



International Federation for the Surgery  
of Obesity and Metabolic Disorders

# Risk of Gastrointestinal cancer after bariatric surgery



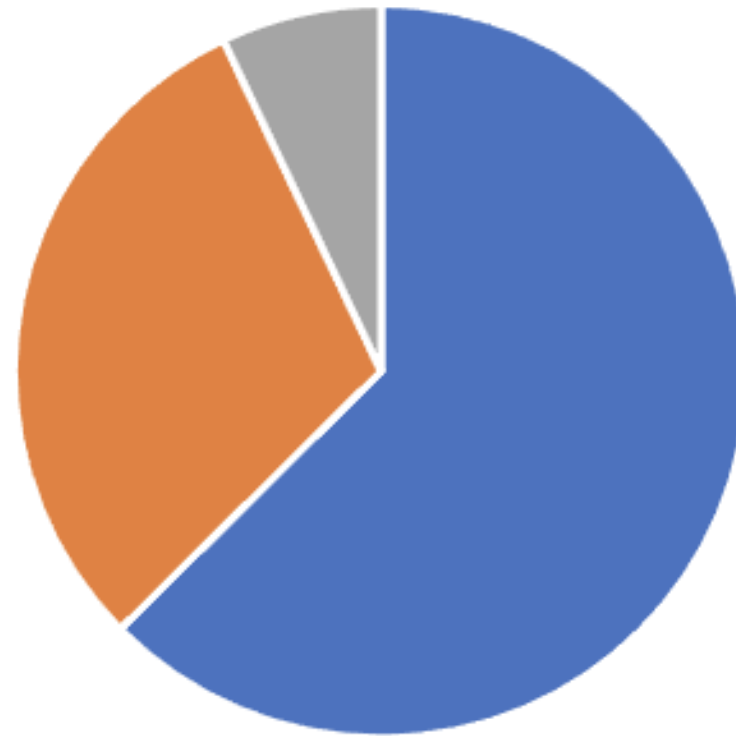
**XXVI  
IFSO WORLD  
CONGRESS**

**OF BARIATRIC  
& METABOLIC SURGERY**

**NAPOLI  
2023**

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# CASE MIX DISCLOSURE



Total > 6000

## CONFLICT OF INTEREST DISCLOSURE

**I have no potential conflict of interest to report**



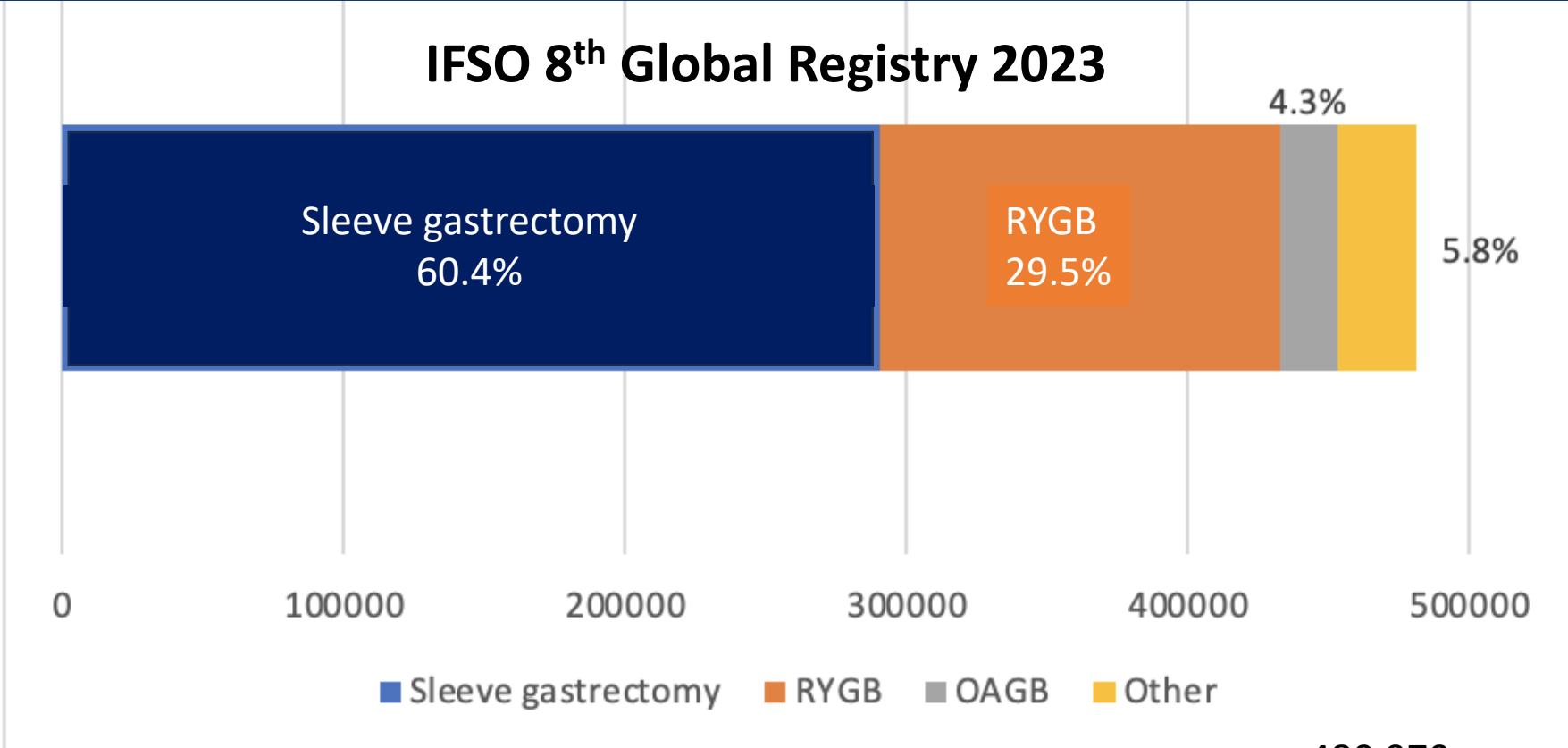
# Obesity and Cancer

- 2016 International Agency for Research on Cancer (IARC) identified 13 cancer sites associated with obesity
  - esophagus (adenocarcinoma);
  - gastric cardia
  - colon and rectum
  - Liver, gallbladder, pancreas,
  - breast (postmenopausal)
  - corpus uteri, ovary;
  - kidney (renal cell);
  - meningioma;
  - thyroid, and
  - multiple myeloma

# Benefits of MBS

- substantial and sustained weight loss
- Improvement/remission of obesity-related comorbidities
- overall improvement in life expectancy
- SPLENDID trial → MBS significantly ↓ incidence of obesity-associated cancers (13) and cancer-related mortality
- Does MBS influences cancer risk
  - ? ↑ risk of esophagogastric cancer
  - ? ↑ risk of colorectal cancer after gastric bypass

# Risk of esophageal cancer after MBS



480,970 procedures  
24 national and 2 regional registries  
81.3% of all MBS registries



# Risk of esophageal cancer after MBS

- SG most common bariatric surgery worldwide
- SG may induce GERD
- Obesity and GERD are independent risk factors for esophageal cancer
- ? impact of SG on risk of esophageal cancer

# Risk of esophageal cancer after MBS

What is the evidence?



# Risk of esophageal cancer after MBS

## Does Sleeve Gastrectomy Expose the Distal Esophagus to Severe Reflux?: A Systematic Review and Meta-analysis



46 studies n= 10,718

Meta-analysis

After SG

19%	↑GERD
23%	De novo reflux
28%	Oesophagitis
8%	BE
4%	severe reflux → RYGB

### Conclusion

**SG → ↑Prevalence – GERD**

**– esophagitis**

**– BE**



# Risk of esophageal cancer after MBS

Esophageal cancer after sleeve gastrectomy: a population-based comparative cohort study



Population base cohort  
MBS 2006-2012 in Quebec, Ontario  
4121 LSG      852 RYGB  
Mean followup 7.6yrs  
8 cased esophageal cancer



# Esophageal Cancer After Sleeve Gastrectomy:

## A Population-based Comparative Cohort Study

Population-level cohort from Quebec, Canada  
All Bariatric surgeries during 01/2006 - 12/2012

2-3 obese controls for each surgical case  
Risk of esophageal cancer



Reflux- protective (RYGB)  
N=852



Reflux- prone (SG & DS)  
N=4,121



Obese controls  
N=12,159

### Incidence rate

(Cancer cases per 100,000 person per year)  
Mean follow-up time 7.6 years

15.4

22.3

6.5

### Hazard ratio

(Adjusted for age, sex, SES, CCI, surgery period,  
associated hiatal hernia repair)

(ref)

0.83 (0.10-7.27) 2.47 (0.82-7.45)

(ref)

# Risk of esophageal cancer after MBS

## Esophageal Cancer After Bariatric Surgery: Increasing Prevalence and Treatment Strategies

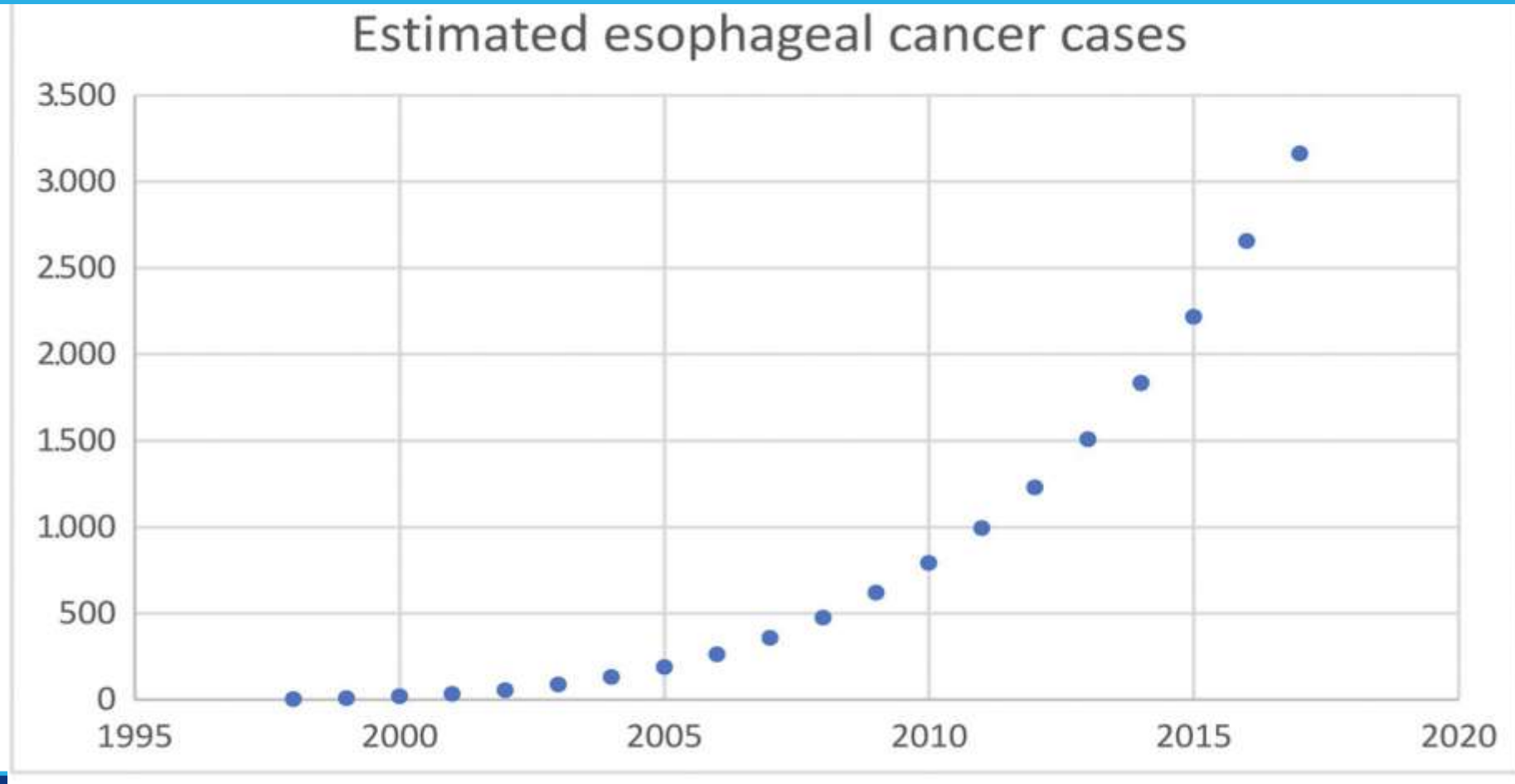
### Global Esophageal Cancer Estimates After MBS

Year	MBS/yr	pop at risk	esophageal cancer cases/yr	total esophageal cancers
1998	40000	40 000	2.2	2
1999	61260	101 147	5.5	8
2003	146301	556 002	31.3	87
2008	344221	1865 847	118.7	476
2013	468609	3721 161	277.5	1508
2016	685874	5570 367	440.6	2656
2017	721756	6270 320	505.7	3162



# Risk of esophageal cancer after MBS

## Esophageal Cancer After Bariatric Surgery: Increasing Prevalence and Treatment Strategies



# Risk of esophageal cancer after MBS

## Esophageal Cancer After Bariatric Surgery: Increasing Prevalence and Treatment Strategies

Multicentre Cohort in Netherlands > 200 esophagectomies/yr

2014 - 2019

n = 3833 esophageal cancers

n = 15 post MBS. 53% males. 60% distal EAC  
13% after BE

46% RYGB

median age 58yrs

6 metastatic disease

7 curative surgery → 5 alive after median followup up 2 years

Conclusion: ↑ esophageal cancer after MBS



# Risk of colorectal cancer after MBS

What is the evidence?



# Risk of colorectal cancer after MBS

Colorectal cancers      9.7 % all cancers  
8.5% all cancer-related deaths globally

Obesity → ↑risk CRC      Colon > rectum

MBS → ? risk CRC

# Risk of colorectal cancer after MBS

## Increased Risk of Colorectal Cancer After Obesity Surgery

Swedish Patient Register 1980-2009

	Obesity Surgery Cohort, n (%)	Obese No Surgery Cohort n (%)
Total	15,095 (100)	62,016 (100)
Gender		
Male	3487 (23)	23,146 (37)
Female	11,608 (77)	38,870 (63)
Age groups at entry into the cohorts, years		
18–39	7764 (51)	18,760 (30)
40–49	4517 (30)	30,096 (18)
≥50	2814 (19)	31,920 (52)



# Risk of colorectal cancer after MBS

	Colorectal Cancer			
	Obesity Surgery Cohort		Obese No Surgery Cohort	
	<i>n</i>	SIR (95% CI)	<i>n</i>	SIR (95% CI)
Total	70	1.60 (1.25–2.02)	373	1.26 (1.14–1.40)
Follow-up time, years				
1–4	8	0.94 (0.41–1.86)	168	1.34 (1.15–1.56)
5–9	13	1.22 (0.65–2.09)	100	1.14 (0.93–1.39)
≥10	49	2.00 (1.48–2.64)	105	1.27 (1.03–1.53)
<i>P</i> for trend		0.20		0.44
Gender				
Male		1.67 (1.10–2.54)		1.67 (1.10–2.54)
Female		1.30 (0.88–1.94)		1.30 (0.88–1.94)
Age group				
18–39		1.88 (0.88–3.99)		1.88 (0.88–3.99)
40–49		1.61 (0.88–2.93)		1.61 (0.88–2.93)
≥50	27	1.34 (0.88–1.94)	324	1.27 (1.15–1.43)
<i>P</i> for trend		0.20		0.44
Obesity surgery procedure				
Vertical banded gastroplasty	31	1.62 (1.10–2.30)	–	–
Adjustable gastric banding	27	1.63 (1.08–2.38)	–	–
Gastric bypass	12	1.50 (0.78–2.62)	–	–

## Conclusion

MBS is associated with ↑ risk of CRC with increasing time after surgery whereas no such pattern was found in the obese patients who did not undergo obesity surgery.

# Risk of colorectal cancer after MBS

## Obesity surgery and risk of cancer

National population-based cohort study Hospital Episode Statistics database in England 1997 -2012.

Obese n= 716 960

MBS n= 8794 patients

- RYGB
- LAGB
- LSG

matched with 8794

obese patients who did not have surgery.

	Control (n = 4978†)	Gastric bypass (n = 4978†)	Odds ratio*
Breast cancer (women only)	129 (3.2)	29 (0.7)	0.22 (0.15, 0.33)
Endometrial cancer (women only)	50 (1.3)	4 (0.1)	0.08 (0.03, 0.22)
Prostate cancer (men only)	18 (1.8)	4 (0.4)	0.22 (0.07, 1.65)
Hormone-related cancers			
Overall	181 (3.6)	30 (0.6)	0.16 (0.11, 0.24)
Men	18 (1.8)	4 (0.4)	0.22 (0.07, 1.65)
Women	163 (4.1)	26 (0.7)	0.15 (0.10, 0.23)
Colorectal cancer			
Overall	8 (0.2)	21 (0.4)	2.63 (1.17, 5.95)
Men	3 (0.3)	6 (0.6)	2.01 (0.50, 8.04)
Women	5 (0.1)	15 (0.4)	3.01 (1.09, 8.28)
Oesophageal cancer			
Overall	7 (0.1)	2 (0.0)	0.29 (0.06, 1.38)
Men	4 (0.4)	2 (0.2)	0.50 (0.09, 2.73)
Women	3 (0.1)	0 (0)	7.01 (0.36, 135.67)



# Risk of colorectal cancer after MBS

Rectal epithelial cell mitosis and expression of macrophage migration inhibitory factor are increased 3 years after Roux-en-Y gastric bypass (RYGB) for morbid obesity: implications for long-term neoplastic risk following RYGB

Six months after RYGB

- ↑rectal mucosal crypt size
- ↑ epithelial cell mitosis
- ↑ increased mucosal proinflammatory gene expression (including cyclooxygenase-2 (COX-2))
- ↑ macrophage migration inhibitory factor (MIF)).

**Hyperproliferation of rectal mucosal cells after gastric bypass (6mths-3 yrs)  
→ ↑ risk of colorectal cancer**

# Risk of colorectal cancer after MBS

Colon and rectal cancer risk after bariatric surgery in a multicountry Nordic cohort study

Population-based cohort study

5 Nordic Countries

Denmark, Finland, Iceland, Norway or Sweden

Obese adults 1980–2015

n= 502,772

MBS = 49,931(9.9%) → 72% RYGB

MBS → ↑ overall SIR of colon cancer (SIR 1.56; 95% CI 1.28–1.88), with higher SIRs ≥10 years postMBS



# Risk of colorectal cancer after MBS

Colon and rectal cancer risk after bariatric surgery in a multicountry Nordic cohort study

Cancer site	HR (95% CI)	Crude incidence rate per 100,000 person-years (95% CI)	
		Bariatric surgery	No bariatric surgery
Colon, follow-up (years)			
Total	1.13 (0.92–1.39) <sup>1</sup>	36.0 (29.9–43.5)	75.0 (71.9–78.1)
0–4	1.01 (0.68–1.50) <sup>2</sup>	20.6 (14.1–30.3)	63.9 (59.8–68.3)
5–9	0.92 (0.56–1.52) <sup>2</sup>	20.8 (12.8–34.0)	72.7 (67.5–78.4)
10–14	1.55 (1.04–2.31) <sup>2</sup>	56.9 (39.0–83.0)	94.2 (85.4–103.9)
15–19	1.34 (0.5–3.6) <sup>2</sup>	30.1 (16.7–53.5)	70.7 (63.5–78.4)
20+	0.93 (0.4–2.1) <sup>2</sup>	26.9 (15.1–47.7)	67.5 (60.1–75.4)
Rectum, follow-up (years)			
Total	1.08 (0.7–1.67) <sup>2</sup>	30.6 (23.1–40.1)	30.6 (21.4–43.8)
0–4	1.04 (0.5–2.1) <sup>2</sup>	16.7 (9.7–28.1)	16.7 (9.7–28.1)
5–9	0.55 (0.2–1.4) <sup>2</sup>	16.7 (9.7–28.1)	16.7 (9.7–28.1)
10–14	1.18 (0.5–2.6) <sup>2</sup>	16.7 (9.7–28.1)	16.7 (9.7–28.1)
15–19	1.06 (0.4–2.8) <sup>2</sup>	16.7 (9.7–28.1)	16.7 (9.7–28.1)
20+	2.11 (1.03–4.32) <sup>2</sup>	49.1 (26.4–91.2)	30.6 (21.4–43.8)

MBS is associated → ↑ risk of colon cancer compared to the general population.

While no statistically significant result of such increase was found for rectal cancer, the risk estimates seemed to increase with longer follow-up.

# Risk of GI Cancer after MBS

## Summary

Obesity increases the risk of at least 13 cancers  
Overall MBS/weight loss → ↓cancer risks

BUT MBS → ↑ esophageal Cancer after SG  
MBS → ↑ colorectal cancer after RYGB

Future RCTs on MBS will be critical  
to inform future cancer prevention and control policies



# Risk of GI Cancer after MBS

thankyou

