

Supplementary Online Content

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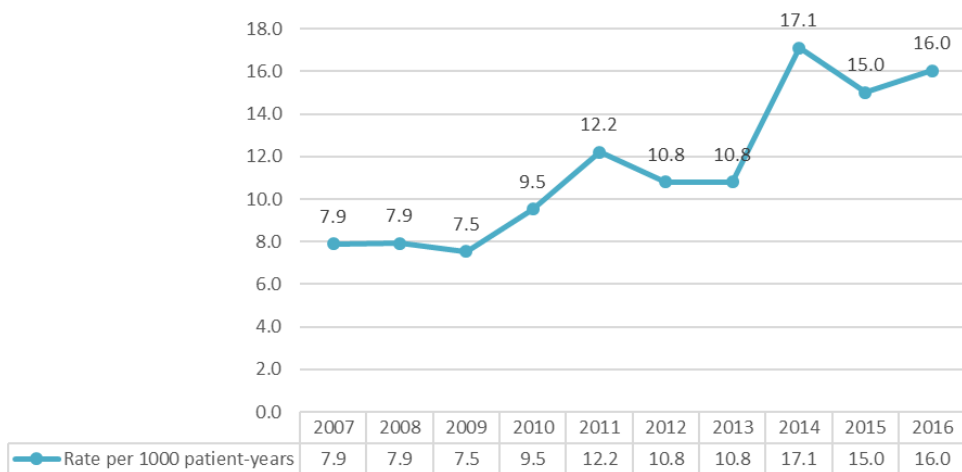
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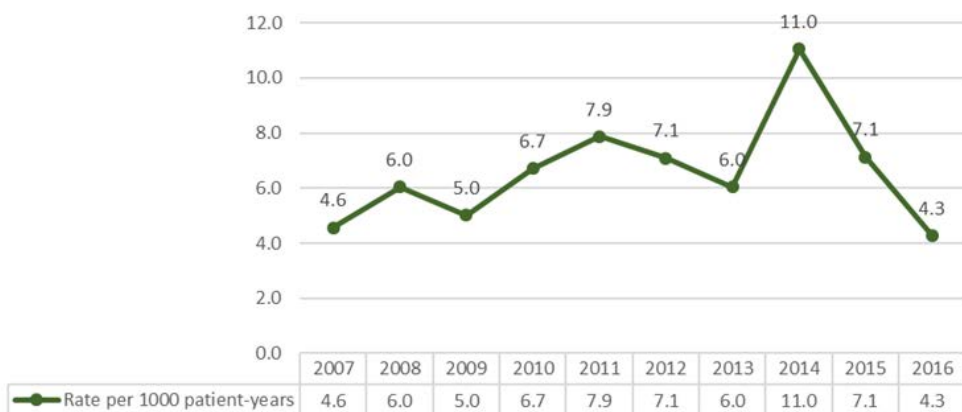
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This supplementary material has been provided by the authors to give readers additional information about their work.

Patients presenting for the first time to psychiatric outpatient clinic services following index bariatric surgery (by year-of-surgery): rates per 1000 patient-years.



Patients presenting for the first time to emergency department services following index bariatric surgery (by year-of-surgery): rate per 1000 patient-years





eFigure 1. First Time Patients Presenting to Mental Health Services Following Index Bariatric Surgery: Rates per 1000 patient years follow up

eTable 1. International Classification of Diseases (ICD-10) Bariatric Surgery Codes.	
ICD 10 Code	Bariatric Surgery Description
The ICD-10 Codes for Bariatric Surgery Prior to July 2013 (Prior to 8th Edition)	
14215-00	Revision of gastric band
30511-00	Gastric reduction
30511-01	Laparoscopic gastric reduction
30512-00	Gastric bypass
30512-01	Laparoscopic biliopancreatic diversion
30512-02	Biliopancreatic diversion
30514-00	Surgical reversal of procedure for morbid obesity
30518-00 with (E66)	Partial gastrectomy (with a co-diagnosis of obesity)
90950-00	Insertion of gastric bubble or balloon
The ICD-10 Codes for Bariatric Surgery from July 2013 (8th Edition)	
30511-09	Laparoscopic sleeve gastrectomy
30511-10	Sleeve gastrectomy
30511-02	Laparoscopic adjustable gastric banding
30511-03	Laparoscopic nonadjustable gastric banding
30511-04	Adjustable gastric banding
30511-05	Nonadjustable gastric banding
30512-03	Laparoscopic gastric bypass
30512-00	Gastric bypass
30512-01	Laparoscopic biliopancreatic diversion
30512-02	Biliopancreatic diversion
30511-06	Laparoscopic gastroplasty
30511-07	Endoscopic gastroplasty
30511-08	Gastroplasty
90940-00	Duodenal-jejunal bypass
90941-00	Ileal interposition
90950-00	Insertion of gastric balloon
90950-01	Removal of gastric balloon
90942-01	Laparoscopic removal of gastric band

90942-02	Endoscopic removal of gastric band
90942-00	Removal of gastric band
14215-01	Adjustment of gastric band reservoir
31441-00	Revision of gastric band reservoir
90943-01	Other laparoscopic procedures for obesity
90943-02	Other endoscopic procedures for obesity
90943-00	Other procedures for obesity
30514-01	Revision procedures for obesity

eTable 2. International Classification of Diseases 10th Version (ICD-10) Mental and Behavioural Disorder Codes.	
ICD-10 Code	Psychiatric Diagnosis
F10–F19	Mental and behavioural disorders due to psychoactive substance use
F20–F29	Schizophrenia, schizotypal, and delusional disorders
F30–F39	Mood-affective affective disorders
F40–F48	Neurotic, stress-related and somatoform disorders
F50–F59	Behavioural syndromes associated with physiological disturbances and physical factors
F60–F69	Disorders of adult personality and behaviour
F99	Unspecified mental disorder
X60–X84	Intentional or deliberate self-harm (DSH) by either overdoses, exposure to toxic chemicals, or physical trauma

eTable 3. Sub-group analysis: The Incidence Risk Ratios for Different Psychiatric Diagnoses Requiring Either Outpatient, Emergency Department or Hospitalization Services Before and After Index Bariatric Surgery

eTable 3a. Sub-group analysis: The Incidence Risk Ratios for Different Psychiatric Diagnoses Requiring Either Outpatient, Emergency Department or Hospitalization Services Before and After Index Bariatric Surgery^a Between 2009 and 2010.^b (n=5015)							
Psychiatric Diagnosis or Symptomatic Presentation	Prior To Index Bariatric Surgery			Post Index Bariatric Surgery			Rates Ratio [95% CI] ^c
	Patients, n	Presentations or Hospitalizations, n	Presentation Rate, per 10 000 patient years	Patients, n	Presentations or Hospitalizations, n	Presentation Rate, per 10 000 patient years	
Outpatient Clinic Presentations ^d							
Organic disorders	2	3	0.8	2	45	12.0	15.9 [4.9 – 51.2]
Mental disorders due to psychoactive substance use	12	62	15.6	19	438	117.0	7.5 [5.7 – 9.8]
Schizophrenia like disorders	13	969	244.1	16	1503	401.4	1.6 [1.5 – 1.8]
Mood disorders	105	1934	487.2	145	3857	1030.0	2.1 [2.0 – 2.2]
Neurotic disorders	66	796	200.5	89	2202	588.1	2.9 [2.7 – 3.2]
Behavioural disorders	8	196	49.4	13	290	77.5	1.6 [1.3 – 1.9]
Personality disorders	17	849	213.9	34	1936	517.1	2.4 [2.2 – 2.6]
Psychological development disorders	0	0	0.0	0	0	0.0	Not able to be estimated
Unspecified disorders	6	426	107.3	5	63	16.8	0.2 [0.1 – 0.2]
Psychiatric evaluation / examination	3	8	15.9	7	148	39.5	2.5 [1.9 – 3.3]
No recorded diagnosis	110	240	60.4	192	596	159.2	2.6 [2.3 – 3.0]
Total	288^e	5483	1381.0	431^e	11 078	2959.0	2.1 [2.1 – 2.2]
Emergency Department Presentations ^f							
Drug & alcohol overdoses	33	39	9.8	95	132	35.3	3.6 [2.5 – 5.1]
Psychotic disorders	4	4	1.0	7	16	4.3	4.2 [1.4 – 12.7]
Mood disorders	12	15	3.8	44	48	12.8	3.4 [1.9 – 6.1]

Neurotic disorders	6	6	1.5	32	45	12.0	8.0 [3.4 – 18.6]
Behavioural disorders	8	8	2.0	35	50	13.4	2.7 [2.2 – 3.4]
Personality disorders	3	3	0.8	20	21	5.6	7.4 [2.2 – 24.9]
Deliberate self-harm	3	3	0.8	20	27	7.2	9.5 [2.9 – 31.5]
Suicidal ideation	6	7	1.8	58	102	27.2	15.5 [7.2 – 33.2]
Non-specific psychiatric	3	3	0.8	21	26	6.9	9.2 [2.8 – 30.4]
Requesting psychiatric review	5	7	1.8	16	22	5.9	3.3 [1.4 – 7.8]
Total	65 ^e	95	23.9	229 ^e	489	130.6	5.5 [4.4 – 6.8]
Hospitalizations ^d							
Mental disorders due to psychoactive substance use	35	77	19.4	102	257	68.6	3.5 [2.7 – 4.6]
Schizophrenia disorders	10	14	3.5	19	88	23.5	6.7 [3.8 – 11.7]
Mood disorders	116	304	76.6	182	423	113.0	1.5 [1.3 – 1.7]
Neurotic disorders	93	209	52.6	170	324	86.5	1.6 [1.4 – 1.9]
Behavioural disorders	1	1	0.3	12	15	4.0	15.9 [2.1 – 120.4]
Personality disorders	17	52	13.1	40	102	27.2	2.1 [1.5 – 2.9]
Total	171 ^e	657	165.5	303 ^e	1209	322.9	1.5 [1.3 – 1.7]

^a Index bariatric surgery refers to the original bariatric surgery occurring between the two year period 2009 - 2010. ^b Follow up periods: 39 699.6 years prior to index bariatric cases and 37 440.2 years post index bariatric surgery. ^c Comparison made between prior-and-post bariatric surgery psychiatric presentation or hospitalization rates. ^d Based on ICD-10 codes. ^e Patients with multiple psychiatric presentations are only counted once. ^f Based on the Department of Health Emergency Department Information System (EDIS).

eTable 3b. Sub-group analysis: The Incidence Risk Ratios for Different Psychiatric Diagnoses Requiring Either Outpatient, Emergency Department or Hospitalization Services Before and After Index Bariatric Surgery ^a Between 2009 and 2010. Subdivided by the Need for Repeat Bariatric Surgery. (n=5015)

Mode of Psychiatric Presentation	Prior To Index Bariatric Surgery			Post Index Bariatric Surgery			Rates Ratio [95% CI] ^b
	Patients, n	Presentations or Hospitalizations, n	Presentation Rate, per 10 000 patient years	Patients, n	Presentations or Hospitalizations, n	Presentation Rate, per 10 000 patient years	
Single Bariatric Admission (n= 3276) ^c							
Outpatient Clinic	169	2918	1122.0	240	7016	2881.0	2.6 [2.5 – 2.7]
Emergency Department	34	55	21.2	132	308	126.5	6.0 [4.5 – 8.0]
Hospitalization	98	349	134.2	168	702	288.2	2.1 [1.9 – 2.2]
Multiple Bariatric Admissions (n=1739) ^d							
Outpatient Clinic	119	2565	1873.0	191	4062	3104.0	1.7 [1.6 – 1.7]
Emergency Department	31	40	29.2	97	181	138.3	4.7 [3.4 – 6.7]
Hospitalization	73	308	224.9	135	507	387.5	1.7 [1.5 – 2.0]

^a Index bariatric surgery refers to the original bariatric surgery occurring between the two year period 2009 - 2010. ^b Comparison made between prior-and-post bariatric surgery psychiatric presentation or hospitalization rates. ^c Follow up period for patients with single bariatric procedures: 26 005.8 years prior to index bariatric cases and 24 355.3 years post index bariatric surgery. ^d Follow up period for patients with multiple bariatric procedures: 13 693.8 years prior to index bariatric cases and 13 084.8 years post index bariatric surgery.

eTable 3c. Sub-group analysis: The Incidence Risk Ratios for Different Psychiatric Diagnoses Requiring Either Outpatient, Emergency Department or Hospitalization Services Before and After Index Bariatric Surgery ^a Between 2007 and 2016. Limited to Patients with ≤ 24 Months Post-operative Follow-up. (n=4392)

Mode of Psychiatric Presentation	Prior To Index Bariatric Surgery ^b			Post Index Bariatric Surgery ^b			Rates Ratio [95% CI] ^c
	Patients, n	Presentations or Hospitalizations, n	Presentation Rate, per 10 000 patient years	Patients, n	Presentations or Hospitalizations, n	Presentation Rate, per 10 000 patient years	
Outpatient Clinic	310	9664	1605.0	172	3017	5568.0	3.5 [3.3 – 3.6]
Emergency Department	167	410	66.1	42	68	125.5	1.9 [1.5 – 2.4]
Hospitalization	175	659	106.2	74	175	323.0	3.0 [2.6 – 3.5]

^a Index bariatric surgery refers to the original bariatric surgery occurring between the two year period 2007 - 2016. ^b Follow up period: 62 076.2 years prior to index bariatric cases and 5418.6 years post index bariatric surgery. ^c Comparison made between prior-and-post bariatric surgery psychiatric presentation or hospitalization rates.

eTable 4. Multivariate Linear Regression with Stepwise Elimination Showing Factors Associated with the Number of Mental Health Presentations for Patients Presenting for the First-Time Following Index Bariatric Surgery Between 2007 and 2016. ^a

Characteristic	First-time Psychiatric OPC Presentation After Bariatric Surgery (n=1207) [95%CI]	First-time Psychiatric ED Presentation After Bariatric Surgery (n=807) [95%CI]	First-time Psychiatric Hospitalization After Bariatric Surgery (n=873) [95%CI]
Constant	175.95	17.98	50.88
Demographics			
Age – per year	-0.002 [-0.003 to -0.002]	-0.002 [0.003 to -0.002]	-0.001 [-0.003 to 0.000]
Sex – male	Excluded	0.02 [0.00 – 0.04]	1.22 [1.03 – 1.44]
Private health insurance	0.43 [0.20 to 0.66]	0.04 [0.02 to 0.06]	Excluded
Charlson comorbidity score ≥ 1	Excluded	Excluded	Excluded
Index surgery undertaken at a rural hospital	Excluded	Excluded	Excluded
SEIFA LGA IRSD 2011 disadvantage score, per increasing decile ^b	Excluded	Excluded	Excluded
Preoperative psychiatric history			
Pre-index surgery psychiatric OPC presentation	n/a	0.18 [0.15 to 0.21]	0.28 [0.22 to 0.34]
Pre-index surgery psychiatric ED presentation	0.92 [0.36 to 1.47]	n/a	0.50 [0.39 – 0.61]
Pre-index surgery psychiatric hospitalization	0.83 [0.40 to 1.26]	0.35 [0.31 to 0.40]	n/a
Surgical factors			
Index surgery – gastric band ^c	Excluded	Excluded	Excluded
Index surgery – sleeve gastrectomy ^c	Excluded	Excluded	Excluded
Index surgery – bypass procedure ^c	Excluded	Excluded	Excluded
Repeat bariatric surgery – obesity only ^d	Excluded	Excluded	Excluded
Repeat bariatric surgery – complication only ^d	Excluded	Excluded	Excluded
Repeat bariatric surgery – complication and obesity ^d	0.29 [0.01 to 0.57]	0.05 [0.03 – 0.08]	Excluded

Abbreviations: CI, confidence intervals; OPC, outpatient clinic; ED, emergency department; SEIFA, Socio-Economic Indexes for Areas; IRSD, The Index of Relative Socio-Economic Disadvantage; LGA, local government area.

^a Total cohort size = 24 766 bariatric patients with the multivariate linear regression adjusted for year-of-surgery and duration of follow-up. ^b The IRSD is a general socio-economic index that summarizes a range of information about the economic and social conditions of people and households within an area. This index includes only measures of relative disadvantage with lower scores equating with increasing disadvantage. The average IRSD equals 1000 and roughly two-thirds of the scores lie between 900 and 1100. ^c When compared to the remaining bariatric surgery group of restrictive procedures. ^d When compared to patients not requiring repeated bariatric procedures.

eTable 5. Multivariate Logistic Regression Showing the Risk Factors for 25 Bariatric Patients Who Committed Suicide Out of 261 Deaths After Index Bariatric Procedure. ^a

Characteristic	Multivariate OR [95%CI] ^b	P value
Age (per year)	n/a ^c	n/a
Sex– male	2.35 [0.93 – 5.95]	0.07
Private insurance	n/a ^c	n/a
Charlson comorbidity index > 0	n/a ^c	n/a
Index bariatric surgery undertaken at a rural hospital	n/a ^c	n/a
SEIFA LGA IRSD, per increasing decile ^d	n/a ^c	n/a
Prior ED presentation with DSH or suicidal ideation	n/a ^c	n/a
Prior hospitalization – deliberate self-harm ^e	5.34 [1.22 – 23.34]	0.03
Prior hospitalization – mental and behavioural disorders due to psychoactive substance use ^e	4.69 [1.03 – 21.30]	0.04
Prior hospitalization – mood disorders ^e	3.47 [0.81 – 14.94]	0.09
Type of operation – gastric band ^f	0.25 [0.04 – 1.70]	0.16
Type of operation – gastric sleeve ^f	0.00	0.99
Type of operation – gastric bypass ^f	0.00	0.99
Repeat surgery – obesity ^g	2.96 [0.35 – 24.95]	0.32
Repeat surgery – complications ^g	3.43 [1.14 – 10.25]	0.28
Repeat surgery – obesity and complications ^g	3.21 [0.64 – 16.12]	0.16

Abbreviations: OR, odds ratio; CI, confidence interval; SEIFA, Socio-Economic Indexes for Areas; LGA, local government area; IRSD, The Index of Relative Socio-Economic Disadvantage; ED, emergency department; DSH, deliberate self-harm.

^a Index procedure is when the original bariatric surgery occurred between 2007 and 2016. Total cohort size = 24 766 bariatric patients. ^b Multivariate logistic regression adjusted for year-of-surgery and duration of follow-up. ^c Excluded in stepwise backward elimination. ^d The IRSD is a general socio-economic index that summarizes a range of information about the economic and social conditions of people and households within an area. It only includes only measures of relative disadvantage with lower deciles equating with increasing disadvantage. ^e Using ICD-10 classifications. ^f Type of surgery as a single categorical variable compared to the remaining bariatric surgery group of restrictive procedures. ^g Repeat surgery as a single categorical variable compared to patients not requiring repeated bariatric procedures.