The prevalence of comorbidities in Danish patients with obesity – a Danish register-based study based on data from 2002 to 2018

Pedersen Mikkel H.\textsuperscript{a}, Bøgelund Mette\textsuperscript{a}, Dirksen Carsten\textsuperscript{b}, Johansen Pierre\textsuperscript{c}, Jørgensen Nils B.\textsuperscript{b}. Madsbad Sten\textsuperscript{b}, Panton Ulrik H.\textsuperscript{c}

\textsuperscript{a}Incentive, Holte Stationsvej 14, 1, 2840 Holte, Denmark.
\textsuperscript{b}Department of Endocrinology, Hvidovre Hospital, Kettegaard Alle 30, 2650 Hvidovre, Denmark.
\textsuperscript{c}Novo Nordisk North West Europe Pharmaceuticals A/S, Crowne Plaza Copenhagen Towers, Ørestads Blvd. 108, 2300 Copenhagen, Denmark.

Corresponding author:
Mikkel H. Pedersen,
T. +45 6017 7416
E. mhp@incentive.dk
A: Holte Stationsvej 14, 1, 2840 Holte, Denmark

Appendix 1: Definition of comorbidities

Table A1: Definition of CV-related comorbidities

| Comorbidity                                | ICD-10 diagnosis code | ATC code for relevant prescription medicines |
|--------------------------------------------|-----------------------|---------------------------------------------|
| Myocardial infarction                      | ICD: I21-23           |                                             |
| Ischemic heart disease (revascularisation) | ICD: I24-25           |                                             |
| Unstable angina                            | ICD: I20.0            |                                             |
| Angina pectoris                            | ICD: I20.1, I20.8, I20.9 |                                            |
| Atrial fibrillation                        | ICD: I48              | ATC: C01B                                   |
| Heart failure                              | ICD: I50              |                                             |
| Stroke                                     | ICD: I60-166          |                                             |
| Haemorrhage                                | ICD: I60-162          |                                             |
| Ischemic                                   | ICD: I63-164          |                                             |
| Transient cerebral ischaemic attacks       | ICD: G45              |                                             |
| Peripheral artery disease                  | ICD: I70-171          |                                             |
| Heart failure with preserved ejection fraction, HFpEF | ICD: I503             |                                             |
| Heart failure                              | ICD: I50              | ATC: C02                                    |
| Comorbidity                        | ICD-10 diagnosis code | ATC code for relevant prescription medicines |
|-----------------------------------|------------------------|---------------------------------------------|
| Gout                              | ICD: M10               |                                             |
| Asthma                            | *See appendix 2        |                                             |
| Atherosclerosis                   |                        | ATC: B01                                   |
| Chronic kidney disease            |                        |                                             |
| Stage I                           | ICD: N18.1             |                                             |
| Stage II                          | ICD: N18.2             |                                             |
| Stage III                         | ICD: N18.3             |                                             |
| Stage IV                          | ICD: N18.4             |                                             |
| Stage V                           | ICD: N18.5             |                                             |
| Depression                        | ICD: F32.9; F33.9      | ATC: N05-N06                               |
| Dementia                          | *See appendix 2        |                                             |
| Diabetes Type I                   | *See appendix 2        |                                             |
| Gallstones                        | ICD: K363              |                                             |
| Gastroesophageal reflux           | ICD: K21               |                                             |
| Hidradenitis suppurativa          | ICD: L73.2             |                                             |
| Idiopathic intracranial hypertension | ICD: G93.2         |                                             |
| Knee/hip osteoarthritis           | ICD: M16, M17          |                                             |
| Polycystic ovary syndrome, PCOS   | ICD: E282              |                                             |
| Female infertility                | ICD: N97               |                                             |
| Osteoarthritis                    | *See appendix 2        |                                             |
| Obstructive sleep apnoea          | ICD: G473              |                                             |
| Psoriasis                         | ICD: L40               | ATC: D05                                   |
| Pancreatitis                      | ICD: K85               |                                             |
| Disorder of urinary system        | ICD: N39               |                                             |
| Non-alcoholic steatohepatitis, NASH | ICD: K758 and K701    |                                             |
| Non-alcoholic fatty liver disease, NAFLD | ICD: K760           |                                             |
| Cancer                            |                        |                                             |
| Gastric cardia cancer             | ICD: C16               |                                             |
| Liver cancer                      | ICD: C22               |                                             |
| Pancreas cancer                   | ICD: C25               |                                             |
| Corpus uteri cancer               | ICD: C54               |                                             |
| Ovary cancer                      | ICD: C56               |                                             |
| Kidney cancer                     | ICD: C64               |                                             |
| Colorectal cancer                 | ICD: C18               |                                             |
| Breast cancer                     | ICD: C50               |                                             |
| Endometrial cancer                | ICD: C54               |                                             |
Table A3: Definition of microvascular comorbidities (only defined for patients with type II diabetes)

| Comorbidity                  | ICD-10 diagnosis code         |
|------------------------------|-------------------------------|
| **Diabetes Type II**         | *See appendix 2*              |
| Diabetic mono-polyneurotherapy | ICD: G99.0, G59.0, G63.2, E11.4, E12.4, E13.4, E14.4 |
| Diabetic eye complication     | ICD: H28.0, H35.8, H36.0, E11.3, E12.3, E13.3, E14.3 |
| Diabetic foot complication    | ICD: E11.6, M14.2, M14.6, M90.8, L98.4, E11.5, E12.5, E13.5, E14.5 |
| Diabetic kidney disease       | ICD: N08.3, E11.2, E12.2, E13.2, E14.2 |
Appendix 2: Definition of comorbidities based on guidelines from The Danish Health Data Authority

Asthma

Persons with minimum one purchase of prescription medication with a labelled indication for asthma (indication codes 202, 203, 822 in the Danish National Prescription Registry).

Persons who have had at least one purchase of montelukast (ATC code: R03DC03), which is only indicated for treatment of asthma.

Persons with minimum one asthma-related hospital contact, i.e. a hospital contact where the ICD code J45 and sublevels has been listed as primary or secondary diagnosis.

Dementia

Persons who have had at least one purchase of prescription medicines indicated for treatment of dementia (ATC code: N06D including sublevels).

Persons with minimum one hospital contact related to dementia, i.e. a hospital contact where the ICD code F00 – F03 including sublevels has been listed as primary or secondary diagnosis.

Type 1 diabetes

Persons who have had a at least one purchase of prescription medicines indicated for treatment of type 1 diabetes (ATC code: A10A including sublevels excluding A10AE54 and A10AE56).
Persons with minimum one hospital contact related to type 1 diabetes, i.e. a hospital contact where the ICD code E10 including sublevels has been listed as primary or secondary diagnosis.

Exclusion criteria:

Persons with type 2 diabetes.

Type 2 diabetes

Persons who have had a at least one purchase of prescription medicines indicated for treatment of type 2 diabetes (ATC code: A10AE54, A10AE56 and A10B including sublevels excluding A10BJ02).

Persons with minimum one hospital contact related to type 1 diabetes, i.e. a hospital contact where the ICD code E11 including sublevels has been listed as primary or secondary diagnosis.