COVID-19 and Diabetes

May 13, 2020

For Today

- Why does it seem so hard to get a straight story when it comes to COVID-19?
- Diabetes as a risk factor for COVID-19
- Obesity as a risk factor for COVID-19
- Glycemic control and COVID-19 outcomes
- What is the story with ACEI/ARBS

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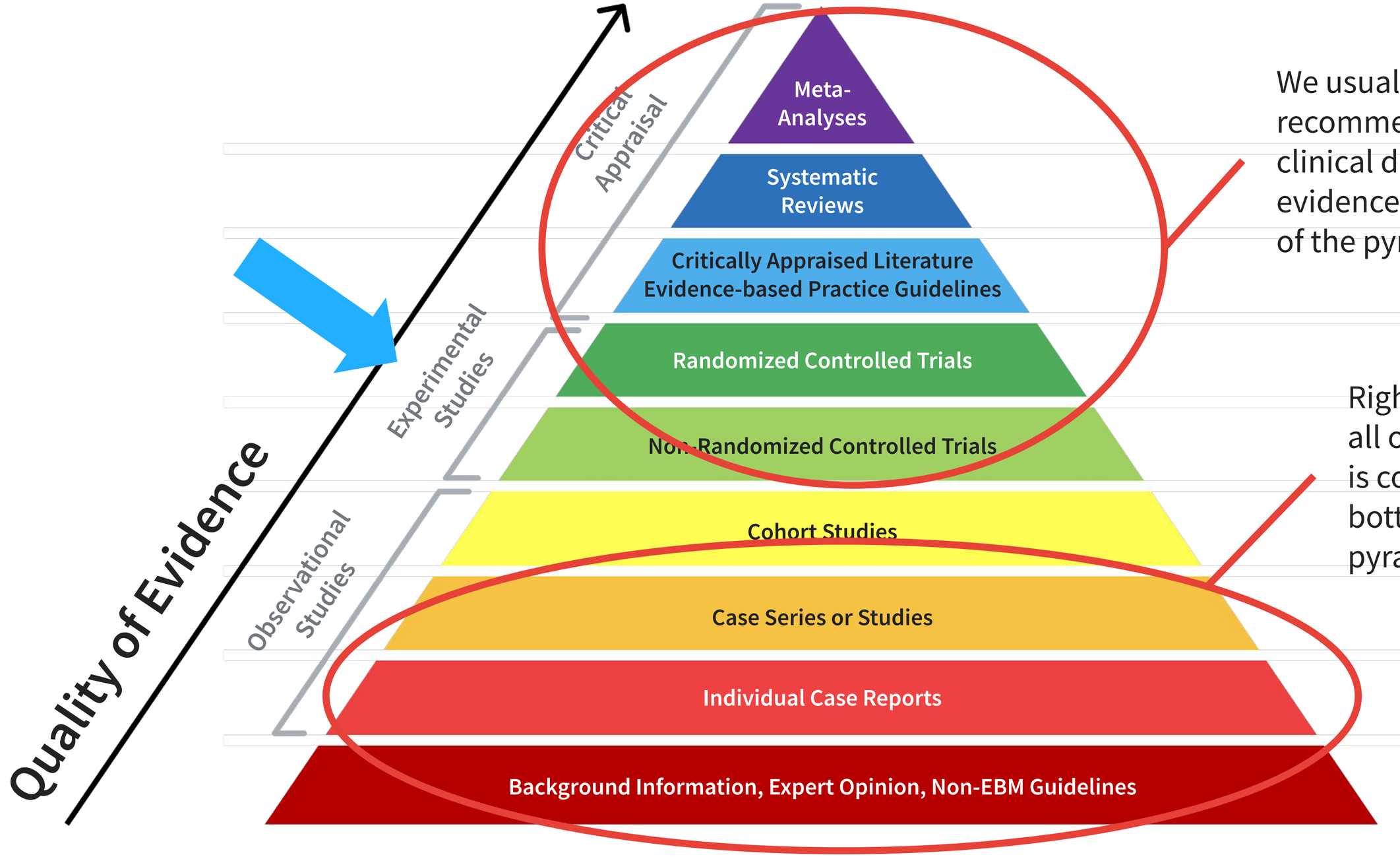

We usually make recommendations and clinical decisions using evidence from the top of the pyramid

Right now almost all our information is coming from the bottom of the pyramid

virta

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Prevalence of comorbidities and its effects in patients infected with SARS-CoV-2: a systematic review and meta-analysis

- Studies published from January 1, 2019 to February 25, 2020—all from China
- Diabetes was the 2nd most common comorbidity
- 7 studies met inclusion and exclusion criteria which included 1,576 patients
- Diabetes rates were 9.7%
  (overall Chinese rates 10.7%)

International Journal of Infectious Diseases,Volume 94,2020,Pages 91-95,ISSN 1201-9712,https://doi.org/10.1016/j.ijid.2020.03.017.

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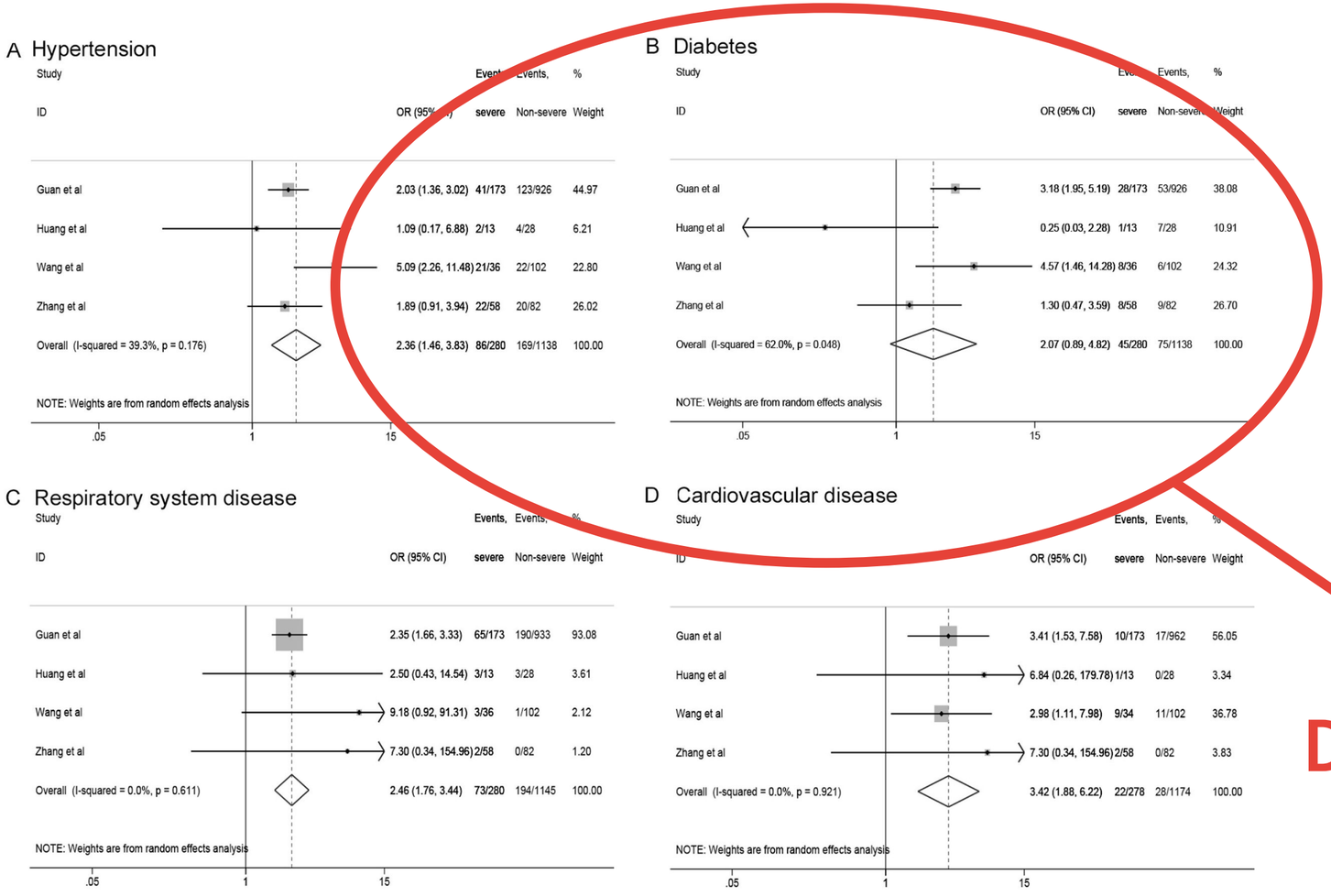


Diabetes

International Journal of Infectious Diseases,Volume 94,2020,Pages 91-95,ISSN 1201-9712,https://doi.org/10.1016/j.ijid.2020.03.017.

Factors associated with hospitalization and critical illness among 4,103 patients with COVID-19 disease in New York City

NYU Langone Health: March 1—April 2 with follow up completed on April 7

Total COVID-19 + population ****Preprint****
(7,719 tested)

- Median age 52
- 50.5% male
- Diabetes—15%
  (NYC total diabetes rates about 15%)
- Obesity—26.8%
  (NYC total obesity rates 22%)

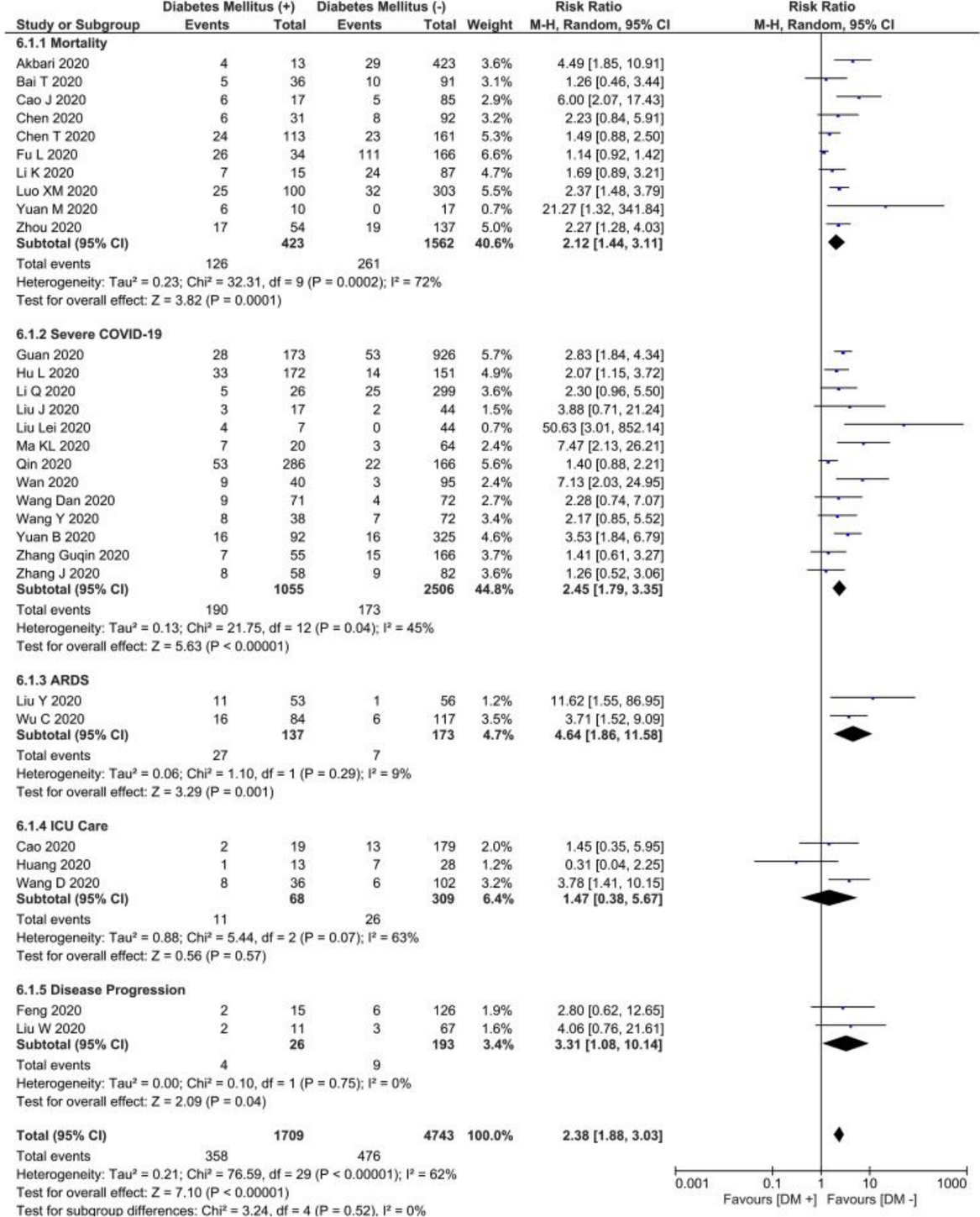
Total COVID-19 hospitalized population
(48.7% of total)

- Median age 62
- 62.6% male
- Diabetes—31.8%
- Obesity—39.8%

medRxiv preprint doi: https://doi.org/10.1101/2020.04.08.20057794

Diabetes mellitus is associated with increased mortality and severity of disease in COVID-19 pneumonia: a systematic review, meta-analysis, and meta-regression

- 6452 patients from 30 studies
- Aim of study is to investigate the association of diabetes with poor outcomes in patients with COVID-19 pneumonia



Diabetes & Metabolic Syndrome: Clinical Research & Reviews,Volume 14, Issue 4,2020,Pages 395-403,ISSN 1871-4021,https://doi.org/10.1016/j.dsx.2020.04.018.

Diabetes mellitus is associated with increased mortality and severity of disease in COVID-19 pneumonia: a systematic review, meta-analysis, and meta-regression

Figure 3. Bubble-plot for Meta-regression. Meta-regression analysis showed that the association between diabetes mellitus and composite poor outcome was affected by age [A] and hypertension [B], but not by cardiovascular diseases [C].

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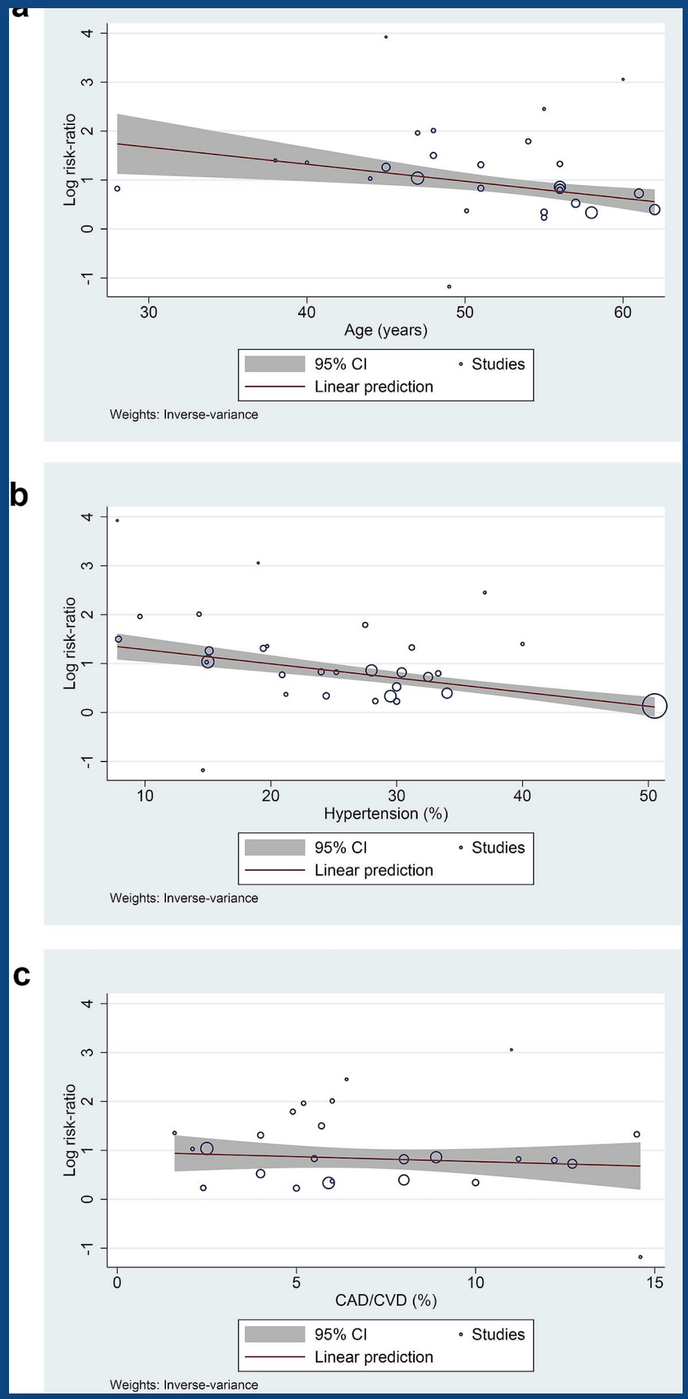

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High prevalence of obesity in severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) requiring invasive mechanical ventilation

- Single center retrospective cohort study
- Lille, France
- Feb 27–April 5th
- All patients admitted to ICU for COVID-19 were examined
- Primary outcome was need for mechanical ventilation
- 124 patients were admitted to ICU during specified time period
- At time of analysis 48% had been discharged, 15% died and **__the rest remained hospitalized__
- Comparing COVID-19 patients to controls:
- Median BMI 29.6 to 24—significant
- Age and gender were not significantly different

Simonnet, A., Chetboun, M., Poissy, J., Raverdy, V., Noulette, J., Duhamel, A., Labreuche, J., Mathieu, D., Pattou, F., Jourdain, M. and (2020), High prevalence of obesity in severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) requiring invasive mechanical ventilation. Obesity. Accepted Author Manuscript. doi:10.1002/oby.22831

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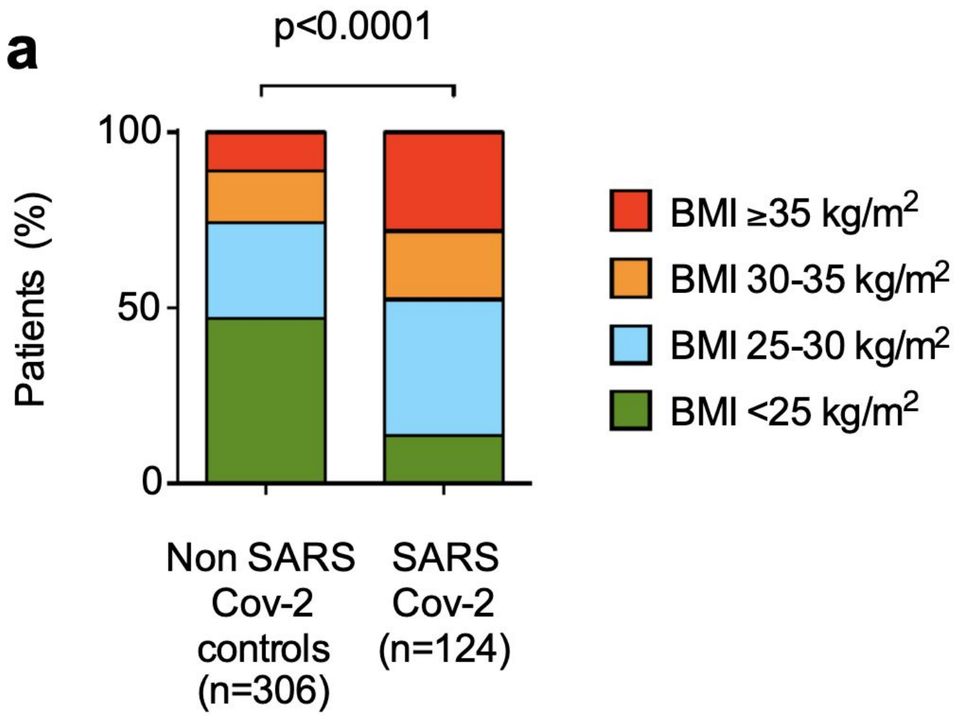

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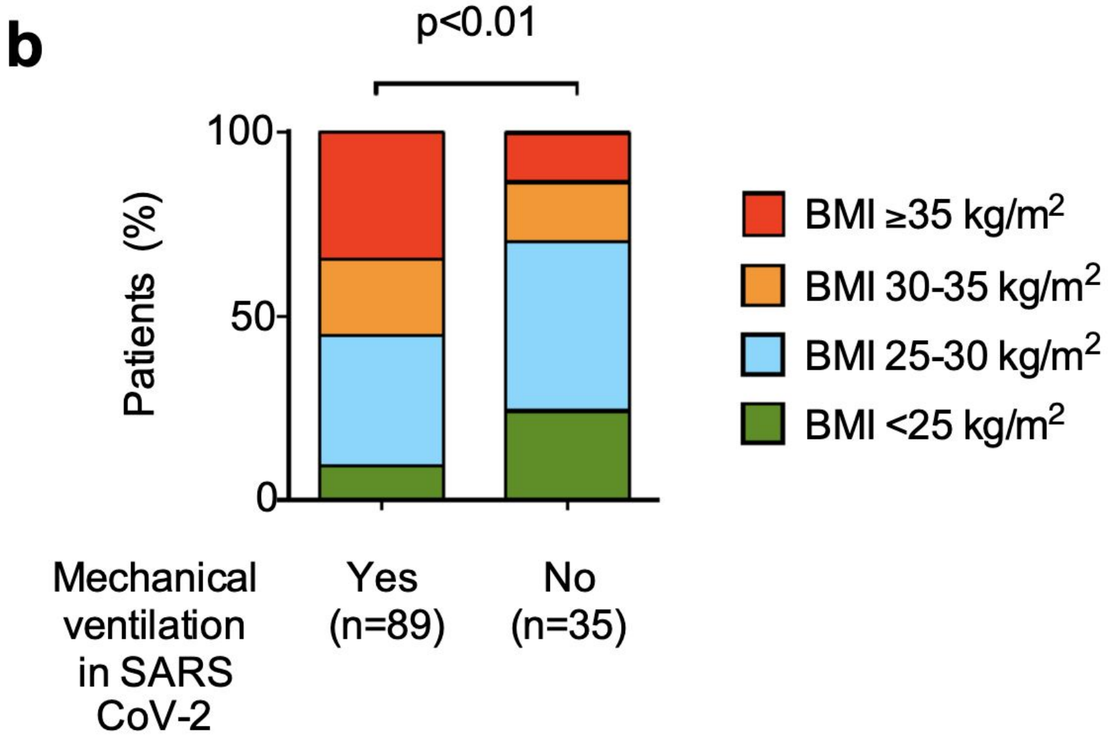

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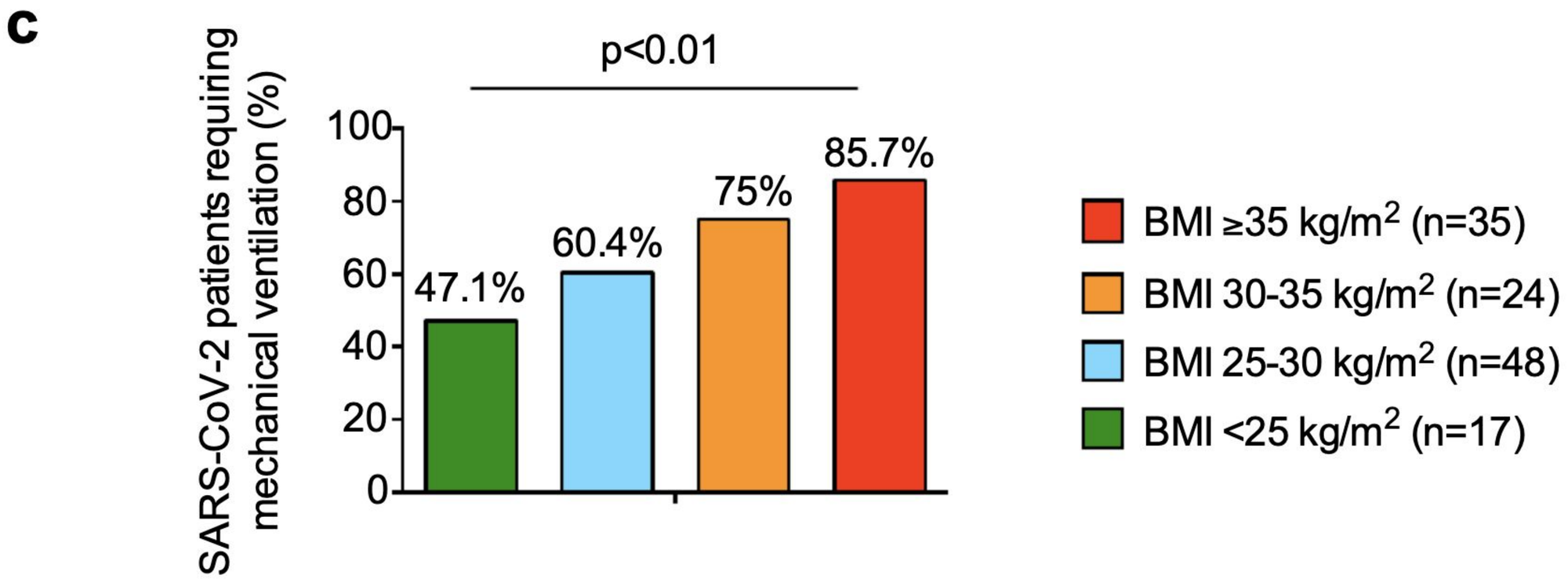

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Obesity is associated with severe forms of COVID-19

- **Similar to previous study but from Lyon, France**
- 291 consecutive patients admitted to ICU for SARS-CoV-2
- February 27th and April 8th 2020
- In the Lyon community the rate of obesity was 11.3 %
- Lille rate of obesity 28.2%
- Lille mechanical ventilation rate—68.6%
- Lyon mechanical ventilation rate—58.4%

Caussy, C., Wallet, F., Laville, M. and Disse, E. (2020), Obesity is associated with severe forms of COVID-19. Obesity. Accepted Author Manuscript. doi:10.1002/oby.22842

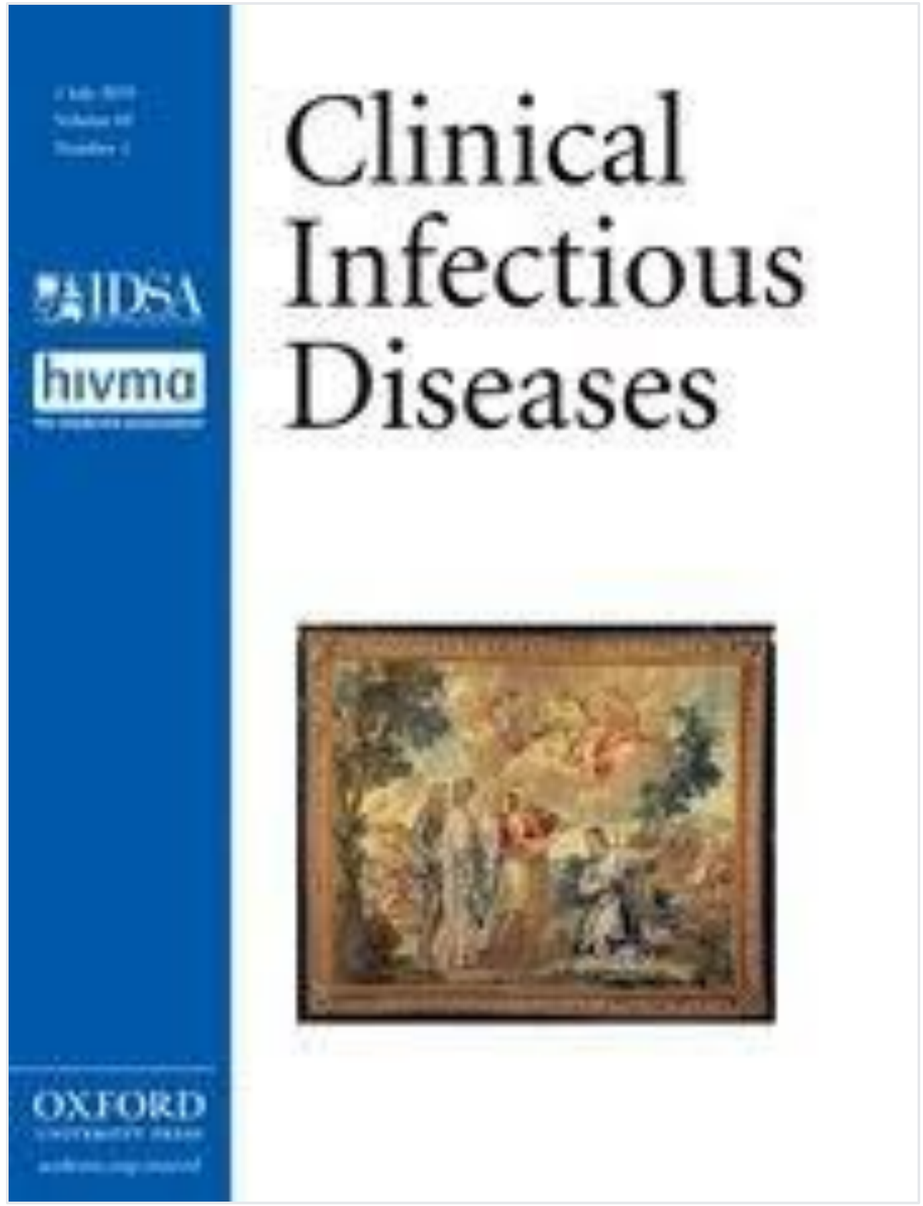
Obesity in patients younger than 60 years is a risk factor for COVID-19 hospital admission

- Retrospective analysis of BMI stratified by age in COVID-19 positive symptomatic patients who presented to a large academic hospital system in New York City (NYC Langone system)
- March 4th–April 4th

Table 1: Adult patients who tested positive for Covid-19 March 3-April 4, 2020 (N= 3,615)

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

Lighter J, Phillips M, Hochman S, et al. Obesity in patients younger than 60 years is a risk factor for COVID-19 hospital admission. Clin Infect Dis 2020



Obesity in patients younger than 60 years is a risk factor for COVID-19 hospital admission

- BMI 30–34 = 21%, BMI >35 = 16% **Total = 38% obese**
- For patients aged <60 years with a BMI between 30-34:
  - 2.0 times more likely to be admitted to acute care (95% 1.6-2.6, p<0.0001)
  - 1.8 times more likely to be admitted to acute critical care (95% CI 1.2-2.7, p=0.006)
- For patients aged <60 with a BMI >35
  - 2.2 times more likely to be admitted to acute care(95% CI 1.7-2.9, p<.0001)
  - 3.6 times more likely to be admitted to acute and critical care (95% CI 2.5-5.3, p=<.0001)

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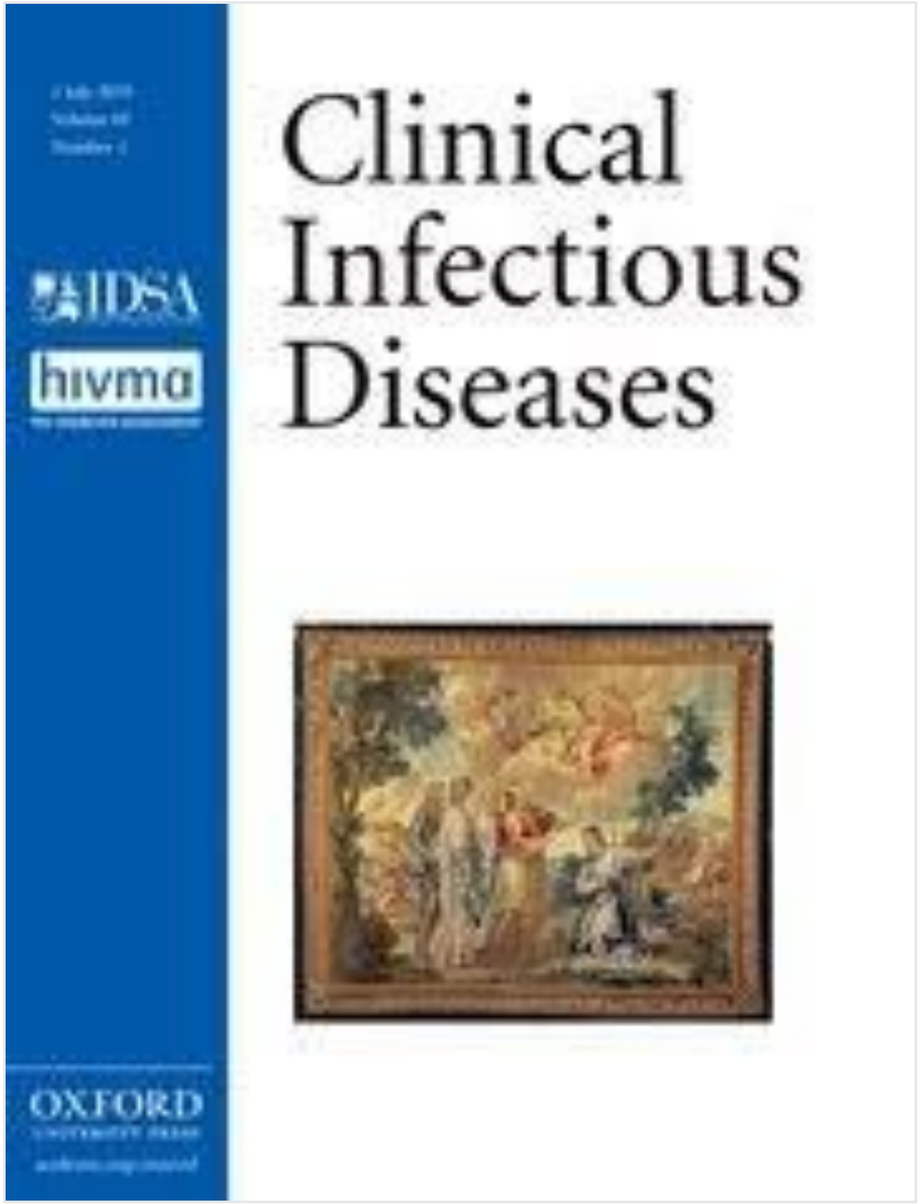

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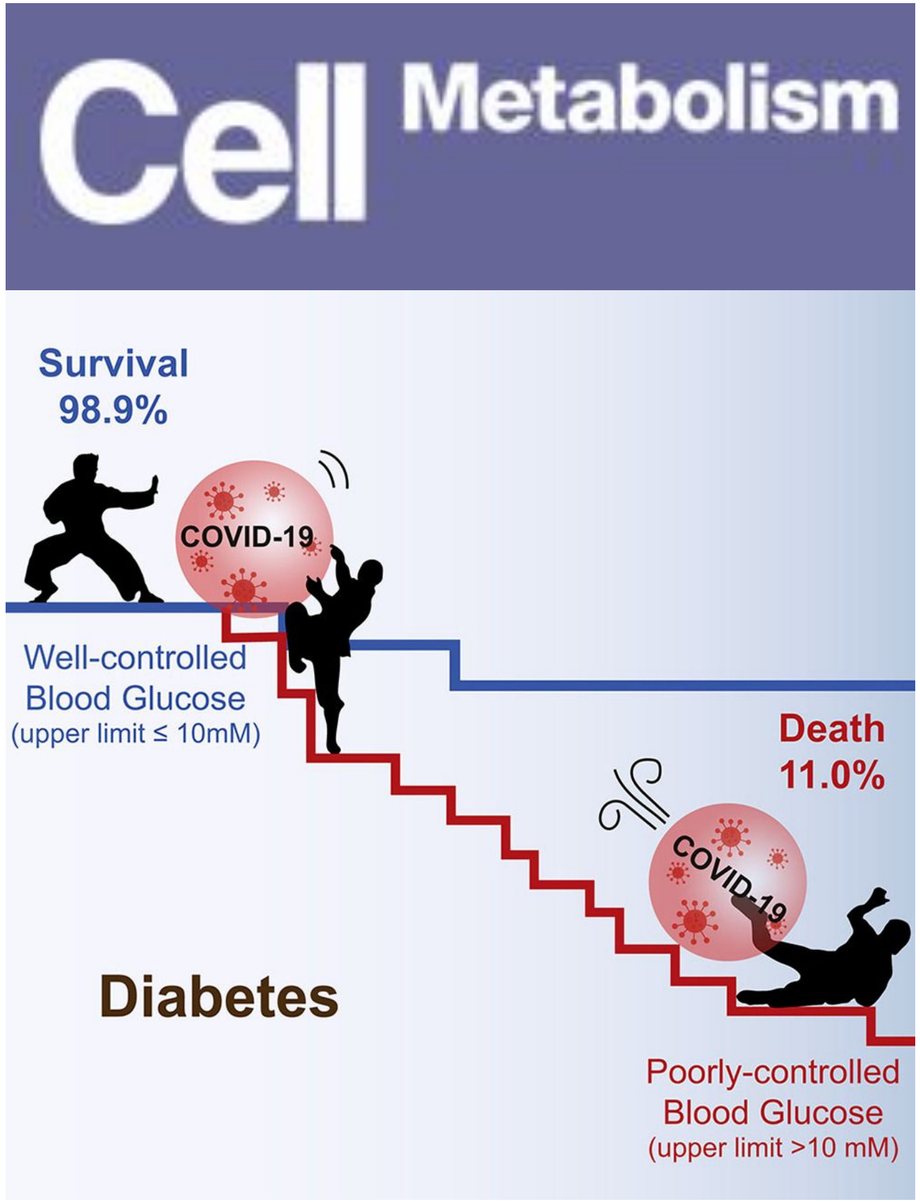
Association of Blood Glucose Control and Outcomes in Patients with COVID-19 and Pre-existing Type 2 Diabetes

- Retrospective longitudinal, multi-centered study from a cohort of 9,663 confirmed COVID-19 cases enrolled among 19 hospitals in Hubei Province, China
- Initial exclusion left over 7k, of which, 952 had pre-existing diabetes
- Well-controlled BG was defined when glycemic variability ranged from 3.9 to 10.0 mmol/L (70–180 mg/dL). *Total n = 282*
- Poorly-controlled BG was defined when the lowest fasting BG was above or equal 3.9 mmol/L (70 mg/dL) and the highest 2 hPG level exceeded 10.0 mmol/L (180 mg/dL). *Total n = 528*



Cell Metabolism,2020,ISSN 1550-4131,https://doi.org/10.1016/j.cmet.2020.04.021.

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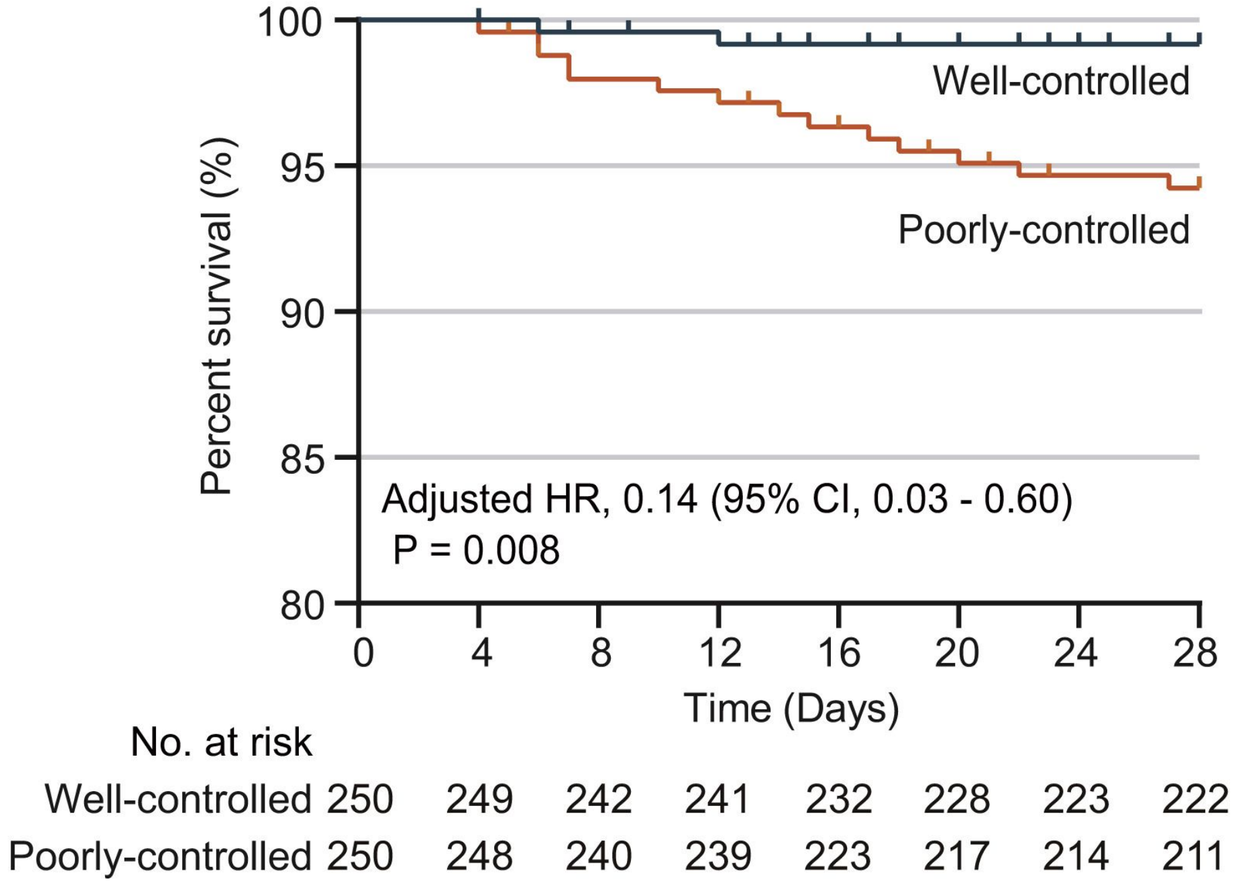

Figure 3. Survival Curves of Patients with Well-Controlled BG or Poorly Controlled BG

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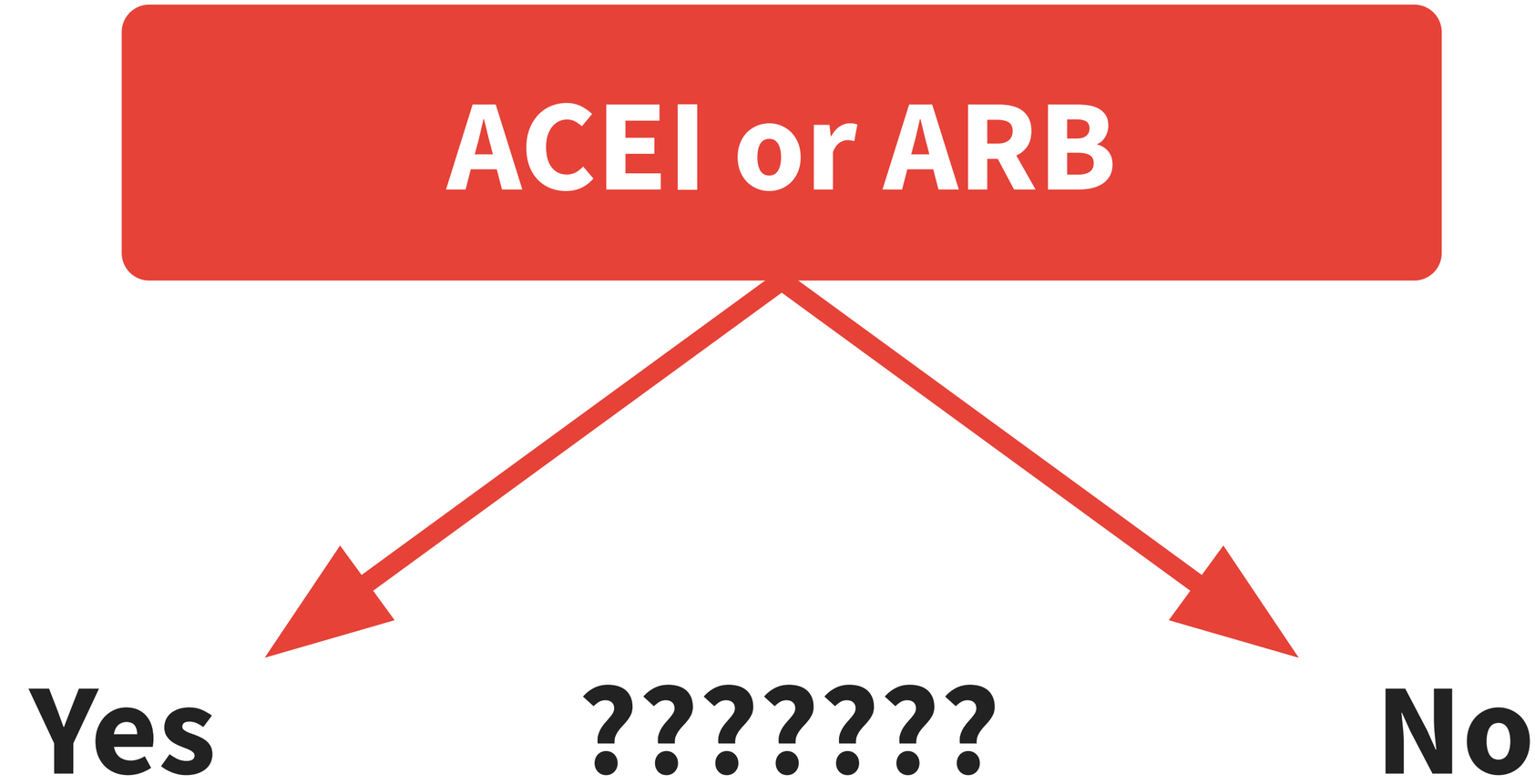

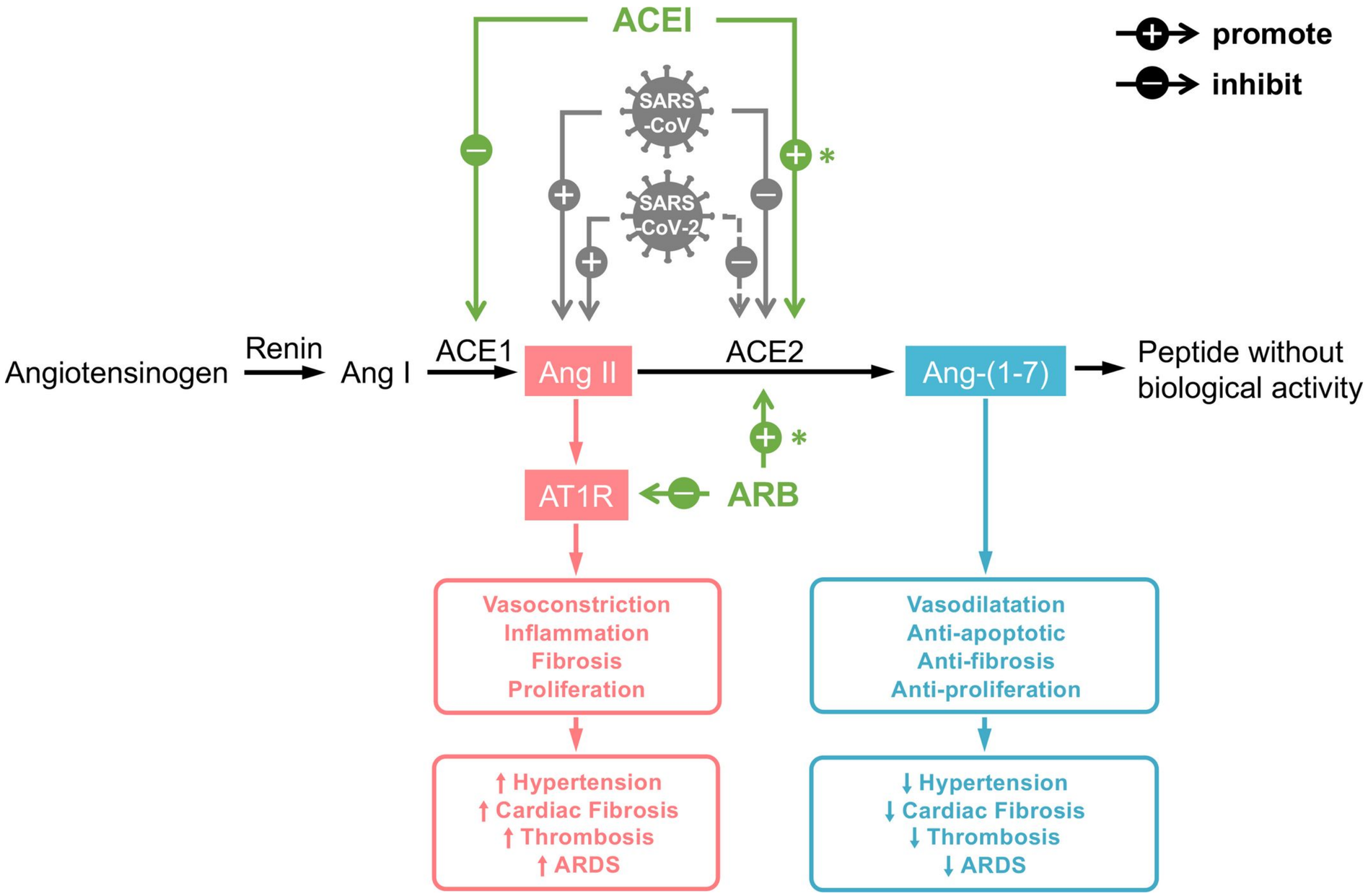

Journal of the American Heart Association. 2020;9:e016219

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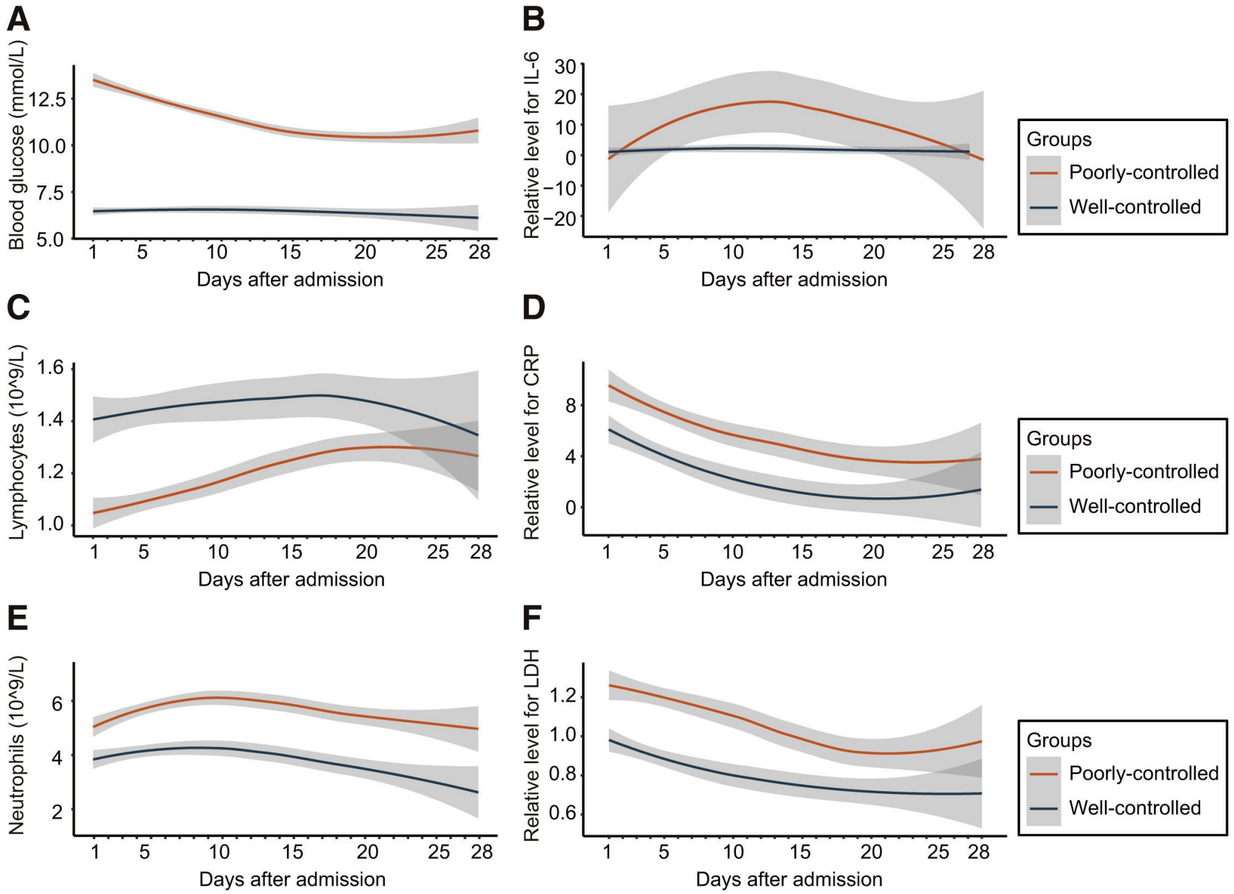


Figure 2. Dynamics of BG, Lymphocytes, Neutrophils, IL-6, CRP, and LDH in Well-Controlled and Poorly Controlled BG Groups during Hospitalization

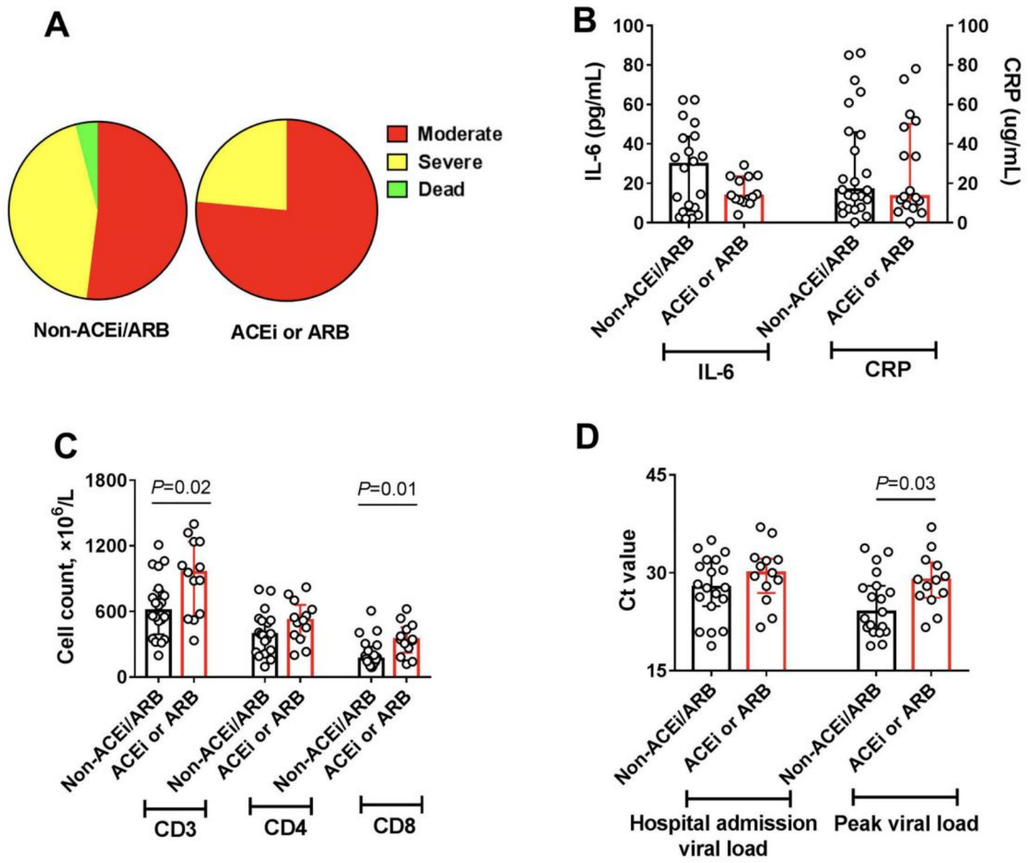
Cell Metabolism,2020,ISSN 1550-4131,https://doi.org/10.1016/j.cmet.2020.04.021.

Renin-angiotensin system inhibitors improve the clinical outcomes of COVID-19 patients with hypertension

- 417 patients admitted to hospital in China
  - 51 patients had hypertension
    - 9 patients were excluded for being on no BP meds
  - 42 Patients included in analysis
    - 17 patients treated with ACEI/ARB (5 with comorbidities)
    - 25 patients with non-ACEI/ARB treatment (8 with comorbidities)
- Similar Baseline characteristics
- Blood pressure of all was controlled with current therapy during hospitalization

Renin-angiotensin system inhibitors improve the clinical outcomes of COVID-19 patients with hypertension

- ACEI/ARB group—23% categorized as severe and none died
- nonACEI/ARB group 48% categorized into severe subgroups and one patient died
- Not a significant difference



Anti-hypertensive Angiotensin II receptor blockers associated to mitigation of disease severity in elderly COVID-19 patients

Preprint

- Medical Records from 3 different hospitals in China reviewed
- 78 patients with COVID-19 pneumonia and hypertension included
  - 40 had mild disease and 38 had severe disease
- No significant difference in disease severity with any hypertension medication in the population overall
- In patients over 65 there was a mildly significant decrease in severe disease in patients on ARBS
- **Not really convincing either way**

Table 1. Association between antihypertensive use and disease severity of COVID-19 patients older than 65 years old with hypertension comorbidity

Characteristics		Total patients (n=46)	Severe patients (n=28)	Mild patients (n=18)	Unadjusted			Adjusted		
					OR	95% CI	p value	OR	95% CI	p value
Antihypertensive use, n(%)										
	No use	8 (17·4)	7 (25)	1 (5·6)	ref		ref	ref		ref
	CCB	26 (56·5)	18 (64·3)	8 (44·4)	0·791	0·548-1·141	0·403	0·359	0·036-3·58	0·382
	ARB	10 (21·7)	3 (10·7)	7 (38·9)	0·343	0·128-0·916	0·025	0·250	0·064-0·976	0·046
	ACEI	2 (4·3)	1 (3·6)	1 (5·6)	0·571	0·139-2·342	0·378	——	——	——
	Thiazide	3 (6·5)	0 (0)	3 (16·7)	——	——	——	——	——	——
	BB	7 (15·2)	3 (10·7)	4 (22·2)	0·49	0·2-1·198	0·119	——	——	——

ARB, angiotensin receptor blocker; ACEI, angiotensin converting enzyme inhibitor; CCB, calcium channel blocker; BB, beta blocker.
OR, odds ratio; CI, confidence interval.
Adjustment was by multivariable logistic regression modeling with sex variable

Bottom Line

Advantage vs Disadvantage still uncertain

Don’t change med regimen for ACEI/ARB in your patients

Summary

- Unknown if diabetes or obesity increase the risk of **getting** COVID-19
- Studies are quite consistent that diabetes and obesity increase the risk for poor outcomes with COVID-19
- Mechanisms for increased poor outcomes have yet to be determined but many theories exist and it may be multiple factors
- Glucose control seems to make a difference in outcomes which is not unexpected
- Don’t change ACEI or ARB use in your patients due to fears over COVID-19