Centre Hospitalier Universitaire de Nice
UNIVERSITÉ CÔTE D'AZUR

CERON PACA Centre d'Étude et de Recherche sur l'Obésité et la Nutrition en PACA

CSO PACA CENTRE SPÉCIALISÉ DE L'OBÉSITÉ

Programme

Journée annuelle de l'Obésité – Vendredi 26 Novembre 2021

Amphithéâtre de pédiatrie HE1
Hôpital La Timone - AP-HM

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Obesity Surgery & Covid-19

Disclosures

No conflict of interest

Agenda

Preamble

- **Covid 19, ACE2 and fat**

BS and Covid 19

- **The epidemiological evidence**
- **The role of fat**

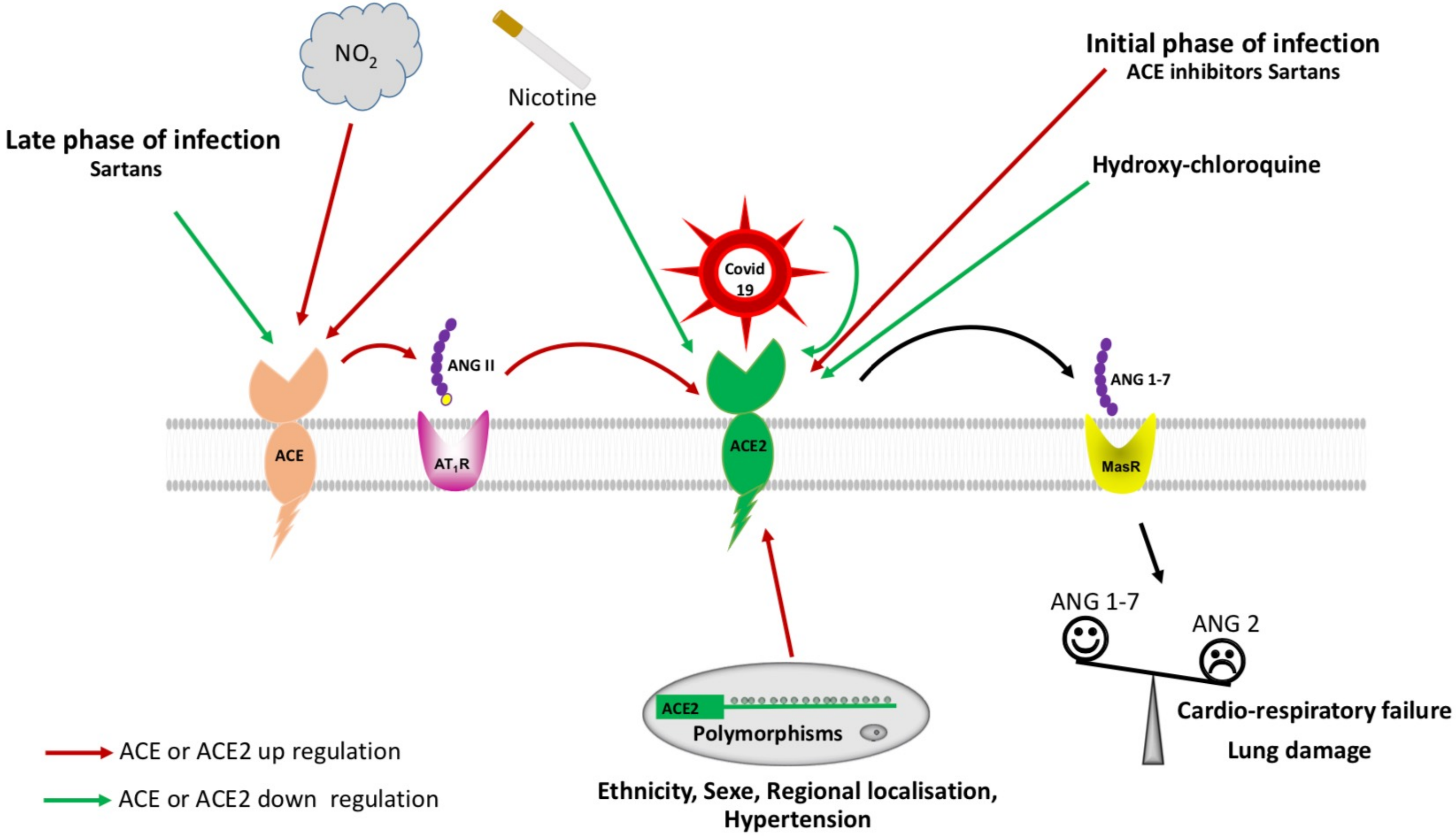
Behavioral food addiction and lock-down

When and how to resume BS

Surgical smoke and Covid-19

Conclusions

Obesity and the ACE2 receptor



Alifano et al Biochimie 2020

Obesity and Covid-19

Mechanical hypotheses

Decreased expiratory reserve volume

Decreased functional capacity

Lower total respiratory system compliance

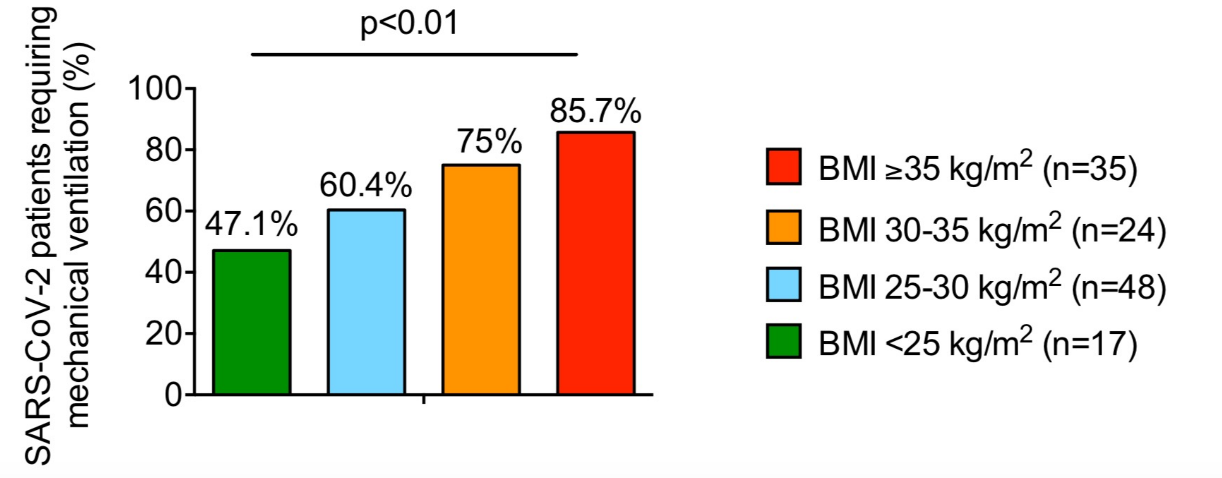
Inflammation

Pro-inflammatory cytokines from adipose tissue on lung

Obesity related comorbidities

T2D

HT



Age ≥ 60 years	N (%)	Admission to acute (vs discharge from ED)	P-value	N (%)	ICU Admission (vs discharge from ED)	P-value
BMI 30-34	141 (19%)	0.9 (95% CI 0.6-1.2)	0.39	57 (22%)	1.1 (95% CI 0.8-1.7)	0.57
BMI ≥ 35	99 (14%)	0.9 (95% CI 0.6-1.3)	0.59	50 (19%)	1.5 (95% CI 0.9-2.3)	0.10
Age < 60 years						
BMI 30-34	173 (29%)	2.0 (95% 1.6-2.6)	<.0001	39 (23%)	1.8 (95% CI 1.2-2.7)	0.006
BMI ≥ 35	134 (22%)	2.2 (95% CI 1.7-2.9)	<.0001	56 (33%)	3.6 (95% CI 2.5-5.3)	<.0001

Simonnet et al Obes Silver Spring 2020; Lighter et al Clin Infect Dis Off Publ Infect Dis Soc Am 2020

The role of fat

Obesity Surgery
https://doi.org/10.1007/s11695-020-04734-7

LETTER TO THE EDITOR

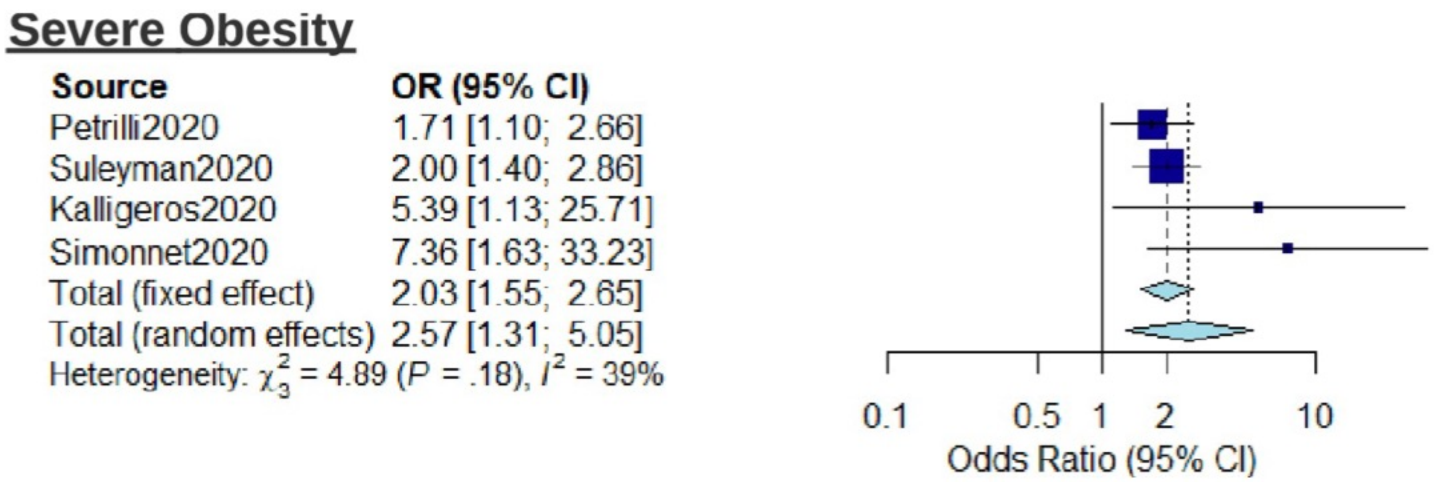
Check for updates

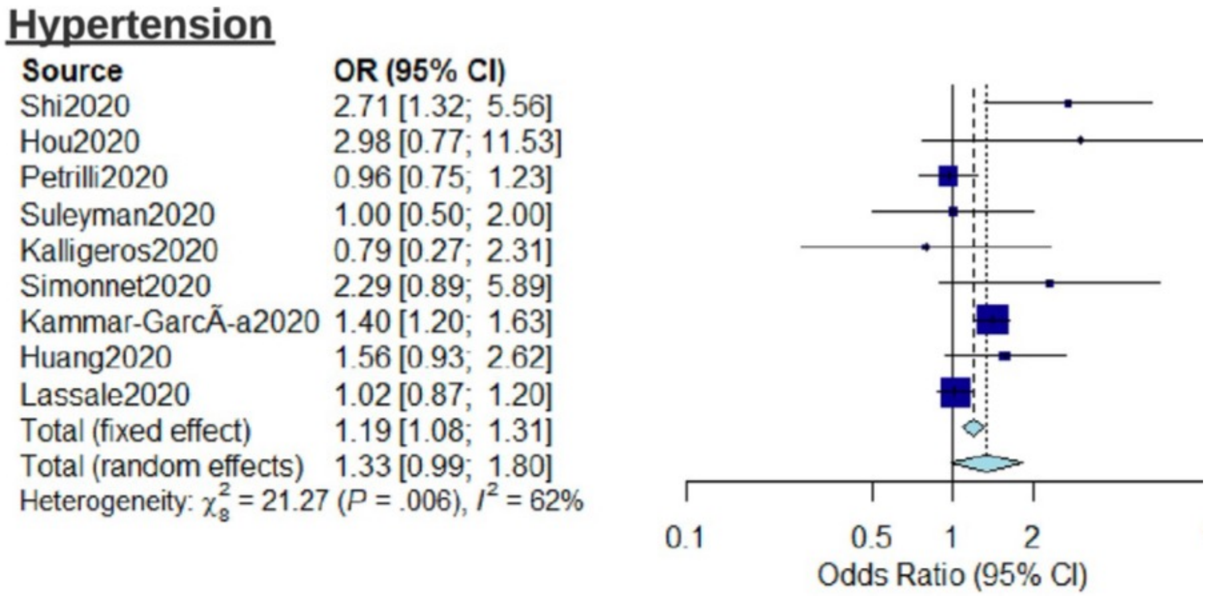
Obesity and COVID-19: ACE 2, the Missing Tile

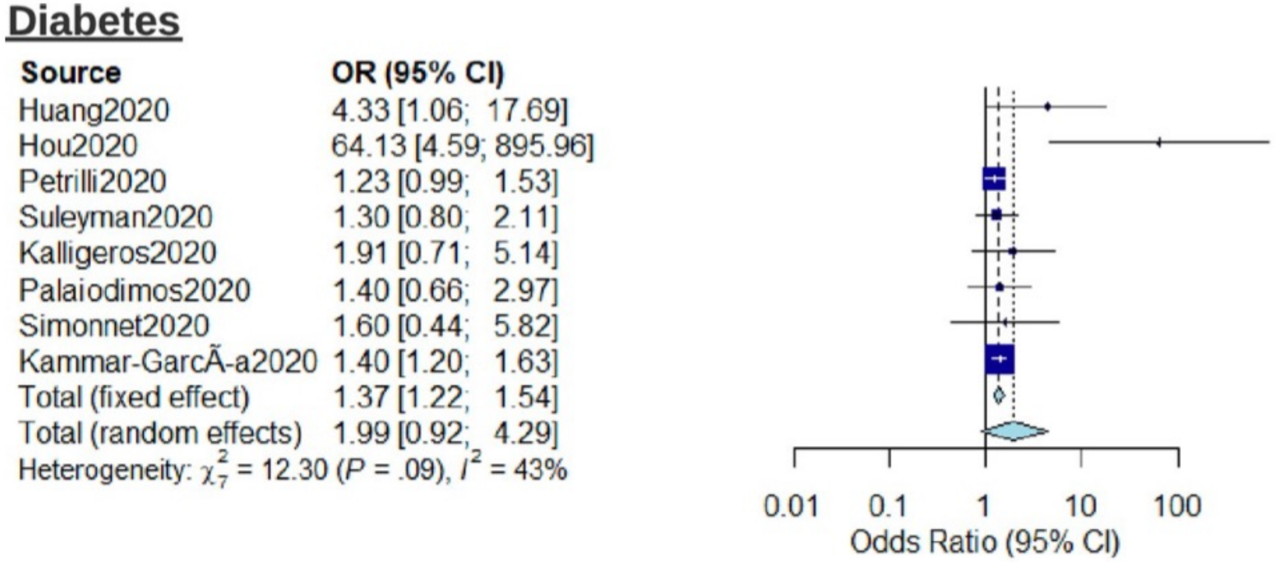
Antonio Iannelli[1,2,3,4] · Guillaume Favre[1,5,6] · Sébastien Frey[1,2] · Vincent Esnault[1,5] · Jean Gugenheim[1,2,3] · Samir Bouam[7] · Luigi Schiavo[8] · Albert Tran[1,3,9] · Marco Alifano[10,11]

Iannelli et al Obes Surg 2020

Obesity is a risk factor for Covid-19 severe outcome







Booth et al Plos One 2021

Agenda

Preamble

- **Covid 19, ACE2 and fat**

BS and Covid 19

- **The epidemiological evidence**
- **The role of fat**

The epidemiological evidence

The Impact of Previous History of Bariatric Surgery on Outcome of COVID-19. A Nationwide Medico-Administrative French Study

Antonio Iannelli[1,2,3,4] • Samir Bouam[5] • Anne-Sophie Schneck[6] • Sébastien Frey[1,2] • Kevin Zarca[7,8] • Jean Gugenheim[1,2,3] • Marco Alifano[9,10]

Abstract

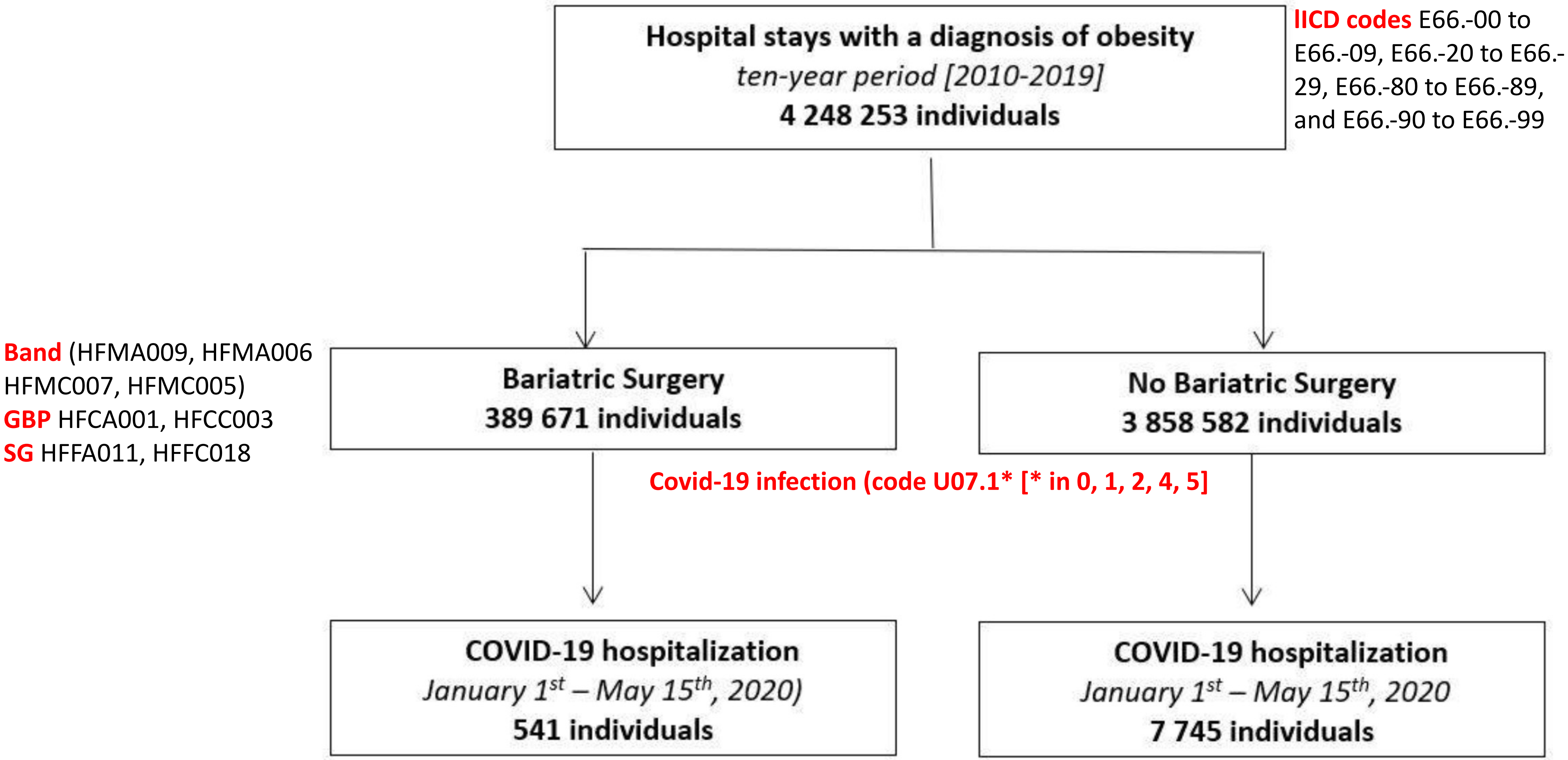
Purpose To determine the risk of invasive mechanical ventilation and death in obese individuals with a history of bariatric surgery (BS) admitted for COVID-19.

Methods All obese inpatients recorded during a hospital stay by the French National Health Insurance were included, and their electronic health data were reviewed retrospectively. Patients who had undergone bariatric surgery comprised the BS group and patients with obesity but no history of BS served as controls. The primary outcome was COVID-19-related death and the secondary outcome was the need for invasive mechanical ventilation.

Results 4,248,253 obese individuals aged 15–75 years were included and followed for a mean observation time of 5.43 ± 2.93 years. 8286 individuals with a previous diagnosis of obesity were admitted for COVID-19 between January 1 and May 15, 2020. Of these patients, 541 had a history of BS and 7745 did not. The need for invasive mechanical ventilation and death occurred in 7% and 3.5% of the BS group versus 15% and 14.2% of the control group, respectively. In logistic regression, the risk of invasive mechanical ventilation was independently associated with increasing age, male sex, and hypertension, and mortality was independently associated with increasing age, male sex, history of heart failure, cancer, and diabetes, whereas BS had an independent protective effect. Two random exact matching tests confirmed the protective effect of BS.

Conclusion This nationwide study showed that BS is independently associated with a reduced risk of death and invasive mechanical ventilation in obese individuals with COVID-19.

Study Flow Chart



Follow-up 5.22 (±2.45) years

Follow-up 5.43 (±2.93) years

78 995 additional individuals (0.12% of the French population), with no history of previous hospitalization for obesity

The epidemiological evidence

Table 1 Univariate analysis of baseline risk factors distribution in COVID-19 obese patients in BS and NBS cohorts

Characteristic	No. (%) of patients			
	Study population $n = 8286$	Bariatric surgery $n = 541$	No bariatric surgery $n = 7745$	p value
Age, mean (SD), year	59.1 (12.6)	49.8 (12.0)	59.8 (12.4)	< 0.0001
34–45	251 (3)	33 (6.1)	218 (2.8)	< 0.0001
15–30	1057 (12.8)	158 (29.2)	899 (11.6)	< 0.0001
46–60	2470 (29.8)	239 (44.2)	2231 (28.8)	< 0.0001
60–75	4508 (54.4)	111 (20.5)	4397 (56.8)	< 0.0001
Sex, M	4296 (51.8)	127 (23.5)	4169 (53.8)	< 0.0001
Sex, F	3990 (48.2)	414 (76.5)	3576 (46.2)	
BMI ($n = 7208$)				< 0.0001
30–39.9	5669 (78.6)	226 (41.8)	5443 (81.6)	
40–50	1323 (18.3)	274 (50.6)	1049 (15.7)	
> 50	216 (3.1)	41 (7.6)	175 (2.7)	
CCI	3.15 (2.58)	1.451 (1.83)	3.26 (2.58)	< 0.0001
COPD, yes	583 (7)	16 (3)	567 (7.3)	< 0.0001
COPD, no	7703 (93)	525 (97)	7178 (92.7)	
Cardiac failure, yes	569 (6.9)	18 (3.3)	551 (7.1)	0.0008
Cardiac failure, no	7717 (93.1)	523 (96.7)	7194 (92.9)	
Cancer, yes	608 (7.3)	11 (2)	597 (7.7)	< 0.0001
Cancer, no	7678 (92.7)	530 (98)	7148 (92.3)	
Diabetes, yes	2917 (35.2)	66 (12.2)	2851 (36.8)	< 0.0001
Diabetes, no	5369 (64.8)	475 (87.8)	4894 (63.2)	
Hypertension, yes	3331 (40.2)	109 (20.2)	3222 (41.6)	< 0.0001
Hypertension, no	4955 (59.8)	432 (78.9)	4523 (58.4)	
Invasive mechanical ventilation, yes	1196 (14.4)	38 (7)	1158 (15)	< 0.0001
Invasive mechanical ventilation, no	7090 (85.6)	503 (93)	6587 (85)	
Death, yes	1117 (13.5)	19 (3.5)	1098 (14.2)	< 0.0001
Death, no	7169 (86.5)	522 (96.5)	6647 (85.8)	

CCI, Charlson Comorbidity Index

COPD, chronic obstructive pulmonary disease

Iannelli et al Obes Surg 2021

The epidemiological evidence

Table 2 Univariate analysis of baseline risk factors for invasive mechanical ventilation and death in COVID-19 obese patients

Characteristic	No. (%) of patients					
	Invasive mechanical ventilation $n = 1196$	No invasive mechanical ventilation $n = 7090$	*p* value	Death $n = 1117$	Alive $n = 7169$	*p* value
Age, mean (SD), y	61.8 (9.9)	58.7 (13.0)	< 0.0001	66.6 (7.7)	57.9 (12.8)	< 0.0001
15–30	6 (0.5)	245 (3.5)	< 0.0001	3 (0.3)	248 (3.5)	< 0.0001
31–45	79 (6.6)	978 (13.8)	< 0.0001	19 (1.7)	1038 (14.5)	< 0.0001
46–60	367 (30.7)	2103 (29.7)	.4738	161 (14.4)	2309 (32.2)	< 0.0001
60–75	744 (62.2)	3764 (53.1)	< 0.0001	934 (83.6)	3574 (49.9)	< 0.0001
Sex, M	793 (66.3)	3503 (49.4)	< 0.0001	737 (66)	3559 (49.6)	< 0.0001
Sex, F	403 (33.7)	3587 (50.6)		380 (34)	3610 (50.4)	
BMI ($n = 7208$)			0.092			0.98
30–39.9	842 (80.3)	4827 (78.4)		780 (78.9)	4889 (78.6)	
40–50	186 (17.7)	1137 (18.5)		180 (18.2)	1143 (18.4)	
> 50	21 (2.0)	195 (3.1)		29 (2.9)	187 (3.0)	
CCI	3.66 (2.37)	3.06 (2.6)	< 0.0001	5.13 (2.92)	2.84 (2.38)	< 0.0001
COPD, yes	94 (7.9)	489 (6.9)	.2286	112 (10)	471 (6.6)	< 0.0001
COPD, no	1102 (92.1)	6601 (93.1)		1005 (90)	6698 (93.4)	
Cardiac failure, yes	113 (9.5)	456 (6.4)	.0001	144 (12.9)	425 (5.9)	< 0.0001
Cardiac failure, no	1083 (90.6)	6634 (93.6)		973 (87.1)	6744 (94.1)	
Cancer, yes	73 (6.1)	535 (7.6)	< 0.0001	197 (17.6)	411 (5.7)	< 0.0001
Cancer, no	1123 (93.9)	6555 (92.5)		920 (82.4)	6758 (94.3)	
Diabetes, yes	545 (45.6)	2372 (33.5)	< 0.0001	531 (47.5)	2386 (33.3)	< 0.0001
Diabetes, no	651 (56.3)	4718 (66.5)		586 (52.5)	4783 (66.7)	
Hypertension, yes	718 (60)	2613 (36.9)	< 0.0001	541 (48.4)	2790 (38.9)	< 0.0001
Hypertension, no	478 (40)	4477 (63.2)		576 (51.6)	4379 (61.1)	
Bariatric Surgery, yes	38 (3.2)	503 (7.1)	< 0.0001	19 (1.7)	522 (7.3)	< 0.0001
Bariatric Surgery, no	1158 (96.8)	6587 (92.9)		1098 (98.3)	6647 (92.7)	

COPD, chronic obstructive pulmonary disease

CCI, Charlson Comorbidity Index

Iannelli et al Obes Surg 2021

The epidemiological evidence

Mechanical ventilation

Table 3 Multivariate analysis of baseline risk factors for invasive mechanical ventilation. Model including the whole population

Characteristic	OR	95% CI	*p* value
Age, mean (SD), year			< 0.0001
15–30	Reference		
31–45	1.17	1.06–1.28	
46–60	1.36	1.13–1.64	
60–75	1.59	1.20–2.10	
Sex, M	1.76	1.54–2.00	< 0.0001
Hypertension	2.25	1.97–2.56	< 0.0001
Bariatric surgery	0.67	0.48–0.95	0.025

Table 4 Multivariate analysis of baseline risk factors for invasive mechanical ventilation. Model including the 7208 patients whose baseline BMI class was available

Characteristic	OR	95% CI	*p* Value
Age, mean (SD), year			0.00042
15–30	Reference		
31–45	1.18	1.08–1.30	
46–60	1.40	1.16–1.69	
60–75	1.65	1.25–2.19	
Sex, M	1.77	1.55–2.02	< 0.0001
Hypertension	2.25	1.97–2.56	<.0001
Bariatric surgery	0.67	0.47–0.94	0.020

Iannelli et al Obes Surg 2021

The epidemiological evidence

Mortality

Table 5 Multivariate analysis of baseline risk factors for death. Model including the whole population

Death			
Characteristic	OR	95% CI	*p* value
Age, mean (SD), year			< 0.0001
15–30	Reference		
31–45	3.10	2.69–3.58	
46–60	9.63	7.25–12.79	
60–75	29.87	19.52–45.73	
Sex, M	1.48	1.28–1.69	< 0.0001
Cardiac failure	1.53	1.24–1.89	< 0.0001
Cancer	2.81	2.32–3.41	< 0.0001
Diabetes	1.33	1.16–1.52	< 0.0001
Bariatric surgery	0.50	0.31–0.80	0.0039

Table 6 Multivariate analysis of baseline risk factors for death. Model including the 7208 patients for whom the baseline BMI class was available

Characteristic	OR	95% CI	*p* Value
Age, mean (SD), year			< 0.0001
15–30	Reference		
31–45	3.12	2.70–3.59	
46–60	9.71	7.31–12.90	
60–75	30.25	19.76–46.33	
Sex, M	1.52	1.32–1.75	< 0.0001
Cardiac failure	1.52	1.23–1.87	< 0.0001
Cancer	2.83	2.33–3.42	< 0.0001
Diabetes	1.32	1.15–1.51	< 0.0001
Bariatric surgery	0.44	0.27–0.71	0.00086
BMI			0.0018
30–39.9	Reference		
40–50	1.26	1.09–1.46	
> 50	1.59	1.19–2.12	

Iannelli et al Obes Surg 2021

The epidemiological evidence

Mortality

Table 7 Univariate analysis of invasive mechanical ventilation and death for two random matched BS and NBS groups

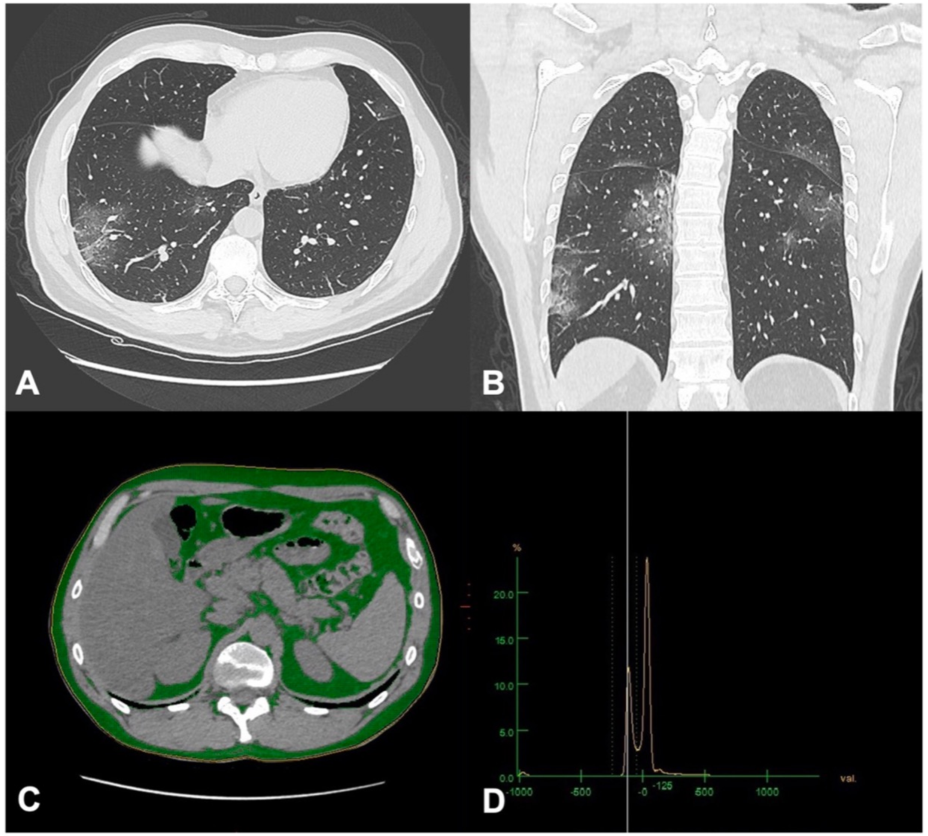
Characteristics	NBS	BS	*N* of patients	*p*		NBS	BS	*N* of patients	*p*
1st random matched group									
Invasive mechanical ventilation, no	207	227	434	< 0.05	Death, no	225	237	462	< 0.05
Invasive mechanical ventilation, yes	36	16	52		Death, yes	18	6	24	
N of patients	243	243	486		*N* of patients	243	243	486	
2nd random matched group									
Invasive mechanical ventilation, no	207	227	434	< 0.05	Death, no	225	237	462	< 0.05
Invasive mechanical ventilation, yes	36	16	52		Death, yes	18	6	24	
N of patients	243	243	486		*N* of patients	243	243	486	

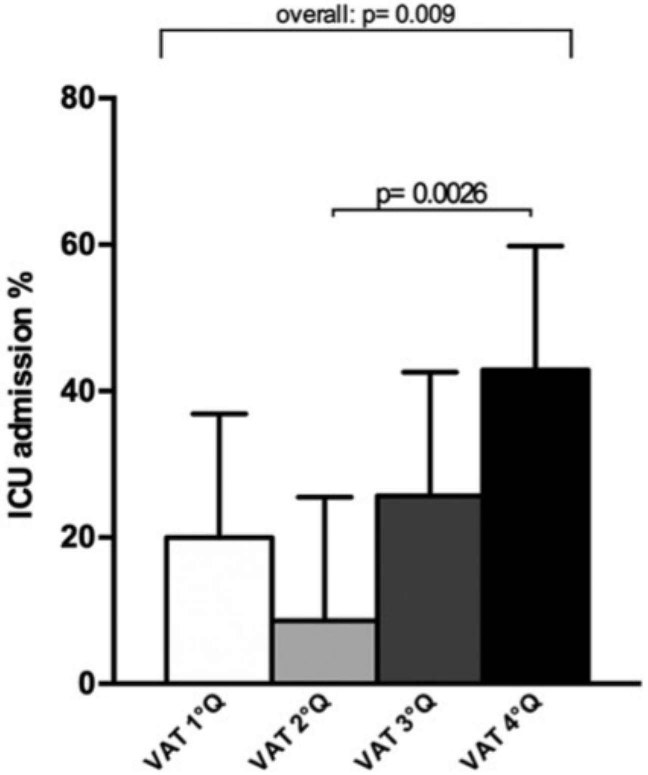
NBS, no bariatric surgery; *BS*, bariatric surgery

Iannelli et al Obes Surg 2021

The role of fat

Visceral Fat shows the Strongest Association with the Need of Intensive Care in Patients with COVID-19





Watanabe et al Metabolism 2020

The role of fat

COVID-19 in Metabolism

Visceral fat is associated to the severity of COVID-19

Guillaume Favre [a,*], Kevin Legueult [b], Christian Pradier [b], Charles Raffaelli [c], Carole Ichai [d], Antonio Iannelli [e], Alban Redheuil [f], Olivier Lucidarme [g], Vincent Esnault [a]

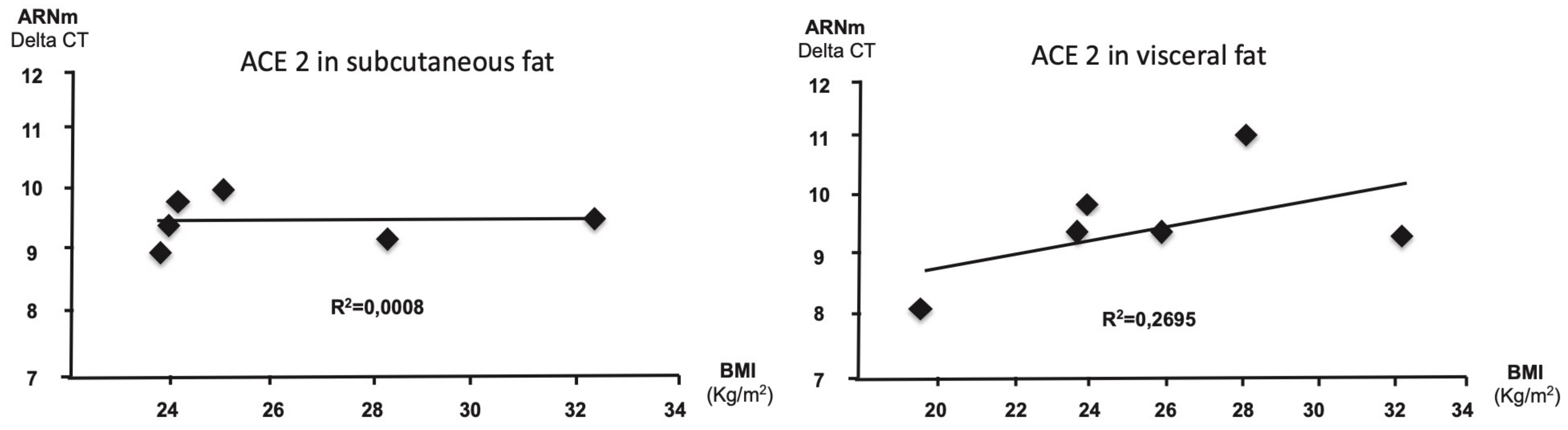


Fig. 1. Exploratory analysis of ACE 2 mRNA expression. This figure shows ACE 2 mRNA expression in fat subcutaneous or visceral fat depots from non-COVID-19 individuals.

Favre et al Metabolism 2021

Roux-en-Y Gastric Bypass Downregulates Angiotensin-Converting Enzyme 2 (ACE2) Gene Expression in Subcutaneous White Adipose Tissue: A Putative Protective Mechanism Against Severe COVID-19

OBES SURG

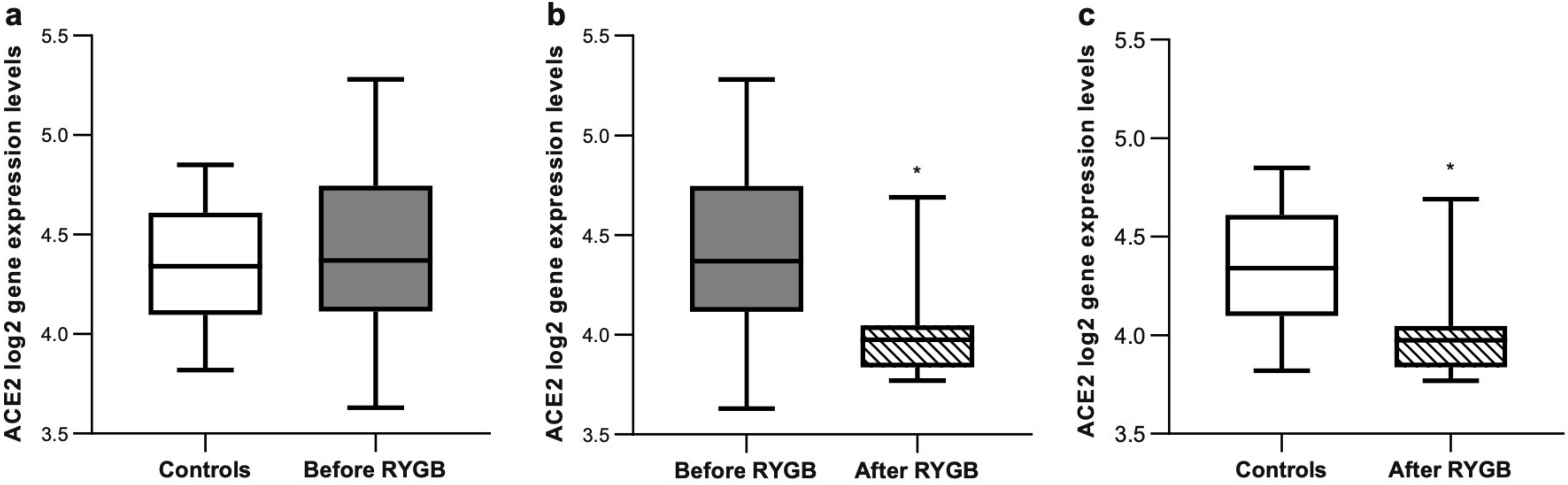


Fig. 1 Angiotensin-converting enzyme 2 (ACE2) log2 gene expression levels in subcutaneous white adipose tissue (sWAT) across groups (boxes represent median and quartiles, whiskers represent min. and max.). **a** log-fold change (logFC)=0.08875, *P*=0.53. **b** logFC=-0.4175, *P*=0.0015. **c** LogFC=-0.32875, *P*=0.0014. **P*<0.05 for LogFC

Kristem et al Obes Surg 2021

Agenda

Preamble

Covid 19, ACE2 and fat

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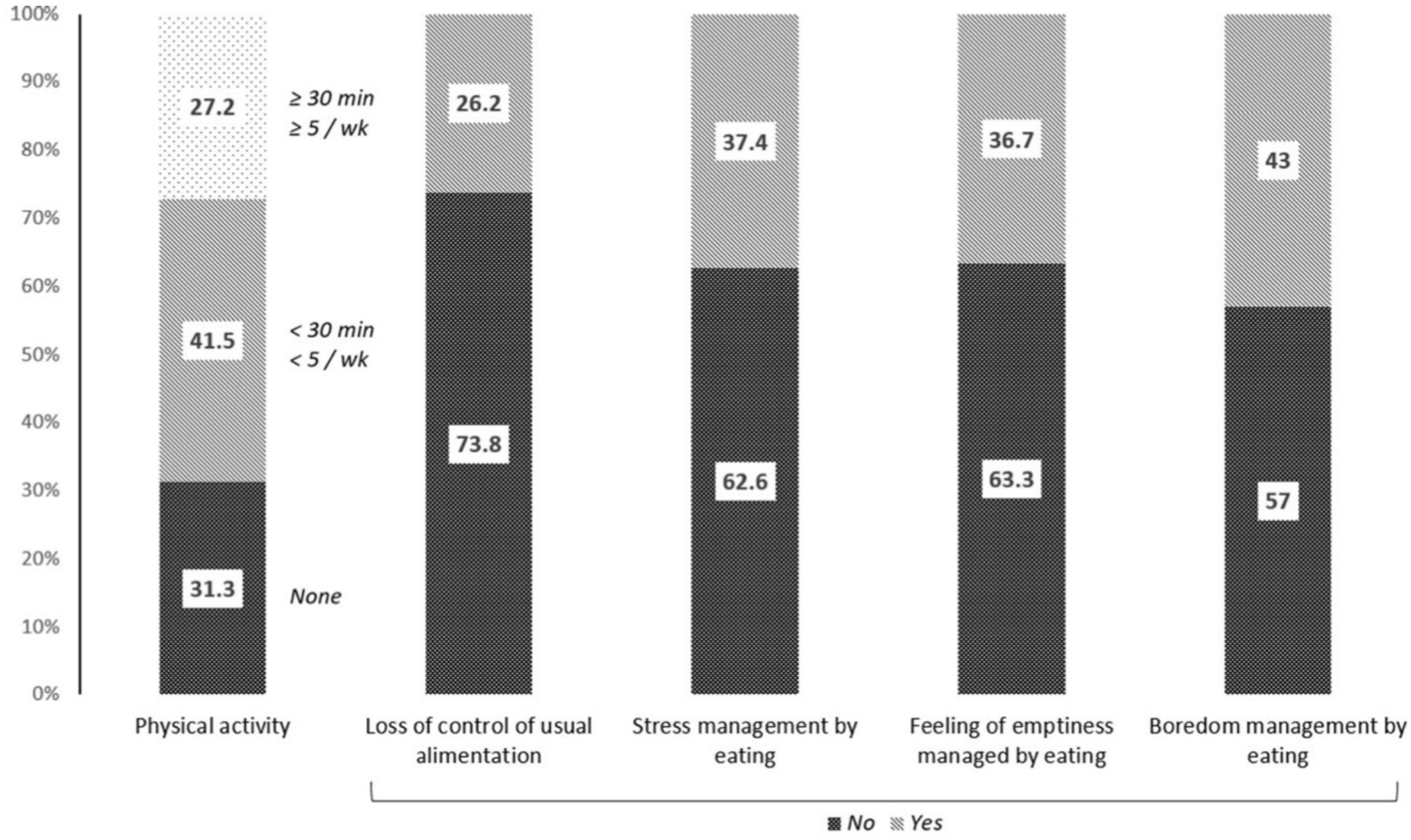
The epidemiological evidence

The role of fat

Behavioral food addiction and lock-down

Behavioural Food Addiction During Lockdown

Fig. 1 Stacked bar chart representing the percentage of answer for each item asked



Cherikh et al Obes Surg 2020

Eating behaviours and weight outcomes

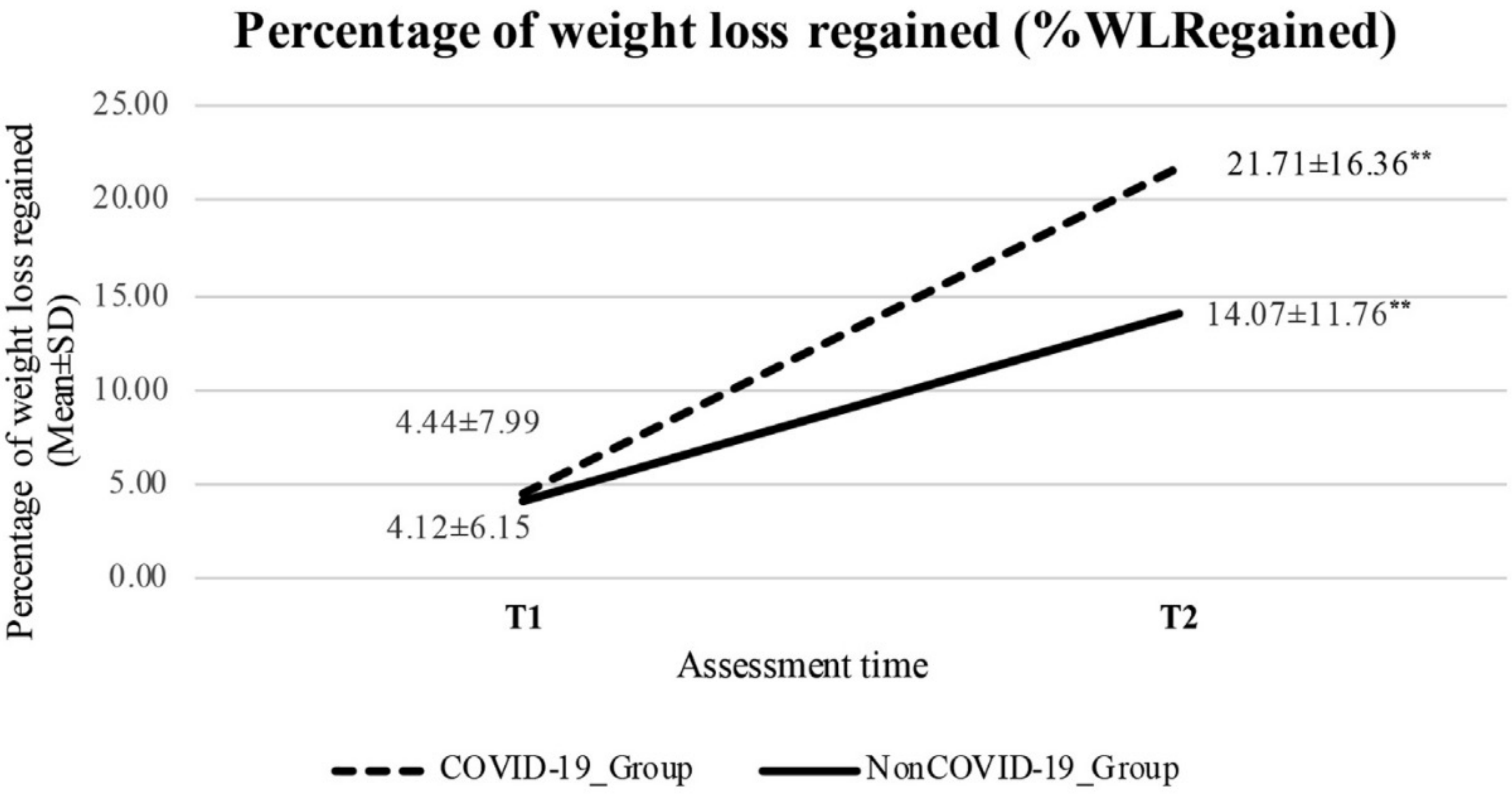


Fig. 2. Weight loss regained (%WLRegained) throughout the different assessment times (T_1 = 1.5 yr after surgery; T_2 = 3 yr after surgery). *$P < .05$; **$P < .01$. Note: for the COVID-19_Group, T_0 and T_1 took place before the pandemic started, and T_2 at the end of the lockdown. The NonCOVID-19_Group completed T_0, T_1 and T_2 assessment before the epidemic began.

Conceiçao et al SOARD 2020

Obesity is a risk factor for Covid-19 severe outcome

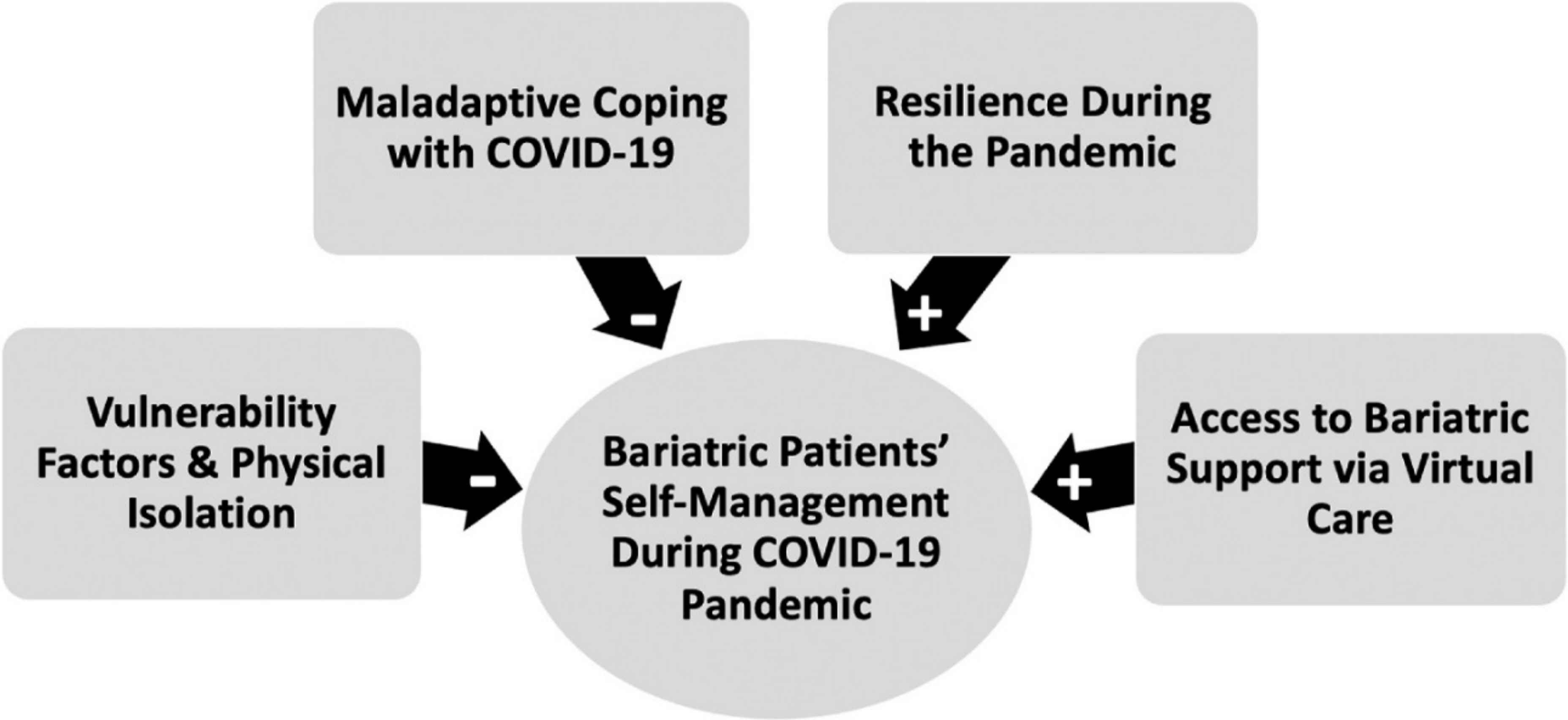


Fig. 1. This diagram illustrates the various factors influencing bariatric patients' self-management during COVID-19.

Yoiussef et al Appetite 2021

When to resume BS

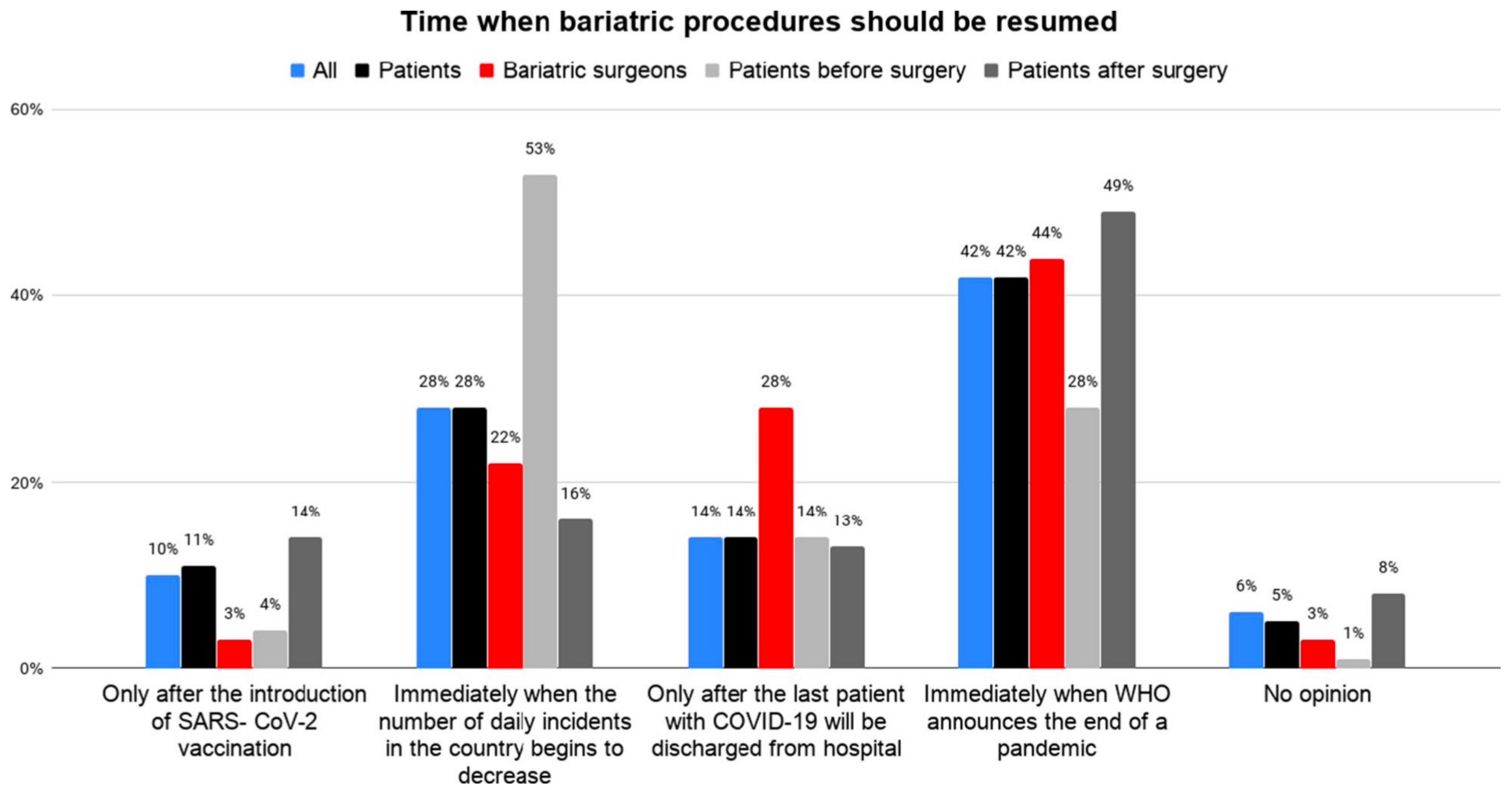


Fig. 2 Time when bariatric procedures should be resumed

Dudek et al. BMC Surg 2021

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Behavioral food addiction and lock-down

When and how to resume BS

How to prioritize access to BS

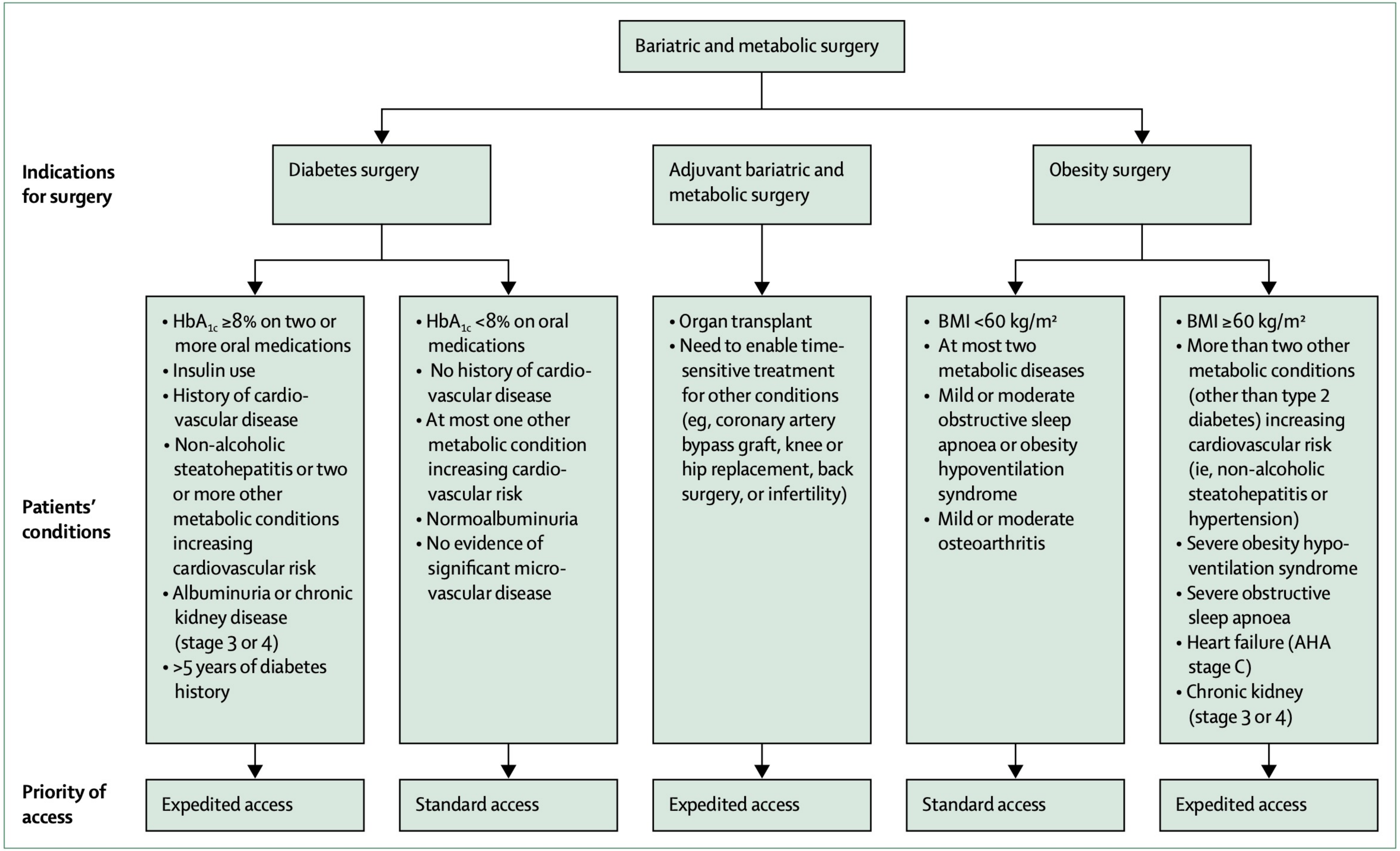


Figure: **Examples of conditions that warrant expedited access to bariatric and metabolic surgery**
AHA=American Heart Association.

Rubino et al Lancet Diabetes Endocrinol 2020

How to prioritize access to BS

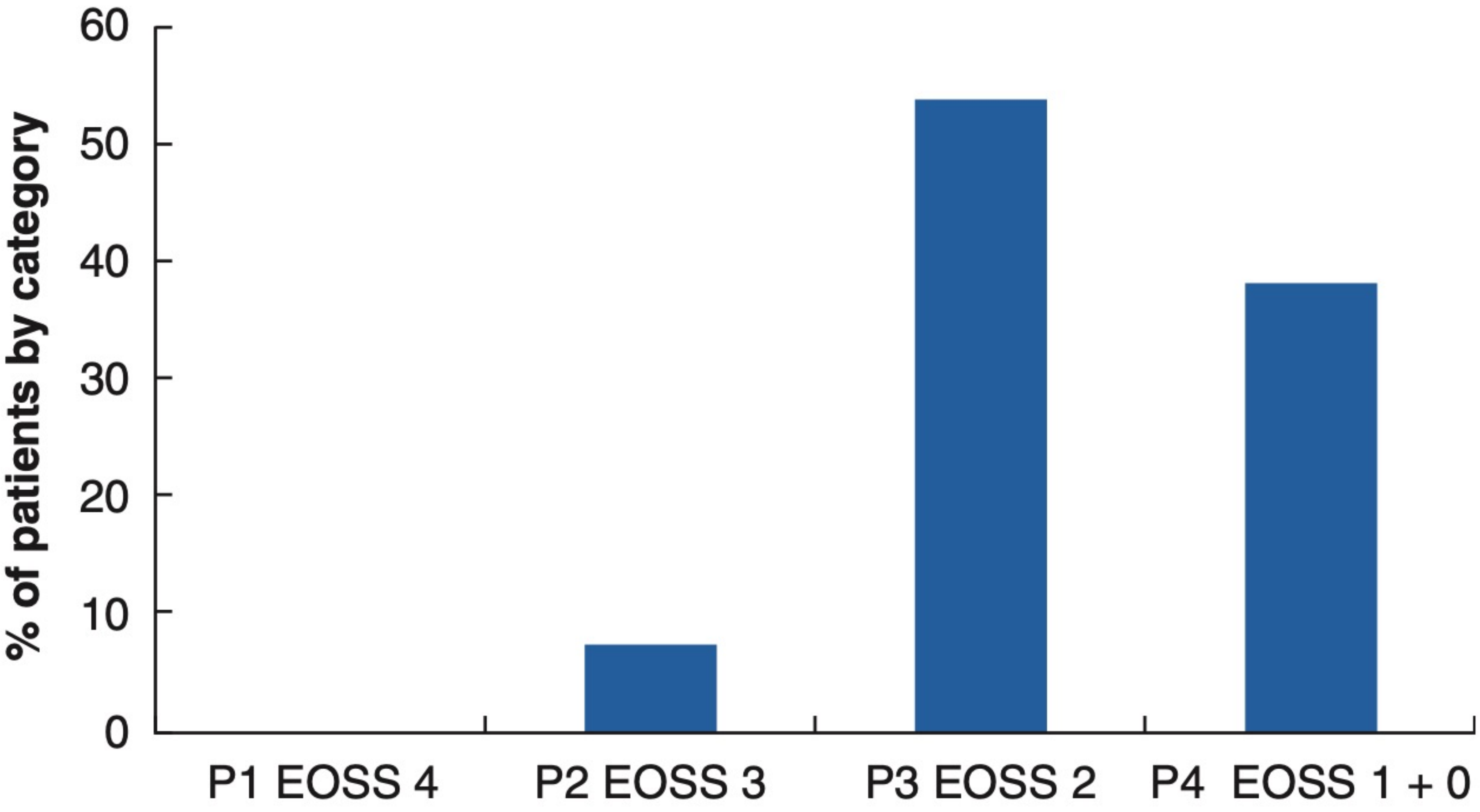


Fig. 1 Proportion of patients in Edmonton Obesity Scoring System categories

Samarasinghe et al Br J Surg 2021

Security Protocol During the COVID-19 Pandemic

Self-quarantined with social distance before

Nasopharyngeal swab/RT-PCR (4-6 days before surgery)

Symptomatic questionnaire at hospital

Serologic tests and further imaging such as chest computed tomography on the basis of clinical history

In case of readmission swab-PCR + chest CT-scan

Balieiro et al Obes Surg 2021

Security Protocol During the COVID-19 Pandemic

17 private hospitals in Rio de Janeiro with "COVID-free" areas

Study period: May 25 to June 31, 2020

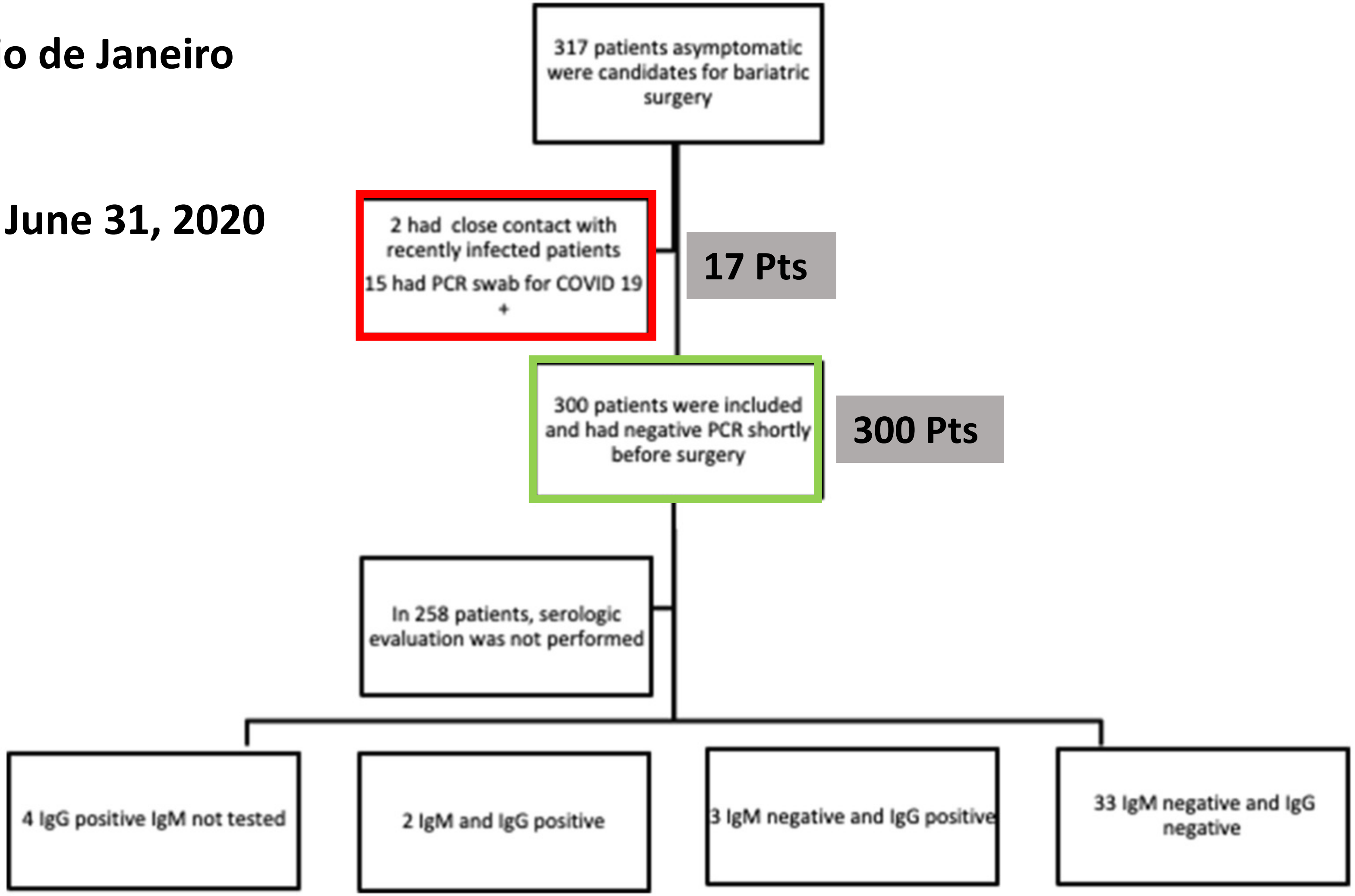
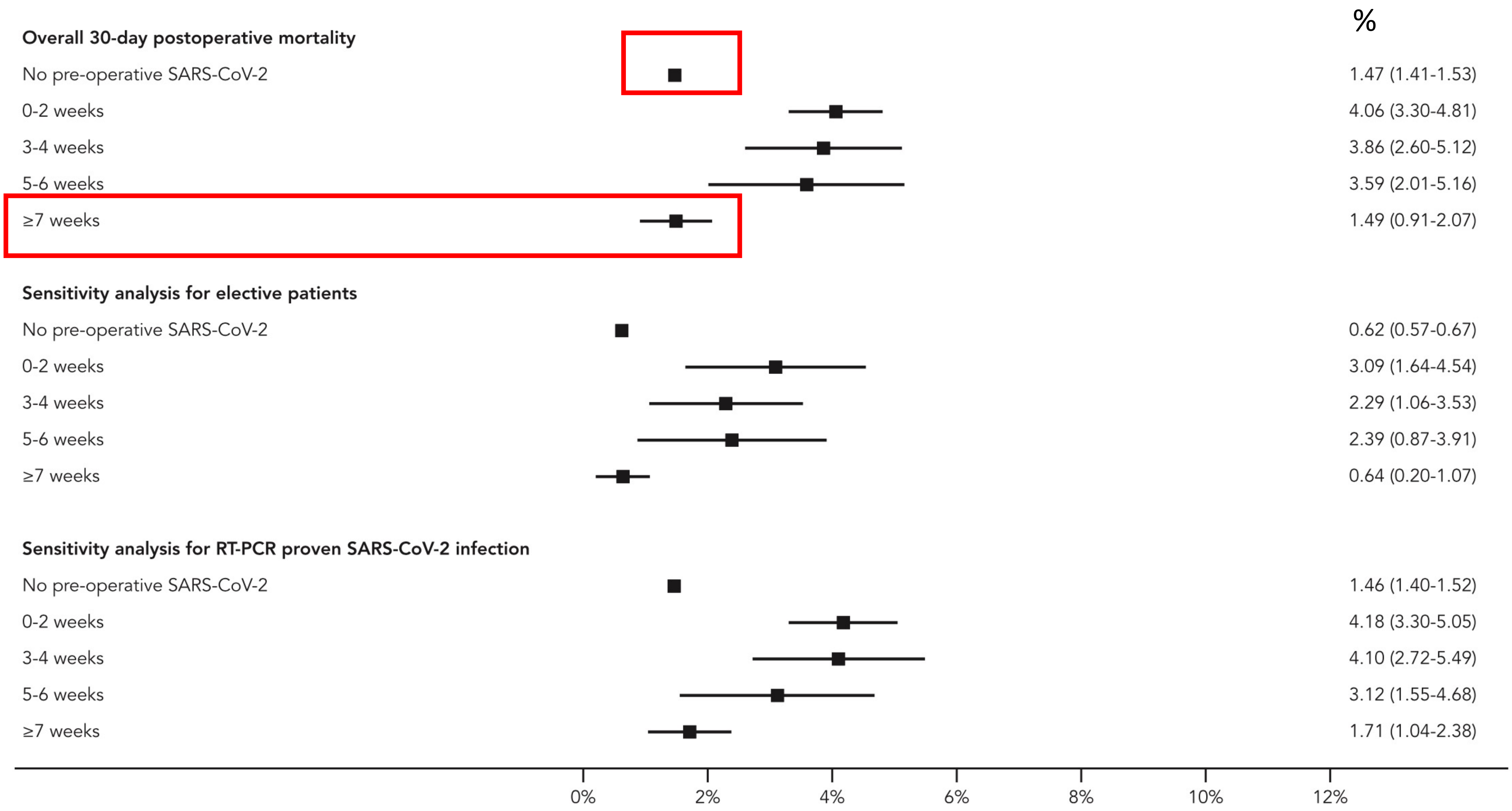


Fig. 1 Diagram of inclusion and testing for COVID-19

Balieiro et al Obes Surg 2021

Timing of surgery following SARS-CoV-2 infection



COVIDSurg Collaborative; GlobalSurg Collaborative. Timing of surgery following SARS-CoV-2 infection: an international prospective cohort study. Anaesthesia. 2021

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Surgical smoke and Covid-19

Smoke and Aerosols

Table 4. Infectivity of Surgical Smoke.[18-24,33,34]

Study	n	Energy Device	Procedure	Results
Kwak et al	11	Undisclosed	Robotic laparoscopic colorectal/ gastric/hepatic resections in HBsAg-positive patients	HBV was detected in 10 of the 11 samples of surgical smoke
Sawchuck et al	8	CO_2 laser and electrocautery	Resection of plantar warts	HPV DNA was present in the vapors derived from both devices
Neumann et al	24	Monopolar energy	Loop electrosurgical excision procedures	Surgical plume was contaminated with high-risk HPV
Capizzi et al	13	CO_2 laser	CO_2 laser resurfacing	5 cultures resulted in growth of coagulase-negative *Staphylococcus*, one also had growth of *Corynebacterium*, and one had growth of *Neisseria*
Weyandt et al	10	CO_2 laser	Treatment of plantar warts	HPV DNA type 6 was found in 3 of the 10 plume strainers
Garden et al	3 calves	CO_2 laser	In vitro/in vivo	Laser plume contained papillomavirus DNA. Verrucous tumors developed at the sites of inoculation
Ziegler et al		YAG laser	In vitro	Laser vapors can contain infectious viruses, viral genes, or viable cells
Johnson et al		Electrocautery	In vitro	No infectious HIV-1 was detected in electrocautery aerosols HIV-1 can remain viable in cool aerosols generated by certain surgical power tools
Baggish et al		CO_2 laser	In vitro	HIV proviral 1 DNA is present in laser smoke. The culture experiment showed that HIV p24 protein was detected for at least 14 days in one case

Pasquier et al Surg Innov 2021

Smoke and Aerosols

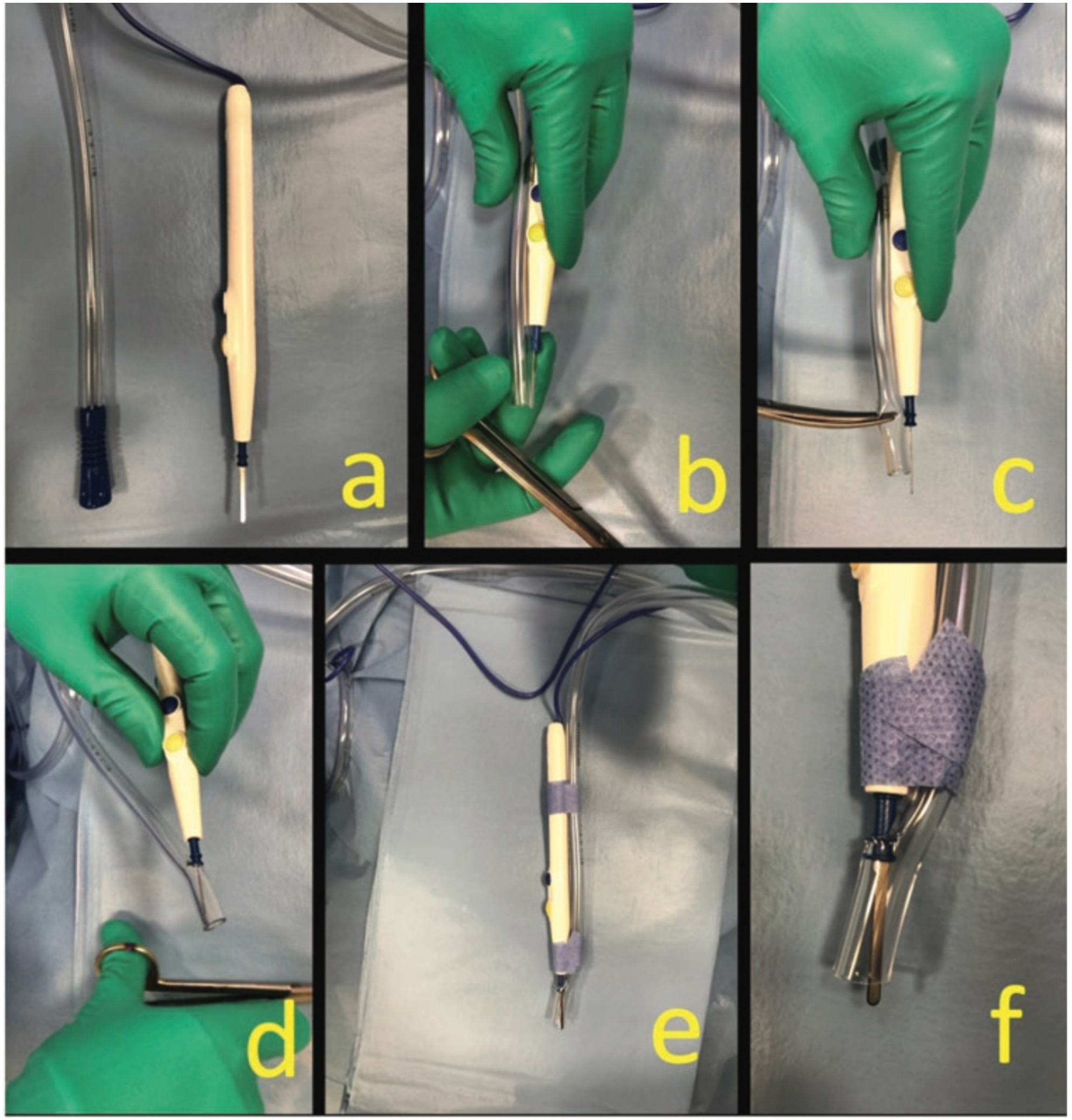
Table 6. Commercially Available Smoke Evacuation Systems.[44]

Company	CONMED	Stryker	Olympus	Medtronic	Ethicon	Cooper	Northgate Technologies	KARL STORZ
Product name	AirSeal Buffalo filter smoke	PneumoClear Neptune Pureview	UHI-4	ValleyLab	Megadyne MegaVac plus	SeeClear	Nebulae	S-PILOT
Open	*	*		*	*			
Laparoscopic	*	*	*	*	*	*	*	*
ULPA	*	*		*	*	*	*	*
Micron filtration	.01	.051-0.1	NA	.1-0.2	0.1	0.1	.12	.027

*Reproduced from a document published by the Society of Gastrointestinal and Endoscopic Surgeons in conjunction with their guidelines for surgeons concerning the use of laparoscopy during the current COVID-19 pandemic.

Pasquier et al Surg Innov 2021

Smoke and Aerosols



Ekci et al Journal of International Medical Research 2020

Conclusions

Obesity is a major role for severe Covid 19 outcomes

BS remains has a strong protective effect against Covid 19 severe outcomes

Care givers should support patients with a history of BS through the lock-down to avoid addictive behaviors

BS should be resumed with security protocols and priority algorithms

Care givers should be offered adequate protection tools in this setting

Thanks for your attention

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