1. Aerosolizing procedures at higher risk of transmission are: cardiopulmonary resuscitation, intubation, extubation, bronchoscopy, nebulizer therapy, sputum induction (if doing for AFB; there should be no sputum induction for COVID). OP and NP are not high risk exposures.

2. COVID is considered mostly droplet precautions unless having those aerosolizing things done. California is still following CDC recommendations. See PPE for Intubating down at #7

3. Consider intubating patients early if it seems that they are progressing. Variable opinion as to threshold to intubate (anywhere from 6 liters FiO2 to 75% FiO2); COVID patients tend to progress to respiratory failure when significantly hypoxic, and it seems that high flow nasal cannula and BiPap aren't ideal (see #s 4 and 5 below).

4. High flow oxygen has the potential to aerosolize and should only be used with the following caveats:
   a. If using high flow nasal cannula, the patient must be in a negative pressure room, and all staff entering the room must have N95 or PAPR. (if no negative pressure, can’t use it)
   b. If using high flow nasal cannula, the patient should have a surgical mask on at all times to reduce aerosolization
   c. If using high flow nasal cannula, the flow should be no higher than 30 liters (ideally 15-30 liters), for scientific and theoretical decreased risk of aerosolization
   d. High flow nasal cannula should be abandoned if the patient is progressively worsening

5. Bipap has the potential to aerosolize, particularly the V-60 Bipap machines (one tube out, into the mask, no return valve, everything the patient breathes out goes out of the mask unfiltered). If utilizing Bipap, the ventilator (Servo-i) non-invasive mode (with inhalation and exhalation limbs meaning it has a mostly closed circuit) should be utilized to reduce the risk of aerosolization. Try to minimize leak from the mask—if significant air leak around the mask, the ventilator BiPap still might not be the best option.

6. If patient requires intubation, only one person, most experienced, doing the intubating.

7. PPE for intubating: Full face shield and N95 and probably hat and gown, maybe goggles aren’t even ideal in aerosolizing procedures since other parts of face would be exposed to droplets. Consider double-gloving for the intubation. If you have a mask with face shield on top of the N95, you potentially could have the N95 in a paper bag to re-use for the same patient.

8. Consider not bagging the patient. Consider placing ventilator filter (virus filter or high efficiency hydrophobic filter) between bag and the mask (and between a mask and breathing circuit) and not squeezing the bag down, and also having a PEEP valve on the bag valve mask and just placing it on the patient with limited loss from around the mask to administer 100% FiO2.

9. Consider not using high flow nasal cannula with peri-intubation of COVID patients--just use bag valve mask and don’t depress the bag

10. If the patient is severely hypoxic, consider using the non-invasive ventilation mode on the ventilator with a facemask (minimize air leak from face mask as much as possible) as pre-oxygenation prior to moving to intubation. It can be left on in the apneic period with a jaw thrust.

11. Weingart (EM-Crit) says to consider using video laryngoscopy as does the anesthesia article. The down side is the machine (glidescope or C-Mac) being in the room and needing to be cleaned by bleach. Alternatively, could use a disposable laryngoscope, though the down side to direct
intubation is face closer to the patient’s aerosolized secretions, so it is felt that video laryngoscopy is preferred.

12. If needing to break the ventilator circuits, consider sedating and paralyzing the patient first so they don’t breathe in or out in with ET Tube clamped, then clamping the ET tube prior to disconnection, re-connecting to next complete circuit, and lastly unclamping the tube.

13. MDIs are preferred over nebulizers for COVID + patients, if bronchodilators are needed

14. If suction is used, it should be closed circuit suction

15. Metanebs should be avoided as they will aerosolize

16. Proning of patients has been very effective in Italy for refractory hypoxia

17. Consider having patient (pre-intubation) wear masks even in negative pressure rooms to minimize aerosolization

18. More technical information here from Internet Book of Critical Care: https://emcrit.org/ibcc/COVID19/#chloroquine

Other management strategies:

1. Supportive care; ~1/3 to ¼ of hospitalized patients progress to critical

2. Antivirals: remdesivir, only available from Gilead at this time
   a. https://clinicaltrials.gov/ct2/show/NCT04280705 has clinical trial information

3. Chloroquine 500 mg PO BID x 10 days (adjust for renal/ hepatic dysfunction, avoid if contraindications) may have some clinical benefit (no data as of 3/13/2020)

4. Lopinavir / Ritonavir (Kaletra) vs. Kaletra + Ribavirin: unclear at this time if any benefit; multiple trials in China, no data as of yet. Some suggestion that this has been a less effective therapy than hoped. Addition of ribavirin may be more helpful than lopinavir/ritonavir alone.

5. Avoid steroids – concern for longer time of viral shedding from SARS / MERS

6. Avoid fluid overloading patients

Clinical course diagram:

Fig. 1 Global picture of severe cases

References/further reading:

https://emcrit.org/emcrit/some-additional-covid-airway-management-thoughts/

https://emcrit.org/ibcc/COVID19/#chloroquine