Supplementary Table 1. Summary of findings from included COVID-19 studies

Study Details	Study Design	Case numbers	Study Population	Intervention	Outcome Measure(s)	Summary of Findings	Study Limitations
Bastoni et al (2020), Italy	Case Series	10 patients	Non-intubated patients undergoing helmet CPAP for respiratory failure secondary to confirmed COVID-19 pneumonia	PP while continuing helmet CPAP plus low dose morphine infusion (to assist with compliance)	• PaO2/FiO2 one hour after commencing PP • Point-of-care lung US signs	• 4 patients were unable to tolerate PP • In 6 patients who were able to PP, median PaO2/FiO2 improved from 68+/-5 to 97+/-8 mmHg • Lung US showed no difference in B line quantity and distribution	• No comparator group • Small sample size • Limited documentation
Burton-Papp al (2020), England	Retrospective, single centre, Observational Cohort Study	33	Non-intubated patients who were COVID-19 positive and who required additional respiratory support beyond oxygen therapy (P/F ratio <200)	NIV (either CPAP or BiPAP) + encouragement to PP depending on tolerability	• Intubation • PaO2/FiO2 ratio • RR • HR • ICU Length of Stay (LOS) • Hospital LOS • Mortality	• 7/20 patients required intubation • Mean PaO2/FiO2 ratio improved by 28.7mmHg • Patients who were subsequently intubated demonstrated lower tolerance of PP and significantly poorer response to PP in terms of oxygenation • RR and HR were unchanged • For those who avoided intubation, ICU LOS was 5 days and Hospital LOS was 11 days • All patients survived to hospital discharge	• No comparator group • Small sample size • Retrospective • Non-representative population (ie most patients aged <60)
Caputo, et al (2020), USA	Prospective observational cohort study (convenience sample)	50	Non-intubated patients with suspected COVID-19 with hypoxia on arrival at the Emergency Department despite supplemental O2	PP without change in FiO2 / O2 delivery device	• Change in SpO2 before and 5 minutes after PP • Requirement for intubation within 24 hours	• Median SpO2 - at triage: 80% - after application of supplemental O2: 84% - after 5 minutes of PP: 94% • 13 patients (24%) failed to improve or maintain SpO2 and required intubation within 24 hours	• No comparator group • Questionable clinical relevance of SpO2 at 5 minutes after PP
Cohen et al, (2020), Israel	Case series	2	Non-intubated patients with Type 1 Respiratory failure secondary to COVID-19 pneumonia	PP	• Oxygenation (SpO2) • RR	• Both patients demonstrated marked improvement in SpO2 within 10-30 minutes after commencing PP • One of the patients exhibited a significant reduction in RR with PP	• No comparator group • Small sample size • Marked variation in PP protocols
Coppo et al (2020), Italy	Prospective Cohort study (convenience sample)	47	Non-intubated patients Age 18-75 COVID-19 positive	PP for at least 3 hours. O2 not changed if possible • Helmet CPAP 44 • Reservoir mask 9 • Venturi mask 3	• PaO2/FiO2 ratio - prior to PP - 10min after PP commenced - 1hour after moved back to supine • PaCO2 change • Intubation rate • Comfort	• Oxygenation improved by >50% 10min after PP • Oxygenation improvement not statistically significant once supine position resumed • No difference in accessory muscle use, dyspnea or PaCO2 • Responders to treatment had PP initiated earlier in their hospital stay • Higher CRP and LDH levels correlated to lower PF ratios • No difference in intubation rate between those who responded to PP and those who did not respond	• No comparator group • Significant selection bias to data provided • Exclusion criteria broad and subjective (eg NYHA class<2, BNP > double normal, had contraindication as decided by the attending physician) • 610 eligible patients did not participate • Adverse events not recorded • Excluded 9 patients based on poor tolerance • Excluded a patient based on age after intervention was performed

Damarla et al (2020), USA	Case series	10	Non-intubated adult patients who were COVID-19 positive with rapidly increasing O2 requirements or increased work of breathing (WOB) Admission to ICU Either on HFNP or NP alone	Patients asked to alternate between prone and supine 2 hourly during the day and sleep in prone position as tolerated	• Change in SpO2and RR 1 hour after initial PP compared to pre prone. • Incidence of intubation within two weeks of first PP • 28 day follow up	• Oxygenation improved following PP. Median SpO2 at 1 hour increased from 94% to 98%. • WOB improved with median RR reduced from 31 to 22. • No adverse events recorded. • 8/10 patients did not require intubation • 7/10 did not require escalation of respiratory care • All patients had been discharged home at 28 day follow up	• No comparator group • Small sample size • Measures of patient dyspnea and comfort not collected • Data on patient adherence to PP not collected after 1st episode • One patient also enrolled in trial remdesivir v placebo
Despres et al (2020), France	Case series	6	Non-intubated patients who were COVID-19 positive with rapidly worsening dyspnea and oxygenation (SpO2 ≤92% despite O2 ≥ 5L/min)	PP with either HFNC or conventional O2 therapy (COT) Duration >1 hour and was maintained depending on tolerance and repeated as necessary	• PaO2/FiO2 ratio • Need for intubation • Subjective dyspnea	• 9 sessions total assessed of PP in 6 patients • 4/9 were with HFNC • 5/9 were with COT • PaO2/FiO2 ratio improved after 4 sessions (3 HFNP, 1 COT) • 3/6 patients intubated • All patients described subjective enhancement of dyspnea with PP	• No comparator group • Small sample size
Dong, et al (2020), China	Retrospective cohort study	25	Non-intubated COVID-19 patients with PaO2/FiO2 <300, RR≥30 or SpO2≤93% *Included patients receiving O2 via nasal prongs, O2 masks, HFNC, NIV masks *Of 48 patients identified in cross-sectional survey, 23 were excluded for reasons including inter-hospital transfer, intolerance of treatment protocol or rapid improvement resulting in exit from treatment protocol at <5days	PP *Duration determined by severity: a) PaO2/FiO2 <200 and bilateral chest infiltrates on CT: 10h/day b) All other patients: 4h/day *For patients not tolerating PP for prescribed length of time, Lateral Position was prescribed	• Mortality • Need for intubation	• All 25 patients survived • None required intubation	• No comparator group • Small sample size • Retrospective • Missing data • Not peer reviewed • Selection bias
Elharrar, et al (2020), France	Prospective, single centre, observational cohort study	24	Non-intubated patients with acute respiratory failure secondary to COVID-19	PP without change in O2 delivery device	• Patient tolerance ≥1h, ≥3h • Proportion of "Responders" (PaO2 increase ≥ 20% before vs during PP) • Variation PaO2 or PaCO2 before vs during PP • Proportion of "persistent responders" (PaO2 increase ≥20% before PP vs 6-12h after supination) • Complications • 10 day follow up	• Patient tolerance: - 4 did not tolerate for ≥1hour - 5 tolerated for 1-3 hours - 15 tolerated for ≥3 hours • Responders: 6 patients (25% of total, 40% of those who tolerated ≥3hours) • Persistent Responders: 3 patients • Complications: - 10 patients reported back pain during PP - No major complications • 10 day follow-up: - 5 patients required intubation and mechanical ventilation	• No comparator group • Small sample size • Outcome measures of questionable clinical significance

Elkattawy, et al (2020), USA	Case Report	1	Non-intubated patient with acute respiratory failure secondary to COVID-19	PP with O2 via nasal cannulae	• Tolerance • Oxygenation	• PP was well tolerated for 12 hours • Patient exhibited significant improvement in oxygenation and secretion clearance	• No comparator group • Small sample size
Froelich et al (2020), France	3 case reports	3	Non-intubated patients with Confirmed COVID-19	Various position: semi-sitting in bed sitting in chair, supine, left and right lateral, PP and PP ergonomically supported Oxygen: Mask 15L/min + NP 6L/min	• Vital signs • Dyspnoea	• Placing the most affected part of the lung on top had the best result • 2/3 tolerated prone positions with significant increases in SpO2 in the ergonomically supported PP (1 patient tolerated <30min)	• No comparator group • Small sample size • Poor tolerance with only 1 >30min • Limited measurements of useful data • No comparator group
Gallardo et al (2020), Italy	Case Series	13	Patients with moderate to severe ARDS secondary to COVID-19 (PaO2:FiO2 ratio <150) who were undergoing Helmet CPAP	PP initiated when PaO2:FiO2 <150 and maintained as long as tolerated (range 2-3.5 hours)	• PaO2:FiO2 ratio • Complications	• 12/13 patients exhibited a significant improvement in PaO2:FiO2 ratio • No complications were recorded	• No comparator group • Small sample size • Retrospective
Jena et al (2020), India	Case Report	1	Non-intubated patient with type I respiratory failure secondary to COVID-19	O2 therapy continuing via NRBM combined with PP for 30min every 2 hours during the day and continuously overnight *Total: 12 hours/day	• Oxygenation	• Patient demonstrated a progressive improvement in mean oxygenation over 2 days after commencing the PP protocol	• No comparator group • Small sample size
Lawton et al (2020), UK	Retrospective observational cohort study	559	Consecutive patients with COVID-19 admitted to Bradford Royal Infirmary, UK prior to 21 May 2020	Treatment algorithm utilising escalating O2 therapy *PP for 30 minutes 2x/day was encouraged in conjunction with the commencement of mask CPAP on the ward	• ICU admission • Intubation • Hospital Mortality • ICU Mortality *Comparisons were made against ISARIC database	• 40 patients were admitted to ICU and 27 patients were intubated (*Based on ISARIC data, expected numbers were 92 requiring ICU admission and 55 requiring intubation) • Hospital Mortality was 33.3% (compared to 38.6% for ISARIC) • ICU Mortality was 54.5% (ISARIC: 53.7%)	• No true comparator group • Retrospective • PP played a relatively minor role in the treatment algorithm and was not reported in detail in the findings • Early commencement of CPAP was the main intervention • Study population not representative of general UK (though likely skewed towards more severe disease due to higher comorbidities and low socio-economic status)
Ng et al (2020), Singapore	Case series	10	Non-intubated patients who were COVID-19 positive and requiring O2 in ward setting. *Excluded if FiO2 ≥50%	PP 1 hr per session, 5 sessions/day, spaced 3 hours apart during awake hours	• Haemodynamics and SpO2 at 0, 30 and 60 mins from start of each session	• 3 patients required increased oxygen support in ICU • 1 patient intubated and subsequently died • All able to tolerate PP protocol	• No comparator group • Small sample size • Rates of intubation compared a retrospective group of patients but no data provided • 8 patients initiated on other therapies (eg lopinavir/ritonavir)

Paul et al (2020), USA	Case Series	2	Non-intubated patients with Type I respiratory failure secondary to COVID-19 *Patient 2 deteriorated post extubation	PP accompanied by low dose alprazolam to manage anxiety and enhance tolerance	• Oxygenation	• Both patients exhibited marked improvement in oxygenation and decrease in O2 requirements within hours of pronation • Neither patient required subsequent intubation • Both were subsequently discharged from the ICU	• No comparator group • Small sample size
Retucci et al, (2020), Italy	Prospective, Pilot Observational Study	26	Consecutive patients with Type I respiratory failure secondary to COVID-19 who were already undergoing Helmet CPAP	Trial of PP (if lung impairment was bilateral) or Lateral Positioning (if lung impairment was unilateral - good lung down)	• A-a Gradient • RR • Dyspnoea • SBP • Patient comfort *Measured: - Prior to PP/LP - 1 hour after commencing PP/LP - 45 minutes after resuming semi-recumbent position *Each trial was designated as "success" or "fail" according to pre-designated criteria for the above measures	• Total of 39 trials (12 PP, 27 LP) were conducted • 6 trials were designated "successful" • 15 trials were designated "failed" • 2 patients were unable to tolerate PP/LP • 7 patients were intubated • 2 patients died	• No comparator group • Small sample size • Arbitrary designation of success/fail criteria (eg decrease in A-a Gradient >20%)
Xu, et al (2020), China	Case Series	10	Non-intubated patients with acute respiratory failure secondary to COVID-19 (PaO2/FiO2<300 mmHg)	Management bundle including: • HFNC • PP>16h/d • Antiviral drug • Negative volume balance • Corticosteroid	• Respiratory parameters measured each day for 3 days, before and after PP - PaO2/FiO2 ratio - PaCO2 • Intubation	• After PP: - Slight increase in median PaCO2 - Significant increase in PaO2/FiO2 • None of the patients progressed to critical illness / required intubation	• No comparator group • Small sample size • Retrospective
Sartini, et al (2020), Italy	Prospective observational study *Selected by cross-sectional survey	15	Non-intubated patients with acute respiratory failure secondary to COVID-19, limited response to NIV in supine position	PP+NIV *Duration and frequency was individualised	• Respiratory parameters *data collected: - before NIV+PP - during NIV+PP (1 hour after start) - 1 hour after NIV+PP ending • Patient comfort (numerical rating scale) • 14 day follow-up	• Respiratory rate: all patients had a reduction during and after pronation • SpO2 and PaO2/FiO2 ratio: - all patients had improvement during pronation - 12/15 patients had improvement after pronation • Comfort: - 11/15 patients reported improvement during pronation - 13/15 patients reported improvement after pronation - 2/15 reported no change • At 14 days: - 9 patients discharge home - 1 improved and ceased pronation - 3 continued pronation - 1 intubated - 1 died	• No comparator group • Small sample size • Intervention compares PP+NIV to supine position with no NIV - therefore does not isolate PP as a variable • Non-standardised protocol • Observation study only • Selection bias: didn't include those patients who failed NIV in PP or those that were intubated or died before selection date.
Sztajnbok, et al (2020), Brazil	Case Series	2	Non-intubated patients with acute respiratory failure secondary to COVID-19	PP without change in O2 delivery device (non-rebreather 10L)	• Oxygenation • Dyspnoea	• Both exhibited dramatic improvements in symptoms and oxygenation • Neither patient required intubation	• No comparator group • Small sample size

Thompson et al (2020), USA	Case series	29	Non-intubated patients who were COVID-19 positive with Severe respiratory failure • RR >30 • SpO2 <93% despite O2 (15L/min by Non-rebreather mask or 6L/min by NP)	PP as long as tolerated up to 24 hours/day. Minimum 1 hour	• Change in SpO2 before and 1 hour after initiation of PP	• 4 refused any PP attempt and were immediately intubated • Median improvement in SpO2 1 hour after PP was 7%. • 19/25 had improved SpO2 • 12/25 required intubation	• No comparator group • Small sample size
Tu et al (2020), China	Pilot study Case series	9	Non-intubated patients who were COVID-19 positive receiving O2 via HFNC *PaO2/FiO2 <150mmHg	Twice daily PP procedures	Pre and post PP measurements of: • PaO2 • PaCO • SaO2 • pH Intubation	• Median duration of PP was 2 hours. IQR 1-4hours • SaO2 and PaO2 increased post PP • 2 required intubation (1 extubated day 8, 1 ECMO	• No comparator group • Small sample size • No time points of when post PP measurements were taken
Whittemore et al (2020), UK	Case Report	1	Non-intubated 60 year old male with Type I respiratory failure secondary to COVID-19	Prolonged PP > 18 hours/ day	• Oxygenation	• Marked and rapid improvement in oxygenation occurred with each resumption of PP	• No comparator group • Small sample size