

Thirty-Day Postoperative Complications as Predictors of Reoperation, Reintervention, and Readmission within Six months after Metabolic Bariatric Surgery: An MBSAQIP Analysis

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Disclosure

Benjamin Clapp is a proctor for Intuitive and a consultant for Medtronic and Endolumik. The rest of the authors have nothing to disclose.





Background

- Bariatric surgery outcomes are commonly assessed within 30 days, potentially missing complications that persist, recur, or require delayed treatment.
- Complications occurring within the first 30 days may have important consequences that extend beyond the traditional postoperative reporting window.
- National data describing how specific 30-day complications shape late readmission, reoperation, and intervention patterns remain limited.





**METABOLIC AND BARIATRIC SURGERY
ACCREDITATION AND QUALITY IMPROVEMENT PROGRAM**

**User Guide for the
2023 Participant Use Data File (PUF)**

Released: October 2024

Position #	Variable Name	Data Type	Variable Label	Search Term in Variables and Definitions	Variable Options	Comments
1	CASEID	Num	Case Identification Number	Each case or record in the database has a unique CaseID number.		
2	SEX	Char	Sex	Variable Name: Sex	Male; Female; Non-binary	
3	AGE	Num	Age (years)	Variable Name: Date of Birth		Values capped between 13 and 80
4	ageLT13	Char	Age Less Than 13 Years	Indicator for patients with recorded age less than 13	Yes; No	
5	ageGT80	Char	Age Greater Than 80 Years	Indicator for patients with recorded age greater than 80	Yes; No	
6	RACE_PUF	Char	Race	Variable Name: Race	White Black or African American American Indian or Alaska Native Native Hawaiian or Other Pacific Islander Asian Some Other Race Unknown/Not Reported	Field is multi-select. Selections are separated by " ~ ". Any unique categories with frequency < 50 are set to 'Race combinations with low frequency'.
7	HISPANIC	Char	Hispanic Ethnicity	Variable Name: Hispanic Ethnicity	Yes; No; Unknown	
8	PROCEDURE_TYPE	Char	Procedure Type	Variable Name: Procedure Type	Conversion; Initial; Revision	Please refer to the Case Exclusion Criteria section in the accompanying User Guide for procedure types and cases eligible for inclusion in these data files.
9	PROC_PREV_SITE	Char	Previous Procedure Completed at Your Site	Variable Name: Previous Procedure Completed at Your Site	Yes; No	
10	CPT	Char	Primary Procedure CPT	Variable Name: Primary Procedure	CPT® codes	
11	CPT_DESCR	Char	Primary Procedure CPT Description	Variable Name: Primary Procedure		
12	INIT_PROC_DESC	Char	Initial Procedure Description	Variable Name: Initial Procedure Description	See "Variable Name: Initial Procedure Description" "Options" List on page 8 of Variables and Definitions	Required if 43659 or 43999 is entered for the Primary Procedure CPT®. If PROCEDURE_TYPE not = 'Initial', then this field will be missing.
13	CONV_PREV_PROC	Char	Conversion Previous Procedure	Variable Name: Conversions Previous Procedure	See "Variable Name: Conversions Previous Procedure" "Options" List on page 9 of Variables and Definitions	Field is multi-select. Selections are separated by " ~ ". If PROCEDURE_TYPE not = 'Conversion', then this field will be missing.
14	CONV_CURR_PROC	Char	Conversion Current Primary Procedure	Variable Name: Conversions Current Primary Procedure	See "Variable Name: Conversions Current Primary Procedure" "Options" List on page 10 of Variables and Definitions	If PROCEDURE_TYPE not = 'Conversion', then this field will be missing.
15	REV_PROC	Char	Revision Procedure Type	Variable Name: Revisions Procedure Type	See "Variable Name: Revisions Procedure Type" "Options" List on page 11 of Variables and Definitions	If PROCEDURE_TYPE not = 'Revision', then this field will be missing.
16	REV_CONV_EMERGCASE	Char	Revision/Conversion Emergency Case	Variable Name: Emergency Case	Yes; No	If PROCEDURE_TYPE = 'Initial', this field will be missing.
17	REV_CONV_FININDIC	Char	Revision/Conversion Final Indication	Variable Name: Final Indication	See "Variable Name: Final Indication" "Options" List on page 13 of Variables and Definitions	If PROCEDURE_TYPE = 'Initial', this field will be missing.
18	CON_ORG_TRAN	Char	Concurrent Organ Transplant	Variable Name: Concurrent Organ Transplant	Yes; No	
19	OTHCPPT1	Char	Other CPT 1	Variable Name: Other Procedures		Any additional CPT® code. If none entered field will be 'NULL'.
20	OTHCPPT2	Char	Other CPT 2			
21	OTHCPPT3	Char	Other CPT 3			
22	OTHCPPT4	Char	Other CPT 4			
23	OTHCPPT5	Char	Other CPT 5			
24	OTHCPPT6	Char	Other CPT 6			
25	OTHCPPT7	Char	Other CPT 7			
26	OTHCPPT8	Char	Other CPT 8			
27	OTHCPPT9	Char	Other CPT 9			
28	OTHCPPT10	Char	Other CPT 10			
29	CONCPT1	Char	Concurrent CPT 1	Variable Name: Concurrent Procedures		Any additional CPT® code. If none entered field will be 'NULL'.
30	CONCPT2	Char	Concurrent CPT 2			
31	CONCPT3	Char	Concurrent CPT 3			
32	CONCPT4	Char	Concurrent CPT 4			
33	CONCPT5	Char	Concurrent CPT 5			
34	CONCPT6	Char	Concurrent CPT 6			
35	CONCPT7	Char	Concurrent CPT 7			
36	CONCPT8	Char	Concurrent CPT 8			
37	CONCPT9	Char	Concurrent CPT 9			
38	CONCPT10	Char	Concurrent CPT 10			
39	STAPLING_PROC	Char	Stapler Used/Anastomosis Completed	Variable Name: Stapler Used/Anastomosis Completed	Yes; No	
40	DISCHARGE_DESTINATION	Char	Discharge Destination	Variable Name: Hospital Discharge Destination	Home/Permanent residence Acute Care Hospital Other facility Expired Against Medical Advice (AMA) Unknown	
41	SURGSPECIALTY_BAR	Char	Medical specialty of the physician performing the Primary Procedure	Variable Name: Medical Specialist	Gastroenterologist General surgeon Interventional radiologist Metabolic and bariatric surgeon Other	
42	OPYEAR	Num	Year of Operation	Year of initial bariatric or metabolic surgery		
43	DTOP	Num	Days to operation from hospital admit date	Days to initial bariatric or metabolic surgery operation date from hospital admission date		Values capped between 0 and 30.
44	DTDISCH_OP	Num	Days to discharge from operation date	Days to hospital discharge from initial bariatric or metabolic surgery date		Values capped between 0 and 150.
45	DTDISCH_ADMIT	Num	Days to discharge from hospital admit date	Days to hospital discharge from hospital admission date		Values capped between 0 and 180.
46	HGT	Num	Height	Variable Name: Height		
47	HGTUNIT	Char	Height Unit	Variable Name: Height	cm; in	
48	WGT_HIGH_BAR	Num	Highest Pre-Op Weight recorded	Variable Name: Highest Recorded Weight		
49	WGT_HIGH_UNIT_BAR	Char	Highest Pre-Op Weight recorded Unit	Variable Name: Highest Recorded Weight	kg; lbs	
50	BMI_HIGH_BAR	Num	Highest Recorded Pre-Op BMI	Calculated from highest recorded pre-op weight and height		Values capped between 15 and 150.
51	WGT_CLOSEST	Num	Pre-Op Weight closest to bariatric surgery	Variable Name: Weight Closest to Procedure		
52	WGTUNIT_CLOSEST	Char	Pre-Op Weight closest to bariatric surgery Unit	Variable Name: Weight Closest to Procedure	kg; lbs	
53	BMI	Num	Pre-Op BMI closest to bariatric surgery	Calculated from pre-op weight closest to procedure and height		Values capped between 15 and 150.
54	MBSAQIP_RISK_CALC	Char	MBSAQIP Risk Calculator Used	Variable Name: Risk Calculator Used		
55	MBSAQIP_SUBST_SCRN	Char	Substance Abuse Screening Completed	Variable Name: Substance Abuse Screening Completed		
56	FUNSTATPRESURG	Char	Pre-Op Functional Health Status	Variable Name: Functional Health Status	Independent Partially dependent	



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**User Guide for the 2023
MBSAQIP
Long-Term Follow-up
(LTFU)
Participant Use
Data File (PUF)**

Released:
December 2025

MBSAQIP 2023 LTFU PUF USER GUIDE | December 2025

(Dates of Surgery: January 1, 2023 – December 31, 2023)

6-Month LTFU PUF Datasets (**Current Release**)

Dataset	File Types Available	Uncompressed File Size	Description
PUF_Comorb_6M	SAS, SPSS, TXT	SAS: 543 MB SPSS: 650 MB TXT: 138 MB	Contains 11 HIPAA compliant variables on 197169 eligible LTFU entries. Each row represents an LTFU entry that occurred within 31-273 days after a case from the 30-day PUF. Multiple rows per case are possible in this file.
PUF_Labs_6M	SAS, SPSS, TXT	SAS: 543 MB SPSS: 650 MB TXT: 138 MB	Contains 10 HIPAA compliant variables on 80963 eligible LTFU entries. Each row represents an LTFU entry that occurred within 31-273 days after a case from the 30-day PUF. Multiple rows per case are possible in this file.
PUF_Read_6M	SAS, SPSS, TXT	SAS: 1.5 MB SPSS: 1.5 MB TXT: 399 KB	Contains 6 HIPAA compliant variables on 2635 readmissions. Each row represents a readmission that occurred within 31-273 days after a case from the 30-day PUF. Multiple rows per case are possible in this file.
PUF_Reop_6M	SAS, SPSS, TXT	SAS: 1.2 MB SPSS: 1.2 MB TXT: 326 KB	Contains 13 HIPAA compliant variables on 1394 reoperations. Each row represents a reoperation that occurred within 31-273 days after a case from the 30-day PUF. Multiple rows per case are possible in this file.
PUF_Intv_6M	SAS, SPSS, TXT	SAS: 768 KB SPSS: 704 KB TXT: 193 KB	Contains 9 HIPAA compliant variables on 6391 interventions. Each row represents an intervention that occurred within 31-273 days after a case from the 30-day PUF. Multiple rows per case are possible in this file.
PUF_Mort_6M	SAS, SPSS, TXT	SAS: 768 KB SPSS: 704 KB TXT: 193 KB	Contains 2 HIPAA compliant variables on 217 mortalities. Each row represents a mortality that occurred within 31-273 days after a case from the 30-day PUF. A case in the 30-day PUF can only link to one entry in this file.

Objective

How do 30-day postoperative complications influence late readmission, reoperation, and intervention, and to characterize the distinct clinical trajectories associated with each complication.



Methods

Study Design

- Retrospective cohort study using the 2023 MBSAQIP Participant Use File linked to long-term follow-up data.

Study Cohort

- Adults undergoing primary SG, RYGB, OAGB, or DS/SADI.
- Conversion and revisional procedures were excluded; the final follow-up cohort included 188,437 patients.

Outcomes

- Early exposures: major complications occurring within 30 days, including leak, organ-space infection, sepsis, ICU admission, transfusion, and pulmonary embolism.
- Late outcomes: readmission, reoperation, and intervention between postoperative days 31–273.

Statistical Analysis

- Logistic regression assessed associations between each early complication and late outcomes, reporting ORs with 95% CIs.



Overall follow up

- 77 % at 6 months.

Result – Study Cohort

- Baseline risk differed across procedures, with DS/SADI patients having the highest BMI (50.1 kg/m²) and prevalence of ASA class $\geq$ III (93.8%).
- Diabetes and GERD were more common in bypass procedures; OAGB had the highest rates of diabetes (37.9%) and GERD (42.0%).
- Age differences were modest, and women represented the majority of patients across all procedures.

Table 1. Baseline characteristics by index bariatric procedure

Variable	SG	RYGB	OAGB	DS/SADI	p-value
Age, years	42.4 $\pm$ 11.8	44.1 $\pm$ 11.6	43.7 $\pm$ 11.5	43.4 $\pm$ 11.1	<0.001
BMI, kg/m ²	44.9 $\pm$ 7.8	45.8 $\pm$ 7.6	46.2 $\pm$ 7.9	50.1 $\pm$ 9.5	<0.001
Female sex	105,777 (81.8)	40,123 (76.3)	1,560 (72.0)	3,345 (76.5)	<0.001
Diabetes	27,349 (21.2)	15,820 (30.1)	820 (37.9)	1,201 (27.5)	<0.001
Hypertension	53,867 (41.7)	26,421 (50.2)	1,100 (50.8)	2,204 (50.4)	<0.001
GERD	31,740 (24.6)	20,430 (38.8)	910 (42.0)	1,692 (38.7)	<0.001
Sleep apnea	46,433 (35.9)	24,300 (46.2)	980 (45.3)	1,967 (45.0)	<0.001
Hyperlipidemia	27,882 (21.6)	13,540 (25.7)	510 (23.5)	995 (22.8)	<0.001
Smoker	8,261 (6.4)	4,200 (8.0)	190 (8.8)	320 (7.3)	<0.001
ASA class $\geq$ III	104,842 (81.1)	45,300 (86.1)	1,950 (90.0)	4,100 (93.8)	<0.001

Values are mean $\pm$ SD or n (%). P-values calculated using analysis of variance for continuous variables and chi-square testing for categorical variables. SG, sleeve gastrectomy; RYGB, Roux-en-Y gastric bypass; OAGB, one-anastomosis gastric bypass; DS/SADI, duodenal switch/single anastomosis duodenoileal bypass.



Results – Thirty-Day Complications by Procedure

- Major 30-day complications were generally lowest after SG and highest after DS/SADI.
- Anastomotic leak 0.11% after SG and 0.55% after DS/SADI, representing an approximately fivefold difference.
- Organ-space infection demonstrated a similar gradient, increasing from 0.17% to 0.85%.
- These early complications formed the exposures evaluated as predictors of late outcomes.

Table 2. Thirty-day complications by index bariatric procedure

Variable	SG	RYGB	OAGB	DS/SADI	p-value
Anastomotic leak	139 (0.11)	140 (0.27)	6 (0.28)	24 (0.55)	<0.001
Organ-space SSI	224 (0.17)	217 (0.41)	9 (0.42)	37 (0.85)	<0.001
Sepsis	68 (0.05)	69 (0.13)	4 (0.18)	9 (0.21)	<0.001
Bleeding (transfusion)	628 (0.49)	437 (0.83)	15 (0.69)	40 (0.92)	<0.001
Unplanned ICU admission	492 (0.38)	354 (0.67)	15 (0.69)	40 (0.92)	<0.001
Pneumonia	127 (0.10)	149 (0.28)	5 (0.23)	11 (0.25)	<0.001
Pulmonary embolism	134 (0.10)	69 (0.13)	1 (0.05)	11 (0.25)	0.013
Acute renal failure	54 (0.04)	36 (0.07)	2 (0.09)	9 (0.21)	<0.001

Values are n (%). SSI, surgical site infection; ICU, intensive care unit.

Results – Late Outcomes by Procedure

- Among 188,437 patients, SG had the lowest rates of late readmission (0.48%), reoperation (0.22%), and intervention (0.82%).
- RYGB had the highest rates of late readmission (1.47%) and intervention (3.73%).
- DS/SADI had the highest late reoperation rate (1.17%).

Table 3. Late outcomes by index bariatric procedure

Procedure	Late readmission (%)	Late reoperation (%)	Late intervention (%)
SG	0.48	0.22	0.82
RYGB	1.47	0.93	3.73
OAGB	0.69	1.02	3.46
DS/SADI	1.46	1.17	1.78

Late outcomes defined as events occurring 31–273 days postoperatively. SG, sleeve gastrectomy; RYGB, Roux-en-Y gastric bypass; OAGB, one-anastomosis gastric bypass; DS/SADI, duodenal switch/single anastomosis duodenoileal bypass.

Results – Early Complications Predicted Late Morbidity

- Anastomotic leak was the strongest predictor of late readmission, reoperation, and intervention, with ORs exceeding 17 for all three outcomes.
- Organ-space infection and sepsis demonstrated similarly strong associations with late morbidity.
- ICU admission, bleeding, and pulmonary embolism were also associated with late events, but with smaller effect sizes.

Table 4. Association of 30-day complications with late outcomes

Leak	Readmission	17.18	12.09–24.41	<0.001
	Reoperation	18.24	11.86–28.04	<0.001
	Intervention	18.81	14.45–24.49	<0.001
Organ-space SSI	Readmission	17.87	13.52–23.63	<0.001
	Reoperation	15.55	10.74–22.52	<0.001
Sepsis	Readmission	16.83	10.12–27.97	<0.001
	Reoperation	16.31	8.55–31.10	<0.001
	Intervention	12.06	7.83–18.57	<0.001
Unplanned ICU	Readmission	6.87	5.07–9.31	<0.001
	Reoperation	7.57	5.20–11.03	<0.001
	Intervention	4.62	3.58–5.96	<0.001
Bleeding (transfusion)	Readmission	3.31	2.26–4.83	<0.001
	Reoperation	2.41	1.36–4.28	0.003
	Intervention	2.29	1.68–3.13	<0.001
Pulmonary embolism	Readmission	5.59	2.86–10.92	<0.001
	Reoperation	3.13	1.00–9.82	0.050
	Intervention	4.72	2.83–7.86	<0.001

OR, odds ratio; CI, confidence interval; SSI, surgical site infection; ICU, intensive care unit; PE, pulmonary embolism. Results derived from multivariable logistic regression.

Results – Complication Type Defined the Clinical Trajectory

- Leak, organ-space infection, and sepsis were followed by persistent structural pathology, including recurrent leak, fistula, and intra-abdominal infection.
- After anastomotic leak, 23.9% required a late intervention and 7.4% required late reoperation.
- Late intervention after leak was most frequent following SG: 35.3%, compared with 13.6% after RYGB and 20.8% after DS/SADI.
- Interventions were predominantly endoscopic, most commonly stent placement or dilation.

Table 6. Procedure-specific trajectories following anastomotic leak

Procedure	N with leak	Late readmission	Late reoperation	Late intervention
SG	139	15 (10.8%)	9 (6.5%)	49 (35.3%)
RYGB	140	15 (10.7%)	12 (8.6%)	19 (13.6%)
OAGB	6	1 (16.7%)	0 (0.0%)	1 (16.7%)
DS/SADI	24	3 (12.5%)	2 (8.3%)	5 (20.8%)

Values are n (%). OAGB subgroup contained only six anastomotic leaks; findings are descriptive only. SG, sleeve gastrectomy; RYGB, Roux-en-Y gastric bypass; OAGB, one-anastomosis gastric bypass; DS/SADI, duodenal switch/single anastomosis duodenoileal bypass.



Table 5. Clinical trajectories of late adverse events by early complication type

Complication	Late readmission (%)	Top readmission causes	Late reoperation (%)	Top reoperation causes	Late intervention (%)	Top intervention causes
Leak	11.72	Leak; sepsis	7.24	Leak; fistula	24.48	Leak; fistula
Organ-space SSI	12.06	Sepsis; leak	6.36	Leak; fistula	18.86	Leak; fistula
Sepsis	11.43	Pain; leak	6.43	Perforation; leak	16.43	Leak; stricture
Unplanned ICU	5.04	N/V; pain	3.21	Fistula	7.33	Leak; ulcer
Bleeding (transfusion)	2.58	N/V; pain	1.10	Perforation	3.78	Ulcer; stricture
Pulmonary embolism	4.29	N/V	1.43	Mixed	7.62	Esophagitis

SSI, surgical site infection; ICU, intensive care unit; N/V, nausea/vomiting. Top causes reflect the most frequently recorded downstream diagnoses in the MBSAQIP long-term follow-up file.

SG had the highest rate of endoscopy

Supplementary Table S2. Type of late interventions following anastomotic leak, by procedure

Procedure	Diagnostic endoscopy	Therapeutic endoscopy (stent/dilation)	Fistula closure	Tube placement	Other (not listed)
SG	14	23	2	1	9
RYGB	6	7	1	0	5
OAGB	0	0	0	0	0
DS/SADI	0	1	0	0	2

Values are counts. Operative procedures are captured under reoperation and are not included in this intervention analysis. Categories reflect MBSAQIP intervention classification definitions.

Limitations

- Retrospective
- Lack of granularity
- 457 OAGBs, 1 leak. Limits analysis

Discussion

- Thirty-day complications were not isolated events; they strongly predicted morbidity extending through the subsequent months after bariatric surgery.
- Anastomotic leak was the dominant predictor, increasing the odds of late readmission, reoperation, and intervention by approximately 17- to 19-fold.
- Leak, organ-space infection, and sepsis shared a similar downstream pattern of recurrent leak, fistula, and intra-abdominal infection, suggesting a persistent disease pathway.

Discussion

- Procedure type influenced the initial risk of developing complications, but the specific complication was more important in determining the later clinical trajectory.
- SG leaks required late intervention more frequently than leaks after other procedures, likely reflecting the high-pressure tubular anatomy and the frequent need for repeated endoscopic management.

Conclusion

- Serious 30-day complications strongly predicted late adverse outcomes.
- Anastomotic leak represented a prolonged disease process rather than a single postoperative event.
- Postoperative surveillance should be tailored to the type of early complication, not solely to the index procedure.



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