COVID-19 – Evidence-Based Best Practice Guidelines Specific to Orthopaedic Surgeons

SUMMARY OF MAIN RECOMMENDATIONS

- Do not use laminar flow, turn off positive pressure, convert to negative *if* available
- Do not use space suits
- Do not use pulse lavage
- Use suction with electrocautery
- Use absorbable sutures whenever possible
- Use clear dressings
- Use backslabs and splints when possible, avoid full cast if possible

SUMMARY OF RECOMMENDATIONS FOR ORTHO PPE USE IN OR

1. **COVID-19 positive case and suspected cases - Covid theatre pack:** N95 mask, covid goggles, blue balaclava, face shield
2. **Non COVID-19 high aerosol (includes power tools; ie reamers, saw, repeat drilling) -** Orange mask, tape sealed, blue balaclava and standard eye protection, face shield
3. **Non COVID-19 simple -** Orange mask, tape sealed, balaclava and standard eye protection.

1.

2.

3.

OPERATING ROOM CONSIDERATIONS

1. **Laminar flow**
    - Positive pressure rooms should not be used, ideally turned off or negative pressure if engineering can achieve this reliably (1, 2).
    - Explanation: SARS, MERS and aerosol transmission guidelines indicate increased air pressure can distribute fine particles through the room and via non-sealed doors to corridors and wider areas.
2. **Space suits with open fan systems (standard ortho suits)**
    - DO NOT USE
    - Explanation: Designed to decrease contamination of wound and protect from splashback. Ineffective at preventing respiratory droplet transmission, contamination noted in SARS cases. Airflow can pull contaminated sub-micron particles into the suit system. More difficult to remove according to PPE protocol at the end of the case, increasing risk of particle release and contamination (3).
3. **Space suits with fan system deactivated**
    - Not advised
    - Explanation: Those who use commonly and have experienced battery drop out know this is not an ideal situation. CO2 retention can occur causing light-headedness and fainting. Fogging occurs when fan system not working and this can impair visibility.
4. **Use of the N95 mask and goggles (see image below)**
    - Use for all COVID-19 positive cases and suspected cases (3-5).
    - Use balaclava, taped orange mask and eye protection for any non COVID-19 cases where power tools will be utilised (Standard now).
    - Explanation: Power tools (drill, saw, burr etc) *may* be associated with droplet and fine particle generation, the infection risk from this is unknown. Standard masking and eye protection as above offer excellent protection
5. **Addition of plastic face shield (see image below)**
    - Plastic face shield over the top of the N95 mask and goggles in COVID-19 cases advised (3, 4).
    - Use of shield for non COVID-19 cases with power tool use or risk of blood/fluid splatter advised.
    - Explanation: Further protection against fluid splatter, they are cheap (approx $30) and effectively decontaminated with soap and water so can be reused in many situations
6. **Use of Powered Air-Purifying Respiratory (PAPR) (see image below)**

- Use of N95 mask with goggles and face shield with standard ortho balaclava to maximise skin coverage is advised (6).
- Explanation: No definitive evidence that PAPR reduces likelihood of viral transmission for potential airborne infections (2). This set-up can be considered equivalent to PAPR protection for Orthopaedic procedures.

N95 with goggles and face shield

PAPR filter respiratory system

7. **Use of power tool, reaming systems, suction irrigation reaming**
   - Consider use carefully: no role for RIA to be standard for all femoral reaming
   - Explanation: Power tools disturb air flow, transmitting infectious droplets. While RIA may remove more blood and debris from the surgical field, the system may be unfamiliar to nurses and surgeons resulting in an increased risk of errors. i.e. Use of a rep is limited to reduce personnel in OR.
8. **Use of pulse lavage**
   - DO NOT USE pulse lavage (7).
   - Explanation: Generation of vapour may increase risk of transmitting infectious agents. No strong reason to use in majority of expected cases
9. **Smoke evacuator on electrocautery**
   - Use smoke evacuator with electrocautery (8).

- Explanation: likely very low risk of viral contagion in smoke but can aid suction of blood product to avoid splatter. Some prior evidence of other virus in smoke plumes. There is no contraindication to use, most now standard.

10. **Selection of wound closure material**
    - Unless there is a strong clinical indication, select subcuticular buried (ie all knots under skin) absorbable suture
    - Explanation: Staples and sutures require increased time for nursing staff in contact. Even in non COVID-19 patient, they may have contracted in hospital environment and be positive at suture removal
11. **Selection of dressings**
    - Use clear tegaderm or opsite visible
    - Avoid wool crepe coverage
    - PICO only if indicated, suction dressings in compound wounds
    - Explanation: Visible dressings allow inspection of wound at a distance from patient reduces need for contact on ward
12. **Application of casts**
    - Use back slabs and removable splints unless clinical need to use full cast
    - Explanation: Cast splitting on ward or removal in clinic increases contact time with patient, can be easier to manage in community clinics

PPE USE RECOMMENDATIONS

IMPORTANT REMINDER: For all patient care staff should follow standard precautions.

PPE TYPE	TRIAGE	FRONTLINE HEALTH STAFF – Symptomatic/suspected COVID patient/SARI/proven COVID-19[1] - BAU body fluid exposure				PATIENTS	VISITORS	CARERS (e.g. in paediatric settings)	CLEANERS
				DHB HOSPITALS					
	Health and non-health care (incl security guards)	Community ambulatory – Primary Care, A&M, EMS, home care/visiting services (unless AGP)	Community residential care - ARC, disability, hospice	General care (all members of the health care team)[2]	Aerosol generating procedures (AGP)[3]	(Suspected/ confirmed –symptomatic patients/ SARI/ proven COVID)	(Suspected/ confirmed –symptomatic patients/ SARI/ proven COVID)	(Suspected/ confirmed –symptomatic patients/ SARI/ proven COVID	Current COVID positive case in room or after exit from rooms – hospital/hotel[4]
SURGICAL MASKS	Yes[5]	Yes	Yes	Yes	No	Yes, whilst waiting assessment and on transfer, not once in a room in isolation[6]	Yes[7]	No	Only if patient in the room
N95/P2 PARTICULATE RESPIRATORS	No	No	No	No	Yes	No	No	No	No
GOWNS/ APRONS	No	EMS and Ambulance **Nonpatient contact:** No gown **Direct patient contact:** [8] fluid-resistant long sleeve gown	Refer to MoH guidance for PPE usage in ARC. This is also appropriate advice for disability sector and hospice	**Direct patient contact:** fluid-resistant long sleeve gown **Nonpatient contact:** plastic apron	Fluid-resistant long sleeve gown	No	No[9]	No	**Nonpatient contact:** plastic apron
GLOVES	No	Yes Single use	Yes Single use	Yes Single use	Yes Single use	No	No	No	Yes Single use or reusable heavy-duty gloves
EYE PROTECTION: DISPOSABLE OR REUSABLE – USE REUSABLE WHENEVER AVAILABLE[10]	No	Yes	Yes	Yes	Yes (Goggles or face shield where available)	No	No	No	Yes if patient is n the room
HAND HYGIENE	Adhere to the '5 moments for hand hygiene'								
OTHER ISSUES	Social (physical) distancing[11]						Social (physical) distancing	Carer to minimise the time spent in the hospital outside of the patient's room.	

1 Criteria will vary. Refer to current Ministry of Health case definition.

2 Minimise number of people in the room or transfer team.

3 Aerosol generating procedures include: tracheal intubation, non-invasive ventilation, tracheostomy, cardiopulmonary resuscitation, manual ventilation before intubation, bronchoscopy (and BAL), sputum induction, suctioning (except with in line ventilator attachment) and administration of high flow nasal oxygen.

4 Specific advice for primary care has already been developed on cleaning rooms between patients where COVID-19 is suspected.

5 Individual providers may have systems/facilities that mean this is not necessary e.g. maintaining greater than 1 metre distance or impermeable partitions.

6 Children may not tolerate wearing a mask.

7 It is important that visitors are made aware of the need to dispose of the mask safely and to preform hand hygiene when leaving the room.

8 Ambulance and Emergency Services health professionals may choose to wear a hazmat suit for ease of use in community settings and during transportation.

9 Visitors are not providing direct patient cares, nor do they provide care for other patients. For this reason, whilst in the room they need protection from droplets only. Guidance should be provided about safe laundering of clothing and hand hygiene when removing mask and exiting the room.

10 There needs to be a process in place to ensure reusable eye protection can be cleaned safely prior to reuse. Prescription glasses are not considered to be eye protection.

11 Maintaining greater than 1 metre distance between patient and staff member.

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References

1. *Park, J., Yoo, S.Y., Ko, J. et al. Infection Prevention Measures for Surgical Procedures during a Middle East Respiratory Syndrome Outbreak in a Tertiary Care Hospital in South Korea. Sci Rep 10, 325 (2020). https://doi.org/10.1038/s41598-019-57216-x*
2. *Wong, J., Goh, Q.Y., Tan, Z. et al. Preparing for a COVID-19 pandemic: a review of operating room outbreak response measures in a large tertiary hospital in Singapore. Can J Anesth/J Can Anesth (2020). https://doi.org/10.1007/s12630-020-01620-9*
3. *Derrick JL, Gomersall CD. Surgical helmets and SARS infection. Emerg Infect Dis. 2004;10(2):277–279. doi:10.3201/eid1002.030764*
4. *American College of Surgeons - COVID-19: Considerations for Optimum Surgeon Protection Before, During, and After Operation. (Accessed March 28, 2020)https://www.facs.org/covid-19/clinical-guidance/surgeon-protection*
5. *Evidence: Long, Y., Hu, T., Liu, L., et al. Effectiveness of N95 respirators versus surgical masks against influenza: A systematic review and meta-analysis. 2020 https://doi.org/10.1111/jebm.12381*
6. *Park, J., Yoo, S.Y., Ko, J. et al. Infection Prevention Measures for Surgical Procedures during a Middle East Respiratory Syndrome Outbreak in a Tertiary Care Hospital in South Korea. Sci Rep 10, 325 (2020). https://doi.org/10.1038/s41598-019-57216-x*
7. *Tellier, R., Li, Y., Cowling, B.J. et al. Recognition of aerosol transmission of infectious agents: a commentary. BMC Infect Dis 19, 101 (2019). https://doi.org/10.1186/s12879-019-3707-y*
8. *Limchantra, Ice & Fong, Yuman & Melstrom, Kurt. (2019). Surgical Smoke Exposure in Operating Room Personnel: A Review. JAMA Surgery. 154. 10.1001/jamasurg.2019.2515.*

Other References

Oxford COVID-19 Evidence Service:

https://www.cebm.net/covid-19/

Cochrane Library Special Collection: Coronavirus (COVID-19): infection control and prevention measures

https://www.cochranelibrary.com/collections/doi/SC000040/full

Chloroquine and hydroxychloroquine: Current evidence for their effectiveness in treating COVID-19

https://www.cebm.net/covid-19/chloroquine-and-hydroxychloroquine-current-evidence-for-their-effectiveness-in-treating-covid-19/

Comparative accuracy of oropharyngeal and nasopharyngeal swabs for diagnosis of COVID-19

https://www.cebm.net/covid-19/comparative-accuracy-of-oropharyngeal-and-nasopharyngeal-swabs-for-diagnosis-of-covid-19/

Coronavirus (COVID-19): evidence relevant to critical care

https://www.cochranelibrary.com/collections/doi/SC000039/full

COVID-19 Guidance for infection prevention and control in healthcare settings

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/874316/Infection_prevention_and_control_guidance_for_pandemic_coronavirus.pdf

What is the efficacy of standard face masks compared to respirator masks in preventing COVID-type respiratory illnesses in primary care staff?

https://www.cebm.net/covid-19/what-is-the-efficacy-of-standard-face-masks-compared-to-respirator-masks-in-preventing-covid-type-respiratory-illnesses-in-primary-care-staff/

American College of Surgeons Committee on Trauma - PPE to be worn for all trauma cases

https://www.facs.org/covid-19/clinical-guidance/maintaining-access

Useful links

NZ: www.covid19.govt.nz

CDC: www.coronavirus.gov

NIH: www.nih.gov.coronavirus