%)	0 (0.0%)		N/A	N/A		24 (0.1%)	0 (0.1%)	-
Lab values- NT-proBNP (within 6 months); n (%)	36 (0.2%)	35 (0.2%)		3 (0.0%)	2 (0.0%)		N/A	N/A		39 (0.1%)	37 (0.1%)	-
Lab values- Total cholesterol (mg/dl) ; n (%)	6,680 (34.8%)	6,217 (32.4%)		1,209 (5.8%)	1,039 (5.0%)		N/A	N/A		7,889 (19.7%)	7,256 (18.2%)	0.04
Lab values- Total cholesterol (mg/dl) (within 3 months) ; n (%)	4,901 (25.5%)	4,436 (23.1%)		892 (4.3%)	761 (3.7%)		N/A	N/A		5,793 (14.5%)	5,197 (13.0%)	0.04
Lab values- Total cholesterol (mg/dl) (within 6 months) ; n (%)	6,680 (34.8%)	6,217 (32.4%)		1,209 (5.8%)	1,039 (5.0%)		N/A	N/A		7,889 (19.7%)	7,256 (18.2%)	0.04
Lab values- Triglyceride level (mg/dl); n (%)	6,635 (34.6%)	6,161 (32.1%)		1,197 (5.8%)	1,020 (4.9%)		N/A	N/A		7,832 (19.6%)	7,181 (18.0%)	0.04
Lab values- Triglyceride level (mg/dl) (within 3 months) ; n (%)	4,872 (25.4%)	4,399 (22.9%)		885 (4.3%)	747 (3.6%)		N/A	N/A		5,757 (14.4%)	5,146 (12.9%)	0.04
Lab values- Triglyceride level (mg/dl) (within 6 months) ; n (%)	6,635 (34.6%)	6,161 (32.1%)		1,197 (5.8%)	1,020 (4.9%)		N/A	N/A		7,832 (19.6%)	7,181 (18.0%)	0.04
Lab result number- HbA1c (%) mean (only 2 to 20 included)	7,607	7,179		1,263	1,104		N/A	N/A		8,870	8,283	
...mean (sd)	8.05 (1.64)	8.03 (1.73)	0.01	8.02 (1.62)	8.03 (1.74)	-0.01	N/A	N/A	#VALUE!	8.05 (1.64)	8.03 (1.73)	0.01
...median [IQR]	7.70 [6.95, 8.80]	7.70 [6.80, 8.93]	0.00	7.70 [6.90, 8.80]	7.70 [6.80, 8.94]	0.00	N/A	N/A	#VALUE!	7.70 (1.64)	7.70 (1.73)	0.00
...Missing; n (%)	11,580 (60.4%)	12,008 (62.6%)	-0.05	19,514 (93.9%)	19,673 (94.7%)	-0.03	N/A	N/A	#VALUE!	31,094 (77.8%)	31,681 (79.3%)	-0.04

Table 1: Liraglutide vs DPP4i

Lab result number- BNP mean	211	206		25	34		N/A	N/A		236	240	
...mean (sd)	178.05 (453.45)	112.46 (210.39)	0.19	11,349.77 (55,969.06)	98.46 (169.53)	0.28	N/A	N/A	#VALUE!	1361.49 (17968.03)	110.48 (205.64)	0.10
...median [IQR]	79.90 [31.80, 158.50]	44.20 [21.62, 112.70]	0.10	72.00 [34.50, 293.25]	44.35 [16.25, 119.12]	0.00	N/A	N/A	#VALUE!	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	18,976 (98.9%)	18,981 (98.9%)	0.00	20,752 (99.9%)	20,743 (99.8%)	0.03	N/A	N/A	#VALUE!	39,728 (99.4%)	39,724 (99.4%)	0.00
Lab result number- BUN (mg/dl) mean	7,901	7,376		1,341	1,179		N/A	N/A		9,242	8,555	
...mean (sd)	19.20 (8.24)	19.56 (8.24)	-0.04	424.78 (7,460.56)	689.04 (11,932.92)	-0.03	N/A	N/A	#VALUE!	78.05 (2841.27)	111.82 (4428.80)	-0.01
...median [IQR]	17.40 [14.00, 22.00]	18.00 [14.00, 23.00]	-0.07	17.00 [13.37, 21.00]	18.00 [14.25, 22.00]	0.00	N/A	N/A	#VALUE!	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	11,286 (58.8%)	11,811 (61.6%)	-0.06	19,436 (93.5%)	19,598 (94.3%)	-0.03	N/A	N/A	#VALUE!	30,722 (76.9%)	31,409 (78.6%)	-0.04
Lab result number- Creatinine (mg/dl) mean (only 0.1 to 15 included)	8,029	7,538		1,288	1,121		N/A	N/A		9,317	8,659	
...mean (sd)	1.06 (0.41)	1.04 (0.37)	0.05	1.02 (0.38)	1.01 (0.32)	0.03	N/A	N/A	#VALUE!	1.05 (0.41)	1.04 (0.36)	0.03
...median [IQR]	0.97 [0.80, 1.21]	0.96 [0.80, 1.20]	0.03	0.96 [0.79, 1.12]	0.96 [0.80, 1.14]	0.00	N/A	N/A	#VALUE!	0.97 (0.41)	0.96 (0.36)	0.03
...Missing; n (%)	11,158 (58.2%)	11,649 (60.7%)	-0.05	19,489 (93.8%)	19,656 (94.6%)	-0.03	N/A	N/A	#VALUE!	30,647 (76.7%)	31,305 (78.3%)	-0.04
Lab result number- HDL level (mg/dl) mean (only =<5000 included)	6,566	6,095		1,186	1,021		N/A	N/A		7,752	7,116	
...mean (sd)	46.32 (13.75)	45.91 (13.13)	0.03	45.33 (15.96)	44.46 (13.85)	0.06	N/A	N/A	#VALUE!	46.17 (14.11)	45.70 (13.24)	0.03
...median [IQR]	44.00 [37.00, 53.50]	44.00 [37.00, 53.00]	0.00	44.00 [36.00, 53.00]	43.00 [36.00, 52.00]	0.07	N/A	N/A	#VALUE!	44.00 (14.11)	43.86 (13.24)	0.01
...Missing; n (%)	12,621 (65.8%)	13,092 (68.2%)	-0.05	19,591 (94.3%)	19,756 (95.1%)	-0.04	N/A	N/A	#VALUE!	32,212 (80.6%)	32,848 (82.2%)	-0.04
Lab result number- LDL level (mg/dl) mean (only =<5000 included)	6,629	6,170		1,149	949		N/A	N/A		7,778	7,119	
...mean (sd)	85.21 (38.16)	81.93 (36.98)	0.09	84.96 (41.84)	83.77 (40.06)	0.03	N/A	N/A	#VALUE!	85.17 (38.73)	82.18 (37.41)	0.08
...median [IQR]	82.00 [62.00, 106.50]	79.00 [60.00, 102.00]	0.08	84.00 [61.50, 108.00]	84.00 [62.00, 106.00]	0.00	N/A	N/A	#VALUE!	82.30 (38.73)	79.67 (37.41)	0.07
...Missing; n (%)	12,558 (65.5%)	13,017 (67.8%)	-0.05	19,628 (94.5%)	19,828 (95.4%)	-0.04	N/A	N/A	#VALUE!	32,186 (80.5%)	32,845 (82.2%)	-0.04
Lab result number- Total cholesterol (mg/dl) mean (only =<5000 included)	6,675	6,213		1,205	1,034		N/A	N/A		7,880	7,247	
...mean (sd)	170.81 (45.37)	167.71 (42.55)	0.07	171.98 (53.53)	170.54 (48.18)	0.03	N/A	N/A	#VALUE!	170.99 (46.71)	168.11 (43.40)	0.06
...median [IQR]	164.67 [141.00, 195.00]	162.00 [139.00, 191.00]	0.06	167.00 [142.00, 199.50]	166.00 [142.88, 196.00]	0.02	N/A	N/A	#VALUE!	165.03 (46.71)	162.57 (43.40)	0.05
...Missing; n (%)	12,512 (65.2%)	12,974 (67.6%)	-0.05	19,572 (94.2%)	19,743 (95.0%)	-0.04	N/A	N/A	#VALUE!	32,084 (80.3%)	32,717 (81.9%)	-0.04
Lab result number- Triglyceride level (mg/dl) mean (only =<5000 included)	6,634	6,161		1,193	1,016		N/A	N/A		7,827	7,177	
...mean (sd)	183.24 (145.11)	184.97 (135.08)	-0.01	188.33 (172.01)	187.81 (148.81)	0.00	N/A	N/A	#VALUE!	184.02 (149.53)	185.37 (137.12)	-0.01
...median [IQR]	152.00 [109.00, 217.00]	155.00 [112.00, 218.00]	-0.02	149.00 [103.00, 221.25]	155.00 [109.00, 221.00]	-0.04	N/A	N/A	#VALUE!	151.54 (149.53)	155.00 (137.12)	-0.02
...Missing; n (%)	12,553 (65.4%)	13,026 (67.9%)	-0.05	19,584 (94.3%)	19,761 (95.1%)	-0.04	N/A	N/A	#VALUE!	32,137 (80.4%)	32,787 (82.0%)	-0.04
Lab result number- Hemoglobin mean (only >0 included)	5,571	5,078		891	783		N/A	N/A		6,462	5,861	
...mean (sd)	13.38 (1.69)	13.43 (1.61)	-0.03	6,166.82 (167,694.97)	13.30 (2.42)	0.05	N/A	N/A	#VALUE!	861.83 (62249.00)	13.41 (1.74)	0.02
...median [IQR]	13.40 [12.30, 14.50]	13.40 [12.40, 14.50]	0.00	13.30 [12.40, 14.45]	13.45 [12.40, 14.70]	0.00	N/A	N/A	#VALUE!	#VALUE!	13.41 (1.74)	#VALUE!
...Missing; n (%)	13,616 (71.0%)	14,109 (73.5%)	-0.06	19,886 (95.7%)	19,994 (96.2%)	-0.03	N/A	N/A	#VALUE!	33,502 (83.8%)	34,103 (85.3%)	-0.04
Lab result number- Serum sodium mean (only > 90 and < 190 included)	7,873	7,386		1,270	1,096		N/A	N/A		9,143	8,482	
...mean (sd)	139.61 (2.73)	139.62 (2.63)	0.00	139.31 (2.56)	139.07 (2.53)	0.09	N/A	N/A	#VALUE!	139.57 (2.71)	139.55 (2.62)	0.01
...median [IQR]	140.00 [138.00, 141.50]	140.00 [138.00, 141.33]	0.00	139.12 [138.00, 141.00]	139.00 [137.54, 141.00]	0.05	N/A	N/A	#VALUE!	139.88 (2.71)	139.87 (2.62)	0.00
...Missing; n (%)	11,314 (59.0%)	11,801 (61.5%)	-0.05	19,507 (93.9%)	19,681 (94.7%)	-0.03	N/A	N/A	#VALUE!	30,821 (77.1%)	31,482 (78.8%)	-0.04
Lab result number- Albumin mean (only >0 and <=10 included)	7,378	6,868		1,142	1,023		N/A	N/A		8,520	7,891	
...mean (sd)	4.23 (0.32)	4.22 (0.31)	0.03	4.11 (0.72)	4.11 (0.68)	0.00	N/A	N/A	#VALUE!	4.21 (0.40)	4.21 (0.38)	0.00
...median [IQR]	4.25 [4.00, 4.45]	4.20 [4.00, 4.40]	0.16	4.20 [4.00, 4.40]	4.20 [4.00, 4.40]	0.00	N/A	N/A	#VALUE!	4.24 (0.40)	4.20 (0.38)	0.10
...Missing; n (%)	11,809 (61.5%)	12,319 (64.2%)	-0.06	19,635 (94.5%)	19,754 (95.1%)	-0.03	N/A	N/A	#VALUE!	31,444 (78.7%)	32,073 (80.3%)	-0.04
Lab result number- Glucose (fasting or random) mean (only 10-1000 included)	7,859	7,362		1,261	1,078		N/A	N/A		9,120	8,440	
...mean (sd)	168.28 (66.76)	166.71 (68.39)	0.02	164.30 (62.49)	168.11 (68.55)	-0.06	N/A	N/A	#VALUE!	167.73 (66.19)	166.89 (68.41)	0.01
...median [IQR]	153.00 [124.00, 196.00]	151.00 [119.00, 196.00]	0.03	150.00 [121.00, 193.00]	152.00 [119.00, 197.62]	-0.03	N/A	N/A	#VALUE!	152.59 (66.19)	151.13 (68.41)	0.02
...Missing; n (%)	11,328 (59.0%)	11,825 (61.6%)	-0.05	19,516 (93.9%)	19,699 (94.8%)	-0.04	N/A	N/A	#VALUE!	30,844 (77.2%)	31,524 (78.9%)	-0.04
Lab result number- Potassium mean (only 1-7 included)	8,018	7,536		1,296	1,146		N/A	N/A		9,314	8,682	
...mean (sd)	4.45 (0.44)	4.46 (0.43)	-0.02	4.34 (0.45)	4.36 (0.45)	-0.04	N/A	N/A	#VALUE!	4.43 (0.44)	4.45 (0.43)	-0.05
...median [IQR]	4.45 [4.20, 4.70]	4.45 [4.20, 4.70]	0.00	4.35 [4.00, 4.60]	4.35 [4.00, 4.60]	0.00	N/A	N/A	#VALUE!	4.44 (0.44)	4.44 (0.43)	0.00
...Missing; n (%)	11,169 (58.2%)	11,651 (60.7%)	-0.05	19,481 (93.8%)	19,631 (94.5%)	-0.03	N/A	N/A	#VALUE!	30,650 (76.7%)	31,282 (78.3%)	-0.04
Comorbidity Scores												
CCI (180 days)- ICD9 and ICD10												
...mean (sd)	2.81 (1.90)	2.81 (1.88)	0.00	2.11 (1.53)	2.10 (1.54)	0.01	2.88 (2.01)	2.88 (1.99)	0.00	2.67 (1.88)	2.67 (1.86)	0.00
...median [IQR]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	0.00	2.00 [1.00, 3.00]	2.00 [1.00, 3.00]	0.00	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	0.00	2.00 (1.88)	2.00 (1.86)	0.00
Frailty Score: Qualitative Version 365 days as Categories, v1												
...0; n (%)	9,675 (50.4%)	9,627 (50.2%)	0.00	6,331 (30.5%)	6,391 (30.8%)	-0.93	14,745 (33.2%)	14,927 (33.6%)	-0.01	30,751 (36.5%)	30,945 (36.7%)	0.00
...1 to 2; n (%)	6,091 (31.7%)	6,185 (32.2%)	-0.01	9,099 (43.8%)	9,298 (44.8%)	-1.25	15,032 (33.9%)	15,014 (33.8%)	0.00	30,222 (35.8%)	30,497 (36.2%)	-0.01
...3 or more; n (%)	3,421 (17.8%)	3,375 (17.6%)	0.01	5,347 (25.7%)	5,088 (24.5%)	0.03	14,604 (32.9%)	14,440 (32.5%)	0.01	23,372 (27.7%)	22,903 (27.2%)	0.01
Frailty Score: Empirical Version 365 days as Categories,												
...<0.12908; n (%)	3,587 (18.7%)	3,404 (17.7%)	0.03	3,596 (17.3%)	3,485 (16.8%)	0.01	4,452 (10.0%)	4,046 (9.1%)	0.03	11,635 (13.8%)	10,935 (13.0%)	0.02
...0.12908 - 0.1631167; n (%)	6,091 (31.7%)	6,047 (31.5%)	0.00	6,834 (32.9%)	6,788 (32.7%)	0.00	10,566 (23.8%)	10,686 (24.1%)	-0.01	23,491 (27.9%)	23,521 (27.9%)	0.00
...>= 0.1631167; n (%)	9,509 (49.6%)	9,736 (50.7%)	-0.02	10,347 (49.8%)	10,504 (50.6%)	-0.02	29,363 (66.2%)	29,649 (66.8%)	-0.01	49,219 (58.4%)	49,889 (59.1%)	-0.01
Non-Frailty; n (%)	11,603 (60.5%)	11,864 (61.8%)	-0.03	11,804 (56.8%)	11,670 (56.2%)	0.01	1,841 (4.1%)	1,879 (4.2%)	-0.01	25,248 (29.9%)	25,413 (30.1%)	0.00
Frailty Score (mean): Qualitative Version 365 days, v1												
...mean (sd)	1.22 (1.81)	1.19 (1.72)	0.02	1.69 (1.76)	1.64 (1.71)	0.03	1.99 (2.19)	1.96 (2.16)	0.01	1.74 (2.01)	1.71 (1.96)	0.02
...median [IQR]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00	1.00 [0.00, 3.00]	1.00 [0.00, 2.00]	0.00	1.00 [0.00, 3.00]	1.00 [0.00, 3.00]	0.00	0.77 (2.01)	0.77 (1.96)	0.00
Frailty Score (mean): Empirical Version 365 days,												
...mean (sd)	0.17 (0.06)	0.17 (0.05)	0.00	0.17 (0.05)	0.17 (0.05)	0.00	0.20 (0.06)	0.20 (0.06)	0.00	0.19 (0.06)	0.19 (0.06)	0.00
...median [IQR]	0.16 [0.14, 0.20]	0.16 [0.14, 0.20]	0.00	0.16 [0.13, 0.19]	0.16 [0.13, 0.19]	0.00	0.18 [0.15, 0.23]	0.18 [0.15, 0.23]	0.00	0.17 (0.06)	0.17 (0.06)	0.00

Table 1: Liraglutide vs DPP4i

Healthcare Utilization	Liraglutide	DPP4i	SMD	Liraglutide	DPP4i	SMD	Liraglutide	DPP4i	SMD	Liraglutide	DPP4i	SMD
Any hospitalization; n (%)	1,541 (8.0%)	1,546 (8.1%)		1,803 (8.7%)	1,753 (8.4%)		3,978 (9.0%)	3,932 (8.9%)		7,322 (8.7%)	7,231 (8.6%)	0.00
Any hospitalization within prior 30 days; n (%)	297 (1.5%)	323 (1.7%)		336 (1.6%)	314 (1.5%)		799 (1.8%)	769 (1.7%)		1,432 (1.7%)	1,406 (1.7%)	0.00
Any hospitalization during prior 31-180 days; n (%)	1,301 (6.8%)	1,288 (6.7%)		1,511 (7.3%)	1,494 (7.2%)		3,337 (7.5%)	3,308 (7.5%)		6,149 (7.3%)	6,090 (7.2%)	0.00
Endocrinologist Visit; n (%)	3,589 (18.7%)	3,976 (20.7%)		4,157 (20.0%)	4,563 (22.0%)		9,939 (22.4%)	10,730 (24.2%)		17,685 (21.0%)	19,269 (22.8%)	-0.04
Endocrinologist Visit (30 days prior); n (%)	2,456 (12.8%)	2,552 (13.3%)		2,994 (14.4%)	3,142 (15.1%)		6,564 (14.8%)	6,748 (15.2%)		12,014 (14.2%)	12,442 (14.8%)	-0.02
Endocrinologist Visit (31 to 180 days prior); n (%)	2,705 (14.1%)	2,807 (14.6%)		3,031 (14.6%)	3,169 (15.3%)		7,860 (17.7%)	8,000 (18.0%)		13,596 (16.1%)	13,976 (16.6%)	-0.01
Internal medicine/family medicine visits; n (%)	16,005 (83.4%)	16,049 (83.6%)		17,889 (86.1%)	17,817 (85.8%)		37,186 (83.8%)	37,213 (83.8%)		71,080 (84.3%)	71,079 (84.3%)	0.00
Internal medicine/family medicine visits (30 days prior) ; n (%)	11,488 (59.9%)	11,453 (59.7%)		12,820 (61.7%)	12,747 (61.4%)		25,129 (56.6%)	25,010 (56.4%)		49,437 (58.6%)	49,210 (58.3%)	0.01
Internal medicine/family medicine visits (31 to 180 days prior) ; n (%)	14,693 (76.6%)	14,746 (76.9%)		16,264 (78.3%)	16,214 (78.0%)		34,222 (77.1%)	34,115 (76.9%)		65,179 (77.3%)	65,075 (77.2%)	0.00
Cardiologist visit; n (%)	6,554 (34.2%)	6,623 (34.5%)		6,991 (33.6%)	6,941 (33.4%)		16,101 (36.3%)	16,090 (36.3%)		29,646 (35.1%)	29,654 (35.2%)	0.00
Number of Cardiologist visits (30 days prior); n (%)	2,161 (11.3%)	2,239 (11.7%)		2,407 (11.6%)	2,317 (11.2%)		5,233 (11.8%)	5,130 (11.6%)		9,801 (11.6%)	9,686 (11.5%)	0.00
Number of Cardiologist visits (31 to 180 days prior); n (%)	5,709 (29.8%)	5,679 (29.6%)		5,994 (28.8%)	5,953 (28.7%)		14,170 (31.9%)	14,138 (31.9%)		25,873 (30.7%)	25,770 (30.6%)	0.00
Electrocardiogram ; n (%)	6,660 (34.7%)	6,494 (33.8%)		7,436 (35.8%)	7,460 (35.9%)		15,567 (35.1%)	15,619 (35.2%)		29,663 (35.2%)	29,573 (35.1%)	0.00
Use of glucose test strips; n (%)	745 (3.9%)	797 (4.2%)		984 (4.7%)	992 (4.8%)		1,670 (3.8%)	1,709 (3.9%)		3,399 (4.0%)	3,498 (4.1%)	-0.01
Dialysis; n (%)	7 (0.0%)	11 (0.1%)		5 (0.0%)	9 (0.0%)		30 (0.1%)	18 (0.0%)		042 (0.0%)	038 (0.0%)	#DIV/0!
Naive new user v8 ; n (%)	2,841 (14.8%)	2,939 (15.3%)		2,502 (12.0%)	2,584 (12.4%)		4,759 (10.7%)	4,824 (10.9%)		10,102 (12.0%)	10,347 (12.3%)	-0.01
N antidiabetic drugs at index date												
…mean (sd)	2.08 (0.83)	2.07 (0.88)	0.01	2.11 (0.84)	2.10 (0.90)	0.01	2.12 (0.82)	2.11 (0.85)	0.01	2.11 (0.83)	2.10 (0.87)	0.01
…median [IQR]	2.00 [1.00, 3.00]	2.00 [1.00, 3.00]	0.00	2.00 [2.00, 3.00]	2.00 [1.00, 3.00]	0.00	2.00 [2.00, 3.00]	2.00 [1.00, 3.00]	0.00	2.00 (0.83)	2.00 (0.87)	0.00
number of different/distinct medication prescriptions												
…mean (sd)	11.67 (5.48)	11.62 (5.07)	0.01	11.57 (5.27)	11.49 (4.84)	0.02	11.32 (5.10)	11.28 (4.68)	0.01	11.46 (5.23)	11.41 (4.81)	0.01
…median [IQR]	11.00 [8.00, 15.00]	11.00 [8.00, 14.00]	0.00	11.00 [8.00, 14.00]	11.00 [8.00, 14.00]	0.00	11.00 [8.00, 14.00]	11.00 [8.00, 14.00]	0.00	11.00 (5.23)	11.00 (4.81)	0.00
Number of Hospitalizations												
…mean (sd)	0.10 (0.36)	0.10 (0.36)	0.00	0.10 (0.35)	0.10 (0.35)	0.00	0.11 (0.40)	0.11 (0.40)	0.00	0.11 (0.38)	0.11 (0.38)	0.00
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (0.38)	0.00 (0.38)	0.00
Number of hospital days												
…mean (sd)	0.50 (2.40)	0.49 (2.58)	0.00	0.47 (2.10)	0.46 (2.30)	0.00	0.64 (2.82)	0.63 (2.98)	0.00	0.57 (2.57)	0.56 (2.74)	0.00
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (2.57)	0.00 (2.74)	0.00
Number of Emergency Department (ED) visits												
…mean (sd)	0.42 (1.17)	0.41 (1.20)	0.01	0.15 (1.58)	0.16 (1.22)	-0.01	0.46 (1.22)	0.45 (1.22)	0.01	0.37 (1.31)	0.37 (1.22)	0.00
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (1.31)	0.00 (1.22)	0.00
Number of Office visits												
…mean (sd)	5.85 (4.25)	5.79 (4.09)	0.01	6.06 (4.48)	6.03 (4.28)	0.01	6.48 (4.81)	6.44 (4.59)	0.01	6.23 (4.61)	6.19 (4.40)	0.01
…median [IQR]	5.00 [3.00, 8.00]	5.00 [3.00, 8.00]	0.00	5.00 [3.00, 8.00]	5.00 [3.00, 8.00]	0.00	5.00 [3.00, 9.00]	5.00 [3.00, 8.00]	0.00	5.00 (4.61)	5.00 (4.40)	0.00
Number of Endocrinologist visits												
…mean (sd)	0.94 (3.12)	1.08 (3.57)	-0.04	1.02 (3.36)	1.15 (3.67)	-0.04	1.37 (4.44)	1.59 (5.06)	-0.05	1.19 (3.92)	1.37 (4.44)	-0.04
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (3.92)	0.00 (4.44)	0.00
Number of internal medicine/family medicine visits												
…mean (sd)	10.22 (14.26)	10.41 (14.28)	-0.01	7.58 (9.28)	7.78 (9.68)	-0.02	8.74 (11.41)	8.76 (11.44)	0.00	8.79 (11.66)	8.89 (11.76)	-0.01
…median [IQR]	6.00 [2.00, 13.00]	6.00 [2.00, 13.00]	0.00	5.00 [2.00, 10.00]	5.00 [2.00, 10.00]	0.00	5.00 [2.00, 12.00]	5.00 [2.00, 12.00]	0.00	5.23 (11.66)	5.23 (11.76)	0.00
Number of Cardiologist visits												
…mean (sd)	1.73 (4.10)	1.70 (4.02)	0.01	1.54 (3.79)	1.53 (3.73)	0.00	1.97 (4.77)	1.97 (4.91)	0.00	1.81 (4.40)	1.80 (4.45)	0.00
…median [IQR]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00	0.00 (4.40)	0.00 (4.45)	0.00
Number electrocardiograms received												
…mean (sd)	0.67 (1.37)	0.67 (1.47)	0.00	0.63 (1.19)	0.64 (1.21)	-0.01	0.70 (1.37)	0.70 (1.34)	0.00	0.68 (1.33)	0.68 (1.34)	0.00
…median [IQR]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 (1.33)	0.00 (1.34)	0.00
Number of HbA1c tests ordered												
…mean (sd)	1.39 (0.93)	1.39 (0.92)	0.00	1.14 (0.94)	1.15 (0.95)	-0.01	1.52 (0.87)	1.52 (0.88)	0.00	1.40 (0.90)	1.40 (0.91)	0.00
…median [IQR]	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	0.00	1.00 [0.00, 2.00]	1.00 [0.00, 2.00]	0.00	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	0.00	1.00 (0.90)	1.00 (0.91)	0.00
Number of glucose tests ordered												
…mean (sd)	0.54 (1.37)	0.57 (1.40)	-0.02	0.50 (1.31)	0.50 (1.20)	0.00	0.50 (1.09)	0.51 (1.13)	-0.01	0.51 (1.21)	0.52 (1.21)	-0.01
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 (1.21)	0.00 (1.21)	0.00
Number of lipid tests ordered												
…mean (sd)	1.09 (0.99)	1.08 (1.01)	0.01	1.00 (1.33)	1.00 (1.30)	0.00	1.11 (0.85)	1.10 (0.88)	0.01	1.08 (1.02)	1.07 (1.03)	0.01
…median [IQR]	1.00 [0.00, 2.00]	1.00 [0.00, 2.00]	0.00	1.00 [0.00, 1.00]	1.00 [0.00, 1.00]	0.00	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	0.00	1.00 (1.02)	1.00 (1.03)	0.00
Number of creatinine tests ordered												
…mean (sd)	0.05 (0.30)	0.06 (0.30)	-0.03	0.06 (0.36)	0.06 (0.34)	0.00	0.09 (0.39)	0.10 (0.41)	-0.02	0.07 (0.36)	0.08 (0.37)	-0.03
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (0.36)	0.00 (0.37)	0.00
Number of BUN tests ordered												
…mean (sd)	0.03 (0.23)	0.03 (0.23)	0.00	0.04 (0.27)	0.04 (0.27)	0.00	0.06 (0.30)	0.06 (0.32)	0.00	0.05 (0.28)	0.05 (0.29)	0.00
…median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00	0.00 (0.28)	0.00 (0.29)	0.00
Number of tests for microalbuminuria												
…mean (sd)	0.86 (1.24)	0.86 (1.25)	0.00	0.63 (1.07)	0.64 (1.07)	-0.01	0.56 (0.79)	0.56 (0.76)	0.00	0.65 (0.98)	0.65 (0.97)	0.00
…median [IQR]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00	0.00 (0.98)	0.00 (0.97)	0.00
Total N distinct ICD9/ICD10 diagnoses at the 3rd digit level												
…mean (sd)	6.95 (8.39)	6.93 (8.40)	0.00	2.39 (4.45)	2.38 (4.64)	0.00	6.22 (8.51)	6.18 (8.55)	0.00	5.44 (7.68)	5.41 (7.73)	0.00
…median [IQR]	5.00 [0.00, 10.00]	5.00 [0.00, 10.00]	0.00	0.00 [0.00, 4.00]	0.00 [0.00, 4.00]	0.00	4.00 [0.00, 10.00]	3.00 [0.00, 10.00]	0.12	3.24 (7.68)	2.72 (7.73)	0.07
Use of thiazide; n (%)	2,737 (14.3%)	2,706 (14.1%)	0.005729859	2,745 (13.2%)	2,771 (13.3%)	-0.00294956	6,857 (15.5%)	6,900 (15.5%)	0	12,339 (14.6%)	12,377 (14.7%)	0.00
Use of beta blockers; n (%)	8,557 (44.6%)	8,627 (45.0%)	-0.01	9,505 (45.7%)	9,500 (45.7%)	0.00	21,602 (48.7%)	21,620 (48.7%)	0.00	39,664 (47.0%)	39,747 (47.1%)	0.00
Use of calcium channel blockers; n (%)	5,718 (29.8%)	5,741 (29.9%)	0.00	6,185 (29.8%)	6,269 (30.2%)	-0.01	14,181 (32.0%)	14,361 (32.4%)	-0.01	26,084 (30.9%)	26,371 (31.3%)	-0.01

Appendix B: Liraglutide vs 2nd Generation Sulfonylureas
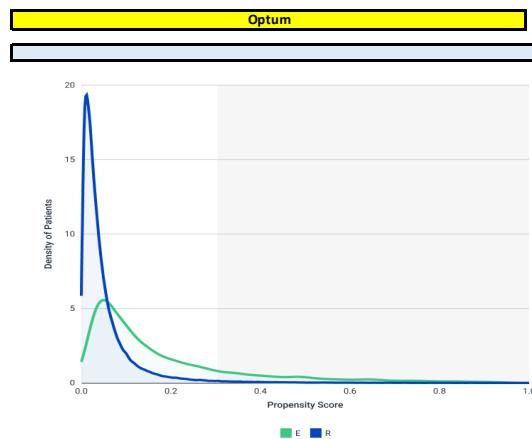
Optum	MarketScan	Medicare

BEFORE PS MATCHING

Figure 49: Pre-matching propensity score overlap
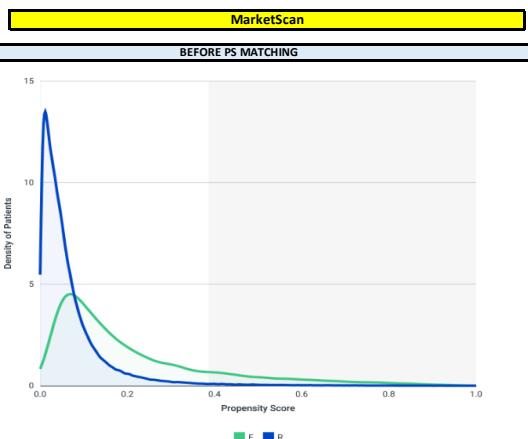
igure 49: Pre-matching propensity score overlap
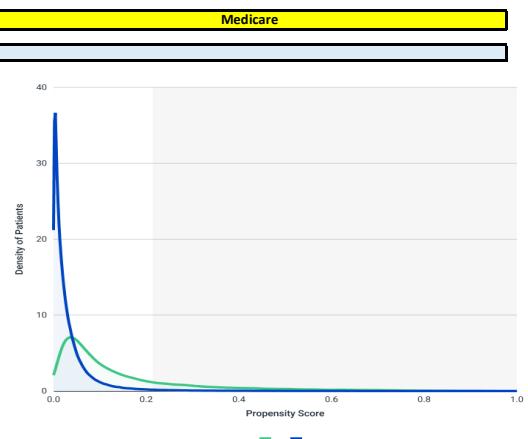
Figure 24: Pre-matching propensity score overlap

The c-statistics for the propensity score model, pre-matching was 0.815. The post-matching c-statistic was 0.535.	The c-statistics for the propensity score model, pre-matching was 0.811. The post-matching c-statistic was 0.538.	The c-statistics for the propensity score model, pre-matching was 0.835. The post-matching c-statistic was 0.525.

## AFTER PS MATCHING
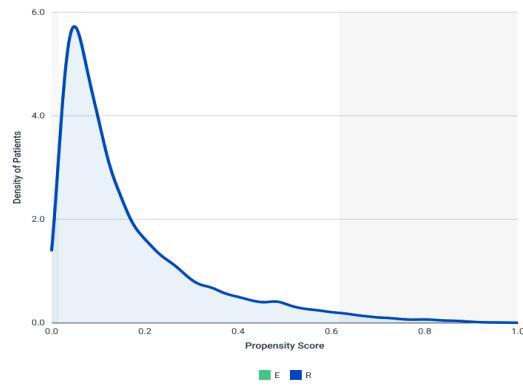
Figure 50: Post-matching propensity score overlap
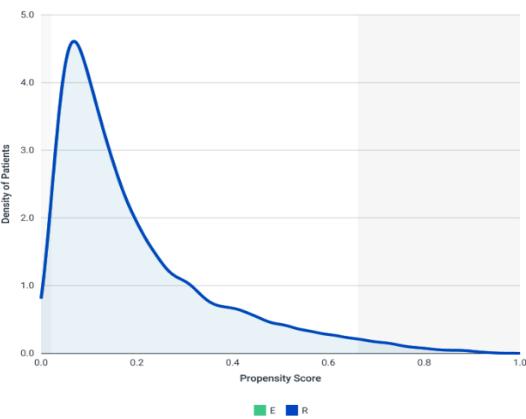
Figure 50: Post-matching propensity score overlap
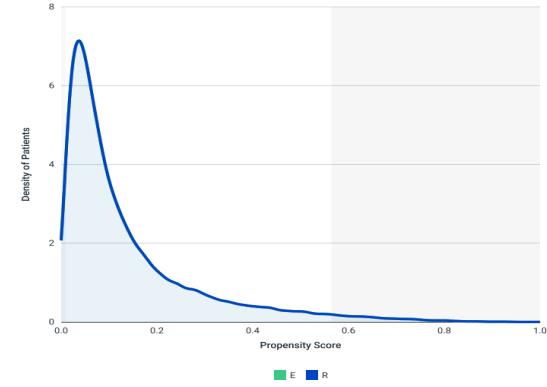
Figure 25: Post-matching propensity score overlap

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

	Unmatched								
	Optum		**MarketScan**		**Medicare**		**POOLED**		
Variable	Reference-2nd Generation SUs	Exposure-Liraglutide	Reference-2nd Generation SUs	Exposure-Liraglutide	Reference-2nd Generation SUs	Exposure-Liraglutide	Reference-2nd Generation SUs	Exposure-Liraglutide	St. Diff.
Number of patients	**196,712**	**12,485**	**160,161**	**13,808**	**571,468**	**28,511**	**928,341**	**54,804**	
Age									
...mean (sd)	70.45 (7.97)	65.70 (6.79)	67.63 (9.31)	62.85 (6.12)	74.52 (7.40)	70.53 (4.98)	72.47 (7.88)	67.49 (5.73)	0.72
...median [IQR]	70.00 [65.00, 76.00]	66.00 [61.00, 70.00]	65.00 [61.00, 74.00]	62.00 [60.00, 65.00]	73.00 [68.00, 79.00]	3.00 [67.00, 73.00]	70.98 (7.88)	66.55 (5.73)	0.64
Age categories									
...18 - 54; n (%)	4,772 (2.4%)	740 (5.9%)	7,998 (5.0%)	1,177 (8.5%)	0 (0.0%)	0 (0.0%)	12,770 (1.4%)	1,917 (3.5%)	-0.14
...55 - 64; n (%)	38,842 (19.7%)	4,610 (36.9%)	70,249 (43.9%)	8,602 (62.3%)	9,764 (1.7%)	694 (2.4%)	118,855 (12.8%)	13,906 (25.4%)	-0.32
...65 - 74; n (%)	93,525 (47.5%)	5,912 (47.4%)	44,191 (27.6%)	3,328 (24.1%)	313,203 (54.8%)	22,386 (78.5%)	450,919 (48.6%)	31,626 (57.7%)	-0.18
...>= 75; n (%)	59,573 (30.3%)	1,223 (9.8%)	37,723 (23.6%)	701 (5.1%)	248,501 (43.5%)	5,431 (19.0%)	345,797 (37.2%)	7,355 (13.4%)	0.57
Gender									
...Males; n (%)	102,630 (52.2%)	5,601 (44.9%)	91,138 (56.9%)	6,730 (48.7%)	260,001 (45.5%)	12,045 (42.2%)	453,769 (48.9%)	24,376 (44.5%)	0.09
...Females; n (%)	94,082 (47.8%)	6,884 (55.1%)	69,023 (43.1%)	7,078 (51.3%)	311,467 (54.5%)	16,466 (57.8%)	474,572 (51.1%)	30,428 (55.5%)	-0.09
Race									
...White; n (%)	N/A	N/A	N/A	N/A	439,116 (76.8%)	24,090 (84.5%)	439,116 (76.8%)	24,090 (84.5%)	-0.20
...Black; n (%)	N/A	N/A	N/A	N/A	69,514 (12.2%)	2,568 (9.0%)	69,514 (12.2%)	2,568 (9.0%)	0.10
...Asian; n (%)	N/A	N/A	N/A	N/A	19,245 (3.4%)	380 (1.3%)	19,245 (3.4%)	380 (1.3%)	0.14
...Hispanic; n (%)	N/A	N/A	N/A	N/A	22,497 (3.9%)	511 (1.8%)	22,497 (3.9%)	511 (1.8%)	0.13
...North American Native; n (%)	N/A	N/A	N/A	N/A	3,768 (0.7%)	122 (0.4%)	3,768 (0.7%)	122 (0.4%)	0.04
...Other/Unknown; n (%)	N/A	N/A	N/A	N/A	17,328 (3.0%)	840 (2.9%)	17,328 (3.0%)	840 (2.9%)	0.01
Region (lumping missing&other category with West)									
...Northeast; n (%)	21,016 (10.7%)	1,203 (9.6%)	28,601 (17.9%)	2,794 (20.2%)	94,259 (16.5%)	4,708 (16.5%)	143,876 (15.5%)	8,705 (15.9%)	-0.01
...South; n (%)	92,464 (47.0%)	6,770 (54.2%)	46,370 (29.0%)	2,793 (20.2%)	247,501 (43.3%)	13,088 (45.9%)	386,335 (41.6%)	22,651 (41.3%)	0.01
...Midwest; n (%)	38,854 (19.8%)	2,335 (18.7%)	61,418 (38.3%)	6,610 (47.9%)	138,467 (24.2%)	6,152 (21.6%)	238,739 (25.7%)	15,097 (27.5%)	-0.04
...West; n (%)	44,378 (22.6%)	2,177 (17.4%)	22,358 (14.0%)	1,452 (10.5%)	91,241 (16.0%)	4,563 (16.0%)	157,977 (17.0%)	8,192 (14.9%)	0.06
...Unknown+missing; n (%)	N/A	N/A	1,414 (0.9%)	159 (1.2%)	N/A	N/A	1,414 (0.9%)	159 (1.2%)	-0.03
CV Covariates									
Ischemic heart disease; n (%)	55,227 (28.1%)	3,702 (29.7%)	52,321 (32.7%)	4,439 (32.1%)	187,624 (32.8%)	8,905 (31.2%)	295,172 (31.8%)	17,046 (31.1%)	0.02
Acute MI; n (%)	3,262 (1.7%)	174 (1.4%)	3,103 (1.9%)	212 (1.5%)	10,813 (1.9%)	338 (1.2%)	17,178 (1.9%)	724 (1.3%)	0.05
ACS/unstable angina; n (%)	3,647 (1.9%)	261 (2.1%)	3,557 (2.2%)	286 (2.1%)	11,272 (2.0%)	482 (1.7%)	18,476 (2.0%)	1,029 (1.9%)	0.01
Old MI; n (%)	8,091 (4.1%)	491 (3.9%)	4,508 (2.8%)	292 (2.1%)	26,566 (4.6%)	1,041 (3.7%)	39,165 (4.2%)	1,824 (3.3%)	0.05
Stable angina; n (%)	7,795 (4.0%)	598 (4.8%)	5,435 (3.4%)	500 (3.6%)	21,550 (3.8%)	1,130 (4.0%)	34,780 (3.7%)	2,228 (4.1%)	-0.02
Coronary atherosclerosis and other forms of chronic ischemic heart disease; n (%)	51,300 (26.1%)	3,479 (27.9%)	49,443 (30.9%)	4,229 (30.6%)	178,665 (31.3%)	8,493 (29.8%)	279,408 (30.1%)	16,201 (29.6%)	0.01
Other atherosclerosis with ICD10 ; n (%)	2,423 (1.2%)	121 (1.0%)	2,102 (1.3%)	159 (1.2%)	11,227 (2.0%)	473 (1.7%)	15,752 (1.7%)	753 (1.4%)	0.02
Previous cardiac procedure (CABG or PTCA or Stent) ; n (%)	1,607 (0.8%)	96 (0.8%)	1,929 (1.2%)	140 (1.0%)	4,469 (0.8%)	143 (0.5%)	8,005 (0.9%)	379 (0.7%)	0.02
History of CABG or PTCA; n (%)	12,855 (6.5%)	921 (7.4%)	6,551 (4.1%)	579 (4.2%)	53,044 (9.3%)	2,384 (8.4%)	72,450 (7.8%)	3,884 (7.1%)	0.03
Any stroke; n (%)	16,353 (8.3%)	905 (7.2%)	15,031 (9.4%)	1,024 (7.4%)	62,700 (11.0%)	2,451 (8.6%)	94,084 (10.1%)	4,380 (8.0%)	0.07
Ischemic stroke (w and w/o mention of cerebral infarction); n (%)	16,102 (8.2%)	900 (7.2%)	14,822 (9.3%)	1,006 (7.3%)	61,905 (10.8%)	2,428 (8.5%)	92,829 (10.0%)	4,334 (7.9%)	0.07
Hemorrhagic stroke; n (%)	545 (0.3%)	16 (0.1%)	459 (0.3%)	28 (0.2%)	2,008 (0.4%)	45 (0.2%)	3,012 (0.3%)	89 (0.2%)	0.02
TIA; n (%)	4,010 (2.0%)	233 (1.9%)	4,022 (2.5%)	242 (1.8%)	14,808 (2.6%)	516 (1.8%)	22,840 (2.5%)	991 (1.8%)	0.05
Other cerebrovascular disease; n (%)	4,639 (2.4%)	230 (1.8%)	3,239 (2.0%)	167 (1.2%)	19,559 (3.4%)	587 (2.1%)	27,437 (3.0%)	984 (1.8%)	0.08
Late effects of cerebrovascular disease; n (%)	4,527 (2.3%)	144 (1.2%)	2,805 (1.8%)	95 (0.7%)	18,669 (3.3%)	415 (1.5%)	26,001 (2.8%)	654 (1.2%)	0.11
Cerebrovascular procedure; n (%)	288 (0.1%)	12 (0.1%)	311 (0.2%)	11 (0.1%)	935 (0.2%)	26 (0.1%)	1,534 (0.2%)	49 (0.1%)	0.03
Heart failure (CHF); n (%)	21,366 (10.9%)	1,275 (10.2%)	16,040 (10.0%)	995 (7.2%)	84,892 (14.9%)	3,352 (11.8%)	122,298 (13.2%)	5,622 (10.3%)	0.09
Peripheral Vascular Disease (PVD) or PVD Surgery ; n (%)	18,962 (9.6%)	1,095 (8.8%)	14,043 (8.8%)	1,080 (7.8%)	73,310 (12.8%)	2,955 (10.4%)	106,315 (11.5%)	5,130 (9.4%)	0.07
Atrial fibrillation; n (%)	18,759 (9.5%)	962 (7.7%)	13,972 (8.7%)	789 (5.7%)	81,612 (14.3%)	3,081 (10.8%)	114,343 (12.3%)	4,832 (8.8%)	0.11
Other cardiac dysrhythmia; n (%)	21,281 (10.8%)	1,309 (10.5%)	14,014 (8.7%)	949 (6.9%)	82,684 (14.5%)	3,363 (11.8%)	117,979 (12.7%)	5,621 (10.3%)	0.08
Cardiac conduction disorders; n (%)	6,617 (3.4%)	355 (2.8%)	4,460 (2.8%)	289 (2.1%)	28,034 (4.9%)	1,077 (3.8%)	39,111 (4.2%)	1,721 (3.1%)	0.06
Other CVD; n (%)	26,092 (13.3%)	1,498 (12.0%)	20,400 (12.7%)	1,465 (10.6%)	99,284 (17.4%)	4,174 (14.6%)	145,776 (15.7%)	7,137 (13.0%)	0.08
Diabetes-related complications									
Diabetic retinopathy; n (%)	11,089 (5.6%)	956 (7.7%)	6,538 (4.1%)	659 (4.8%)	32,274 (5.6%)	2,394 (8.4%)	49,901 (5.4%)	4,009 (7.3%)	-0.08
Diabetes with other ophthalmic manifestations; n (%)	1,424 (0.7%)	91 (0.7%)	4,704 (2.9%)	449 (3.3%)	13,704 (2.4%)	880 (3.1%)	19,832 (2.1%)	1,420 (2.6%)	-0.03
Retinal detachment, vitreous hemorrhage, vitrectomy; n (%)	717 (0.4%)	54 (0.4%)	464 (0.3%)	47 (0.3%)	1,892 (0.3%)	138 (0.5%)	3,073 (0.3%)	239 (0.4%)	-0.02
Retinal laser coagulation therapy; n (%)	944 (0.5%)	75 (0.6%)	860 (0.5%)	92 (0.7%)	2,550 (0.4%)	201 (0.7%)	4,354 (0.5%)	368 (0.7%)	-0.03
Occurrence of Diabetic Neuropathy ; n (%)	34,538 (17.6%)	2,995 (24.0%)	17,014 (10.6%)	1,961 (14.2%)	95,926 (16.8%)	6,700 (23.5%)	147,478 (15.9%)	11,656 (21.3%)	-0.14

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

Occurrence of diabetic nephropathy with ICD10 ; n (%)	31,872 (16.2%)	2,161 (17.3%)	11,026 (6.9%)	1,042 (7.5%)	54,295 (9.5%)	3,539 (12.4%)	97,193 (10.5%)	6,742 (12.3%)	-0.06
Hypoglycemia ; n (%)	5,003 (2.5%)	275 (2.2%)	5,026 (3.1%)	413 (3.0%)	16,139 (2.8%)	853 (3.0%)	26,168 (2.8%)	1,541 (2.8%)	0.00
Hyperglycemia; n (%)	8,676 (4.4%)	579 (4.6%)	5,054 (3.2%)	429 (3.1%)	29,706 (5.2%)	1,240 (4.3%)	43,436 (4.7%)	2,248 (4.1%)	0.03
Disorders of fluid electrolyte and acid-base balance; n (%)	17,943 (9.1%)	827 (6.6%)	11,019 (6.9%)	607 (4.4%)	69,422 (12.1%)	2,164 (7.6%)	98,384 (10.6%)	3,598 (6.6%)	0.14
Diabetic ketoacidosis; n (%)	210 (0.1%)	14 (0.1%)	153 (0.1%)	17 (0.1%)	731 (0.1%)	33 (0.1%)	1,094 (0.1%)	64 (0.1%)	0.00
Hyperosmolar hyperglycemic nonketotic syndrome (HONK); n (%)	1,026 (0.5%)	70 (0.6%)	579 (0.4%)	44 (0.3%)	2,876 (0.5%)	128 (0.4%)	4,481 (0.5%)	242 (0.4%)	0.01
Diabetes with peripheral circulatory disorders with ICD-10 ; n (%)	15,191 (7.7%)	987 (7.9%)	6,670 (4.2%)	540 (3.9%)	42,778 (7.5%)	2,040 (7.2%)	64,639 (7.0%)	3,567 (6.5%)	0.02
Diabetic Foot; n (%)	4,860 (2.5%)	320 (2.6%)	3,959 (2.5%)	304 (2.2%)	18,615 (3.3%)	940 (3.3%)	27,434 (3.0%)	1,564 (2.9%)	0.01
Gangrene ; n (%)	669 (0.3%)	34 (0.3%)	552 (0.3%)	20 (0.1%)	2,088 (0.4%)	60 (0.2%)	3,309 (0.4%)	114 (0.2%)	0.04
Lower extremity amputation; n (%)	1,382 (0.7%)	109 (0.9%)	710 (0.4%)	41 (0.3%)	4,515 (0.8%)	165 (0.6%)	6,607 (0.7%)	315 (0.6%)	0.01
Osteomyelitis; n (%)	1,371 (0.7%)	88 (0.7%)	1,120 (0.7%)	66 (0.5%)	4,379 (0.8%)	168 (0.6%)	6,870 (0.7%)	322 (0.6%)	0.01
Skin infections ; n (%)	11,149 (5.7%)	742 (5.9%)	9,819 (6.1%)	811 (5.9%)	43,277 (7.6%)	2,258 (7.9%)	64,245 (6.9%)	3,811 (7.0%)	0.00
Erectile dysfunction; n (%)	4,789 (2.4%)	360 (2.9%)	3,269 (2.0%)	318 (2.3%)	10,887 (1.9%)	833 (2.9%)	18,945 (2.0%)	1,511 (2.8%)	-0.05
Diabetes with unspecified complication; n (%)	9,112 (4.6%)	827 (6.6%)	5,419 (3.4%)	659 (4.8%)	25,116 (4.4%)	1,673 (5.9%)	39,647 (4.3%)	3,159 (5.8%)	-0.07
Diabetes mellitus without mention of complications; n (%)	174,528 (88.7%)	10,824 (86.7%)	150,098 (93.7%)	12,905 (93.5%)	539,347 (94.4%)	26,472 (92.8%)	863,973 (93.1%)	50,201 (91.6%)	0.06
Hypertension: 1 inpatient or 2 outpatient claims within 365 days; n (%)	185,514 (94.3%)	11,887 (95.2%)	139,282 (87.0%)	12,287 (89.0%)	550,194 (96.3%)	27,630 (96.9%)	874,990 (94.3%)	51,804 (94.5%)	-0.01
Hyperlipidemia ; n (%)	144,099 (73.3%)	9,851 (78.9%)	99,840 (62.3%)	9,823 (71.1%)	435,198 (76.2%)	23,633 (82.9%)	679,137 (73.2%)	43,307 (79.0%)	-0.14
Edema; n (%)	14,841 (7.5%)	1,088 (8.7%)	9,129 (5.7%)	846 (6.1%)	62,616 (11.0%)	3,218 (11.3%)	86,586 (9.3%)	5,152 (9.4%)	0.00
Renal Dysfunction (non-diabetic) ; n (%)	50,792 (25.8%)	2,889 (23.1%)	27,130 (16.9%)	1,892 (13.7%)	141,930 (24.8%)	6,290 (22.1%)	219,852 (23.7%)	11,071 (20.2%)	0.08
Occurrence of acute renal disease ; n (%)	9,401 (3.0%)	369 (3.0%)	6,016 (3.8%)	216 (1.6%)	35,473 (6.2%)	909 (3.2%)	50,890 (5.5%)	1,494 (2.7%)	0.14
Occurrence of chronic renal insufficiency; n (%)	42,651 (21.7%)	2,481 (19.9%)	19,946 (12.5%)	1,449 (10.5%)	116,950 (20.5%)	5,396 (18.9%)	179,547 (19.3%)	9,326 (17.0%)	0.06
Chronic kidney disease ; n (%)	41,223 (21.0%)	2,405 (19.3%)	19,353 (12.1%)	1,392 (10.1%)	111,247 (19.5%)	5,116 (17.9%)	171,823 (18.5%)	8,913 (16.3%)	0.06
CKD Stage 3-4; n (%)	29,293 (14.9%)	1,735 (13.9%)	13,900 (8.7%)	1,030 (7.5%)	76,878 (13.5%)	3,680 (12.9%)	120,071 (12.9%)	6,445 (11.8%)	0.03
Occurrence of hypertensive nephropathy; n (%)	18,774 (9.5%)	1,084 (8.7%)	8,031 (5.0%)	535 (3.9%)	56,974 (10.0%)	2,269 (8.0%)	83,779 (9.0%)	3,888 (7.1%)	0.07
Occurrence of miscellaneous renal insufficiency ; n (%)	12,325 (6.3%)	641 (5.1%)	7,652 (4.8%)	513 (3.7%)	45,632 (8.0%)	1,823 (6.4%)	65,609 (7.1%)	2,977 (5.4%)	0.07
Glaucoma or cataracts ; n (%)	41,679 (21.2%)	2,571 (20.6%)	28,496 (17.8%)	2,350 (17.0%)	144,998 (25.4%)	8,094 (28.4%)	215,173 (23.2%)	13,015 (23.7%)	-0.01
Cellulitis or abscess of toe; n (%)	2,852 (1.4%)	189 (1.5%)	1,698 (1.1%)	126 (0.9%)	9,051 (1.6%)	446 (1.6%)	13,601 (1.5%)	761 (1.4%)	0.01
Foot ulcer; n (%)	4,802 (2.4%)	302 (2.4%)	4,015 (2.5%)	304 (2.2%)	18,697 (3.3%)	921 (3.2%)	27,514 (3.0%)	1,527 (2.8%)	0.01
Bladder stones; n (%)	269 (0.1%)	8 (0.1%)	223 (0.1%)	14 (0.1%)	1,039 (0.2%)	41 (0.1%)	1,531 (0.2%)	63 (0.1%)	0.03
Kidney stones; n (%)	4,100 (2.1%)	318 (2.5%)	3,487 (2.2%)	341 (2.5%)	14,180 (2.5%)	805 (2.8%)	21,767 (2.3%)	1,464 (2.7%)	-0.03
Urinary tract infections (UTIs); n (%)	19,351 (9.8%)	1,136 (9.1%)	11,757 (7.3%)	940 (6.8%)	84,914 (14.9%)	3,659 (12.8%)	116,022 (12.5%)	5,735 (10.5%)	0.06
Dipstick urinalysis; n (%)	68,120 (34.6%)	4,493 (36.0%)	46,700 (29.2%)	4,559 (33.0%)	223,752 (39.2%)	11,639 (40.8%)	338,572 (36.5%)	20,691 (37.8%)	-0.03
Non-dipstick urinalysis; n (%)	76,422 (38.8%)	5,479 (43.9%)	42,377 (26.5%)	4,897 (35.5%)	205,498 (36.0%)	13,140 (46.1%)	324,297 (34.9%)	23,516 (42.9%)	-0.16
Urine function test; n (%)	4,806 (2.4%)	280 (2.2%)	4,075 (2.5%)	345 (2.5%)	17,903 (3.1%)	986 (3.5%)	26,784 (2.9%)	1,611 (2.9%)	0.00
Cytology; n (%)	1,477 (0.8%)	85 (0.7%)	1,544 (1.0%)	115 (0.8%)	5,802 (1.0%)	288 (1.0%)	8,823 (1.0%)	488 (0.9%)	0.01
Cystos; n (%)	2,368 (1.2%)	147 (1.2%)	2,245 (1.4%)	176 (1.3%)	8,292 (1.5%)	418 (1.5%)	12,905 (1.4%)	741 (1.4%)	0.00
Other Covariates									
Liver disease; n (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	#VALUE!	000 (0.0%)	#VALUE!
Osteoarthritis; n (%)	33,853 (17.2%)	2,542 (20.4%)	21,855 (13.6%)	2,219 (16.1%)	136,870 (24.0%)	7,450 (26.1%)	192,578 (20.7%)	12,211 (22.3%)	-0.04
Other arthritis, arthropathies and musculoskeletal pain; n (%)	71,081 (36.1%)	5,138 (41.2%)	53,785 (33.6%)	5,188 (37.6%)	259,992 (45.5%)	13,940 (48.9%)	384,858 (41.5%)	24,266 (44.3%)	-0.06
Dorsopathies; n (%)	41,440 (21.1%)	3,364 (26.9%)	30,075 (18.8%)	3,095 (22.4%)	150,059 (26.3%)	8,971 (31.5%)	221,574 (23.9%)	15,430 (28.2%)	-0.10
Fractures ; n (%)	6,554 (3.3%)	371 (3.0%)	5,196 (3.2%)	351 (2.5%)	26,453 (4.6%)	1,070 (3.8%)	38,203 (4.1%)	1,792 (3.3%)	0.04
Falls ; n (%)	7,893 (4.0%)	372 (3.0%)	2,427 (1.5%)	138 (1.0%)	31,012 (5.4%)	971 (3.4%)	41,332 (4.5%)	1,481 (2.7%)	0.10
Osteoporosis; n (%)	10,537 (5.4%)	556 (4.5%)	5,586 (3.5%)	427 (3.1%)	44,053 (7.7%)	2,028 (7.1%)	60,176 (6.5%)	3,011 (5.5%)	0.04
Hyperthyroidism ; n (%)	1,325 (0.7%)	102 (0.8%)	756 (0.5%)	72 (0.5%)	5,224 (0.9%)	285 (1.0%)	7,305 (0.8%)	459 (0.8%)	0.00
Hypothyroidism ; n (%)	29,473 (15.0%)	2,544 (20.4%)	16,299 (10.2%)	2,095 (15.2%)	84,955 (14.9%)	5,114 (17.9%)	130,727 (14.1%)	9,753 (17.8%)	-0.10
Other disorders of thyroid gland ; n (%)	5,691 (2.9%)	690 (5.5%)	3,833 (2.4%)	717 (5.2%)	19,904 (3.5%)	1,782 (6.3%)	29,428 (3.2%)	3,189 (5.8%)	-0.13
Depression; n (%)	15,620 (7.9%)	1,336 (10.7%)	10,206 (6.4%)	1,173 (8.5%)	65,406 (11.4%)	3,664 (12.9%)	91,232 (9.8%)	6,173 (11.3%)	-0.05
Anxiety; n (%)	12,813 (6.5%)	1,186 (9.5%)	6,953 (4.3%)	770 (5.6%)	50,865 (8.9%)	2,569 (9.0%)	70,631 (7.6%)	4,525 (8.3%)	-0.03
Sleep_Disorder; n (%)	12,444 (6.3%)	1,304 (10.4%)	13,885 (8.7%)	2,243 (16.2%)	49,765 (8.7%)	3,988 (14.0%)	76,094 (8.2%)	7,535 (13.7%)	-0.18
Dementia; n (%)	10,450 (5.3%)	258 (2.1%)	6,100 (3.8%)	146 (1.1%)	54,395 (9.5%)	1,006 (3.5%)	70,945 (7.6%)	1,410 (2.6%)	0.23
Delirium; n (%)	3,084 (1.6%)	93 (0.7%)	2,269 (1.4%)	69 (0.5%)	16,516 (2.9%)	351 (1.2%)	21,869 (2.4%)	513 (0.9%)	0.12
Psychosis; n (%)	2,498 (1.3%)	81 (0.6%)	1,727 (1.1%)	57 (0.4%)	15,982 (2.8%)	256 (0.9%)	20,207 (2.2%)	394 (0.7%)	0.13
Obesity; n (%)	31,831 (16.2%)	4,320 (34.6%)	16,930 (10.6%)	3,086 (22.3%)	77,359 (13.5%)	7,939 (27.8%)	126,120 (13.6%)	15,345 (28.0%)	-0.36
Overweight; n (%)	9,079 (4.6%)	534 (4.3%)	2,442 (1.5%)	267 (1.9%)	17,903 (3.1%)	820 (2.9%)	29,424 (3.2%)	1,621 (3.0%)	0.01
Smoking; n (%)	20,336 (10.3%)	1,403 (11.2%)	8,760 (5.5%)	632 (4.6%)	77,008 (13.5%)	3,563 (12.5%)	106,104 (11.4%)	5,598 (10.2%)	0.04
Alcohol abuse or dependence; n (%)	1,443 (0.7%)	47 (0.4%)	840 (0.5%)	38 (0.3%)	4,133 (0.7%)	97 (0.3%)	6,416 (0.7%)	182 (0.3%)	0.06
Drug abuse or dependence; n (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	#VALUE!	00 (0.0%)	#VALUE!
COPD; n (%)	17,677 (9.0%)	1,036 (8.3%)	10,715 (6.7%)	671 (4.9%)	76,066 (13.3%)	3,280 (11.5%)	104,458 (11.3%)	4,987 (9.1%)	0.07

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

	C1	C2	C3	C4	C5	C6	C7	C8	Diff
Asthma; n (%)	9,916 (5.0%)	930 (7.4%)	6,975 (4.4%)	821 (5.9%)	37,105 (6.5%)	2,443 (8.6%)	53,996 (5.8%)	4,194 (7.7%)	-0.08
Obstructive sleep apnea; n (%)	14,202 (7.2%)	2,283 (18.3%)	12,619 (7.9%)	2,406 (17.4%)	38,734 (6.8%)	4,306 (15.1%)	65,555 (7.1%)	8,995 (16.4%)	-0.29
Pneumonia; n (%)	5,880 (3.0%)	256 (2.1%)	4,981 (3.1%)	241 (1.7%)	28,237 (4.9%)	795 (2.8%)	39,098 (4.2%)	1,292 (2.4%)	0.10
Imaging; n (%)	349 (0.2%)	15 (0.1%)	247 (0.2%)	10 (0.1%)	1,541 (0.3%)	34 (0.1%)	2,137 (0.2%)	59 (0.1%)	0.03
Diabetes Medications									
DM Medications - AGIs; n (%)	658 (0.3%)	40 (0.3%)	522 (0.3%)	48 (0.3%)	2,010 (0.4%)	121 (0.4%)	3,190 (0.3%)	209 (0.4%)	-0.02
DM Medications - Glitazones; n (%)	16,520 (8.4%)	1,216 (9.7%)	17,287 (10.8%)	1,827 (13.2%)	37,921 (6.6%)	2,572 (9.0%)	71,728 (7.7%)	5,615 (10.2%)	-0.09
DM Medications - Insulin; n (%)	11,363 (5.8%)	2,682 (21.5%)	9,783 (6.1%)	2,740 (19.8%)	40,963 (7.2%)	7,037 (24.7%)	62,109 (6.7%)	12,459 (22.7%)	-0.46
DM Medications - Meglitinides; n (%)	1,281 (0.7%)	146 (1.2%)	1,525 (1.0%)	311 (2.3%)	5,854 (1.0%)	590 (2.1%)	8,660 (0.9%)	1,047 (1.9%)	-0.09
DM Medications - Metformin; n (%)	125,476 (63.8%)	7,325 (58.7%)	100,419 (62.7%)	8,570 (62.1%)	355,150 (62.1%)	17,242 (60.5%)	581,045 (62.6%)	33,137 (60.5%)	0.04
Concomitant initiation or current use of SGLT2i; n (%)	2,699 (1.4%)	717 (5.7%)	1,961 (1.2%)	731 (5.3%)	4,774 (0.8%)	1,220 (4.3%)	9,434 (1.0%)	2,668 (4.9%)	-0.23
Concomitant initiation or current use of AGIs; n (%)	472 (0.2%)	22 (0.2%)	391 (0.2%)	29 (0.2%)	1,434 (0.3%)	83 (0.3%)	2,297 (0.2%)	134 (0.2%)	0.00
Concomitant initiation or current use of Glitazones; n (%)	12,440 (6.3%)	873 (7.0%)	12,991 (8.1%)	1,304 (9.4%)	28,770 (5.0%)	1,961 (6.9%)	54,201 (5.8%)	4,138 (7.6%)	-0.07
Concomitant initiation or current use of DPP4i ; n (%)	4,204 (2.1%)	109 (0.9%)	4,943 (3.1%)	124 (0.9%)	13,128 (2.3%)	225 (0.8%)	22,275 (2.4%)	#VALUE!	#VALUE!
Concomitant initiation or current use of Insulin; n (%)	6,048 (3.1%)	1,683 (13.5%)	5,661 (3.5%)	1,712 (12.4%)	22,161 (3.9%)	4,433 (15.5%)	33,870 (3.6%)	7,828 (14.3%)	-0.38
Concomitant initiation or current use of Meglitinides; n (%)	781 (0.4%)	86 (0.7%)	931 (0.6%)	215 (1.6%)	3,651 (0.6%)	402 (1.4%)	5,363 (0.6%)	703 (1.3%)	-0.07
Concomitant initiation or current use of Metformin; n (%)	105,292 (53.5%)	5,852 (46.9%)	83,840 (52.3%)	6,810 (49.3%)	296,366 (51.9%)	13,865 (48.6%)	485,498 (52.3%)	26,527 (48.4%)	0.08
Past use of SGLT2i ; n (%)	1,362 (0.7%)	294 (2.4%)	795 (0.5%)	249 (1.8%)	2,664 (0.5%)	540 (1.9%)	4,821 (0.5%)	1,083 (2.0%)	-0.14
Past use of AGIs ; n (%)	186 (0.1%)	18 (0.1%)	131 (0.1%)	19 (0.1%)	576 (0.1%)	38 (0.1%)	893 (0.1%)	75 (0.1%)	0.00
Past use of Glitazones ; n (%)	4,080 (2.1%)	343 (2.7%)	4,296 (2.7%)	523 (3.8%)	9,151 (1.6%)	611 (2.1%)	17,527 (1.9%)	1,477 (2.7%)	-0.05
Past use of DPP4i ; n (%)	4,798 (2.4%)	474 (3.8%)	4,852 (3.0%)	747 (5.4%)	17,036 (3.0%)	1,321 (4.6%)	26,686 (2.9%)	2,542 (4.6%)	-0.09
Past use of Insulin ; n (%)	5,316 (2.7%)	999 (8.0%)	4,122 (2.6%)	1,028 (7.4%)	18,807 (3.3%)	2,604 (9.1%)	28,245 (3.0%)	4,631 (8.5%)	-0.24
Past use of Meglitinides ; n (%)	500 (0.3%)	60 (0.5%)	594 (0.4%)	96 (0.7%)	2,203 (0.4%)	188 (0.7%)	3,297 (0.4%)	344 (0.6%)	-0.03
Past use of metformin (final) ; n (%)	20,184 (10.3%)	1,473 (11.8%)	16,579 (10.4%)	1,760 (12.7%)	58,784 (10.3%)	3,377 (11.8%)	95,547 (10.3%)	6,610 (12.1%)	-0.06
Other Medications									
Use of ACE inhibitors; n (%)	95,481 (48.5%)	5,189 (41.6%)	75,829 (47.3%)	5,623 (40.7%)	267,223 (46.8%)	11,669 (40.9%)	438,533 (47.2%)	22,481 (41.0%)	0.13
Use of ARBs; n (%)	50,472 (25.7%)	4,265 (34.2%)	43,683 (27.3%)	5,149 (37.3%)	155,237 (27.2%)	10,277 (36.0%)	249,392 (26.9%)	19,691 (35.9%)	-0.19
Use of Loop Diuretics ; n (%)	29,814 (15.2%)	2,153 (17.2%)	25,579 (16.0%)	2,138 (15.5%)	122,938 (21.5%)	6,242 (21.9%)	178,331 (19.2%)	10,533 (19.2%)	0.00
Use of other diuretics; n (%)	6,145 (3.1%)	543 (4.3%)	5,612 (3.5%)	609 (4.4%)	22,856 (4.0%)	1,451 (5.1%)	34,613 (3.7%)	2,603 (4.7%)	-0.05
Use of nitrates-United; n (%)	13,013 (6.6%)	889 (7.1%)	13,267 (8.3%)	986 (7.1%)	50,608 (8.9%)	2,246 (7.9%)	76,888 (8.3%)	4,121 (7.5%)	0.03
Use of other hypertension drugs; n (%)	17,387 (8.8%)	893 (7.2%)	13,879 (8.7%)	917 (6.6%)	55,688 (9.7%)	2,257 (7.9%)	86,954 (9.4%)	4,067 (7.4%)	0.07
Use of digoxin; n (%)	4,907 (2.5%)	177 (1.4%)	4,877 (3.0%)	221 (1.6%)	22,362 (3.9%)	602 (2.1%)	32,146 (3.5%)	1,000 (1.8%)	0.11
Use of Anti-arrhythmics; n (%)	3,586 (1.8%)	208 (1.7%)	3,575 (2.2%)	229 (1.7%)	15,299 (2.7%)	638 (2.2%)	22,460 (2.4%)	1,075 (2.0%)	0.03
Use of COPD/asthma meds; n (%)	24,498 (12.5%)	2,132 (17.1%)	21,896 (13.7%)	2,435 (17.6%)	92,859 (16.2%)	5,747 (20.2%)	139,253 (15.0%)	10,314 (18.8%)	-0.10
Use of statins; n (%)	129,470 (65.8%)	8,672 (69.5%)	104,551 (65.3%)	9,624 (69.7%)	379,136 (66.3%)	20,297 (71.2%)	613,157 (66.0%)	38,593 (70.4%)	-0.09
Use of other lipid-lowering drugs; n (%)	20,454 (10.4%)	1,705 (13.7%)	22,311 (13.9%)	2,476 (17.9%)	62,387 (10.9%)	4,234 (14.9%)	105,152 (11.3%)	8,415 (15.4%)	-0.12
Use of antiplatelet agents; n (%)	26,712 (13.6%)	1,885 (15.1%)	29,039 (18.1%)	2,574 (18.6%)	88,937 (15.6%)	4,508 (15.8%)	144,688 (15.6%)	8,967 (16.4%)	-0.02
Use of oral anticoagulants (Dabigatran, Rivaroxaban, Apixaban, Warfarin); n (%)	15,431 (7.8%)	898 (7.2%)	13,337 (8.3%)	865 (6.3%)	64,168 (11.2%)	2,746 (9.6%)	92,936 (10.0%)	4,509 (8.2%)	0.06
Use of heparin and other low-molecular weight heparins; n (%)	997 (0.5%)	70 (0.6%)	42 (0.0%)	0 (0.0%)	3,443 (0.6%)	141 (0.5%)	4,482 (0.5%)	211 (0.4%)	0.01
Use of NSAIDs; n (%)	27,926 (14.2%)	2,195 (17.6%)	22,554 (14.1%)	2,437 (17.6%)	88,637 (15.5%)	5,192 (18.2%)	139,117 (15.0%)	9,824 (17.9%)	-0.08
Use of oral corticosteroids; n (%)	29,383 (14.9%)	2,095 (16.8%)	24,298 (15.2%)	2,189 (15.9%)	105,691 (18.5%)	5,314 (18.6%)	159,372 (17.2%)	9,598 (17.5%)	-0.01
Use of bisphosphonate (United); n (%)	5,538 (2.8%)	246 (2.0%)	3,396 (2.1%)	213 (1.5%)	18,770 (3.3%)	730 (2.6%)	27,704 (3.0%)	1,189 (2.2%)	0.05
Use of opioids; n (%)	46,368 (23.6%)	3,558 (28.5%)	41,697 (26.0%)	3,960 (28.7%)	152,202 (26.6%)	8,558 (30.0%)	240,267 (25.9%)	16,076 (29.3%)	-0.08
Use of antidepressants; n (%)	40,204 (20.4%)	3,993 (32.0%)	32,509 (20.3%)	4,226 (30.6%)	141,130 (24.7%)	9,732 (34.1%)	213,843 (23.0%)	17,951 (32.8%)	-0.22
Use of antipsychotics; n (%)	4,150 (2.1%)	303 (2.4%)	3,031 (1.9%)	263 (1.9%)	20,868 (3.7%)	741 (2.6%)	28,049 (3.0%)	1,307 (2.4%)	0.04
Use of anticonvulsants; n (%)	27,511 (14.0%)	2,594 (20.8%)	18,209 (11.4%)	2,061 (14.9%)	93,566 (16.4%)	5,868 (20.6%)	139,286 (15.0%)	10,523 (19.2%)	-0.11
Use of lithium; n (%)	205 (0.1%)	12 (0.1%)	203 (0.1%)	16 (0.1%)	735 (0.1%)	38 (0.1%)	1,143 (0.1%)	066 (0.1%)	0.00
Use of Benzos; n (%)	15,195 (7.7%)	1,491 (11.9%)	16,820 (10.5%)	1,814 (13.1%)	56,618 (9.9%)	3,401 (11.9%)	88,633 (9.5%)	6,706 (12.2%)	-0.09
Use of anxiolytics/hypnotics; n (%)	9,918 (5.0%)	963 (7.7%)	9,756 (6.1%)	1,225 (8.9%)	34,826 (6.1%)	2,308 (8.1%)	54,500 (5.9%)	4,496 (8.2%)	-0.09
Use of dementia meds; n (%)	5,629 (2.9%)	120 (1.0%)	3,983 (2.5%)	99 (0.7%)	30,389 (5.3%)	615 (2.2%)	40,001 (4.3%)	834 (1.5%)	0.17
Use of antiparkinsonian meds; n (%)	4,469 (2.3%)	437 (3.5%)	3,486 (2.2%)	441 (3.2%)	19,549 (3.4%)	1,259 (4.4%)	27,504 (3.0%)	2,137 (3.9%)	-0.05
Any use of pramlintide; n (%)	3 (0.0%)	5 (0.0%)	8 (0.0%)	25 (0.2%)	**	**	**	**	**
Any use of 1st generation sulfonylureas; n (%)	75 (0.0%)	0 (0.0%)	164 (0.1%)	1 (0.0%)	**	**	**	**	**
Entresto (sacubitril/valsartan); n (%)	199 (0.1%)	38 (0.3%)	56 (0.0%)	9 (0.1%)	291 (0.1%)	26 (0.1%)	546 (0.1%)	073 (0.1%)	0.00
Initiation as monotherapy ; n (%)	34,741 (17.7%)	1,801 (14.4%)	25,845 (16.1%)	1,561 (11.3%)	86,804 (15.2%)	2,776 (9.7%)	147,390 (15.9%)	6,138 (11.2%)	0.14
Labs						356,873	26,293		
Lab values- HbA1c (%) ; n (%)	64,253 (32.7%)	4,705 (37.7%)	10,520 (6.6%)	752 (5.4%)	N/A	N/A	74,773 (21.0%)	5,457 (20.8%)	0.00
Lab values- HbA1c (%) (within 3 months) ; n (%)	49,248 (25.0%)	3,593 (28.8%)	8,071 (5.0%)	591 (4.3%)	N/A	N/A	57,319 (16.1%)	4,184 (15.9%)	0.01
Lab values- HbA1c (%) (within 6 months) ; n (%)	64,253 (32.7%)	4,705 (37.7%)	10,520 (6.6%)	752 (5.4%)	N/A	N/A	74,773 (21.0%)	5,457 (20.8%)	0.00

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

Lab values- BNP; n (%)	1,407 (0.7%)	128 (1.0%)	199 (0.1%)	24 (0.2%)	N/A	N/A	1,606 (0.5%)	152 (0.6%)	-0.01
Lab values- BNP (within 3 months); n (%)	867 (0.4%)	84 (0.7%)	137 (0.1%)	21 (0.2%)	N/A	N/A	1,004 (0.3%)	105 (0.4%)	-0.02
Lab values- BNP (within 6 months); n (%)	1,407 (0.7%)	128 (1.0%)	199 (0.1%)	24 (0.2%)	N/A	N/A	1,606 (0.5%)	152 (0.6%)	-0.01
Lab values- BUN (mg/dl); n (%)	65,450 (33.3%)	4,847 (38.8%)	7,968 (5.0%)	784 (5.7%)	N/A	N/A	73,418 (20.6%)	5,631 (21.4%)	-0.02
Lab values- BUN (mg/dl) (within 3 months); n (%)	49,920 (25.4%)	3,669 (29.4%)	5,916 (3.7%)	596 (4.3%)	N/A	N/A	55,836 (15.6%)	4,265 (16.2%)	-0.02
Lab values- BUN (mg/dl) (within 6 months); n (%)	65,450 (33.3%)	4,847 (38.8%)	7,968 (5.0%)	784 (5.7%)	N/A	N/A	73,418 (20.6%)	5,631 (21.4%)	-0.02
Lab values- Creatinine (mg/dl) ; n (%)	66,968 (34.0%)	5,002 (40.1%)	8,308 (5.2%)	816 (5.9%)	N/A	N/A	75,276 (21.1%)	5,818 (22.1%)	-0.02
Lab values- Creatinine (mg/dl) (within 3 months) ; n (%)	51,084 (26.0%)	3,790 (30.4%)	6,181 (3.9%)	620 (4.5%)	N/A	N/A	57,265 (16.0%)	4,410 (16.8%)	-0.02
Lab values- Creatinine (mg/dl) (within 6 months) ; n (%)	66,968 (34.0%)	5,002 (40.1%)	8,308 (5.2%)	816 (5.9%)	N/A	N/A	75,276 (21.1%)	5,818 (22.1%)	-0.02
Lab values- HDL level (mg/dl); n (%)	53,958 (27.4%)	4,018 (32.2%)	8,896 (5.6%)	697 (5.0%)	N/A	N/A	62,854 (17.6%)	4,715 (17.9%)	-0.01
Lab values- HDL level (mg/dl) (within 3 months); n (%)	38,832 (19.7%)	2,867 (23.0%)	6,324 (3.9%)	519 (3.8%)	N/A	N/A	45,156 (12.7%)	3,386 (12.9%)	-0.01
Lab values- HDL level (mg/dl) (within 6 months); n (%)	53,958 (27.4%)	4,018 (32.2%)	8,896 (5.6%)	697 (5.0%)	N/A	N/A	62,854 (17.6%)	4,715 (17.9%)	-0.01
Lab values- LDL level (mg/dl) ; n (%)	55,693 (28.3%)	4,146 (33.2%)	9,674 (6.0%)	720 (5.2%)	N/A	N/A	65,367 (18.3%)	4,866 (18.5%)	-0.01
Lab values- LDL level (mg/dl) (within 3 months) ; n (%)	40,047 (20.4%)	2,966 (23.8%)	6,888 (4.3%)	531 (3.8%)	N/A	N/A	46,935 (13.2%)	3,497 (13.3%)	0.00
Lab values- LDL level (mg/dl) (within 6 months) ; n (%)	55,693 (28.3%)	4,146 (33.2%)	9,674 (6.0%)	720 (5.2%)	N/A	N/A	65,367 (18.3%)	4,866 (18.5%)	-0.01
Lab values- NT-proBNP ; n (%)	178 (0.1%)	30 (0.2%)	15 (0.0%)	3 (0.0%)	N/A	N/A	193 (0.1%)	33 (0.1%)	0.00
Lab values- NT-proBNP (within 3 months); n (%)	108 (0.1%)	20 (0.2%)	8 (0.0%)	1 (0.0%)	N/A	N/A	116 (0.0%)	21 (0.1%)	-
Lab values- NT-proBNP (within 6 months); n (%)	178 (0.1%)	30 (0.2%)	15 (0.0%)	3 (0.0%)	N/A	N/A	193 (0.1%)	33 (0.1%)	-
Lab values- Total cholesterol (mg/dl) ; n (%)	54,700 (27.8%)	4,119 (33.0%)	9,020 (5.6%)	707 (5.1%)	N/A	N/A	63,720 (17.9%)	4,826 (18.4%)	-0.01
Lab values- Total cholesterol (mg/dl) (within 3 months) ; n (%)	39,389 (20.0%)	2,940 (23.5%)	6,388 (4.0%)	528 (3.8%)	N/A	N/A	45,777 (12.8%)	3,468 (13.2%)	-0.01
Lab values- Total cholesterol (mg/dl) (within 6 months) ; n (%)	54,700 (27.8%)	4,119 (33.0%)	9,020 (5.6%)	707 (5.1%)	N/A	N/A	63,720 (17.9%)	4,826 (18.4%)	-0.01
Lab values- Triglyceride level (mg/dl); n (%)	54,124 (27.5%)	4,074 (32.6%)	8,795 (5.5%)	692 (5.0%)	N/A	N/A	62,919 (17.6%)	4,766 (18.1%)	-0.01
Lab values- Triglyceride level (mg/dl) (within 3 months); n (%)	39,010 (19.8%)	2,913 (23.3%)	6,245 (3.9%)	514 (3.7%)	N/A	N/A	45,255 (12.7%)	3,427 (13.0%)	-0.01
Lab values- Triglyceride level (mg/dl) (within 6 months); n (%)	54,124 (27.5%)	4,074 (32.6%)	8,795 (5.5%)	692 (5.0%)	N/A	N/A	62,919 (17.6%)	4,766 (18.1%)	-0.01
Lab result number- HbA1c (%) mean (only 2 to 20 included)	63,912	4,683	8,515	708	N/A	N/A	72,427	5,391	
...mean (sd)	7.88 (1.69)	7.88 (1.76)	7.94 (1.76)	7.85 (1.82)	N/A	N/A	7.89 (1.70)	7.88 (1.77)	0.01
...median [IQR]	7.50 [6.80, 8.55]	7.45 [6.60, 8.80]	7.50 [6.80, 8.60]	7.40 [6.50, 8.80]	N/A	N/A	7.50 (1.70)	7.44 (1.77)	0.03
...Missing; n (%)	132,800 (67.5%)	7,802 (62.5%)	151,646 (94.7%)	13,100 (94.9%)	N/A	N/A	284,446 (79.7%)	20,902 (79.5%)	0.00
Lab result number- BNP mean	1,407	128	199	24	N/A	N/A	1,606	152	
...mean (sd)	206.69 (379.43)	104.88 (129.95)	374.49 (927.73)	112.61 (201.88)	N/A	N/A	227.48 (482.27)	106.10 (143.82)	0.34
...median [IQR]	91.10 [35.30, 238.60]	48.85 [21.92, 141.45]	83.67 [34.00, 320.00]	27.00 [14.00, 134.95]	N/A	N/A	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	195,305 (99.3%)	12,357 (99.0%)	159,962 (99.9%)	13,784 (99.8%)	N/A	N/A	355,267 (99.5%)	26,141 (99.4%)	0.01
Lab result number- BUN (mg/dl) mean	65,450	4,847	7,968	784	N/A	N/A	73,418	5,631	
...mean (sd)	19.59 (8.55)	18.99 (7.63)	605.16 (9,769.77)	681.77 (10,970.52)	N/A	N/A	83.14 (3218.41)	111.27 (4091.96)	-0.01
...median [IQR]	18.00 [14.00, 23.00]	17.50 [14.00, 22.00]	17.12 [14.00, 22.50]	17.17 [14.00, 22.00]	N/A	N/A	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	131,262 (66.7%)	7,638 (61.2%)	152,193 (95.0%)	13,024 (94.3%)	N/A	N/A	283,455 (79.4%)	20,662 (78.6%)	0.02
Lab result number- Creatinine (mg/dl) mean (only 0.1 to 15 included)	66,538	4,972	7,775	746	N/A	N/A	74,313	5,718	
...mean (sd)	1.08 (0.41)	1.02 (0.36)	1.06 (0.40)	0.99 (0.30)	N/A	N/A	1.08 (0.41)	1.02 (0.35)	0.16
...median [IQR]	0.99 [0.82, 1.23]	0.95 [0.78, 1.16]	0.99 [0.82, 1.18]	0.93 [0.78, 1.13]	N/A	N/A	0.99 (0.41)	0.95 (0.35)	0.10
...Missing; n (%)	130,174 (66.2%)	7,513 (60.2%)	152,386 (95.1%)	13,062 (94.6%)	N/A	N/A	282,560 (79.2%)	20,575 (78.3%)	0.02
Lab result number- HDL level (mg/dl) mean (only =<5000 included)	53,958	4,018	8,873	695	N/A	N/A	62,831	4,713	
...mean (sd)	46.95 (13.91)	46.76 (13.33)	45.59 (47.34)	44.84 (14.34)	N/A	N/A	46.76 (21.97)	46.48 (13.48)	0.02
...median [IQR]	45.00 [37.50, 54.00]	45.00 [37.50, 54.00]	44.00 [36.67, 52.00]	43.50 [36.00, 53.00]	N/A	N/A	44.86 (21.97)	44.78 (13.48)	0.00
...Missing; n (%)	142,754 (72.6%)	8,467 (67.8%)	151,288 (94.5%)	13,113 (95.0%)	N/A	N/A	294,042 (82.4%)	21,580 (82.1%)	0.01
Lab result number- LDL level (mg/dl) mean (only =<5000 included)	54,466	4,060	8,748	635	N/A	N/A	63,214	4,695	
...mean (sd)	87.59 (38.87)	83.15 (38.01)	88.66 (40.81)	83.36 (41.13)	N/A	N/A	87.74 (39.14)	83.18 (38.45)	0.12
...median [IQR]	84.00 [63.50, 109.81]	79.50 [60.54, 103.00]	85.00 [64.50, 111.00]	83.00 [62.00, 107.00]	N/A	N/A	84.14 (39.14)	79.97 (38.45)	0.11
...Missing; n (%)	142,246 (72.3%)	8,425 (67.5%)	151,413 (94.5%)	13,173 (95.4%)	N/A	N/A	293,659 (82.3%)	21,598 (82.1%)	0.01
Lab result number- Total cholesterol (mg/dl) mean (only =<5000 included)	54,656	4,118	8,992	704	N/A	N/A	63,648	4,822	
...mean (sd)	172.55 (45.90)	168.99 (44.50)	172.40 (50.33)	171.70 (49.20)	N/A	N/A	172.53 (46.55)	169.39 (45.22)	0.07
...median [IQR]	167.00 [142.00, 197.00]	162.50 [140.00, 192.00]	167.25 [142.00, 198.00]	166.50 [143.00, 198.00]	N/A	N/A	167.04 (46.55)	163.08 (45.22)	0.09
...Missing; n (%)	142,056 (72.2%)	8,367 (67.0%)	151,169 (94.4%)	13,104 (94.9%)	N/A	N/A	293,225 (82.2%)	21,471 (81.7%)	0.01

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

Lab result number- Triglyceride level (mg/dl) mean (only =<5000 included)	54,122	4,074	8,770	690	N/A	N/A	62,892	4,764	
...mean (sd)	177.75 (139.01)	180.45 (141.28)	182.37 (160.30)	188.30 (138.00)	N/A	N/A	178.39 (142.17)	181.59 (140.82)	-0.02
...median [IQR]	148.00 [106.00, 209.00]	150.00 [108.00, 212.00]	148.00 [105.00, 213.00]	153.00 [108.00, 225.12]	N/A	N/A	148.00 (142.17)	150.43 (140.82)	-0.02
...Missing; n (%)	142,590 (72.5%)	8,411 (67.4%)	151,391 (94.5%)	13,118 (95.0%)	N/A	N/A	293,981 (82.4%)	21,529 (81.9%)	0.01
Lab result number- Hemoglobin mean (only >0 included)	46,203	3,404	5,302	532	N/A	N/A	51,505	3,936	
...mean (sd)	13.33 (1.71)	13.48 (1.59)	4,366.28 (194,400.62)	302.76 (6,676.17)	N/A	N/A	461.43 (62368.39)	52.58 (2453.09)	0.01
...median [IQR]	13.40 [12.20, 14.50]	13.50 [12.40, 14.50]	13.50 [12.30, 14.60]	13.50 [12.50, 14.60]	N/A	N/A	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	150,509 (76.5%)	9,081 (72.7%)	154,859 (96.7%)	13,276 (96.1%)	N/A	N/A	305,368 (85.6%)	22,357 (85.5%)	0.02
Lab result number- Serum sodium mean (only > 90 and < 190 included)	64,988	4,879	7,382	734	N/A	N/A	72,370	5,613	
...mean (sd)	139.46 (2.82)	139.80 (2.62)	139.02 (2.67)	139.17 (2.52)	N/A	N/A	139.42 (2.81)	139.72 (2.61)	-0.11
...median [IQR]	140.00 [138.00, 141.00]	140.00 [138.00, 141.50]	139.00 [137.50, 141.00]	139.00 [138.00, 141.00]	N/A	N/A	139.90 (2.81)	139.87 (2.61)	0.01
...Missing; n (%)	131,724 (67.0%)	7,606 (60.9%)	152,779 (95.4%)	13,074 (94.7%)	N/A	N/A	284,503 (79.7%)	20,680 (78.7%)	0.02
Lab result number- Albumin mean (only >0 and <=10 included)	59,908	4,526	6,409	689	N/A	N/A	66,317	5,215	
...mean (sd)	4.22 (0.33)	4.22 (0.30)	4.14 (0.59)	4.11 (0.62)	N/A	N/A	4.21 (0.36)	4.21 (0.36)	0.00
...median [IQR]	4.23 [4.00, 4.40]	4.20 [4.00, 4.40]	4.20 [4.00, 4.40]	4.20 [4.00, 4.40]	N/A	N/A	4.23 (0.36)	4.20 (0.36)	0.08
...Missing; n (%)	136,804 (69.5%)	7,959 (63.7%)	153,752 (96.0%)	13,119 (95.0%)	N/A	N/A	290,556 (81.4%)	21,078 (80.2%)	0.03
Lab result number- Glucose (fasting or random) mean (only 10-1000 included)	64,902	4,876	7,253	722	N/A	N/A	72,155	5,598	
...mean (sd)	165.03 (68.57)	160.65 (68.99)	169.17 (71.16)	163.38 (68.72)	N/A	N/A	165.45 (68.84)	161.00 (68.96)	0.06
...median [IQR]	148.50 [121.00, 189.00]	143.00 [113.00, 186.00]	151.50 [122.00, 195.50]	145.00 [114.38, 191.00]	N/A	N/A	148.80 (68.84)	143.26 (68.96)	0.08
...Missing; n (%)	131,810 (67.0%)	7,609 (60.9%)	152,908 (95.5%)	13,086 (94.8%)	N/A	N/A	284,718 (79.8%)	20,695 (78.7%)	0.03
Lab result number- Potassium mean (only 1-7 included)	66,412	4,964	7,815	768	N/A	N/A	74,227	5,732	
...mean (sd)	4.45 (0.45)	4.45 (0.42)	4.37 (0.45)	4.33 (0.46)	N/A	N/A	4.44 (0.45)	4.43 (0.43)	0.02
...median [IQR]	4.40 [4.17, 4.70]	4.40 [4.20, 4.70]	4.35 [4.05, 4.65]	4.30 [4.00, 4.60]	N/A	N/A	4.39 (0.45)	4.39 (0.43)	0.00
...Missing; n (%)	130,300 (66.2%)	7,521 (60.2%)	152,346 (95.1%)	13,040 (94.4%)	N/A	N/A	282,646 (79.2%)	20,561 (78.2%)	0.02
Comorbidity Scores									
CCI (180 days)- ICD9 and ICD10									
...mean (sd)	2.83 (2.07)	2.76 (1.84)	2.22 (1.78)	2.06 (1.51)	3.18 (2.40)	2.91 (2.02)	2.94 (2.24)	2.66 (1.86)	0.14
...median [IQR]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 3.00]	2.00 [1.00, 3.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 (2.24)	2.00 (1.86)	0.00
Frailty Score: Qualitative Version 365 days as Categories,									
...0; n (%)	86,571 (44.0%)	6,594 (52.8%)	44,870 (28.0%)	4,399 (31.9%)	158,210 (27.7%)	9,861 (34.6%)	289,651 (31.2%)	20,854 (38.1%)	-0.15
...1 to 2; n (%)	66,596 (33.9%)	3,860 (30.9%)	69,481 (43.4%)	6,189 (44.8%)	191,508 (33.5%)	9,366 (32.9%)	327,585 (35.3%)	19,415 (35.4%)	0.00
...3 or more; n (%)	43,545 (22.1%)	2,031 (16.3%)	45,810 (28.6%)	3,220 (23.3%)	221,750 (38.8%)	9,284 (32.6%)	311,105 (33.5%)	14,535 (26.5%)	0.15
Frailty Score: Empirical Version 365 days as Categories,									
...<0.12908; n (%)	37,724 (19.2%)	2,178 (17.4%)	25,919 (16.2%)	2,299 (16.6%)	52,677 (9.2%)	2,579 (9.0%)	116,320 (12.5%)	7,056 (12.9%)	-0.01
...0.12908 - 0.1631167; n (%)	63,072 (32.1%)	3,967 (31.8%)	51,002 (31.8%)	4,561 (33.0%)	127,292 (22.3%)	6,775 (23.8%)	241,366 (26.0%)	15,303 (27.9%)	-0.04
...>=0.1631167; n (%)	95,916 (48.8%)	6,340 (50.8%)	83,240 (52.0%)	6,948 (50.3%)	391,499 (68.5%)	19,157 (67.2%)	570,655 (61.5%)	32,445 (59.2%)	0.05
Non-Frailty; n (%)	111,432 (56.6%)	7,721 (61.8%)	81,246 (50.7%)	7,771 (56.3%)	25,833 (4.5%)	1,177 (4.1%)	218,511 (23.5%)	16,669 (30.4%)	-0.16
Frailty Score (mean): Qualitative Version 365 days,									
...mean (sd)	1.50 (2.05)	1.11 (1.65)	1.90 (2.04)	1.58 (1.65)	2.46 (2.61)	1.97 (2.22)	2.16 (2.41)	1.68 (1.97)	0.22
...median [IQR]	1.00 [0.00, 2.00]	0.00 [0.00, 2.00]	1.00 [0.00, 3.00]	1.00 [0.00, 2.00]	2.00 [0.00, 4.00]	1.00 [0.00, 3.00]	1.62 (2.41)	0.77 (1.97)	0.39
Frailty Score (mean): Empirical Version 365 days,									
...mean (sd)	0.17 (0.06)	0.17 (0.05)	0.17 (0.05)	0.17 (0.05)	0.21 (0.08)	0.20 (0.07)	0.19 (0.07)	0.19 (0.06)	0.00
...median [IQR]	0.16 [0.14, 0.20]	0.16 [0.14, 0.20]	0.16 [0.13, 0.19]	0.16 [0.13, 0.19]	0.19 [0.15, 0.24]	0.19 [0.15, 0.23]	0.18 (0.07)	0.18 (0.06)	0.00
Healthcare Utilization									
Any hospitalization; n (%)	22,822 (11.6%)	932 (7.5%)	22,913 (14.3%)	1,089 (7.9%)	94,431 (16.5%)	2,641 (9.3%)	140,166 (15.1%)	4,662 (8.5%)	0.21
Any hospitalization within prior 30 days; n (%)	8,976 (4.6%)	186 (1.5%)	7,999 (5.0%)	174 (1.3%)	34,791 (6.1%)	501 (1.8%)	51,766 (5.6%)	861 (1.6%)	0.22
Any hospitalization during prior 31-180 days; n (%)	15,333 (7.8%)	789 (6.3%)	16,116 (10.1%)	941 (6.8%)	68,046 (11.9%)	2,248 (7.9%)	99,495 (10.7%)	3,978 (7.3%)	0.12
Endocrinologist Visit; n (%)	10,612 (5.4%)	2,709 (21.7%)	9,104 (5.7%)	3,114 (22.6%)	39,543 (6.9%)	7,223 (25.3%)	59,259 (6.4%)	13,046 (23.8%)	-0.50
Endocrinologist Visit (30 days prior); n (%)	5,832 (3.0%)	1,706 (13.7%)	5,126 (3.2%)	2,086 (15.1%)	21,478 (3.8%)	4,455 (15.6%)	32,436 (3.5%)	8,247 (15.0%)	-0.40
Endocrinologist Visit (31 to 180 days prior); n (%)	7,605 (3.9%)	2,033 (16.3%)	6,514 (4.1%)	2,270 (16.4%)	29,932 (5.2%)	5,602 (19.6%)	44,051 (4.7%)	9,905 (18.1%)	-0.43
Internal medicine/family medicine visits; n (%)	174,004 (88.5%)	10,331 (82.7%)	134,865 (84.2%)	11,859 (85.9%)	484,478 (84.8%)	23,819 (83.5%)	793,347 (85.5%)	46,009 (84.0%)	0.04
Internal medicine/family medicine visits (30 days prior) ; n (%)	130,177 (66.2%)	7,189 (57.6%)	98,733 (61.6%)	8,352 (60.5%)	347,640 (60.8%)	15,622 (54.8%)	576,550 (62.1%)	31,163 (56.9%)	0.11
Internal medicine/family medicine visits (31 to 180 days prior) ; n (%)	153,193 (77.9%)	9,462 (75.8%)	117,762 (73.5%)	10,731 (77.7%)	424,882 (74.3%)	21,819 (76.5%)	695,837 (75.0%)	42,012 (76.7%)	-0.04
Cardiologist visit; n (%)	61,106 (31.1%)	4,345 (34.8%)	46,909 (29.3%)	4,666 (33.8%)	217,811 (38.1%)	10,584 (37.1%)	325,826 (35.1%)	19,595 (35.8%)	-0.01
Number of Cardiologist visits (30 days prior); n (%)	23,285 (11.8%)	1,441 (11.5%)	17,006 (10.6%)	1,545 (11.2%)	81,708 (14.3%)	3,371 (11.8%)	121,999 (13.1%)	6,357 (11.6%)	0.05

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

Number of Cardiologist visits (31 to 180 days prior); n (%)	50,549 (25.7%)	3,740 (30.0%)	39,491 (24.7%)	4,016 (29.1%)	185,317 (32.4%)	9,345 (32.8%)	275,357 (29.7%)	17,101 (31.2%)	-0.03
Electrocardiogram ; n (%)	66,713 (33.9%)	4,279 (34.3%)	58,412 (36.5%)	5,031 (36.4%)	220,597 (38.6%)	10,338 (36.3%)	345,722 (37.2%)	19,648 (35.9%)	0.03
Use of glucose test strips; n (%)	7,094 (3.6%)	514 (4.1%)	5,465 (3.4%)	626 (4.5%)	19,740 (3.5%)	1,110 (3.9%)	32,299 (3.5%)	2,250 (4.1%)	-0.03
Dialysis; n (%)	117 (0.1%)	8 (0.1%)	144 (0.1%)	6 (0.0%)	647 (0.1%)	11 (0.0%)	908 (0.1%)	025 (0.0%)	0.04
Naive new user v8 ; n (%)	59,575 (30.3%)	2,843 (22.8%)	47,064 (29.4%)	2,515 (18.2%)	153,729 (26.9%)	4,885 (17.1%)	260,368 (28.0%)	10,243 (18.7%)	0.22
N antidiabetic drugs at index date									
...mean (sd)	1.67 (0.62)	1.75 (0.72)	1.69 (0.65)	1.77 (0.75)	1.65 (0.62)	1.78 (0.71)	1.66 (0.63)	1.77 (0.72)	-0.16
...median [IQR]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 (0.63)	2.00 (0.72)	0.00
number of different/distinct medication prescriptions									
...mean (sd)	9.22 (4.44)	11.19 (5.24)	9.31 (4.45)	11.10 (4.95)	9.61 (4.49)	11.07 (4.88)	9.48 (4.47)	11.10 (4.98)	-0.34
...median [IQR]	9.00 [6.00, 12.00]	11.00 [8.00, 14.00]	9.00 [6.00, 12.00]	11.00 [8.00, 14.00]	9.00 [6.00, 12.00]	10.00 [8.00, 14.00]	9.00 (4.47)	10.48 (4.98)	-0.31
Number of Hospitalizations									
...mean (sd)	0.14 (0.45)	0.09 (0.34)	0.17 (0.46)	0.09 (0.33)	0.23 (0.62)	0.12 (0.41)	0.20 (0.56)	0.11 (0.38)	0.19
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (0.56)	0.00 (0.38)	0.00
Number of hospital days									
...mean (sd)	0.86 (3.80)	0.45 (2.50)	1.02 (4.23)	0.43 (2.24)	1.61 (5.91)	0.69 (3.22)	1.35 (5.26)	0.57 (2.84)	0.18
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (5.26)	0.00 (2.84)	0.00
Number of Emergency Department (ED) visits									
...mean (sd)	0.47 (1.33)	0.40 (1.19)	0.27 (1.64)	0.14 (1.20)	0.69 (1.57)	0.46 (1.22)	0.57 (1.53)	0.37 (1.21)	0.14
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 [0.00, 0.00]	0.00 (1.53)	0.00 (1.21)	0.00
Number of Office visits									
...mean (sd)	4.71 (3.74)	5.85 (4.16)	5.01 (4.03)	6.08 (4.35)	5.31 (4.32)	6.61 (4.77)	5.13 (4.15)	6.30 (4.53)	-0.27
...median [IQR]	4.00 [2.00, 6.00]	5.00 [3.00, 8.00]	4.00 [2.00, 7.00]	5.00 [3.00, 8.00]	4.00 [2.00, 7.00]	6.00 [3.00, 9.00]	4.00 (4.15)	5.52 (4.53)	-0.35
Number of Endocrinologist visits									
...mean (sd)	0.24 (1.59)	1.18 (3.75)	0.25 (1.57)	1.22 (3.84)	0.38 (2.33)	1.74 (5.44)	0.33 (2.07)	1.48 (4.72)	-0.32
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 (2.07)	0.00 (4.72)	0.00
Number of internal medicine/family medicine visits									
...mean (sd)	10.56 (13.70)	10.28 (14.77)	7.25 (9.99)	7.76 (9.80)	8.78 (11.47)	8.76 (11.54)	8.89 (11.75)	8.85 (11.97)	0.00
...median [IQR]	6.00 [2.00, 14.00]	6.00 [2.00, 13.00]	4.00 [2.00, 9.00]	5.00 [2.00, 10.00]	5.00 [2.00, 12.00]	5.00 [2.00, 12.00]	5.04 (11.75)	5.23 (11.97)	-0.02
Number of Cardiologist visits									
...mean (sd)	1.59 (4.13)	1.69 (3.99)	1.34 (3.54)	1.56 (3.83)	2.16 (5.18)	2.04 (5.04)	1.90 (4.72)	1.84 (4.53)	0.01
...median [IQR]	0.00 [0.00, 1.00]	0.00 [0.00, 2.00]	0.00 [0.00, 1.00]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00 (4.72)	0.00 (4.53)	
Number electrocardiograms received									
...mean (sd)	0.71 (1.57)	0.67 (1.46)	0.69 (1.33)	0.64 (1.22)	0.86 (1.63)	0.72 (1.36)	0.80 (1.57)	0.69 (1.35)	0.08
...median [IQR]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 (1.57)	0.00 (1.35)	
Number of HbA1c tests ordered									
...mean (sd)	1.18 (0.89)	1.37 (0.92)	0.86 (0.89)	1.14 (0.94)	1.27 (0.87)	1.50 (0.88)	1.18 (0.88)	1.38 (0.90)	-0.22
...median [IQR]	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	1.00 [0.00, 1.00]	1.00 [0.00, 2.00]	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	1.00 (0.88)	1.00 (0.90)	0.00
Number of glucose tests ordered									
...mean (sd)	0.47 (2.36)	0.58 (1.39)	0.38 (1.34)	0.49 (1.14)	0.39 (1.02)	0.53 (1.18)	0.41 (1.46)	0.53 (1.22)	-0.09
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 (1.46)	0.00 (1.22)	0.00
Number of lipid tests ordered									
...mean (sd)	0.94 (0.93)	1.08 (1.02)	0.74 (1.19)	1.00 (1.28)	0.93 (0.82)	1.11 (0.90)	0.90 (0.92)	1.08 (1.03)	-0.18
...median [IQR]	1.00 [0.00, 1.00]	1.00 [0.00, 2.00]	0.00 [0.00, 1.00]	1.00 [0.00, 2.00]	1.00 [0.00, 1.00]	1.00 [1.00, 2.00]	0.83 (0.92)	1.00 (1.03)	-0.17
Number of creatinine tests ordered									
...mean (sd)	0.07 (0.35)	0.06 (0.32)	0.10 (0.50)	0.07 (0.35)	0.09 (0.42)	0.10 (0.40)	0.09 (0.42)	0.08 (0.37)	0.03
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (0.42)	0.00 (0.37)	0.00
Number of BUN tests ordered									
...mean (sd)	0.04 (0.28)	0.03 (0.24)	0.06 (0.37)	0.04 (0.29)	0.06 (0.34)	0.06 (0.30)	0.06 (0.33)	0.05 (0.28)	0.03
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (0.33)	0.00 (0.28)	0.00
Number of tests for microalbuminuria									
...mean (sd)	0.71 (1.13)	0.85 (1.24)	0.44 (0.90)	0.63 (1.06)	0.41 (0.68)	0.56 (0.78)	0.48 (0.83)	0.64 (0.97)	-0.18
...median [IQR]	0.00 [0.00, 1.00]	0.00 [0.00, 2.00]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 (0.83)	0.00 (0.97)	0.00
Total N distinct ICD9/ICD10 diagnoses at the 3rd digit level									
...mean (sd)	5.56 (7.93)	7.14 (8.40)	2.46 (5.45)	2.45 (4.54)	6.43 (9.60)	6.71 (8.93)	5.56 (8.67)	5.73 (7.92)	-0.02
...median [IQR]	3.00 [0.00, 8.00]	5.00 [0.00, 11.00]	0.00 [0.00, 3.00]	0.00 [0.00, 4.00]	3.00 [0.00, 9.00]	4.00 [0.00, 10.00]	2.48 (8.67)	3.22 (7.92)	-0.09
Use of thiazide; n (%)	27,419 (13.9%)	1,625 (13.0%)	21,582 (13.5%)	1,717 (12.4%)	84,834 (14.8%)	4,198 (14.7%)	133,835 (14.4%)	7,540 (13.8%)	0.02
Use of beta blockers; n (%)	85,663 (43.5%)	5,416 (43.4%)	74,450 (46.5%)	6,002 (43.5%)	283,394 (49.6%)	13,479 (47.3%)	443,507 (47.8%)	24,897 (45.4%)	0.05
Use of calcium channel blockers; n (%)	62,900 (32.0%)	3,589 (28.7%)	50,730 (31.7%)	3,915 (28.4%)	199,227 (34.9%)	8,767 (30.7%)	312,857 (33.7%)	16,271 (29.7%)	0.09

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

	PS-matched								
	Optum		MarketScan		Medicare		POOLED		
Variable	Reference-2nd Generation SUs	Exposure-Liraglutide	Reference-2nd Generation SUs	Exposure-Liraglutide	Reference-2nd Generation SUs	Exposure-Liraglutide	Reference-2nd Generation SUs	Exposure-Liraglutide	St. Diff.
Number of patients	12253	12253	13591	13591	28338	28338	54,182	54,182	
Age									
...mean (sd)	65.57 (7.08)	65.79 (6.77)	62.61 (6.66)	62.89 (6.12)	70.39 (5.17)	70.55 (4.99)	67.35 (6.04)	67.55 (5.73)	-0.03
...median [IQR]	66.00 [61.00, 70.00]	66.00 [61.00, 70.00]	62.00 [60.00, 65.00]	62.00 [60.00, 65.00]	69.00 [66.00, 73.00]	69.00 [67.00, 73.00]	66.57 (6.04)	66.57 (5.73)	0.00
Age categories									
...18 - 54; n (%)	856 (7.0%)	700 (5.7%)	1,433 (10.5%)	1,145 (8.4%)	0 (0.0%)	0 (0.0%)	2,289 (4.2%)	1,845 (3.4%)	0.04
...55 - 64; n (%)	4,440 (36.2%)	4,474 (36.5%)	8,439 (62.1%)	8,448 (62.2%)	876 (3.1%)	682 (2.4%)	13,755 (25.4%)	13,604 (25.1%)	0.01
...65 - 74; n (%)	5,664 (46.2%)	5,858 (47.8%)	2,893 (21.3%)	3,298 (24.3%)	22,136 (78.1%)	22,229 (78.4%)	30,693 (56.6%)	31,385 (57.9%)	-0.03
...>= 75; n (%)	1,293 (10.6%)	1,221 (10.0%)	826 (6.1%)	700 (5.2%)	5,326 (18.8%)	5,427 (19.2%)	7,445 (13.7%)	7,348 (13.6%)	0.00
Gender									
...Males; n (%)	5,550 (45.3%)	5,514 (45.0%)	6,577 (48.4%)	6,643 (48.9%)	11,978 (42.3%)	11,972 (42.2%)	24,105 (44.5%)	24,129 (44.5%)	0.00
...Females; n (%)	6,703 (54.7%)	6,739 (55.0%)	7,014 (51.6%)	6,948 (51.1%)	16,360 (57.7%)	16,366 (57.8%)	30,077 (55.5%)	30,053 (55.5%)	0.00
Race									
...White; n (%)	N/A	N/A	N/A	N/A	24,117 (85.1%)	23,930 (84.4%)	24,117 (85.1%)	23,930 (84.4%)	0.02
...Black; n (%)	N/A	N/A	N/A	N/A	2,464 (8.7%)	2,557 (9.0%)	2,464 (8.7%)	2,557 (9.0%)	-0.01
...Asian; n (%)	N/A	N/A	N/A	N/A	364 (1.3%)	380 (1.3%)	364 (1.3%)	380 (1.3%)	0.00
...Hispanic; n (%)	N/A	N/A	N/A	N/A	481 (1.7%)	511 (1.8%)	481 (1.7%)	511 (1.8%)	-0.01
...North American Native; n (%)	N/A	N/A	N/A	N/A	89 (0.3%)	122 (0.4%)	89 (0.3%)	122 (0.4%)	-0.02
...Other/Unknown; n (%)	N/A	N/A	N/A	N/A	823 (2.9%)	838 (3.0%)	823 (2.9%)	838 (3.0%)	-0.01
Region (lumping missing&other category with West)									
...Northeast; n (%)	1,166 (9.5%)	1,177 (9.6%)	2,666 (19.6%)	2,729 (20.1%)	4,555 (16.1%)	4,669 (16.5%)	8,387 (15.5%)	8,575 (15.8%)	-0.01
...South; n (%)	6,705 (54.7%)	6,635 (54.2%)	2,735 (20.1%)	2,766 (20.4%)	13,129 (46.3%)	13,013 (45.9%)	22,569 (41.7%)	22,414 (41.4%)	0.01
...Midwest; n (%)	2,289 (18.7%)	2,291 (18.7%)	6,666 (49.0%)	6,500 (47.8%)	6,131 (21.6%)	6,116 (21.6%)	15,086 (27.8%)	14,907 (27.5%)	0.01
...West; n (%)	2,093 (17.1%)	2,150 (17.5%)	1,372 (10.1%)	1,439 (10.6%)	4,523 (16.0%)	4,540 (16.0%)	7,988 (14.7%)	8,129 (15.0%)	-0.01
...Unknown+missing; n (%)	N/A	N/A	152 (1.1%)	157 (1.2%)	N/A	N/A	152 (1.1%)	157 (1.2%)	-0.01
CV Covariates									
Ischemic heart disease; n (%)	3,626 (29.6%)	3,604 (29.4%)	4,206 (30.9%)	4,351 (32.0%)	8,731 (30.8%)	8,831 (31.2%)	16,563 (30.6%)	16,786 (31.0%)	-0.01
Acute MI; n (%)	177 (1.4%)	170 (1.4%)	192 (1.4%)	210 (1.5%)	328 (1.2%)	334 (1.2%)	697 (1.3%)	714 (1.3%)	0.00
ACS/unstable angina; n (%)	234 (1.9%)	254 (2.1%)	271 (2.0%)	281 (2.1%)	511 (1.8%)	477 (1.7%)	1,016 (1.9%)	1,012 (1.9%)	0.00
Old MI; n (%)	485 (4.0%)	479 (3.9%)	279 (2.1%)	288 (2.1%)	1,043 (3.7%)	1,034 (3.6%)	1,807 (3.3%)	1,801 (3.3%)	0.00
Stable angina; n (%)	552 (4.5%)	583 (4.8%)	475 (3.5%)	488 (3.6%)	1,057 (3.7%)	1,123 (4.0%)	2,084 (3.8%)	2,194 (4.0%)	-0.01
Coronary atherosclerosis and other forms of chronic ischemic heart disease; n (%)	3,397 (27.7%)	3,383 (27.6%)	3,991 (29.4%)	4,144 (30.5%)	8,336 (29.4%)	8,421 (29.7%)	15,724 (29.0%)	15,948 (29.4%)	-0.01
Other atherosclerosis with ICD10 ; n (%)	111 (0.9%)	119 (1.0%)	139 (1.0%)	155 (1.1%)	443 (1.6%)	470 (1.7%)	693 (1.3%)	744 (1.4%)	-0.01
Previous cardiac procedure (CABG or PTCA or Stent) ; n (%)	88 (0.7%)	96 (0.8%)	125 (0.9%)	137 (1.0%)	174 (0.6%)	140 (0.5%)	387 (0.7%)	373 (0.7%)	0.00
History of CABG or PTCA; n (%)	868 (7.1%)	896 (7.3%)	548 (4.0%)	566 (4.2%)	2,354 (8.3%)	2,366 (8.3%)	3,770 (7.0%)	3,828 (7.1%)	0.00
Any stroke; n (%)	925 (7.5%)	891 (7.3%)	958 (7.0%)	1,002 (7.4%)	2,454 (8.7%)	2,433 (8.6%)	4,337 (8.0%)	4,326 (8.0%)	0.00
Ischemic stroke (w and w/o mention of cerebral infarction); n (%)	912 (7.4%)	886 (7.2%)	938 (6.9%)	985 (7.2%)	2,437 (8.6%)	2,410 (8.5%)	4,287 (7.9%)	4,281 (7.9%)	0.00
Hemorrhagic stroke; n (%)	19 (0.2%)	16 (0.1%)	27 (0.2%)	27 (0.2%)	38 (0.1%)	45 (0.2%)	084 (0.2%)	088 (0.2%)	0.00
TIA; n (%)	229 (1.9%)	224 (1.8%)	234 (1.7%)	239 (1.8%)	516 (1.8%)	511 (1.8%)	979 (1.8%)	974 (1.8%)	0.00
Other cerebrovascular disease; n (%)	182 (1.5%)	225 (1.8%)	182 (1.3%)	164 (1.2%)	615 (2.2%)	583 (2.1%)	979 (1.8%)	972 (1.8%)	0.00
Late effects of cerebrovascular disease; n (%)	146 (1.2%)	143 (1.2%)	97 (0.7%)	92 (0.7%)	382 (1.3%)	415 (1.5%)	625 (1.2%)	650 (1.2%)	0.00
Cerebrovascular procedure; n (%)	14 (0.1%)	12 (0.1%)	10 (0.1%)	11 (0.1%)	35 (0.1%)	25 (0.1%)	059 (0.1%)	048 (0.1%)	0.00
Heart failure (CHF); n (%)	1,220 (10.0%)	1,238 (10.1%)	978 (7.2%)	976 (7.2%)	3,335 (11.8%)	3,322 (11.7%)	5,533 (10.2%)	5,536 (10.2%)	0.00
Peripheral Vascular Disease (PVD) or PVD Surgery ; n (%)	1,032 (8.4%)	1,076 (8.8%)	1,066 (7.8%)	1,057 (7.8%)	2,898 (10.2%)	2,934 (10.4%)	4,996 (9.2%)	5,067 (9.4%)	-0.01
Atrial fibrillation; n (%)	927 (7.6%)	947 (7.7%)	769 (5.7%)	774 (5.7%)	3,069 (10.8%)	3,058 (10.8%)	4,765 (8.8%)	4,779 (8.8%)	0.00
Other cardiac dysrhythmia; n (%)	1,257 (10.3%)	1,284 (10.5%)	896 (6.6%)	925 (6.8%)	3,317 (11.7%)	3,335 (11.8%)	5,470 (10.1%)	5,544 (10.2%)	0.00
Cardiac conduction disorders; n (%)	349 (2.8%)	350 (2.9%)	228 (1.7%)	281 (2.1%)	1,094 (3.9%)	1,069 (3.8%)	1,671 (3.1%)	1,700 (3.1%)	0.00
Other CVD; n (%)	1,446 (11.8%)	1,455 (11.9%)	1,455 (10.7%)	1,447 (10.6%)	4,255 (15.0%)	4,141 (14.6%)	7,156 (13.2%)	7,043 (13.0%)	0.01
Diabetes-related complications									
Diabetic retinopathy; n (%)	828 (6.8%)	904 (7.4%)	613 (4.5%)	641 (4.7%)	2,266 (8.0%)	2,359 (8.3%)	3,707 (6.8%)	3,904 (7.2%)	-0.02
Diabetes with other ophthalmic manifestations; n (%)	85 (0.7%)	90 (0.7%)	398 (2.9%)	440 (3.2%)	834 (2.9%)	867 (3.1%)	1,317 (2.4%)	1,397 (2.6%)	-0.01
Retinal detachment, vitreous hemorrhage, vitrectomy; n (%)	55 (0.4%)	53 (0.4%)	48 (0.4%)	46 (0.3%)	144 (0.5%)	135 (0.5%)	247 (0.5%)	234 (0.4%)	0.01
Retinal laser coagulation therapy; n (%)	70 (0.6%)	71 (0.6%)	82 (0.6%)	91 (0.7%)	190 (0.7%)	199 (0.7%)	342 (0.6%)	361 (0.7%)	-0.01
Occurrence of Diabetic Neuropathy ; n (%)	2,907 (23.7%)	2,874 (23.5%)	1,852 (13.6%)	1,890 (13.9%)	6,479 (22.9%)	6,619 (23.4%)	11,238 (20.7%)	11,383 (21.0%)	-0.01

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

Occurrence of diabetic nephropathy with ICD10 ; n (%)	2,029 (16.6%)	2,102 (17.2%)	1,042 (7.7%)	1,008 (7.4%)	3,374 (11.9%)	3,490 (12.3%)	6,445 (11.9%)	6,600 (12.2%)	-0.01
Hypoglycemia ; n (%)	267 (2.2%)	271 (2.2%)	369 (2.7%)	400 (2.9%)	866 (3.1%)	840 (3.0%)	1,502 (2.8%)	1,511 (2.8%)	0.00
Hyperglycemia; n (%)	563 (4.6%)	561 (4.6%)	425 (3.1%)	424 (3.1%)	1,251 (4.4%)	1,233 (4.4%)	2,239 (4.1%)	2,218 (4.1%)	0.00
Disorders of fluid electrolyte and acid-base balance; n (%)	766 (6.3%)	812 (6.6%)	603 (4.4%)	592 (4.4%)	2,084 (7.4%)	2,147 (7.6%)	3,453 (6.4%)	3,551 (6.6%)	-0.01
Diabetic ketoacidosis; n (%)	16 (0.1%)	14 (0.1%)	19 (0.1%)	15 (0.1%)	31 (0.1%)	32 (0.1%)	066 (0.1%)	061 (0.1%)	0.00
Hyperosmolar hyperglycemic nonketotic syndrome (HONK); n (%)	61 (0.5%)	68 (0.6%)	41 (0.3%)	44 (0.3%)	122 (0.4%)	125 (0.4%)	224 (0.4%)	237 (0.4%)	0.00
Diabetes with peripheral circulatory disorders with ICD-10 ; n (%)	950 (7.8%)	959 (7.8%)	497 (3.7%)	522 (3.8%)	1,985 (7.0%)	2,021 (7.1%)	3,432 (6.3%)	3,502 (6.5%)	-0.01
Diabetic Foot; n (%)	309 (2.5%)	308 (2.0%)	275 (2.0%)	296 (2.2%)	909 (3.2%)	931 (3.3%)	1,493 (2.8%)	1,535 (2.8%)	0.00
Gangrene ; n (%)	35 (0.3%)	33 (0.3%)	24 (0.2%)	20 (0.1%)	53 (0.2%)	60 (0.2%)	112 (0.2%)	113 (0.2%)	0.00
Lower extremity amputation; n (%)	114 (0.9%)	103 (0.8%)	39 (0.3%)	41 (0.3%)	153 (0.5%)	163 (0.6%)	306 (0.6%)	307 (0.6%)	0.00
Osteomyelitis; n (%)	112 (0.9%)	87 (0.7%)	71 (0.5%)	66 (0.5%)	196 (0.7%)	166 (0.6%)	379 (0.7%)	319 (0.6%)	0.01
Skin infections ; n (%)	693 (5.7%)	714 (5.8%)	788 (5.8%)	794 (5.8%)	2,223 (7.8%)	2,241 (7.9%)	3,704 (6.8%)	3,749 (6.9%)	0.00
Erectile dysfunction; n (%)	353 (2.9%)	350 (2.9%)	307 (2.3%)	312 (2.3%)	833 (2.9%)	821 (2.9%)	1,493 (2.8%)	1,483 (2.7%)	0.01
Diabetes with unspecified complication; n (%)	742 (6.1%)	789 (6.4%)	634 (4.7%)	634 (4.7%)	1,595 (5.6%)	1,646 (5.8%)	2,971 (5.5%)	3,069 (5.7%)	-0.01
Diabetes mellitus without mention of complications; n (%)	10,682 (87.2%)	10,639 (86.8%)	12,694 (93.4%)	12,712 (93.5%)	26,299 (92.8%)	26,320 (92.9%)	49,675 (91.7%)	49,671 (91.7%)	0.00
Hypertension: 1 inpatient or 2 outpatient claims within 365 days; n (%)	11,668 (95.2%)	11,662 (95.2%)	12,150 (89.4%)	12,086 (88.9%)	27,462 (96.9%)	27,458 (96.9%)	51,280 (94.6%)	51,206 (94.5%)	0.00
Hyperlipidemia ; n (%)	9,662 (78.9%)	9,646 (78.7%)	9,610 (70.7%)	9,643 (71.0%)	23,411 (82.6%)	23,471 (82.8%)	42,683 (78.8%)	42,760 (78.9%)	0.00
Edema; n (%)	1,043 (8.5%)	1,052 (8.6%)	801 (5.9%)	818 (6.0%)	3,069 (10.8%)	3,179 (11.2%)	4,913 (9.1%)	5,049 (9.3%)	-0.01
Renal Dysfunction (non-diabetic) ; n (%)	2,712 (22.1%)	2,829 (23.1%)	1,804 (13.3%)	1,850 (13.6%)	6,163 (21.7%)	6,236 (22.0%)	10,679 (19.7%)	10,915 (20.1%)	-0.01
Occurrence of acute renal disease ; n (%)	378 (3.1%)	362 (3.0%)	199 (1.5%)	212 (1.6%)	922 (3.3%)	902 (3.2%)	1,499 (2.8%)	1,476 (2.7%)	0.01
Occurrence of chronic renal insufficiency; n (%)	2,280 (18.6%)	2,425 (19.8%)	1,368 (10.1%)	1,413 (10.4%)	5,213 (18.4%)	5,351 (18.9%)	8,861 (16.4%)	9,189 (17.0%)	-0.02
Chronic kidney disease ; n (%)	2,222 (18.1%)	2,351 (19.2%)	1,305 (9.6%)	1,356 (10.0%)	4,960 (17.5%)	5,072 (17.9%)	8,487 (15.7%)	8,779 (16.2%)	-0.01
CKD Stage 3-4; n (%)	1,662 (13.6%)	1,694 (13.8%)	967 (7.1%)	1,002 (7.4%)	3,531 (12.5%)	3,647 (12.9%)	6,160 (11.4%)	6,343 (11.7%)	-0.01
Occurrence of hypertensive nephropathy; n (%)	996 (8.1%)	1,051 (8.6%)	517 (3.8%)	517 (3.8%)	2,208 (7.8%)	2,249 (7.9%)	3,721 (6.9%)	3,817 (7.0%)	-0.01
Occurrence of miscellaneous renal insufficiency ; n (%)	632 (5.2%)	632 (5.2%)	499 (3.7%)	509 (3.7%)	1,836 (6.5%)	1,803 (6.4%)	2,967 (5.5%)	2,944 (5.4%)	0.00
Glaucoma or cataracts ; n (%)	2,530 (20.6%)	2,514 (20.5%)	2,365 (17.4%)	2,305 (17.0%)	7,914 (27.9%)	8,032 (28.3%)	12,809 (23.6%)	12,851 (23.7%)	0.00
Cellulitis or abscess of toe; n (%)	189 (1.5%)	180 (1.5%)	117 (0.9%)	122 (0.9%)	457 (1.6%)	440 (1.6%)	763 (1.4%)	742 (1.4%)	0.00
Foot ulcer; n (%)	301 (2.5%)	290 (2.4%)	274 (2.0%)	296 (2.2%)	894 (3.2%)	912 (3.2%)	1,469 (2.7%)	1,498 (2.8%)	-0.01
Bladder stones; n (%)	17 (0.1%)	8 (0.1%)	15 (0.1%)	14 (0.1%)	43 (0.2%)	41 (0.1%)	075 (0.1%)	063 (0.1%)	0.00
Kidney stones; n (%)	327 (2.7%)	308 (2.5%)	342 (2.5%)	334 (2.5%)	797 (2.8%)	799 (2.8%)	1,466 (2.7%)	1,441 (2.7%)	0.00
Urinary tract infections (UTIs); n (%)	1,051 (8.6%)	1,112 (9.1%)	926 (6.8%)	927 (6.8%)	3,560 (12.6%)	3,636 (12.8%)	5,537 (10.2%)	5,675 (10.5%)	-0.01
Dipstick urinalysis; n (%)	4,584 (37.4%)	4,408 (36.0%)	4,689 (34.5%)	4,477 (32.9%)	11,652 (41.1%)	11,552 (40.8%)	20,925 (38.6%)	20,437 (37.7%)	0.02
Non-dipstick urinalysis; n (%)	5,535 (45.2%)	5,355 (43.7%)	4,803 (35.3%)	4,780 (35.2%)	12,816 (45.2%)	13,035 (46.0%)	23,154 (42.7%)	23,170 (42.8%)	0.00
Urine function test; n (%)	320 (2.6%)	272 (2.2%)	370 (2.7%)	340 (2.5%)	1,106 (3.9%)	974 (3.4%)	1,796 (3.3%)	1,586 (2.9%)	0.02
Cytology; n (%)	92 (0.8%)	84 (0.7%)	127 (0.9%)	113 (0.8%)	315 (1.1%)	286 (1.0%)	534 (1.0%)	483 (0.9%)	0.01
Cystos; n (%)	175 (1.4%)	144 (1.2%)	193 (1.4%)	171 (1.3%)	491 (1.7%)	413 (1.5%)	859 (1.6%)	728 (1.3%)	0.03
Other Covariates									
Liver disease; n (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	000 (0.0%)	000 (0.0%)	#DIV/0!
Osteoarthritis; n (%)	2,500 (20.4%)	2,480 (20.2%)	2,220 (16.3%)	2,172 (16.0%)	7,480 (26.4%)	7,389 (26.1%)	12,200 (22.5%)	12,041 (22.2%)	0.01
Other arthritis, arthropathies and musculoskeletal pain; n (%)	5,020 (41.0%)	5,007 (40.9%)	5,094 (37.5%)	5,080 (37.4%)	13,898 (49.0%)	13,833 (48.8%)	24,012 (44.3%)	23,920 (44.1%)	0.00
Dorsopathies; n (%)	3,323 (27.1%)	3,268 (26.7%)	3,062 (22.5%)	3,026 (22.3%)	9,051 (31.9%)	8,893 (31.4%)	15,436 (28.5%)	15,187 (28.0%)	0.01
Fractures; n (%)	348 (2.8%)	360 (2.9%)	347 (2.6%)	346 (2.5%)	1,087 (3.8%)	1,065 (3.8%)	1,782 (3.3%)	1,771 (3.3%)	0.00
Falls ; n (%)	366 (3.0%)	366 (3.0%)	148 (1.1%)	137 (1.0%)	1,009 (3.6%)	967 (3.4%)	1,523 (2.8%)	1,470 (2.7%)	0.01
Osteoporosis; n (%)	558 (4.6%)	551 (4.5%)	422 (3.1%)	421 (3.1%)	1,974 (7.0%)	2,013 (7.1%)	2,954 (5.5%)	2,985 (5.5%)	0.00
Hyperthyroidism; n (%)	126 (1.0%)	98 (0.8%)	103 (0.8%)	68 (0.5%)	339 (1.2%)	285 (1.0%)	568 (1.0%)	451 (0.8%)	0.02
Hypothyroidism ; n (%)	2,366 (19.3%)	2,484 (20.3%)	2,087 (15.4%)	2,028 (14.9%)	4,983 (17.6%)	5,062 (17.9%)	9,436 (17.4%)	9,574 (17.7%)	-0.01
Other disorders of thyroid gland ; n (%)	674 (5.5%)	663 (5.4%)	673 (5.0%)	689 (5.1%)	1,711 (6.0%)	1,749 (6.2%)	3,058 (5.6%)	3,101 (5.7%)	0.00
Depression; n (%)	1,294 (10.6%)	1,297 (10.6%)	1,141 (8.4%)	1,143 (8.4%)	3,570 (12.6%)	3,635 (12.8%)	6,005 (11.1%)	6,075 (11.2%)	0.00
Anxiety; n (%)	1,173 (9.6%)	1,157 (9.4%)	774 (5.7%)	753 (5.5%)	2,518 (8.9%)	2,547 (9.0%)	4,465 (8.2%)	4,457 (8.2%)	0.00
Sleep_Disorder; n (%)	1,217 (9.9%)	1,263 (10.3%)	2,193 (16.1%)	2,170 (16.0%)	4,004 (14.1%)	3,931 (13.9%)	7,414 (13.7%)	7,364 (13.6%)	0.00
Dementia; n (%)	225 (1.8%)	256 (2.1%)	125 (0.9%)	144 (1.1%)	949 (3.3%)	1,006 (3.6%)	1,299 (2.4%)	1,406 (2.6%)	-0.01
Delirium; n (%)	82 (0.7%)	92 (0.8%)	80 (0.6%)	69 (0.5%)	345 (1.2%)	350 (1.2%)	507 (0.9%)	511 (0.9%)	0.00
Psychosis; n (%)	74 (0.6%)	80 (0.7%)	48 (0.4%)	52 (0.4%)	240 (0.8%)	256 (0.9%)	362 (0.7%)	388 (0.7%)	0.00
Obesity; n (%)	4,171 (34.0%)	4,169 (34.0%)	3,000 (22.1%)	2,988 (22.0%)	7,848 (27.7%)	7,815 (27.6%)	15,019 (27.7%)	14,972 (27.6%)	0.00
Overweight; n (%)	509 (4.2%)	525 (4.3%)	281 (2.1%)	264 (1.9%)	804 (2.8%)	818 (2.9%)	1,594 (2.9%)	1,607 (3.0%)	-0.01
Smoking; n (%)	1,387 (11.3%)	1,375 (11.2%)	650 (4.8%)	629 (4.6%)	3,607 (12.7%)	3,542 (12.5%)	5,644 (10.4%)	5,546 (10.2%)	0.01
Alcohol abuse or dependence; n (%)	41 (0.3%)	46 (0.4%)	24 (0.2%)	37 (0.3%)	105 (0.4%)	97 (0.3%)	170 (0.3%)	180 (0.3%)	0.00
Drug abuse or dependence; n (%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	000 (0.0%)	000 (0.0%)	#DIV/0!
COPD; n (%)	1,011 (8.3%)	1,025 (8.4%)	652 (4.8%)	655 (4.8%)	3,311 (11.7%)	3,256 (11.5%)	4,974 (9.2%)	4,936 (9.1%)	0.00

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

Asthma; n (%)	915 (7.5%)	900 (7.3%)	800 (5.9%)	801 (5.9%)	2,455 (8.7%)	2,417 (8.5%)	4,170 (7.7%)	4,118 (7.6%)	0.00
Obstructive sleep apnea; n (%)	2,161 (17.6%)	2,192 (17.9%)	2,342 (17.2%)	2,318 (17.1%)	4,225 (14.9%)	4,227 (14.9%)	8,728 (16.1%)	8,737 (16.1%)	0.00
Pneumonia; n (%)	219 (1.8%)	249 (2.0%)	265 (1.9%)	241 (1.8%)	763 (2.7%)	788 (2.8%)	1,247 (2.3%)	1,278 (2.4%)	-0.01
Imaging; n (%)	8 (0.1%)	15 (0.1%)	8 (0.1%)	10 (0.1%)	37 (0.1%)	34 (0.1%)	53 (0.1%)	59 (0.1%)	0.00
Diabetes Medications									
DM Medications - AGIs; n (%)	36 (0.3%)	40 (0.3%)	51 (0.4%)	48 (0.4%)	114 (0.4%)	120 (0.4%)	201 (0.4%)	208 (0.4%)	0.00
DM Medications - Glitazones; n (%)	1,225 (10.0%)	1,202 (9.8%)	1,799 (13.2%)	1,801 (13.3%)	2,672 (9.4%)	2,555 (9.0%)	5,696 (10.5%)	5,558 (10.3%)	0.01
DM Medications - Insulin; n (%)	2,389 (19.5%)	2,476 (20.2%)	2,319 (17.1%)	2,561 (18.8%)	6,609 (23.3%)	6,878 (24.3%)	11,317 (20.9%)	11,915 (22.0%)	-0.03
DM Medications - Meglitinides; n (%)	133 (1.1%)	144 (1.2%)	295 (2.2%)	297 (2.2%)	570 (2.0%)	585 (2.1%)	998 (1.8%)	1,026 (1.9%)	-0.01
DM Medications - Metformin; n (%)	7,287 (59.5%)	7,222 (58.9%)	8,603 (63.3%)	8,476 (62.4%)	17,200 (60.7%)	17,179 (60.6%)	33,090 (61.1%)	32,877 (60.7%)	0.01
Concomitant initiation or current use of SGLT2i; n (%)	638 (5.2%)	670 (5.5%)	681 (5.0%)	681 (5.0%)	1,135 (4.0%)	1,182 (4.2%)	2,454 (4.5%)	2,533 (4.7%)	-0.01
Concomitant initiation or current use of AGIs; n (%)	25 (0.2%)	22 (0.2%)	43 (0.3%)	29 (0.2%)	70 (0.2%)	82 (0.3%)	138 (0.3%)	133 (0.2%)	0.02
Concomitant initiation or current use of Glitazones; n (%)	916 (7.5%)	864 (7.1%)	1,260 (9.3%)	1,289 (9.5%)	2,006 (7.1%)	1,949 (6.9%)	4,182 (7.7%)	4,102 (7.6%)	0.00
Concomitant initiation or current use of DPP4i ; n (%)	109 (0.9%)	109 (0.9%)	130 (1.0%)	124 (0.9%)	217 (0.8%)	225 (0.8%)	456 (0.8%)	458 (0.8%)	0.00
Concomitant initiation or current use of Insulin; n (%)	1,423 (11.6%)	1,523 (12.4%)	1,389 (10.2%)	1,588 (11.7%)	4,047 (14.3%)	4,309 (15.2%)	6,859 (12.7%)	7,420 (13.7%)	-0.03
Concomitant initiation or current use of Meglitinides; n (%)	72 (0.6%)	84 (0.7%)	170 (1.3%)	207 (1.5%)	392 (1.4%)	398 (1.4%)	634 (1.2%)	689 (1.3%)	-0.01
Concomitant initiation or current use of Metformin; n (%)	5,832 (47.6%)	5,784 (47.2%)	6,814 (50.1%)	6,740 (49.6%)	13,754 (48.5%)	13,814 (48.7%)	26,400 (48.7%)	26,338 (48.6%)	0.00
Past use of SGLT2i ; n (%)	264 (2.2%)	278 (2.3%)	242 (1.8%)	236 (1.7%)	526 (1.9%)	530 (1.9%)	1,032 (1.9%)	1,044 (1.9%)	0.00
Past use of AGIs ; n (%)	11 (0.1%)	18 (0.1%)	8 (0.1%)	19 (0.1%)	44 (0.2%)	38 (0.1%)	063 (0.1%)	075 (0.1%)	0.00
Past use of Glitazones ; n (%)	309 (2.5%)	338 (2.8%)	539 (4.0%)	512 (3.8%)	666 (2.4%)	606 (2.1%)	1,514 (2.8%)	1,456 (2.7%)	0.01
Past use of DPP4i ; n (%)	476 (3.9%)	463 (3.8%)	782 (5.8%)	738 (5.4%)	1,389 (4.9%)	1,313 (4.6%)	2,647 (4.9%)	2,514 (4.6%)	0.01
Past use of Insulin ; n (%)	966 (7.9%)	953 (7.8%)	930 (6.8%)	973 (7.2%)	2,565 (9.1%)	2,569 (9.1%)	4,461 (8.2%)	4,495 (8.3%)	0.00
Past use of Meglitinides ; n (%)	61 (0.5%)	60 (0.5%)	125 (0.9%)	90 (0.7%)	178 (0.6%)	187 (0.7%)	364 (0.7%)	337 (0.6%)	0.01
Past use of metformin (final) ; n (%)	1,455 (11.9%)	1,438 (11.7%)	1,789 (13.2%)	1,736 (12.8%)	3,446 (12.2%)	3,365 (11.9%)	6,690 (12.3%)	6,539 (12.1%)	0.01
Other Medications									
Use of ACE inhibitors; n (%)	5,063 (41.3%)	5,097 (41.6%)	5,527 (40.7%)	5,554 (40.9%)	11,457 (40.4%)	11,611 (41.0%)	22,047 (40.7%)	22,262 (41.1%)	-0.01
Use of ARBs; n (%)	4,202 (34.3%)	4,160 (34.0%)	5,158 (38.0%)	5,036 (37.1%)	10,227 (36.1%)	10,180 (35.9%)	19,587 (36.2%)	19,376 (35.8%)	0.01
Use of Loop Diuretics ; n (%)	2,037 (16.6%)	2,076 (16.9%)	2,059 (15.1%)	2,080 (15.3%)	6,079 (21.5%)	6,171 (21.8%)	10,175 (18.8%)	10,327 (19.1%)	-0.01
Use of other diuretics; n (%)	501 (4.1%)	516 (4.2%)	565 (4.2%)	591 (4.3%)	1,463 (5.2%)	1,427 (5.0%)	2,529 (4.7%)	2,534 (4.7%)	0.00
Use of nitrates-United; n (%)	852 (7.0%)	864 (7.1%)	907 (6.7%)	968 (7.1%)	2,172 (7.7%)	2,226 (7.9%)	3,931 (7.3%)	4,058 (7.5%)	-0.01
Use of other hypertension drugs; n (%)	871 (7.1%)	875 (7.1%)	900 (6.6%)	899 (6.6%)	2,265 (8.0%)	2,241 (7.9%)	4,036 (7.4%)	4,015 (7.4%)	0.00
Use of digoxin; n (%)	176 (1.4%)	173 (1.4%)	182 (1.3%)	221 (1.6%)	623 (2.2%)	600 (2.1%)	981 (1.8%)	994 (1.8%)	0.00
Use of Anti-arrhythmics; n (%)	207 (1.7%)	203 (1.7%)	222 (1.6%)	224 (1.6%)	668 (2.4%)	636 (2.2%)	1,097 (2.0%)	1,063 (2.0%)	0.00
Use of COPD/asthma meds; n (%)	2,039 (16.6%)	2,073 (16.9%)	2,388 (17.6%)	2,380 (17.5%)	5,744 (20.3%)	5,694 (20.1%)	10,171 (18.8%)	10,147 (18.7%)	0.00
Use of statins; n (%)	8,485 (69.2%)	8,487 (69.3%)	9,378 (69.0%)	9,460 (69.6%)	20,077 (70.8%)	20,155 (71.1%)	37,940 (70.0%)	38,102 (70.3%)	-0.01
Use of other lipid-lowering drugs; n (%)	1,675 (13.7%)	1,649 (13.5%)	2,457 (18.1%)	2,425 (17.8%)	4,125 (14.6%)	4,179 (14.7%)	8,257 (15.2%)	8,253 (15.2%)	0.00
Use of antiplatelet agents; n (%)	1,783 (14.6%)	1,827 (14.9%)	2,483 (18.3%)	2,532 (18.6%)	4,427 (15.6%)	4,465 (15.8%)	8,693 (16.0%)	8,824 (16.3%)	-0.01
Use of oral anticoagulants (Dabigatran, Rivaroxaban, Apixaban, Warfarin); n (%)	911 (7.4%)	886 (7.2%)	847 (6.2%)	849 (6.2%)	2,747 (9.7%)	2,722 (9.6%)	4,505 (8.3%)	4,457 (8.2%)	0.00
Use of heparin and other low-molecular weight heparins; n (%)	60 (0.5%)	67 (0.5%)	0 (0.0%)	0 (0.0%)	153 (0.5%)	140 (0.5%)	213 (0.4%)	207 (0.4%)	0.00
Use of NSAIDs; n (%)	2,128 (17.4%)	2,143 (17.5%)	2,463 (18.1%)	2,389 (17.6%)	5,307 (18.7%)	5,160 (18.2%)	9,898 (18.3%)	9,692 (17.9%)	0.01
Use of oral corticosteroids; n (%)	2,113 (17.2%)	2,056 (16.8%)	2,208 (16.2%)	2,148 (15.8%)	5,336 (18.8%)	5,278 (18.6%)	9,657 (17.8%)	9,482 (17.5%)	0.01
Use of bisphosphonate (United); n (%)	247 (2.0%)	244 (2.0%)	223 (1.6%)	210 (1.5%)	674 (2.4%)	727 (2.6%)	1,144 (2.1%)	1,181 (2.2%)	-0.01
Use of opioids; n (%)	3,459 (28.2%)	3,463 (28.3%)	3,962 (29.2%)	3,881 (28.6%)	8,527 (30.1%)	8,497 (30.0%)	15,948 (29.4%)	15,841 (29.2%)	0.00
Use of antidepressants; n (%)	3,896 (31.8%)	3,877 (31.6%)	4,178 (30.7%)	4,117 (30.3%)	9,729 (34.3%)	9,631 (34.0%)	17,803 (32.9%)	17,625 (32.5%)	0.01
Use of antipsychotics; n (%)	298 (2.4%)	291 (2.4%)	259 (1.9%)	251 (1.8%)	740 (2.6%)	738 (2.6%)	1,297 (2.4%)	1,280 (2.4%)	0.01
Use of anticonvulsants; n (%)	2,473 (20.2%)	2,503 (20.4%)	2,053 (15.1%)	2,005 (14.8%)	5,861 (20.7%)	5,797 (20.5%)	10,387 (19.2%)	10,305 (19.0%)	0.01
Use of lithium; n (%)	20 (0.2%)	11 (0.1%)	37 (0.3%)	15 (0.1%)	48 (0.2%)	38 (0.1%)	105 (0.2%)	064 (0.1%)	0.03
Use of Benzos; n (%)	1,479 (12.1%)	1,453 (11.9%)	1,788 (13.2%)	1,768 (13.0%)	3,457 (12.2%)	3,377 (11.9%)	6,724 (12.4%)	6,598 (12.2%)	0.01
Use of anxiolytics/hypnotics; n (%)	923 (7.5%)	931 (7.6%)	1,214 (8.9%)	1,203 (8.9%)	2,382 (8.4%)	2,284 (8.1%)	4,519 (8.3%)	4,418 (8.2%)	0.00
Use of dementia meds; n (%)	117 (1.0%)	120 (1.0%)	91 (0.7%)	98 (0.7%)	587 (2.1%)	614 (2.2%)	795 (1.5%)	832 (1.5%)	0.00
Use of antiparkinsonian meds; n (%)	465 (3.8%)	423 (3.5%)	439 (3.2%)	428 (3.1%)	1,225 (4.3%)	1,242 (4.4%)	2,129 (3.9%)	2,093 (3.9%)	0.00
Any use of pramlintide; n (%)	0 (0.0%)	5 (0.0%)	4 (0.0%)	21 (0.2%)	**	**	**	**	**
Any use of 1st generation sulfonylureas; n (%)	1 (0.0%)	0 (0.0%)	8 (0.1%)	1 (0.0%)	**	**	**	**	**
Entresto (sacubitril/valsartan); n (%)	28 (0.2%)	36 (0.3%)	10 (0.1%)	9 (0.1%)	22 (0.1%)	26 (0.1%)	060 (0.1%)	071 (0.1%)	0.00
Initiation as monotherapy ; n (%)	1,596 (13.0%)	1,798 (14.7%)	1,351 (9.9%)	1,557 (11.5%)	2,855 (10.1%)	2,775 (9.8%)	5,802 (10.7%)	6,130 (11.3%)	-0.02
Labs							25,844	25,844	
Lab values- HbA1c (%) ; n (%)	4,749 (38.8%)	4,611 (37.6%)	981 (7.2%)	738 (5.4%)	N/A	N/A	5,730 (22.2%)	5,349 (20.7%)	0.04
Lab values- HbA1c (%) (within 3 months) ; n (%)	3,629 (29.6%)	3,522 (28.7%)	743 (5.5%)	580 (4.3%)	N/A	N/A	4,372 (16.9%)	4,102 (15.9%)	0.03
Lab values- HbA1c (%) (within 6 months) ; n (%)	4,749 (38.8%)	4,611 (37.6%)	981 (7.2%)	738 (5.4%)	N/A	N/A	5,730 (22.2%)	5,349 (20.7%)	0.04

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

Lab values- BNP; n (%)	121 (1.0%)	124 (1.0%)	21 (0.2%)	23 (0.2%)	N/A	N/A	142 (0.5%)	147 (0.6%)	-0.01
Lab values- BNP (within 3 months); n (%)	72 (0.6%)	81 (0.7%)	12 (0.1%)	21 (0.2%)	N/A	N/A	084 (0.3%)	102 (0.4%)	-0.02
Lab values- BNP (within 6 months); n (%)	121 (1.0%)	124 (1.0%)	21 (0.2%)	23 (0.2%)	N/A	N/A	142 (0.5%)	147 (0.6%)	-0.01
Lab values- BUN (mg/dl); n (%)	4,869 (39.7%)	4,746 (38.7%)	902 (6.6%)	766 (5.6%)	N/A	N/A	5,771 (22.3%)	5,512 (21.3%)	0.02
Lab values- BUN (mg/dl) (within 3 months); n (%)	3,694 (30.1%)	3,594 (29.3%)	654 (4.8%)	581 (4.3%)	N/A	N/A	4,348 (16.8%)	4,175 (16.2%)	0.02
Lab values- BUN (mg/dl) (within 6 months); n (%)	4,869 (39.7%)	4,746 (38.7%)	902 (6.6%)	766 (5.6%)	N/A	N/A	5,771 (22.3%)	5,512 (21.3%)	0.02
Lab values- Creatinine (mg/dl) ; n (%)	4,980 (40.6%)	4,900 (40.0%)	955 (7.0%)	797 (5.9%)	N/A	N/A	5,935 (23.0%)	5,697 (22.0%)	0.02
Lab values- Creatinine (mg/dl) (within 3 months) ; n (%)	3,790 (30.9%)	3,714 (30.3%)	695 (5.1%)	605 (4.5%)	N/A	N/A	4,485 (17.4%)	4,319 (16.7%)	0.02
Lab values- Creatinine (mg/dl) (within 6 months) ; n (%)	4,980 (40.6%)	4,900 (40.0%)	955 (7.0%)	797 (5.9%)	N/A	N/A	5,935 (23.0%)	5,697 (22.0%)	0.02
Lab values- HDL level (mg/dl); n (%)	4,142 (33.8%)	3,943 (32.2%)	903 (6.6%)	681 (5.0%)	N/A	N/A	5,045 (19.5%)	4,624 (17.9%)	0.04
Lab values- HDL level (mg/dl) (within 3 months); n (%)	2,951 (24.1%)	2,818 (23.0%)	630 (4.6%)	508 (3.7%)	N/A	N/A	3,581 (13.9%)	3,326 (12.9%)	0.03
Lab values- HDL level (mg/dl) (within 6 months); n (%)	4,142 (33.8%)	3,943 (32.2%)	903 (6.6%)	681 (5.0%)	N/A	N/A	5,045 (19.5%)	4,624 (17.9%)	0.04
Lab values- LDL level (mg/dl) ; n (%)	4,233 (34.5%)	4,065 (33.2%)	932 (6.9%)	704 (5.2%)	N/A	N/A	5,165 (20.0%)	4,769 (18.5%)	0.04
Lab values- LDL level (mg/dl) (within 3 months); n (%)	3,015 (24.6%)	2,914 (23.8%)	648 (4.8%)	520 (3.8%)	N/A	N/A	3,663 (14.2%)	3,434 (13.3%)	0.03
Lab values- LDL level (mg/dl) (within 6 months); n (%)	4,233 (34.5%)	4,065 (33.2%)	932 (6.9%)	704 (5.2%)	N/A	N/A	5,165 (20.0%)	4,769 (18.5%)	0.04
Lab values- NT-proBNP; n (%)	10 (0.1%)	30 (0.2%)	1 (0.0%)	3 (0.0%)	N/A	N/A	11 (0.0%)	0 (0.1%)	-
Lab values- NT-proBNP (within 3 months); n (%)	5 (0.0%)	20 (0.2%)	0 (0.0%)	1 (0.0%)	N/A	N/A	05 (0.0%)	0 (0.1%)	-
Lab values- NT-proBNP (within 6 months); n (%)	10 (0.1%)	30 (0.2%)	1 (0.0%)	3 (0.0%)	N/A	N/A	11 (0.0%)	33 (0.1%)	-
Lab values- Total cholesterol (mg/dl) ; n (%)	4,202 (34.3%)	4,042 (33.0%)	911 (6.7%)	691 (5.1%)	N/A	N/A	5,113 (19.8%)	4,733 (18.3%)	0.04
Lab values- Total cholesterol (mg/dl) (within 3 months) ; n (%)	3,000 (24.5%)	2,889 (23.6%)	634 (4.7%)	517 (3.8%)	N/A	N/A	3,634 (14.1%)	3,406 (13.2%)	0.03
Lab values- Total cholesterol (mg/dl) (within 6 months) ; n (%)	4,202 (34.3%)	4,042 (33.0%)	911 (6.7%)	691 (5.1%)	N/A	N/A	5,113 (19.8%)	4,733 (18.3%)	0.04
Lab values- Triglyceride level (mg/dl); n (%)	4,168 (34.0%)	3,999 (32.6%)	901 (6.6%)	676 (5.0%)	N/A	N/A	5,069 (19.6%)	4,675 (18.1%)	0.04
Lab values- Triglyceride level (mg/dl) (within 3 months); n (%)	2,979 (24.3%)	2,862 (23.4%)	629 (4.6%)	503 (3.7%)	N/A	N/A	3,608 (14.0%)	3,365 (13.0%)	0.03
Lab values- Triglyceride level (mg/dl) (within 6 months); n (%)	4,168 (34.0%)	3,999 (32.6%)	901 (6.6%)	676 (5.0%)	N/A	N/A	5,069 (19.6%)	4,675 (18.1%)	0.04
Lab result number- HbA1c (%) mean (only 2 to 20 included)	4,726	4,589	877	694	N/A	N/A	5,603	5,283	
...mean (sd)	8.09 (1.82)	7.86 (1.75)	8.13 (1.91)	7.85 (1.83)	N/A	N/A	8.10 (1.83)	7.86 (1.76)	0.13
...median [IQR]	7.70 [6.90, 8.85]	7.40 [6.60, 8.70]	7.60 [6.90, 8.90]	7.40 [6.50, 8.76]	N/A	N/A	7.68 (1.83)	7.40 (1.76)	0.16
...Missing; n (%)	7,527 (61.4%)	7,664 (62.5%)	12,714 (93.5%)	12,897 (94.9%)	N/A	N/A	20,241 (78.3%)	20,561 (79.6%)	-0.03
Lab result number- BNP mean	121	124	21	23	N/A	N/A	142	147	
...mean (sd)	146.97 (207.33)	105.07 (131.54)	72.61 (105.14)	105.16 (203.02)	N/A	N/A	135.97 (196.72)	105.08 (145.18)	0.18
...median [IQR]	67.00 [20.55, 178.80]	46.65 [21.92, 138.88]	42.00 [10.50, 64.50]	24.00 [14.00, 124.00]	N/A	N/A	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	12,132 (99.0%)	12,129 (99.0%)	13,570 (99.8%)	13,568 (99.8%)	N/A	N/A	25,702 (99.5%)	25,697 (99.4%)	0.01
Lab result number- BUN (mg/dl) mean	4,869	4,746	902	766	N/A	N/A	5,771	5,512	
...mean (sd)	18.85 (8.25)	18.98 (7.61)	556.53 (9,565.83)	697.32 (11,098.36)	N/A	N/A	102.89 (3780.71)	113.25 (4135.75)	0.00
...median [IQR]	17.00 [13.63, 22.00]	17.50 [14.00, 22.00]	17.00 [14.00, 22.08]	17.00 [14.00, 22.00]	N/A	N/A	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	7,384 (60.3%)	7,507 (61.3%)	12,689 (93.4%)	12,825 (94.4%)	N/A	N/A	20,073 (77.7%)	20,332 (78.7%)	-0.02
Lab result number- Creatinine (mg/dl) mean (only 0.1 to 15 included)	4,951	4,872	855	730	N/A	N/A	5,806	5,602	
...mean (sd)	1.04 (0.41)	1.02 (0.36)	1.03 (0.38)	0.99 (0.30)	N/A	N/A	1.04 (0.41)	1.02 (0.35)	0.05
...median [IQR]	0.94 [0.79, 1.17]	0.95 [0.78, 1.16]	0.97 [0.80, 1.15]	0.93 [0.78, 1.13]	N/A	N/A	0.94 (0.41)	0.95 (0.35)	-0.03
...Missing; n (%)	7,302 (59.6%)	7,381 (60.2%)	12,736 (93.7%)	12,861 (94.6%)	N/A	N/A	20,038 (77.5%)	20,242 (78.3%)	-0.02
Lab result number- HDL level (mg/dl) mean (only =<5000 included)	4,142	3,943	901	679	N/A	N/A	5,043	4,622	
...mean (sd)	46.63 (13.79)	46.80 (13.34)	45.37 (14.04)	44.85 (14.28)	N/A	N/A	46.40 (13.84)	46.51 (13.48)	-0.01
...median [IQR]	44.50 [37.00, 54.00]	45.00 [37.50, 54.00]	44.00 [36.50, 53.00]	43.50 [36.00, 53.00]	N/A	N/A	44.41 (13.84)	44.78 (13.48)	-0.03
...Missing; n (%)	8,111 (66.2%)	8,310 (67.8%)	12,690 (93.4%)	12,912 (95.0%)	N/A	N/A	20,801 (80.5%)	21,222 (82.1%)	-0.04
Lab result number- LDL level (mg/dl) mean (only =<5000 included)	4,143	3,983	870	619	N/A	N/A	5,013	4,602	
...mean (sd)	87.05 (39.40)	83.22 (37.92)	92.02 (41.04)	83.66 (41.01)	N/A	N/A	87.91 (39.69)	83.28 (38.35)	0.12
...median [IQR]	84.00 [63.00, 109.00]	79.50 [61.00, 103.33]	88.25 [67.00, 115.50]	83.00 [62.00, 107.00]	N/A	N/A	84.74 (39.69)	79.97 (38.35)	0.12
...Missing; n (%)	8,110 (66.2%)	8,270 (67.5%)	12,721 (93.6%)	12,972 (95.4%)	N/A	N/A	20,831 (80.6%)	21,242 (82.2%)	-0.04
Lab result number- Total cholesterol (mg/dl) mean (only =<5000 included)	4,198	4,041	909	688	N/A	N/A	5,107	4,729	
...mean (sd)	174.87 (45.66)	168.95 (44.31)	177.69 (50.94)	171.56 (49.44)	N/A	N/A	175.37 (46.65)	169.33 (45.10)	0.13
...median [IQR]	169.00 [144.00, 199.00]	162.50 [140.00, 192.00]	173.00 [146.25, 204.00]	166.25 [143.00, 198.00]	N/A	N/A	169.71 (46.65)	163.05 (45.10)	0.15
...Missing; n (%)	8,055 (65.7%)	8,212 (67.0%)	12,682 (93.3%)	12,903 (94.9%)	N/A	N/A	20,737 (80.2%)	21,115 (81.7%)	-0.04

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

Lab result number- Triglyceride level (mg/dl) mean (only =<5000 included)	4,168	3,999	899	674	N/A	N/A	5,067	4,673	
...mean (sd)	189.65 (149.17)	179.99 (140.90)	191.74 (149.61)	186.92 (137.38)	N/A	N/A	190.02 (149.26)	180.99 (140.41)	0.06
...median [IQR]	155.00 [109.50, 223.00]	150.00 [107.00, 212.00]	157.00 [108.00, 220.50]	152.00 [108.00, 224.00]	N/A	N/A	155.35 (149.26)	150.29 (140.41)	0.03
...Missing; n (%)	8,085 (66.0%)	8,254 (67.4%)	12,692 (93.4%)	12,917 (95.0%)	N/A	N/A	20,777 (80.4%)	21,171 (81.9%)	-0.04
Lab result number- Hemoglobin mean (only >0 included)	3,487	3,344	640	521	N/A	N/A	4,127	3,865	
...mean (sd)	13.46 (1.66)	13.48 (1.58)	16,304.65 (395,377.51)	308.91 (6,746.28)	N/A	N/A	2539.84 (155633.49)	53.30 (2475.48)	0.02
...median [IQR]	13.50 [12.40, 14.50]	13.50 [12.40, 14.50]	13.50 [12.40, 14.60]	13.50 [12.50, 14.65]	N/A	N/A	#VALUE!	#VALUE!	#VALUE!
...Missing; n (%)	8,766 (71.5%)	8,909 (72.7%)	12,951 (95.3%)	13,070 (96.2%)	N/A	N/A	21,717 (84.0%)	21,979 (85.0%)	-0.03
Lab result number- Serum sodium mean (only > 90 and < 190 included)	4,853	4,782	895	717	N/A	N/A	5,748	5,499	
...mean (sd)	139.54 (2.72)	139.80 (2.62)	139.15 (2.58)	139.15 (2.51)	N/A	N/A	139.48 (2.70)	139.72 (2.61)	-0.09
...median [IQR]	140.00 [138.00, 141.00]	140.00 [138.00, 141.50]	139.00 [137.50, 141.00]	139.00 [137.88, 141.00]	N/A	N/A	139.84 (2.70)	139.87 (2.61)	-0.01
...Missing; n (%)	7,400 (60.4%)	7,471 (61.0%)	12,696 (93.4%)	12,874 (94.7%)	N/A	N/A	20,096 (77.8%)	20,345 (78.7%)	-0.02
Lab result number- Albumin mean (only >0 and <=10 included)	4,530	4,437	788	676	N/A	N/A	5,318	5,113	
...mean (sd)	4.23 (0.32)	4.22 (0.30)	4.15 (0.58)	4.11 (0.62)	N/A	N/A	4.22 (0.37)	4.21 (0.36)	0.03
...median [IQR]	4.25 [4.05, 4.43]	4.20 [4.00, 4.40]	4.20 [4.00, 4.40]	4.20 [4.00, 4.40]	N/A	N/A	4.24 (0.37)	4.20 (0.36)	0.11
...Missing; n (%)	7,723 (63.0%)	7,816 (63.8%)	12,803 (94.2%)	12,915 (95.0%)	N/A	N/A	20,526 (79.4%)	20,731 (80.2%)	-0.02
Lab result number- Glucose (fasting or random) mean (only 10-1000 included)	4,843	4,782	885	704	N/A	N/A	5,728	5,486	
...mean (sd)	169.27 (69.50)	160.44 (68.75)	169.76 (71.09)	164.21 (69.10)	N/A	N/A	169.35 (69.75)	160.92 (68.80)	0.12
...median [IQR]	152.00 [123.00, 197.00]	143.00 [113.00, 186.00]	152.00 [122.00, 195.75]	145.25 [115.00, 192.25]	N/A	N/A	152.00 (69.75)	143.29 (68.80)	0.13
...Missing; n (%)	7,410 (60.5%)	7,471 (61.0%)	12,706 (93.5%)	12,887 (94.8%)	N/A	N/A	20,116 (77.8%)	20,358 (78.8%)	-0.02
Lab result number- Potassium mean (only 1-7 included)	4,941	4,865	883	749	N/A	N/A	5,824	5,614	
...mean (sd)	4.44 (0.43)	4.44 (0.42)	4.34 (0.44)	4.33 (0.46)	N/A	N/A	4.42 (0.43)	4.43 (0.43)	-0.02
...median [IQR]	4.41 [4.20, 4.70]	4.40 [4.20, 4.70]	4.30 [4.00, 4.70]	4.30 [4.00, 4.60]	N/A	N/A	4.39 (0.43)	4.39 (0.43)	0.00
...Missing; n (%)	7,312 (59.7%)	7,388 (60.3%)	12,708 (93.5%)	12,842 (94.5%)	N/A	N/A	20,020 (77.5%)	20,230 (78.3%)	-0.02
Comorbidity Scores									
CCI (180 days)- ICD9 and ICD10									
...mean (sd)	2.71 (1.81)	2.75 (1.84)	2.04 (1.47)	2.05 (1.50)	2.89 (2.02)	2.91 (2.02)	2.64 (1.85)	2.66 (1.86)	-0.01
...median [IQR]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 3.00]	2.00 [1.00, 3.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 (1.85)	2.00 (1.86)	0.00
Frailty Score: Qualitative Version 365 days as Categories,									
...0; n (%)	6,556 (53.5%)	6,470 (52.8%)	4,392 (32.3%)	4,325 (31.8%)	9,934 (35.1%)	9,809 (34.6%)	20,882 (38.5%)	20,604 (38.0%)	0.01
...1 to 2; n (%)	3,663 (29.9%)	3,793 (31.0%)	5,956 (43.8%)	6,111 (45.0%)	9,080 (32.0%)	9,317 (32.9%)	18,699 (34.5%)	19,221 (35.5%)	-0.02
...3 or more; n (%)	2,034 (16.6%)	1,990 (16.2%)	3,243 (23.9%)	3,155 (23.2%)	9,324 (32.9%)	9,212 (32.5%)	14,601 (26.9%)	14,357 (26.5%)	0.01
Frailty Score: Empirical Version 365 days as Categories,									
...<0.12908; n (%)	2,200 (18.0%)	2,163 (17.7%)	2,347 (17.3%)	2,284 (16.8%)	2,788 (9.8%)	2,572 (9.1%)	7,335 (13.5%)	7,019 (13.0%)	0.01
...0.12908 - 0.1631167; n (%)	4,002 (32.7%)	3,922 (32.0%)	4,497 (33.1%)	4,507 (33.2%)	6,595 (23.3%)	6,757 (23.8%)	15,094 (27.9%)	15,186 (28.0%)	0.00
...>=0.1631167; n (%)	6,051 (49.4%)	6,168 (50.3%)	6,747 (49.6%)	6,800 (50.0%)	18,955 (66.9%)	19,009 (67.1%)	31,753 (58.6%)	31,977 (59.0%)	-0.01
Non-Frailty; n (%)	7,239 (59.1%)	7,551 (61.6%)	7,578 (55.8%)	7,639 (56.2%)	1,368 (4.8%)	1,168 (4.1%)	16,185 (29.9%)	16,358 (30.2%)	-0.01
Frailty Score (mean): Qualitative Version 365 days,									
...mean (sd)	1.15 (1.76)	1.11 (1.65)	1.60 (1.71)	1.58 (1.64)	1.99 (2.24)	1.97 (2.22)	1.70 (2.01)	1.68 (1.97)	0.01
...median [IQR]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	1.00 [0.00, 2.00]	1.00 [0.00, 2.00]	1.00 [0.00, 3.00]	1.00 [0.00, 3.00]	0.77 (2.01)	0.77 (1.97)	0.00
Frailty Score (mean): Empirical Version 365 days,									
...mean (sd)	0.17 (0.05)	0.17 (0.05)	0.16 (0.05)	0.16 (0.05)	0.20 (0.06)	0.20 (0.07)	0.18 (0.06)	0.18 (0.06)	0.00
...median [IQR]	0.16 [0.14, 0.20]	0.16 [0.14, 0.20]	0.16 [0.13, 0.19]	0.16 [0.13, 0.19]	0.19 [0.15, 0.23]	0.18 [0.15, 0.23]	0.18 (0.06)	0.17 (0.06)	0.17
Healthcare Utilization									
Any hospitalization; n (%)	941 (7.7%)	916 (7.5%)	1,031 (7.6%)	1,065 (7.8%)	2,631 (9.3%)	2,630 (9.3%)	4,603 (8.5%)	4,611 (8.5%)	0.00
Any hospitalization within prior 30 days; n (%)	162 (1.3%)	186 (1.5%)	158 (1.2%)	171 (1.3%)	509 (1.8%)	500 (1.8%)	829 (1.5%)	857 (1.6%)	-0.01
Any hospitalization during prior 31-180 days; n (%)	802 (6.5%)	773 (6.3%)	898 (6.6%)	919 (6.8%)	2,216 (7.8%)	2,238 (7.9%)	3,916 (7.2%)	3,930 (7.3%)	0.00
Endocrinologist Visit; n (%)	2,262 (18.5%)	2,532 (20.7%)	2,533 (18.6%)	2,934 (21.6%)	6,395 (22.6%)	7,062 (24.9%)	11,190 (20.7%)	12,528 (23.1%)	-0.06
Endocrinologist Visit (30 days prior); n (%)	1,446 (11.8%)	1,557 (12.7%)	1,734 (12.8%)	1,932 (14.2%)	4,097 (14.5%)	4,318 (15.2%)	7,277 (13.4%)	7,807 (14.4%)	-0.03
Endocrinologist Visit (31 to 180 days prior); n (%)	1,786 (14.6%)	1,874 (15.3%)	1,918 (14.1%)	2,110 (15.5%)	5,288 (18.7%)	5,456 (19.3%)	8,992 (16.6%)	9,440 (17.4%)	-0.02
Internal medicine/family medicine visits; n (%)	10,202 (83.3%)	10,147 (82.8%)	11,788 (86.7%)	11,665 (85.8%)	23,822 (84.1%)	23,670 (83.5%)	45,812 (84.6%)	45,482 (83.9%)	0.02
Internal medicine/family medicine visits (30 days prior) ; n (%)	7,061 (57.6%)	7,104 (58.0%)	8,414 (61.9%)	8,259 (60.8%)	15,702 (55.4%)	15,549 (54.9%)	31,177 (57.5%)	30,912 (57.1%)	0.01
Internal medicine/family medicine visits (31 to 180 days prior) ; n (%)	9,245 (75.5%)	9,285 (75.8%)	10,665 (78.5%)	10,541 (77.6%)	21,778 (76.9%)	21,674 (76.5%)	41,688 (76.9%)	41,500 (76.6%)	0.01
Cardiologist visit; n (%)	4,160 (34.0%)	4,220 (34.4%)	4,436 (32.6%)	4,565 (33.6%)	10,443 (36.9%)	10,503 (37.1%)	19,039 (35.1%)	19,288 (35.6%)	-0.01
Number of Cardiologist visits (30 days prior); n (%)	1,419 (11.6%)	1,400 (11.4%)	1,393 (10.2%)	1,516 (11.2%)	3,361 (11.9%)	3,349 (11.8%)	6,173 (11.4%)	6,265 (11.6%)	-0.01

Table 1: Liraglutide vs 2nd Generation Sulfonylureas

Number of Cardiologist visits (31 to 180 days prior); n (%)	3,594 (29.3%)	3,630 (29.6%)	3,842 (28.3%)	3,921 (28.8%)	9,261 (32.7%)	9,271 (32.7%)	16,697 (30.8%)	16,822 (31.0%)	0.00
Electrocardiogram ; n (%)	4,252 (34.7%)	4,193 (34.2%)	4,843 (35.6%)	4,951 (36.4%)	10,287 (36.3%)	10,253 (36.2%)	19,382 (35.8%)	19,397 (35.8%)	0.00
Use of glucose test strips; n (%)	500 (4.1%)	503 (4.1%)	623 (4.6%)	615 (4.5%)	1,140 (4.0%)	1,101 (3.9%)	2,263 (4.2%)	2,219 (4.1%)	0.01
Dialysis; n (%)	5 (0.0%)	8 (0.1%)	3 (0.0%)	6 (0.0%)	16 (0.1%)	11 (0.0%)	024 (0.0%)	025 (0.0%)	#DIV/0!
Naïve new user v8 ; n (%)	2,783 (22.7%)	2,834 (23.1%)	2,462 (18.1%)	2,509 (18.5%)	4,946 (17.5%)	4,883 (17.2%)	10,191 (18.8%)	10,226 (18.9%)	0.00
N antidiabetic drugs at index date									
...mean (sd)	1.74 (0.70)	1.74 (0.72)	1.78 (0.71)	1.77 (0.74)	1.77 (0.70)	1.77 (0.71)	1.77 (0.70)	1.76 (0.72)	0.01
...median [IQR]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 [1.00, 2.00]	2.00 (0.70)	2.00 (0.72)	0.00
number of different/distinct medication prescriptions									
...mean (sd)	11.07 (5.36)	11.08 (5.16)	11.05 (5.23)	11.02 (4.89)	11.05 (5.15)	11.03 (4.85)	11.05 (5.22)	11.04 (4.93)	0.00
...median [IQR]	10.00 [7.00, 14.00]	10.00 [8.00, 14.00]	10.00 [7.00, 14.00]	10.00 [8.00, 14.00]	10.00 [7.00, 14.00]	10.00 [8.00, 14.00]	10.00 (5.22)	10.00 (4.93)	0.00
Number of Hospitalizations									
...mean (sd)	0.09 (0.34)	0.09 (0.34)	0.09 (0.32)	0.09 (0.33)	0.12 (0.41)	0.12 (0.41)	0.11 (0.37)	0.11 (0.38)	0.00
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (0.37)	0.00 (0.38)	0.00
Number of hospital days									
...mean (sd)	0.45 (2.24)	0.45 (2.52)	0.40 (1.80)	0.43 (2.25)	0.68 (3.01)	0.69 (3.23)	0.56 (2.59)	0.57 (2.86)	0.00
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (2.59)	0.00 (2.86)	0.00
Number of Emergency Department (ED) visits									
...mean (sd)	0.40 (1.08)	0.40 (1.20)	0.14 (1.11)	0.14 (1.17)	0.47 (1.21)	0.46 (1.22)	0.37 (1.16)	0.37 (1.20)	0.00
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (1.16)	0.00 (1.20)	0.00
Number of Office visits									
...mean (sd)	5.79 (4.49)	5.80 (4.12)	6.02 (5.06)	6.03 (4.31)	6.59 (5.00)	6.58 (4.75)	6.27 (4.90)	6.27 (4.51)	0.00
...median [IQR]	5.00 [3.00, 8.00]	5.00 [3.00, 8.00]	5.00 [3.00, 8.00]	5.00 [3.00, 8.00]	5.00 [3.00, 9.00]	5.00 [3.00, 9.00]	5.00 (4.90)	5.00 (4.51)	0.00
Number of Endocrinologist visits									
...mean (sd)	0.98 (3.22)	1.09 (3.58)	0.91 (3.04)	1.15 (3.71)	1.48 (4.78)	1.70 (5.36)	1.22 (4.08)	1.42 (4.62)	-0.05
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (4.08)	0.00 (4.62)	0.00
Number of internal medicine/family medicine visits									
...mean (sd)	9.88 (14.15)	10.31 (14.74)	7.49 (9.52)	7.76 (9.83)	8.62 (12.28)	8.76 (11.52)	8.62 (12.12)	8.86 (11.95)	-0.02
...median [IQR]	6.00 [2.00, 13.00]	6.00 [2.00, 13.00]	5.00 [2.00, 10.00]	5.00 [2.00, 10.00]	5.00 [2.00, 11.00]	5.00 [2.00, 12.00]	5.23 (12.12)	5.23 (11.95)	0.00
Number of Cardiologist visits									
...mean (sd)	1.76 (4.28)	1.68 (4.00)	1.42 (3.34)	1.55 (3.80)	2.04 (5.01)	2.04 (5.04)	1.82 (4.48)	1.84 (4.53)	0.00
...median [IQR]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00 [0.00, 1.00]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00 (4.48)	0.00 (4.53)	0.00
Number electrocardiograms received									
...mean (sd)	0.67 (1.35)	0.67 (1.47)	0.64 (1.21)	0.64 (1.22)	0.74 (1.40)	0.72 (1.36)	0.70 (1.34)	0.69 (1.35)	0.01
...median [IQR]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 (1.34)	0.00 (1.35)	0.00
Number of HbA1c tests ordered									
...mean (sd)	1.35 (0.92)	1.36 (0.92)	1.13 (0.93)	1.13 (0.93)	1.49 (0.90)	1.49 (0.88)	1.37 (0.91)	1.37 (0.90)	0.00
...median [IQR]	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	1.00 [0.00, 2.00]	1.00 [0.00, 2.00]	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	1.00 (0.91)	1.00 (0.90)	0.00
Number of glucose tests ordered									
...mean (sd)	0.56 (2.54)	0.57 (1.38)	0.49 (1.40)	0.48 (1.12)	0.52 (1.30)	0.53 (1.17)	0.52 (1.68)	0.53 (1.21)	-0.01
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 [0.00, 0.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 (1.68)	0.00 (1.21)	0.00
Number of lipid tests ordered									
...mean (sd)	1.09 (1.01)	1.08 (1.02)	1.00 (1.40)	1.00 (1.28)	1.12 (0.89)	1.11 (0.90)	1.08 (1.07)	1.08 (1.03)	0.00
...median [IQR]	1.00 [0.00, 2.00]	1.00 [0.00, 2.00]	1.00 [0.00, 1.00]	1.00 [0.00, 1.00]	1.00 [1.00, 2.00]	1.00 [1.00, 2.00]	1.00 (1.07)	1.00 (1.03)	0.00
Number of creatinine tests ordered									
...mean (sd)	0.06 (0.33)	0.06 (0.32)	0.07 (0.39)	0.07 (0.36)	0.10 (0.43)	0.10 (0.40)	0.08 (0.40)	0.08 (0.37)	0.00
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (0.40)	0.00 (0.37)	0.00
Number of BUN tests ordered									
...mean (sd)	0.04 (0.25)	0.03 (0.24)	0.04 (0.26)	0.04 (0.29)	0.06 (0.33)	0.06 (0.30)	0.05 (0.30)	0.05 (0.28)	0.00
...median [IQR]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 [0.00, 0.00]	0.00 (0.30)	0.00 (0.28)	0.00
Number of tests for microalbuminuria									
...mean (sd)	0.87 (1.24)	0.84 (1.23)	0.63 (1.07)	0.62 (1.06)	0.56 (0.81)	0.56 (0.78)	0.65 (0.99)	0.64 (0.97)	0.01
...median [IQR]	0.00 [0.00, 2.00]	0.00 [0.00, 2.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 [0.00, 1.00]	0.00 (0.99)	0.00 (0.97)	0.00
Total N distinct ICD9/ICD10 diagnoses at the 3rd digit level									
...mean (sd)	7.11 (8.17)	7.09 (8.36)	2.46 (4.33)	2.42 (4.51)	6.66 (8.69)	6.69 (8.92)	5.71 (7.70)	5.71 (7.91)	0.00
...median [IQR]	5.00 [0.00, 11.00]	5.00 [0.00, 11.00]	0.00 [0.00, 4.00]	0.00 [0.00, 4.00]	4.00 [0.00, 10.00]	4.00 [0.00, 10.00]	3.22 (7.70)	3.22 (7.91)	0.00
Use of thiazide; n (%)	1,601 (13.1%)	1,597 (13.0%)	1,648 (12.1%)	1,695 (12.5%)	4,220 (14.9%)	4,168 (14.7%)	7,469 (13.8%)	7,460 (13.8%)	0.00
Use of beta blockers; n (%)	5,279 (43.1%)	5,288 (43.2%)	5,784 (42.6%)	5,886 (43.3%)	13,340 (47.1%)	13,381 (47.2%)	24,403 (45.0%)	24,555 (45.3%)	-0.01
Use of calcium channel blockers; n (%)	3,483 (28.4%)	3,522 (28.7%)	3,883 (28.6%)	3,851 (28.3%)	8,623 (30.4%)	8,726 (30.8%)	15,989 (29.5%)	16,099 (29.7%)	0.00