Bone & Joint Open

Supplementary Material

10.1302/2633-1462.21.BJO2020-0183.R1

Supplementary Figures and Reported Outcomes

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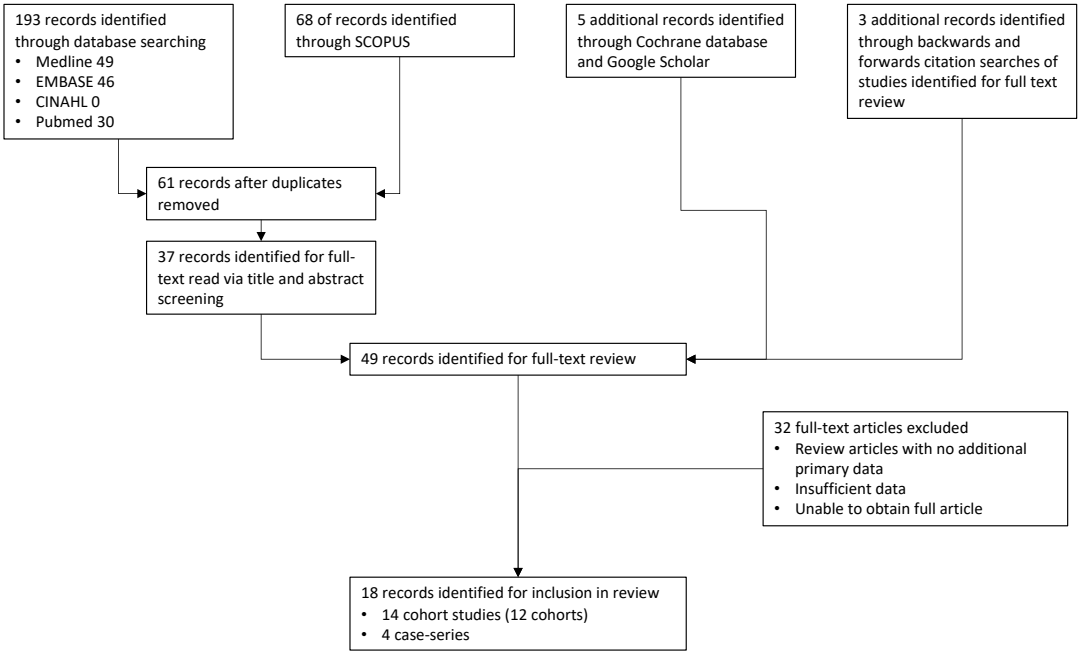
PRISMA Study flow chart

Numbers of studies at each stage of the review process



For ease of reading, the analyses are presented in the same order for each outcome: full analysis of case-control data; case-control data with large studies only; summary of absolute values (including case-series data); absolute values with large studies only; additional analyses excluding studies as discussed in the main text.

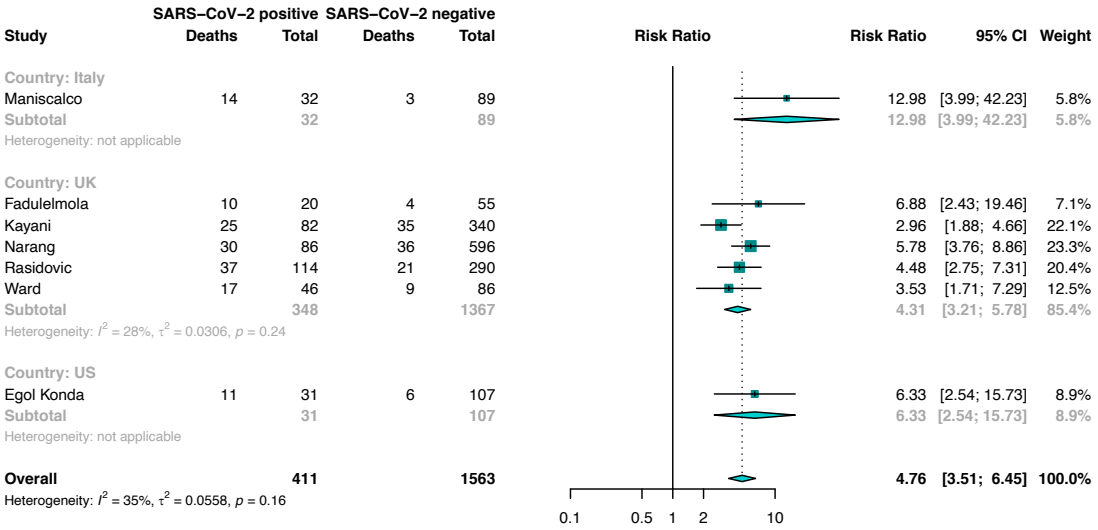
Large studies are those with ≥ 30 included participants in the non-COVID group or ≥ 10 deaths in the COVID group.

Mortality

Risk Ratio for early mortality associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies

(Main paper)

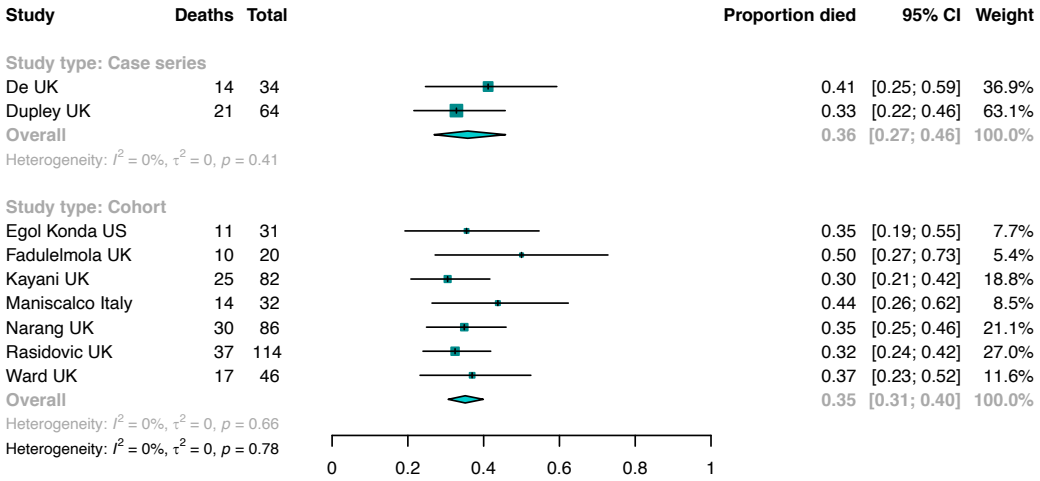
Risk Ratio for early mortality associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies



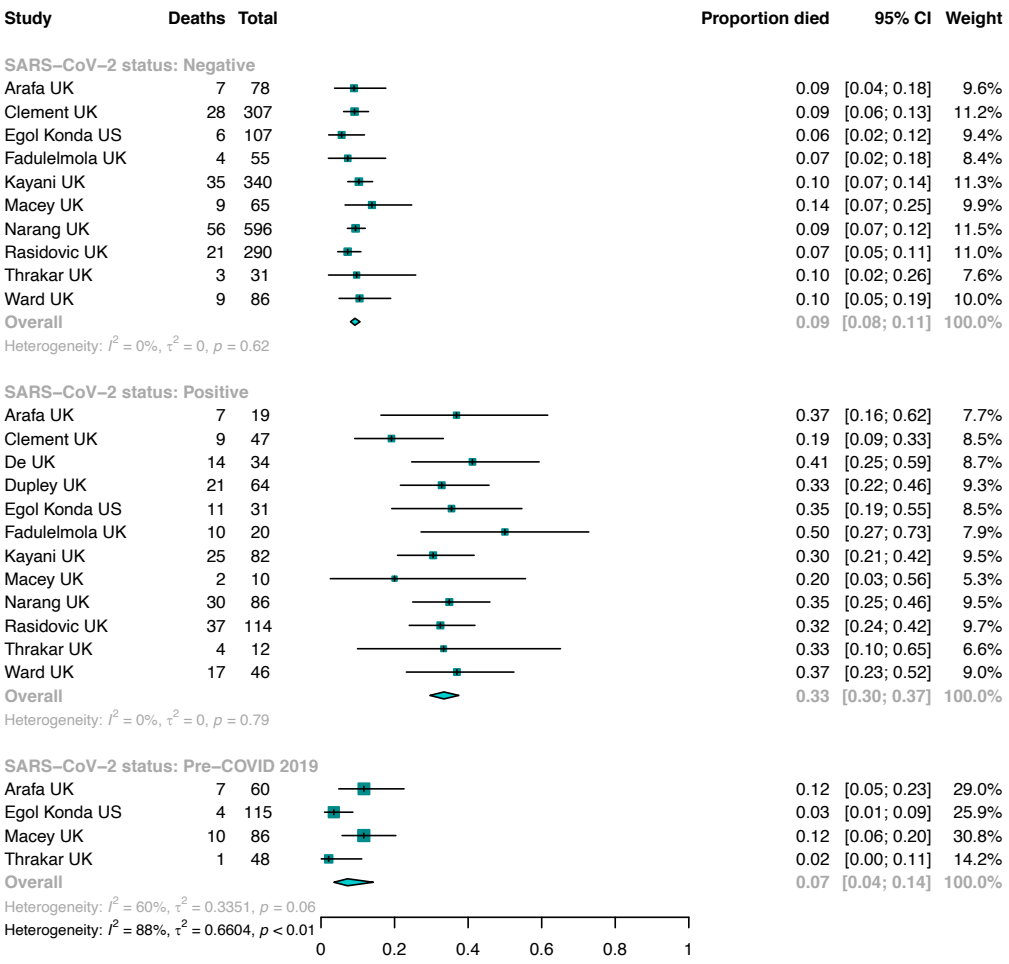
Absolute risk for early mortality associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies

(Main paper)

Absolute risk for early mortality associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies



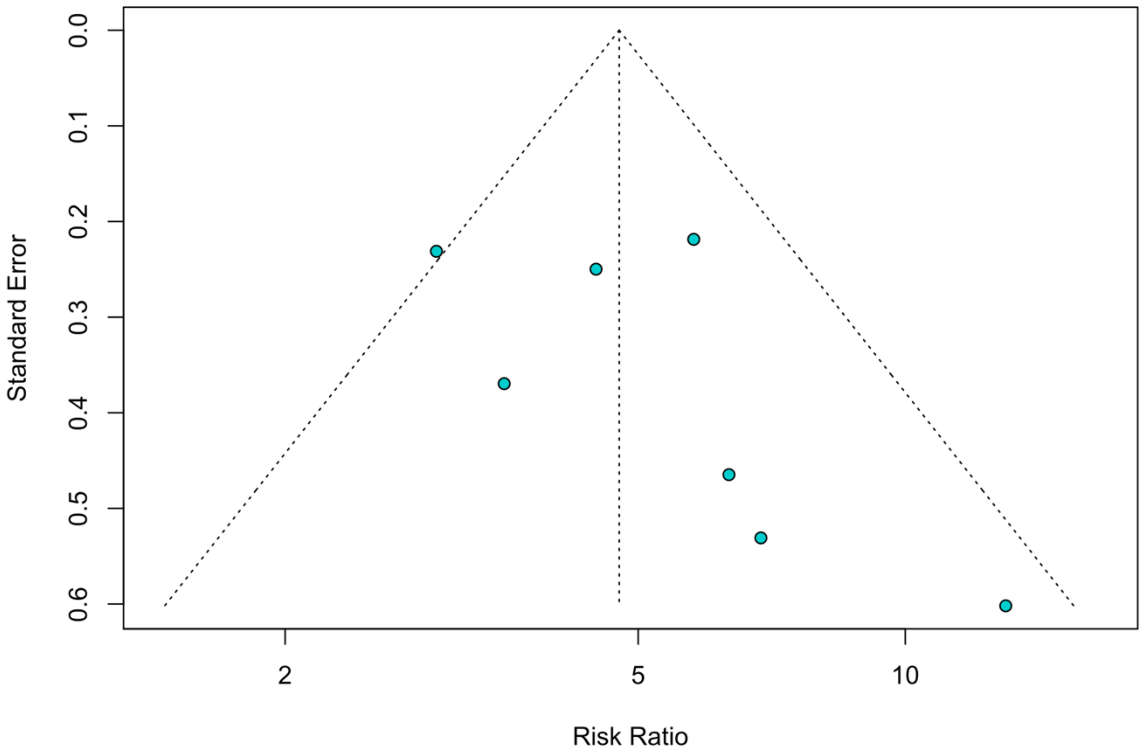
Absolute risk for early mortality associated with SARS-CoV-2 infection in older people with fragility hip fracture: 30-day mortality only



Funnel plot of included studies for early mortality associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies

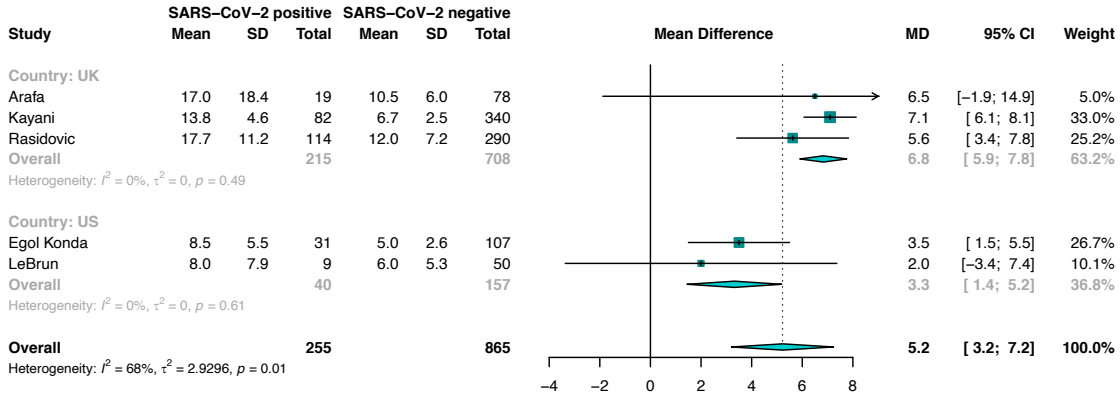
(Main paper)

Funnel plot of included studies for early mortality associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies

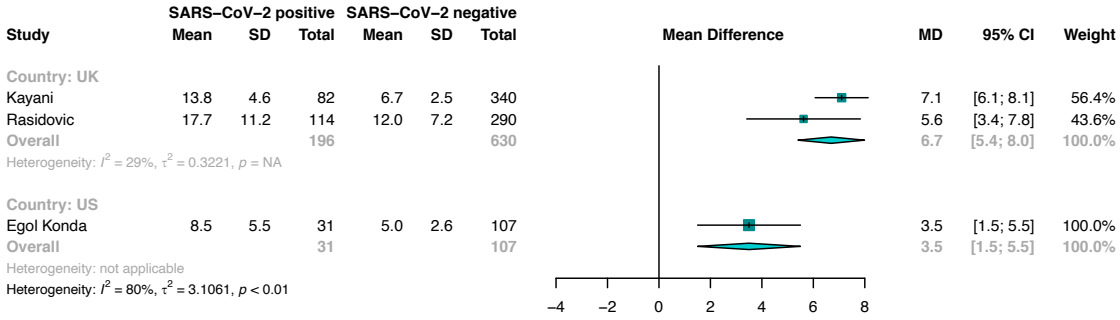


Length of stay

Mean difference (days) for length of stay associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies



Mean difference (days) for length of stay associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies

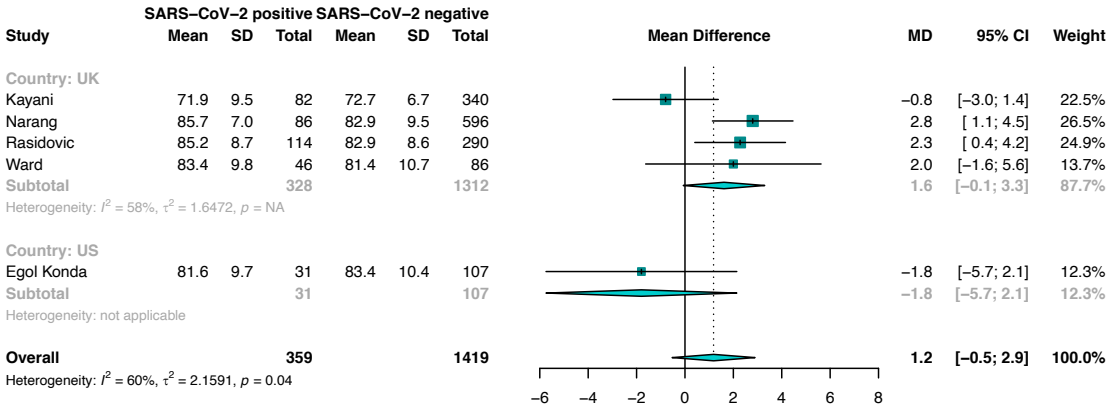


Age

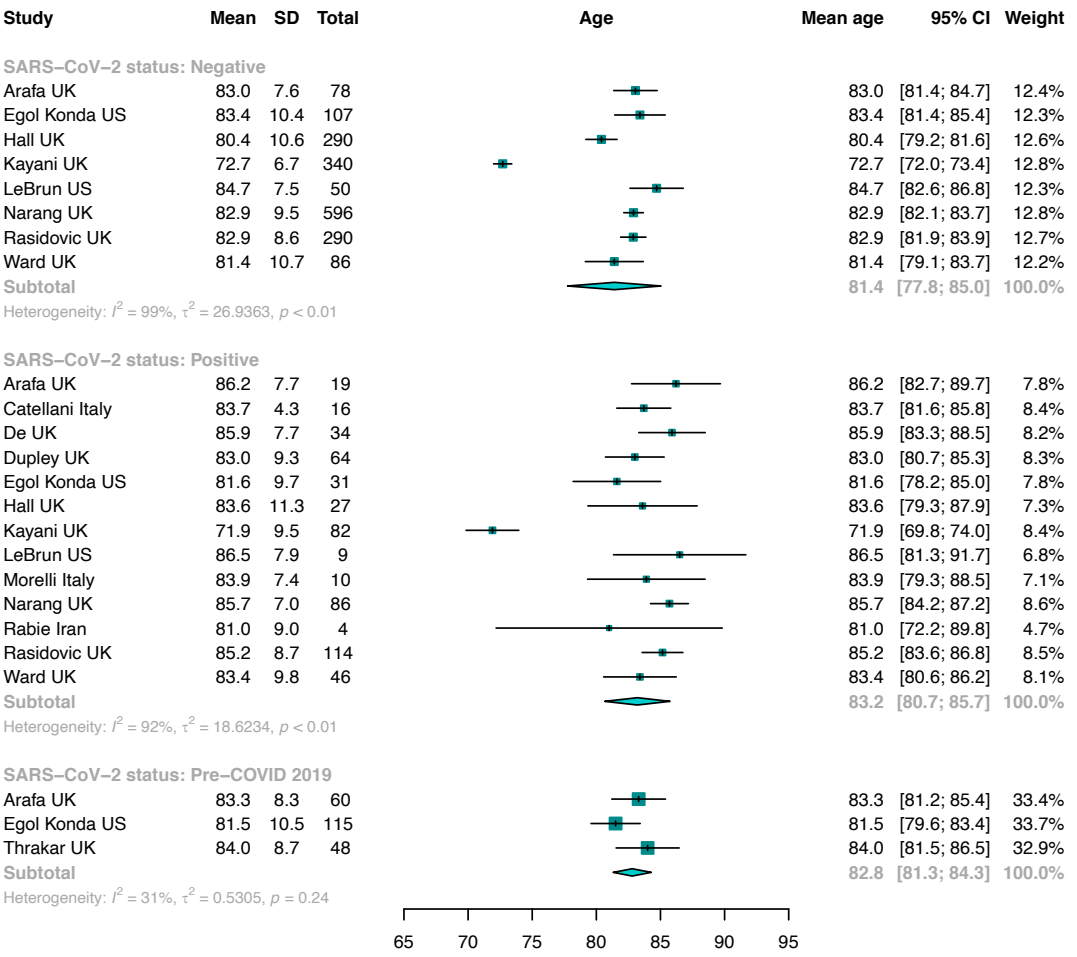
Mean difference (years) for patient age associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies

Main paper

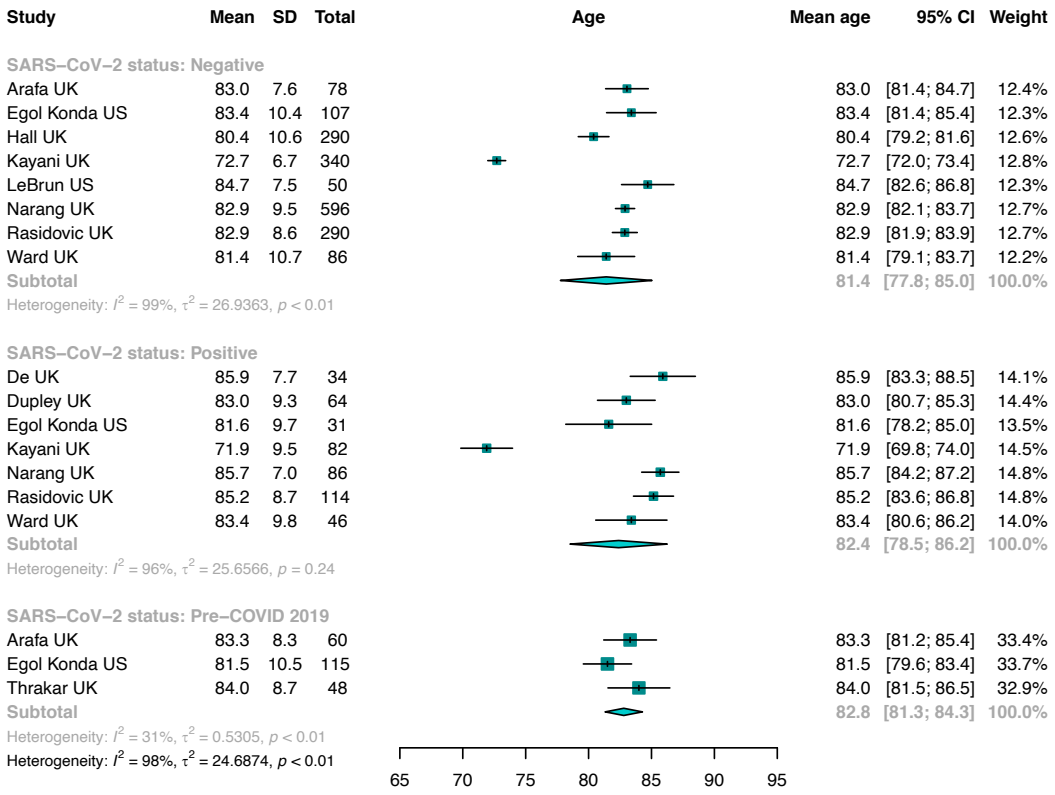
Mean difference (years) for patient age associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies



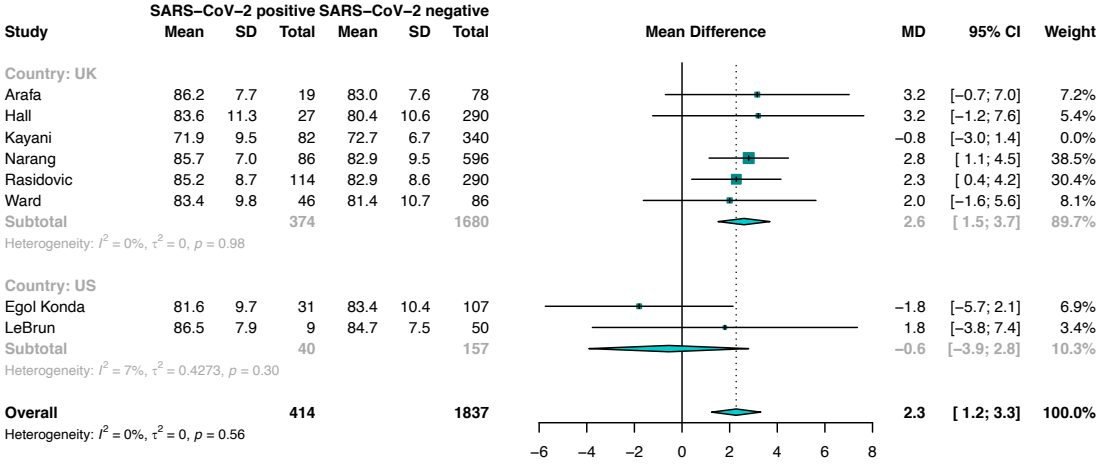
Absolute patient age (years) associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies



Absolute patient age (years) associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies

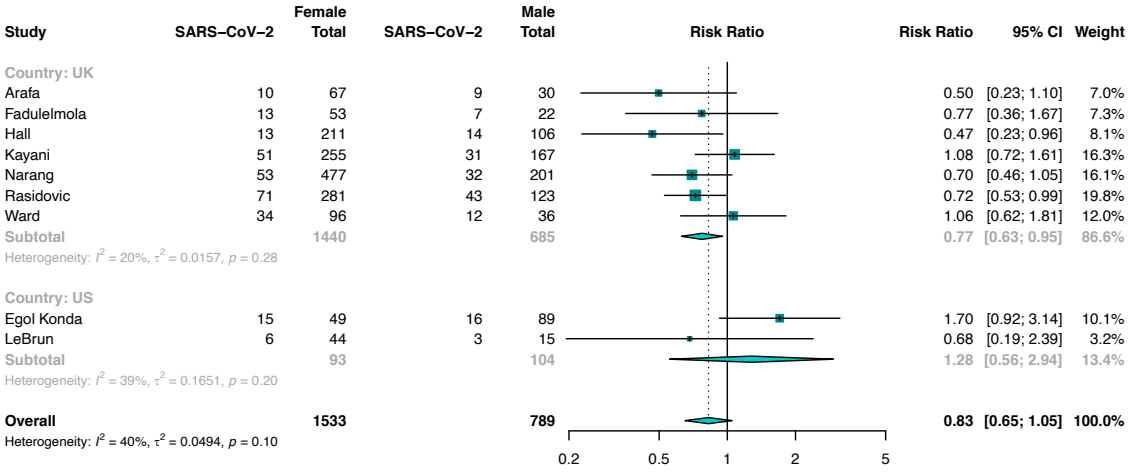


Mean difference for patient age (years) associated with SARS-CoV-2 infection in older people with fragility hip fracture: excluding Kayani et al.

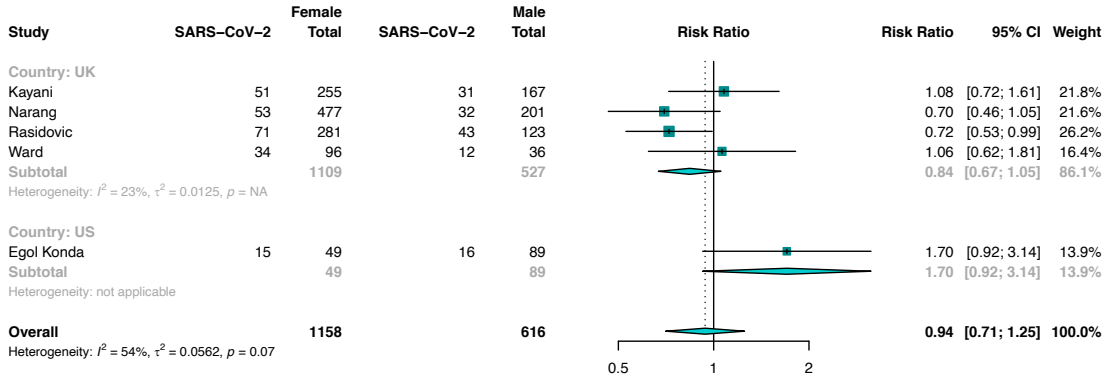


Sex

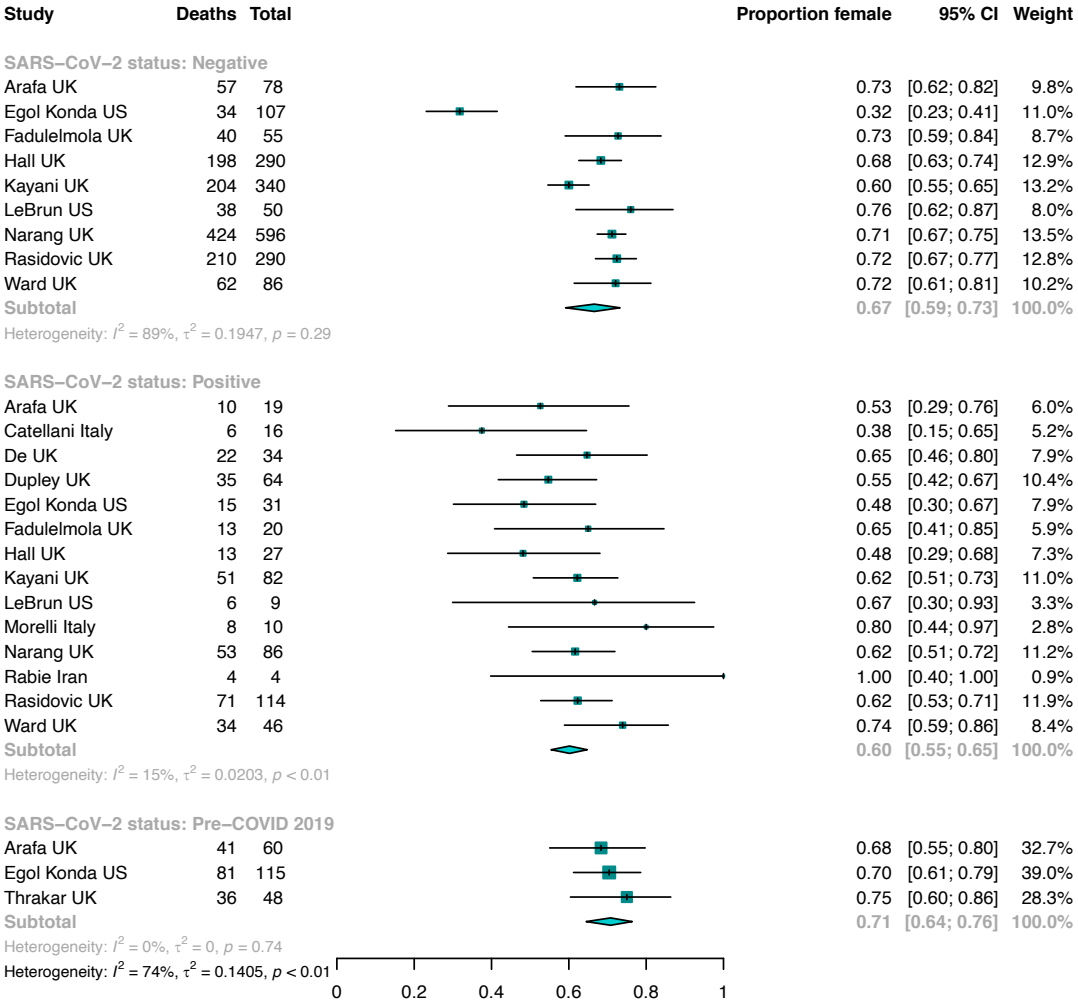
Risk ratio for female sex associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies



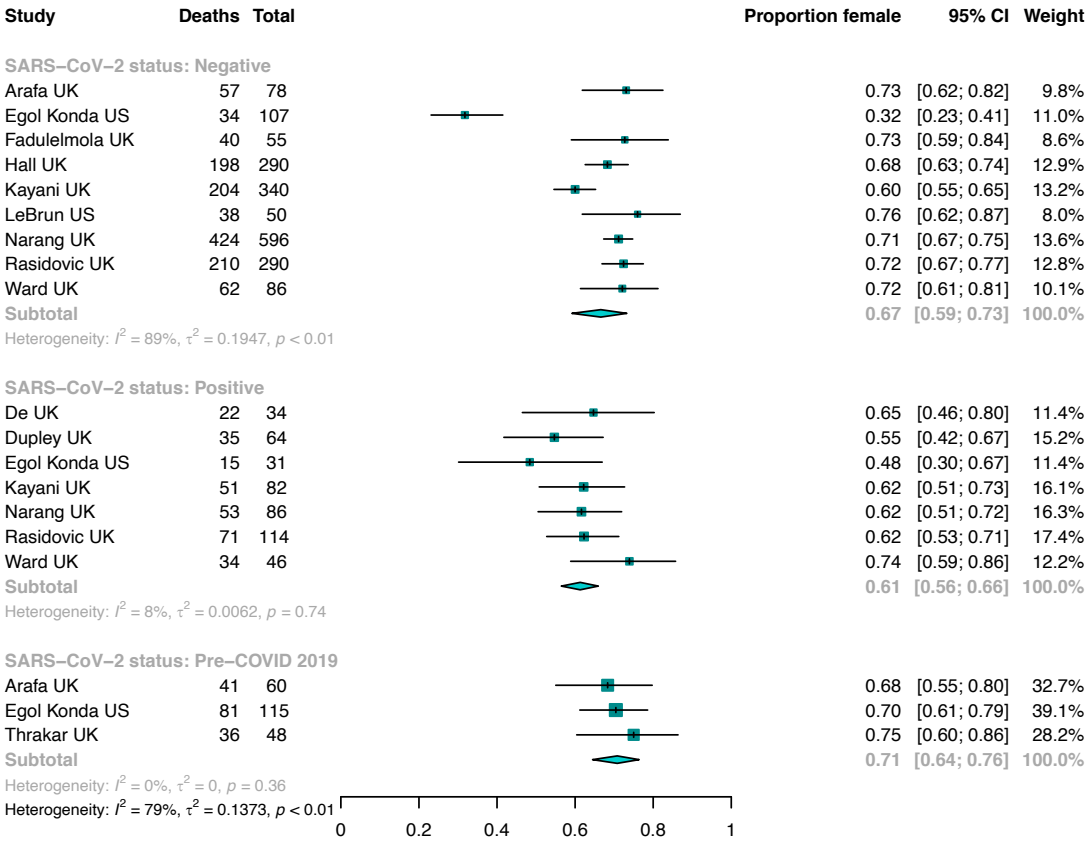
Risk ratio for female sex associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies



Absolute proportions of female sex associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies

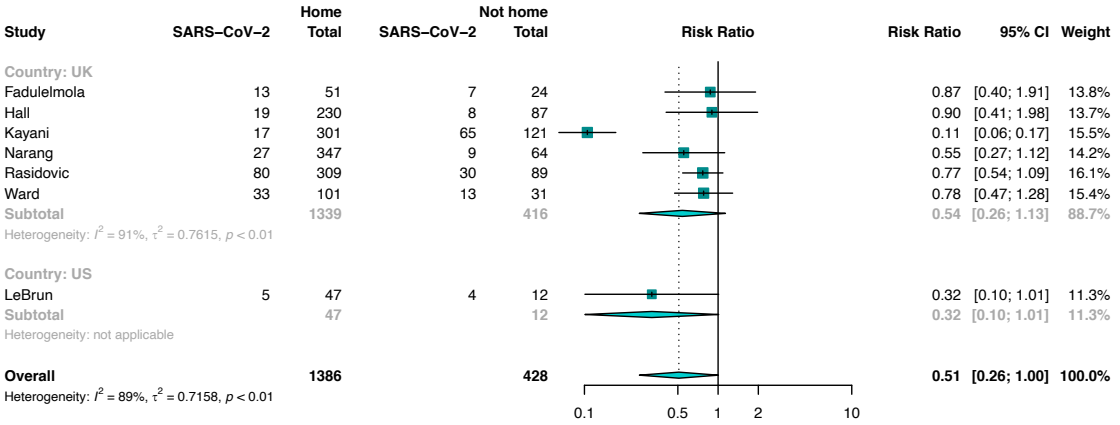


Absolute proportions of female sex associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies

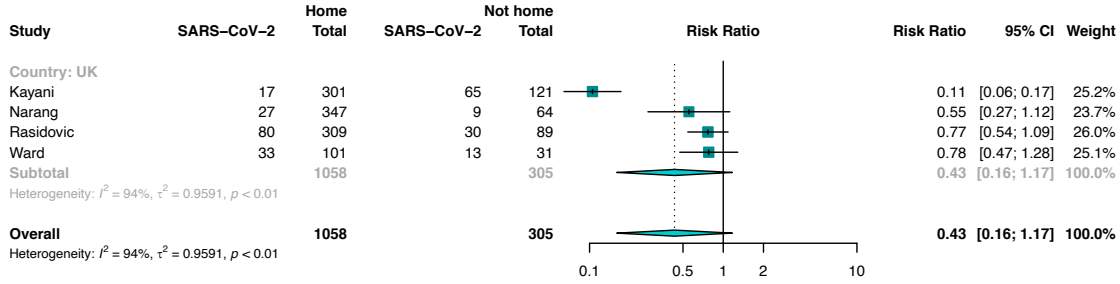


Source of admission

Risk ratio for admission from home associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies



Risk ratio for admission from home associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies



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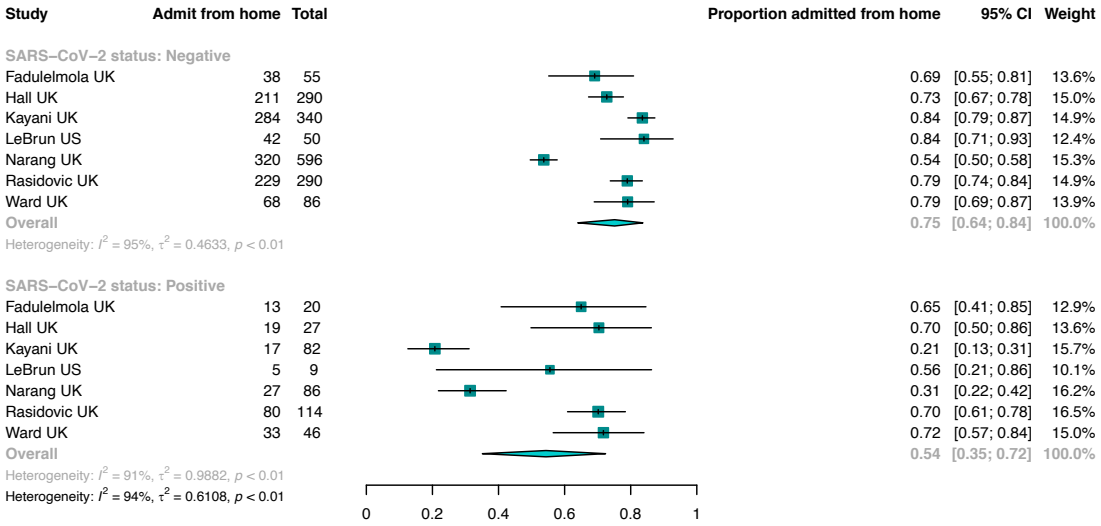
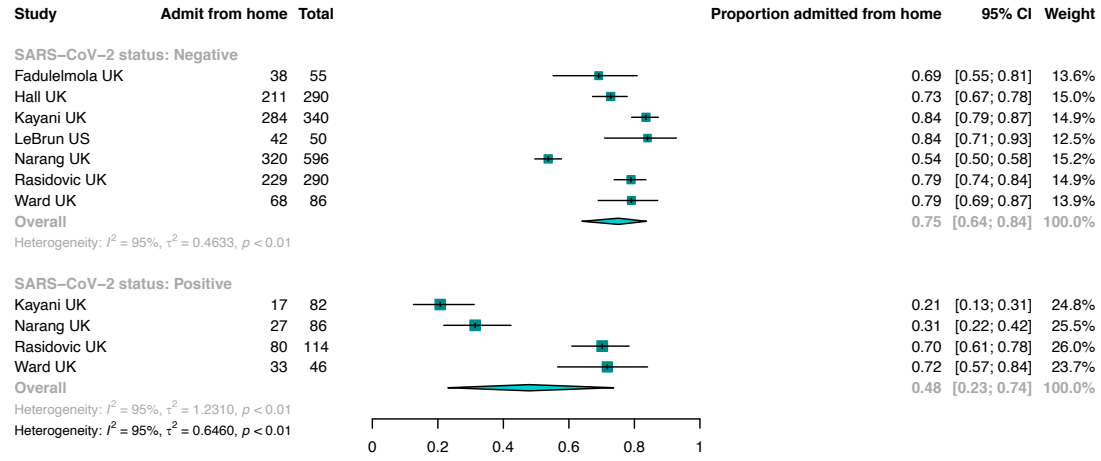
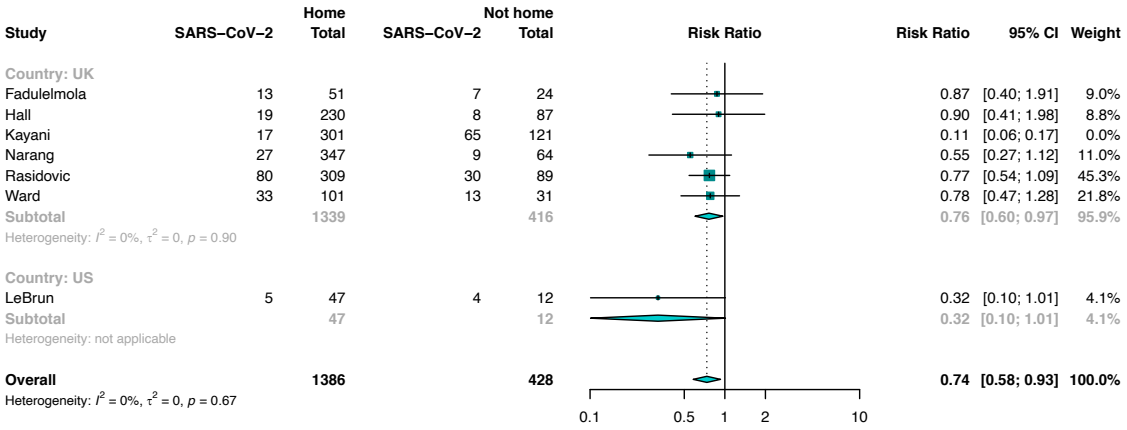


Absolute proportions of admission from home associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies

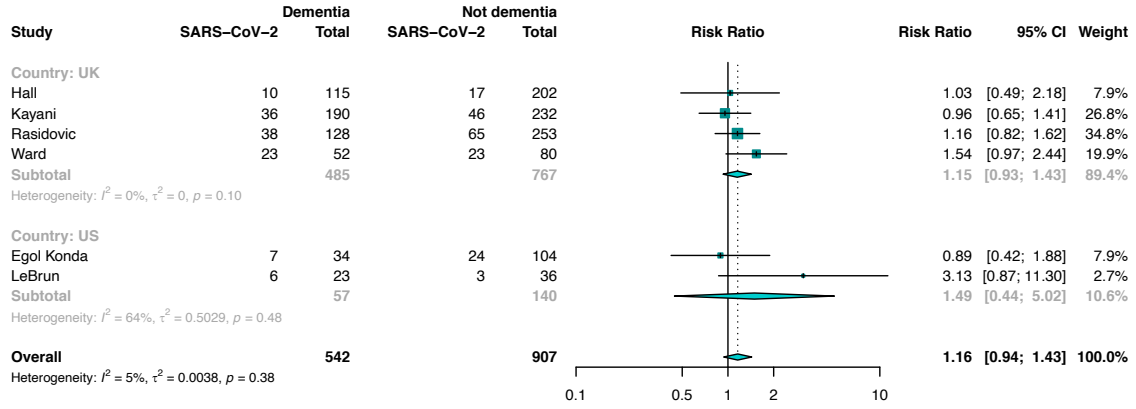


Risk ratio for admission from home associated with SARS-CoV-2 infection in older people with fragility hip fracture: excluding Kayani et al.

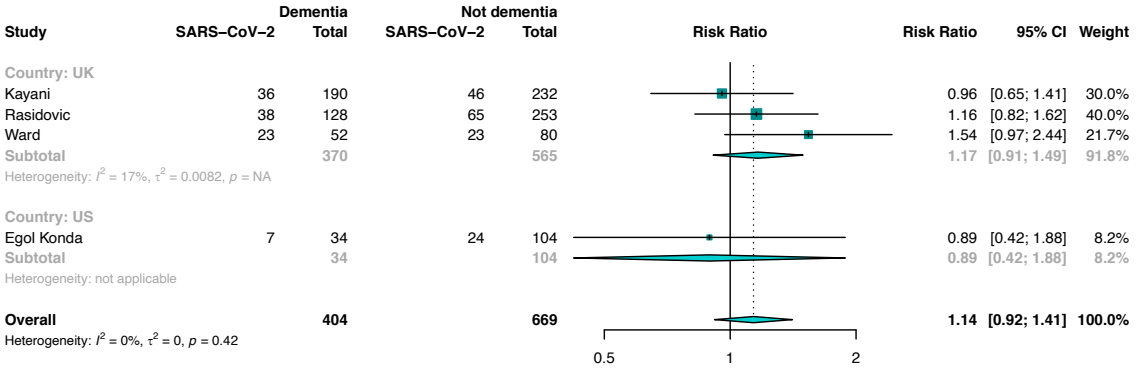


Dementia

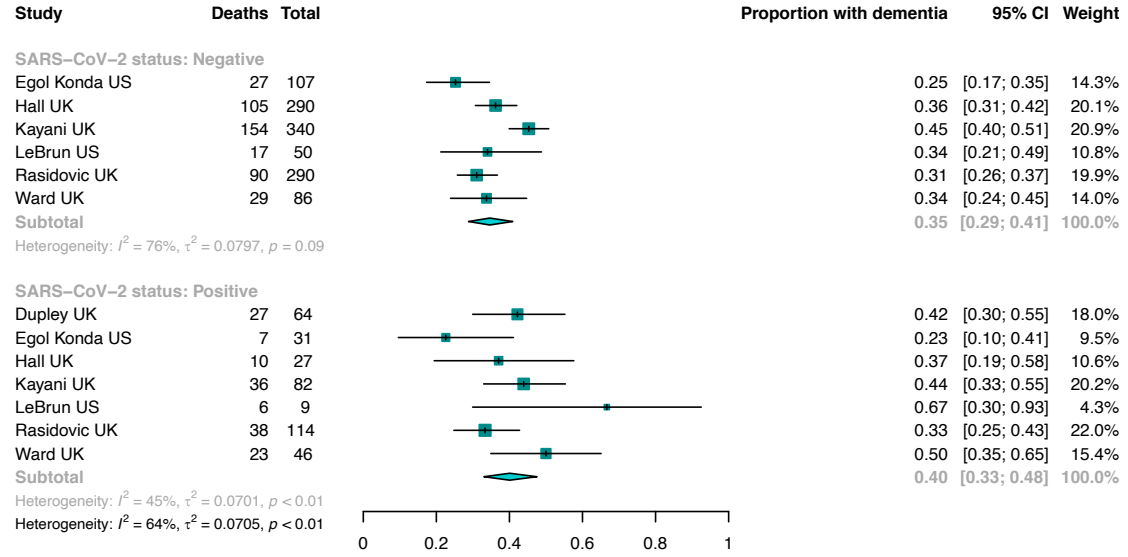
Risk ratio for presence of dementia associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies



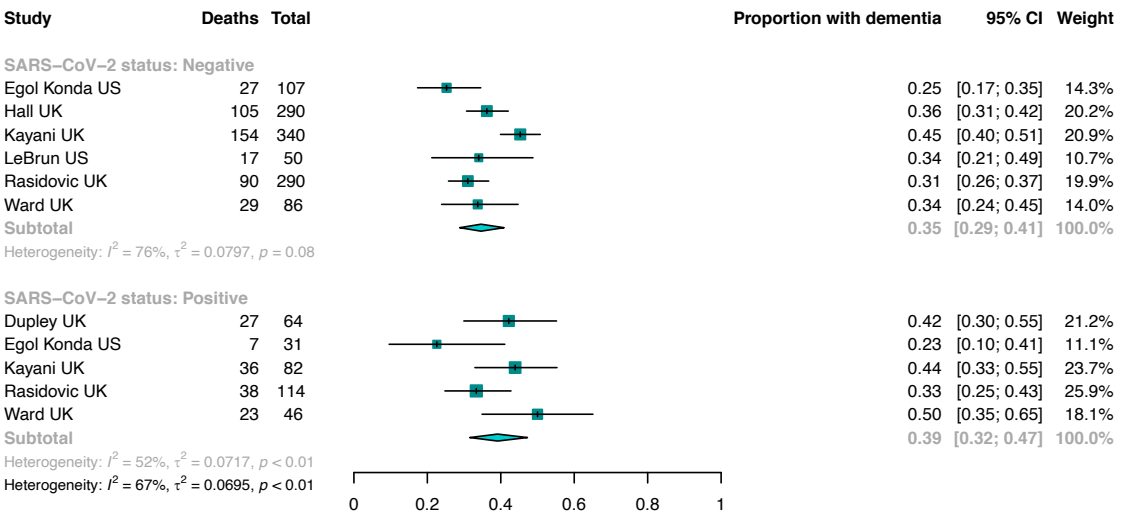
Risk ratio for presence of dementia associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies



Absolute proportions of people with dementia associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies



Absolute proportions of people with dementia associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies

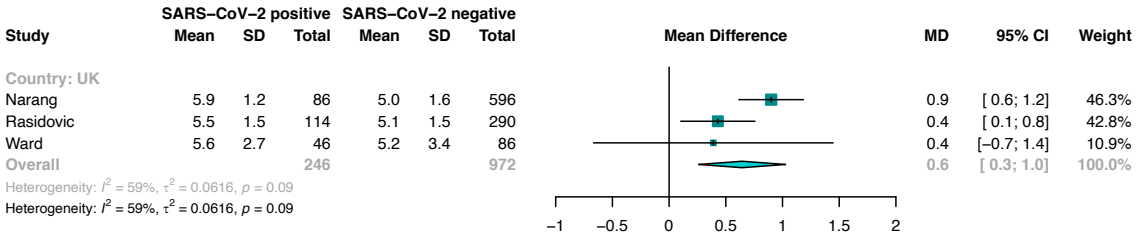


Nottingham Hip Fracture Score

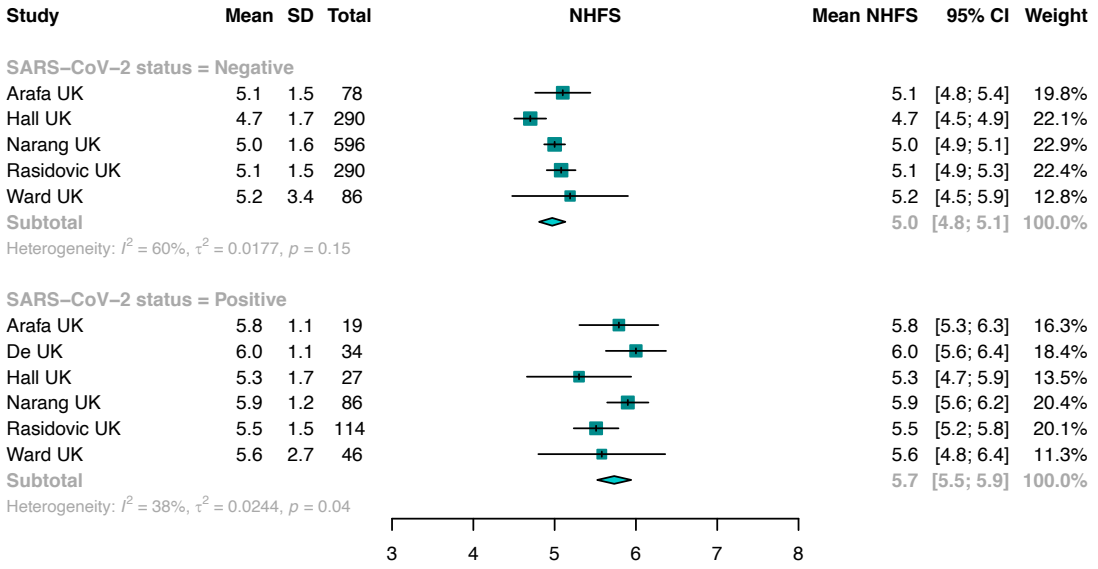
Mean difference for Nottingham Hip Fracture Score (points) associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies

(Main paper)

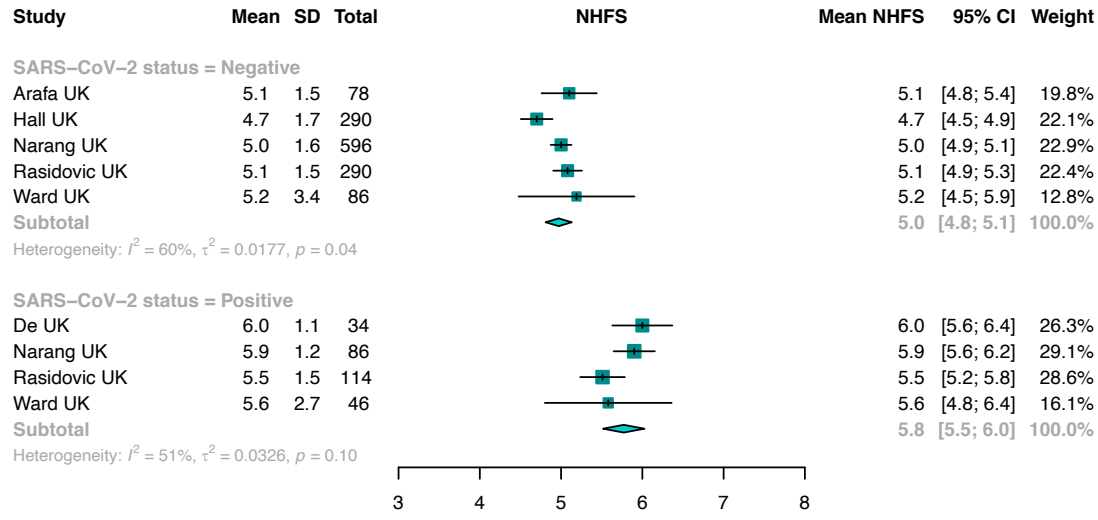
Mean difference for Nottingham Hip Fracture Score (points) associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies



Absolute Nottingham Hip Fracture Score (points) associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies

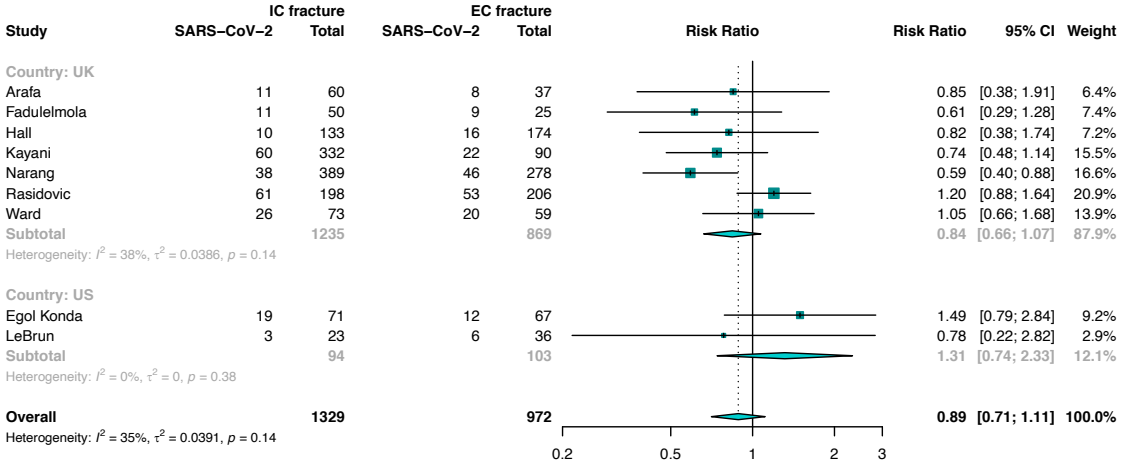


Absolute Nottingham Hip Fracture Score (points) associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies

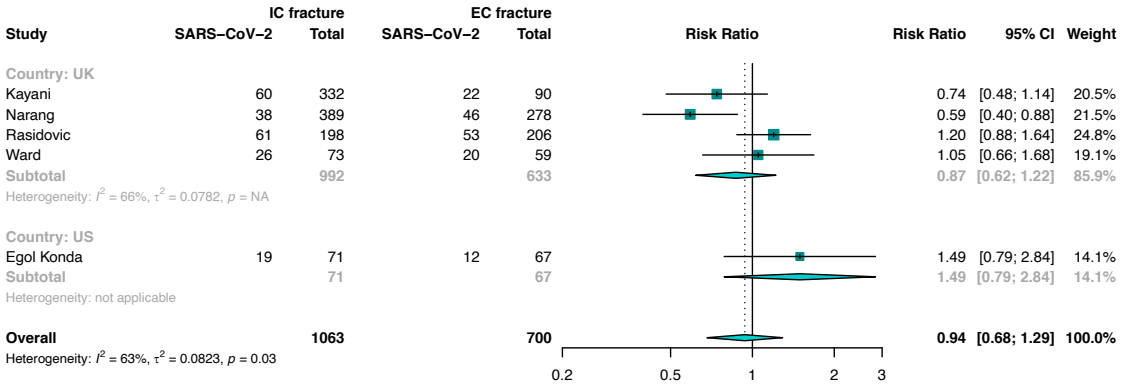


Fracture type

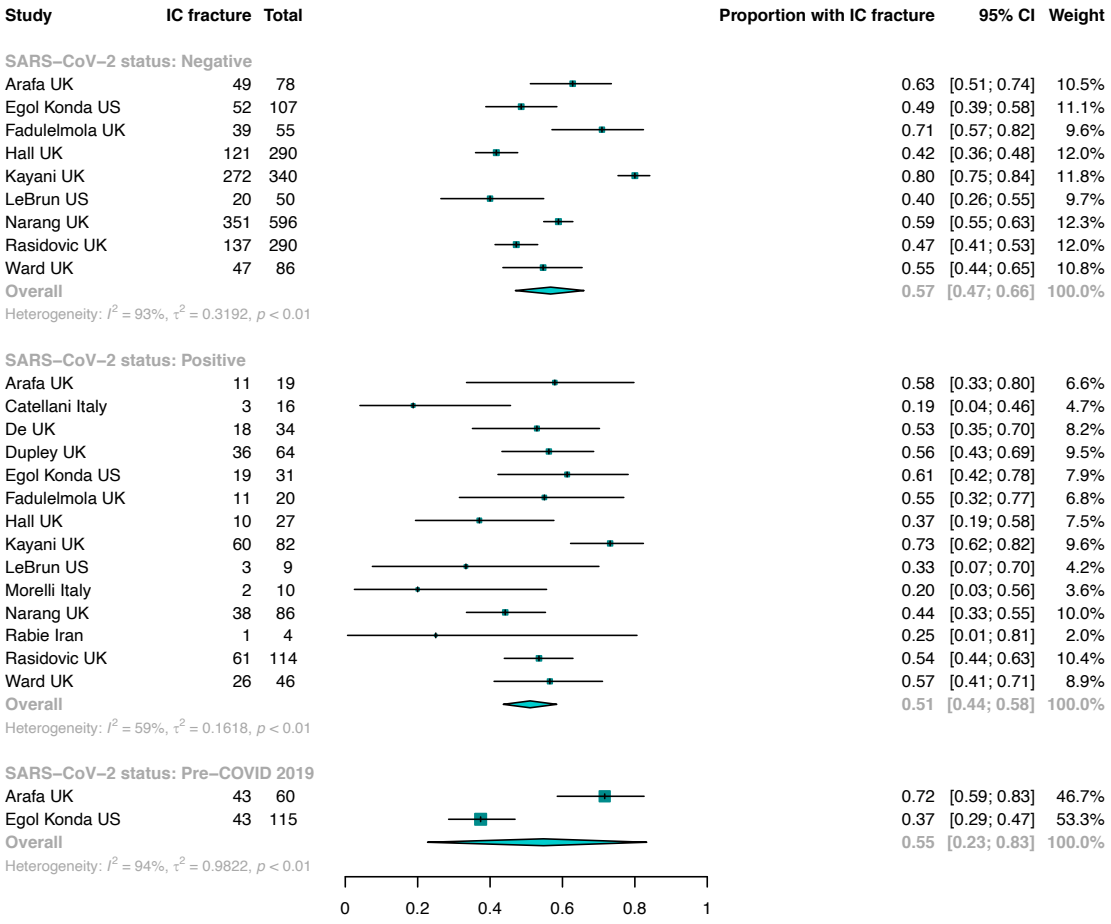
Risk ratio for intracapsular fracture associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies



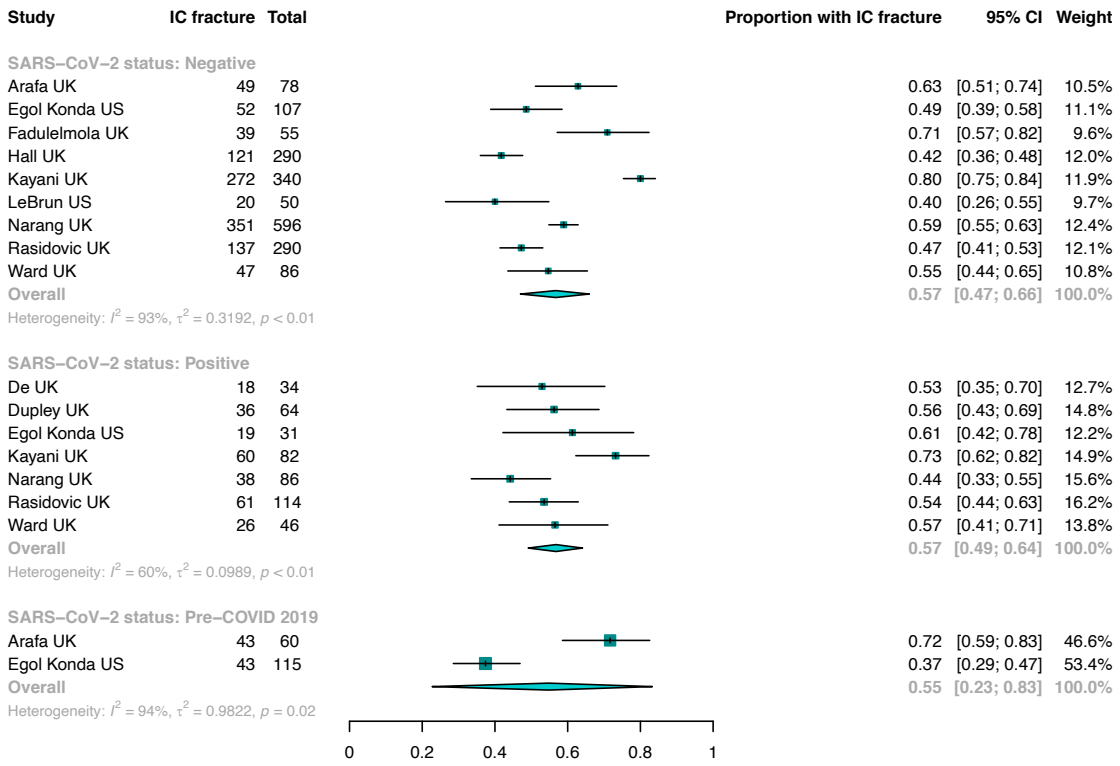
Risk ratio for intracapsular fracture associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies



Absolute proportions of intracapsular fracture associated with SARS-CoV-2 infection in older people with fragility hip fracture: all studies

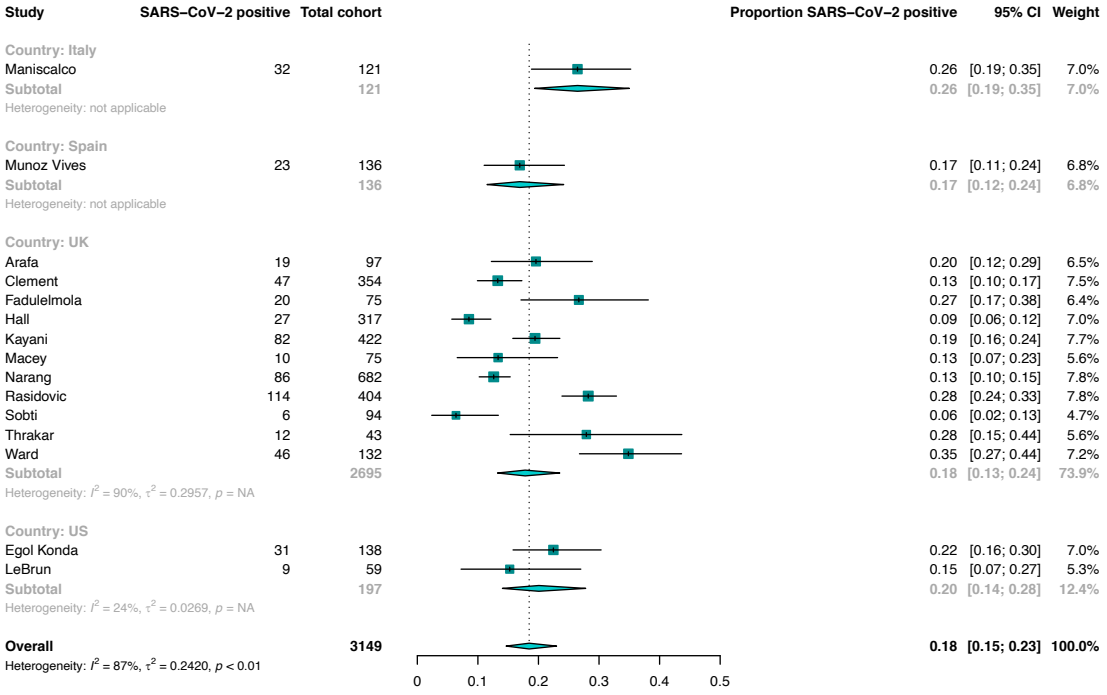


Absolute proportions of intracapsular fracture associated with SARS-CoV-2 infection in older people with fragility hip fracture: large studies

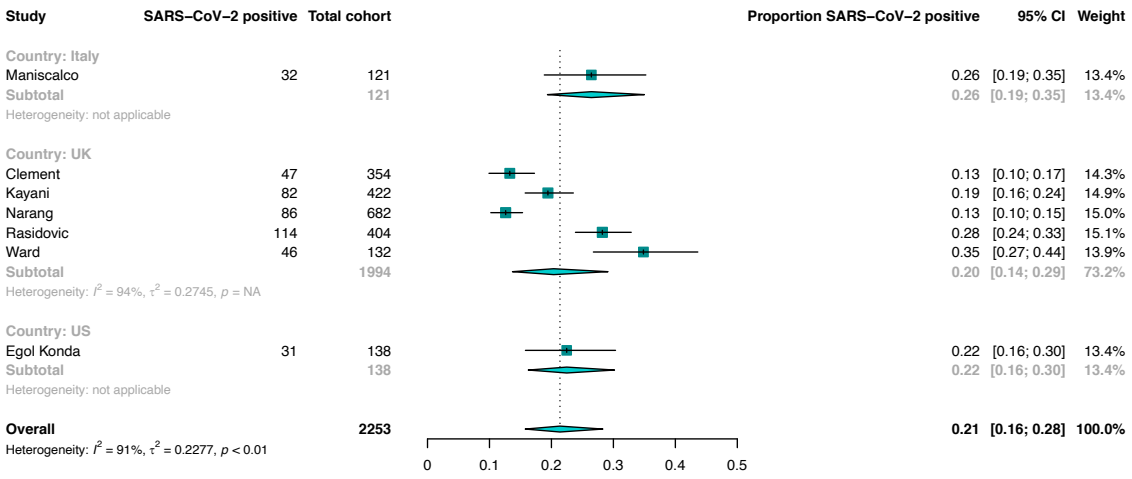


SARS-CoV-2 prevalence

Proportions of cohorts with SARS-CoV-2 infection: all studies



Proportions of cohorts with SARS-CoV-2 infection: large studies



ICU Admissions

Five studies reported outcome data for intensive care unit (ICU) admissions in SARS-COV-2 hip fracture patients. Egol et al. [1] reported 8/31 patients (5 confirmed 3 strongly suspected) with SARS-COV-2 admitted to ICU compared to 18/107 non-infected patients. They also reported 13/111 matched hip fracture patients admitted to the ICU in 2019. Kayani et al. [2] reported 8/82 patients with SARS-CoV-2 admitted to ICU compared to 3/340 non-infected patients; 42/82 SARS-CoV-2 patients were admitted to High Dependency Units (HDU) compared with 59/340 non-infected. LeBrun et al. [3] reported 3/9 patients with SARS-COV-2 admitted to ICU compared to 1/50 non-infected patients. Macey et al. [11] reported 0/10 patients with SARS-COV-2 were admitted to Intensive care compared to 0/66 non-infected patients and 1/76 matched hip fracture patients from 2019. In a case series, Rabie et al. [12] reported 3/4 hip fracture patients with SARS-COV-2 were admitted to a Respiratory Intensive Care Unit.

Non-operative management

Seven studies reported outcome data for surgical/conservative management in SARS-COV-2 hip fracture patients. Egol et al. [1] reported that 23/31 patients with SARS-COV-2 underwent surgical fixation compared to 107/107 non-infected patients. Egol et al. [1] also reported on matched hip fracture patients from 2019. In this group, 111/115 patients underwent surgical fixation. LeBrun et al. [3] reported that 2/9 patients with SARS-CoV-2 died before surgery whilst 50/50 non-infected patients had surgery. Catellani et al. [4] reported that 3 out of 16 SARS-CoV-2 patients died before surgery. Dupley et al. [5] reported that all 58 SARS-COV-2 patients had surgical fixation (37 of whom were operated on within 36 hours). Hall et al. [6] reported that 75/78 patients with SARS-CoV-2 had surgical fixation compared to 739/755 non-infected patients (when adjusted for 30-day COVID status, data obtained from authors). Fadulelmola et al. [7] reported that 19/20 patients with SARS-COV-2 underwent surgical fixation compared to 53/55 non-infected patients. Arafa et al. [8] reported that 17/19 patients with SARS-COV-2 compared to 77/78 non-infected patients. Arafa et al. [8] also reported on matched hip fracture patients from 2019 in whom 57/60 patients underwent surgical fixation.

Time to surgery

Egol et al. [1] reported a mean (SD) time to surgery from admission was 65 (94) hours in the SARS-CoV-2 confirmed group, 50 (50) hours in the COVID suspected group, and 26 (14) hours in the non-SARS-CoV-2 group. A matched group from 2019 had surgery 34 (19) hours after admission. LeBrun et al. [3] reported median [IQR] time to surgery of 29.9 [17.0 – 49.4] hours in SARS-CoV-2 positive patients and 21.5 [17.1 – 26.2] hours in the non-SARS-CoV-2 positive patients. Catellani et al. [4] reported that 10 of 13 operated SARS-CoV-2 positive patients had surgery 12-24 hours from admission; 3 were delayed for reversal of direct thrombin inhibitors. Dupley et al. [5] reported that 37 of 58 SARS-CoV-2 positive patients were operated on within 36 hours from admission. Hall et al. [6] reported that 57/78 SARS-CoV-2 positive patients underwent surgery within 36 hours, compared to 550/739 non-SARS-CoV-2 positive patients. Fadulelmola et al. [7] reported mean time to surgery was 37.4 hours in SARS-CoV-2 positive patients, and 39.8 hours in the non-SARS-CoV-2 positive patients. Arafa et al. [8] reported a mean time to surgery was 28.6 (10.2) hours in the SARS-CoV-2 positive group (median [IQR] 26 [22 – 35] hours) and 29.0 (47.9) hours in the non-SARS-CoV-2 group (median [IQR] time 20 [16-24] hours). They also reported on matched hip fracture patients from 2019 with a mean time to surgery of 24.96 (15.3) (19.1 [13.0 – 35.1]) hours from admission.

Table: Time to surgery metrics

Study	SARS-CoV (hours)	SARS-CoV-2 (other details)	Non-SARS-CoV (hours)	Non-SARS-CoV-2 (other details)	2019 cohort (hours)
Egol	65 (94)		26 (14)		34 (19)
LeBrun	29.9 [17.0 – 49.4]		21.5 [17.1 – 26.2]		
Catellani		10/13 12-24 hours			
Dupley		37/58 within 36 hours			
Hall		57/78 within 36 hours		550/739 within 36 hours	
Fadulelmola	37.4		39.8		
Arafa	28.6 (10.2) 26 [22 – 35]		29.0 (47.9) 20 [16 – 24]		25.0 (15.4) 19 [13 – 35]

Data are reported as mean (SD) or median [interquartile range]

Readmission rates

Only Egol et al. [1] reported on readmission rates. 3/31 SARS-CoV-2 patients were readmitted to hospital compared to 3/107 without SARS-CoV-2.

Re-operation rates

Two studies reported reoperation rates. Arafa et al. [8] reported 0/19 COVID patients were reported on compared to 2/78 non-COVID patients and 1/60 matched hip fracture patients from 2019. Mansicalco et al. [9] reported that 0/32 SARS-CoV-2 patients underwent reoperation compared with 2/89 non-SARS-CoV-2 patients and 1/169 matched hip fracture patients from 2019.

Discharge destination

Discharge destination was reported differently between studies and it was not often specified what was meant by rehabilitation or the causes for it. We present general themes from studies that gave mention to this outcome. Egol et al. [1] reported that 20/31 SARS-CoV-2 patients were discharged to rehab services compared to 83/107 non-SARS-CoV-2 patients. Kayani et al. [2] reported that 30/82 SARS-CoV-2 patients experienced a "decline in setup" at discharge compared to 62/340 non-SARS-CoV-2 patients. LeBrun et al. [3] reported that 3/9 SARS-CoV-2 patients were discharged to a nursing home and 1/9 to a hospice, compared to 15/50 and 1/50 non- SARS-CoV-2 patients respectively. Catellani et al. [4] reported out of 16 COVID positive cases (9 survivors) 2 were discharged to rehabilitation services. Finally, Morelli et al. [10] reported that out of 10 SARS-CoV-2 cases, all 8 survivors were discharged to rehabilitation service

Respiratory Complications

Hypoxia/respiratory failure

Five studies made a comment on hypoxia. Egol et al. [1] reported that 11/31 SARS-CoV-2 patients (7 confirmed 4 suspected) had acute respiratory failure compared to 2/107 non-COVID patients. In this study 4/31 patients from the SARS-CoV-2 group received oxygen therapy via invasive ventilation compared with 1/107 patients in the non-SARS-CoV-2 group. Kayani et al. [2] reported 8/82 SARS-CoV-2 patients suffered from acute respiratory distress syndrome. LeBrun et al. [3] reported that 5/9 SARS-CoV-2 patients suffered from hypoxia compared to 13/50 non-SARS-CoV-2 patients. In this study 4/9 of the SARS-CoV-2 patients received supplemental oxygen therapy (2 of whom underwent invasive ventilation) compared with 13/50 non-SARS-CoV-2 patients. Catellani et al. [4] reported that 4/13 patients suffered respiratory failure and died as a result. All 16 patients with SARS-CoV-2 received supplemental oxygen therapy. Fadulelmola et al. [7] did not report outcomes between different groups but reported that all 10/20 SARS-CoV-2 patients who died suffered from hypoxia. All 20 SARS-CoV-2 patients received supplemental oxygen therapy. Morelli et al. [10] reported that 9/10 SARS-CoV-2 patients required supplemental oxygen therapy.

Pneumonia

Four studies reported on secondary pneumonia though studies are at risk of investigation bias. Egol et al. [1] reported 7/31 SARS-CoV-2 patients with pneumonia compared to 1/107 non-SARS-CoV-2 patients. Kayani et al. [2] reported 11/82 SARS-CoV-2 patients suffered from respiratory infection. LeBrun et al. [3] reported 2/9 SARS-CoV-2 patients suffered from pneumonia compared with 3/50 non-SARS-CoV-2 patients. Arafa et al. [8] reported 0 cases of pneumonia in the SARS-CoV-2 patients (7/19 had SARS-CoV-2-related pneumonitis), compared to 3 cases with bacterial pneumonia and 2/78 with imaging of pneumonitis suspicious of SARS-CoV-2 despite a negative test. There were 0/60 cases of pneumonia for matched 2019 patients in this study.

Pulmonary embolism (PE) /Venous thromboembolism (VTE)

Three studies reported outcomes for PE/VTE though studies are at risk of investigation bias due to the emerging understanding of higher thrombotic events in patients with SARS-CoV-2. Egol et al. [1] reported 2/31 SARS-CoV-2 patients suffered with VTE/PE compared to 3/107 non- SARS-CoV-2 patients. Kayani et al. [2] reported that 11/82 SARS-CoV-2 patients suffered from VTE. Macey et al. [11] reported 0/10 VTE events in COVID patients compared with 1/76 matched hip fracture patients in 2019.

Cardiovascular Complications

Myocardial infarction (MI)

Three studies reported outcomes for myocardial infarction though criteria for diagnosis were unclear. Egol et al. [1] reported 2/31 SARS-CoV-2 patients suffered an MI compared to 3/107 non-SARS-CoV-2 patients. Kayani et al. [2] reported 2/82 SARS-CoV-2 patients suffered an MI. Arafa et al. [8] reported 0/19 SARS-CoV-2 patients suffered an MI compared to 1/78 non-COVID patients. They also reported 4/60 matched hip fracture patients suffered and MI in 2019.

Stroke/Cerebrovascular accident

One study reported outcomes with respect to stroke. Egol et al. [1] reported that 0/31 SARS-CoV-2 patients suffered a stroke compared to 2/107 non-SARS-CoV-2 patients.

Acute Kidney Injury (AKI)

Three studies reported outcomes for AKI though criteria for diagnosis were unclear. Egol et al. [1] reported 4/31 SARS-CoV-2 patients suffered from an AKI compared to 8/107 non-SARS-CoV-2 patients. Kayani et al. [2] reported 10/82 SARS-CoV-2 patients suffered from an AKI. Mansicalco et al. [9] reported that 1/32 SARS-CoV-2 patients experienced an AKI; they also commented that 3/32 patients died of multi-organ failure.

Sepsis

Four studies reported outcomes for sepsis though criteria for diagnosis were unclear. Egol et al. [1] reported 4/31 SARS-CoV-2 patients suffered from sepsis compared to 2/107 non-SARS-CoV-2 patients. Kayani et al. [2] reported 9/82 SARS-CoV-2 patients suffered from sepsis. Arafa et al.[8] reported 0/19 SARS-CoV-2 patients suffered from sepsis compared to 1/78 non-SARS-CoV-2 patients. They also reported 3/60 matched hip fracture patients suffered from sepsis in 2019. Maniscalco et al. [9] reported 2/32 SARS-CoV-2 patients suffered from sepsis.

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References for data in the forest plots are in the main paper.

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