

H1N1 Influenza Management in the ICU / HDU

The spread of the H1N1 variant of influenza is a significant concern this year, and it is inevitable that the critical care unit of the Mater Misericordiae University Hospital shall be required to care for patients who become critically ill with this disease. We are somewhat fortunate living in the Western hemisphere as the Southern hemisphere is already exposed to the outbreak, and through the networking available to us we can learn much from their experience. There have also been a significant number of cases in the UK requiring intensive care, and the case histories and experience with those patients is very informative.

A number of important lessons are available-

1. The scale of the disease has been manageable to date, such that hospital activity has largely been able to continue in many centres.
2. The impact upon ICU in New Zealand has been that approximately 1/5th of ICU beds have been occupied by patients with H1N1 flu, with the rest of the ICU beds being available for routine case-mix.
3. The management is very similar to that of many severe pneumonias and with good survival statistics.

The aim of this document is to present in a concise manner the particular intensive care management aspects. Broader information related to occupational health and non-intensive care management can be accessed on-line thru www.hpsc.ie.

Identifying the patient with H1N1

Patients presenting with community acquired pneumonia or with prior flu-like symptoms referred to critical care. Unless there is specific evidence of primary bacterial pneumonia, these patients shall be considered as possible H1N1 carriers, and for appropriate precautions to be taken, as below.

Infection Control Precautions / Personal Protective Equipment (PPE)

Isolation

- 1) all patients suspected of having influenza require single rooms
- 2) positive or negative pressure is not required for these rooms
- 3) cohorting of patients with a proven diagnosis of H1N1 is acceptable
- 4) avoid use of fans (air recirculation)
- 5) visitors kept to a minimum and educated in standard infection control and PPE appropriate to level of contact (see "Staff" below)

Staff

- a) standard precautions as always for all patients
- b) hand hygiene
- c) surgical mask if entry to cohorted area but no patient contact
- d) gloves, plastic apron, surgical mask, eye protection if patient contact
- e) gloves, gown , FFP3 mask, eye protection if aerosol generating procedure
- f) staff rostered to isolation cubicles should adopt the same precautions as for aerosol generating procedures - as per e) above.










Environmental Cleaning and Disinfections

- <http://www.hpsc.ie/hpsc/A-Z/EmergencyPlanning/AvianPandemicInfluenza/SwineInfluenza/AdviceforHealthProfessionals/InfectionControl/File,3628.en.pdf>

Personal Protective Equipment (PPE)

Adapted for influenza A(H1N1)v

Correct sequence for putting on and removing PPE to prevent contamination of the face, mucous membranes and clothing.

Putting on PPE	
1. Decontaminate hands 2. Put on disposable apron/gown 3. Put on mask (Surgical or FFP2 or FFP3)	 
For FFP2 or FFP3 masks: A. Place mask over nose, mouth and chin B. Fit flexible nose piece over nose bridge C. Secure on head with elastic D. Adjust to fit E. Inhale – mask should collapse F. Exhale – check for leakage around face	
4. Put on goggles if required 5. Put on gloves	
Removing PPE	
1. Remove gloves (avoid touching the outside of the gloves)	
2. Decontaminate hands	
3. Remove goggles	
4. Remove gown or apron (avoid touching the front of the gown/apron)	
5. Remove mask by breaking the ties (avoid touching the front of the mask & use ties to discard)	 
6. Discard all PPE into healthcare risk waste	
7. Decontaminate your hands	

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Aerosol generating procedures

Definition

Aerosol-generating procedures are procedures that stimulate coughing and promote the generation of aerosols.¹

Aerosol generating procedures

WHO² has advised that the following aerosol generating procedures have been associated with a documented **increased risk** of pathogen transmission:

- Intubation and related procedures, e.g. manual ventilation
- Respiratory and airway suctioning (including tracheostomy care)
- Nasopharyngeal aspiration
- Cardiopulmonary resuscitation
- Bronchoscopy
- Autopsy procedures

Other Aerosol generating procedures with a **possible increased risk** of pathogen transmission are:

- Nebulisation
- Non-invasive positive pressure ventilation
- Bi-level positive airway pressure (BPAP)
- High frequency oscillating ventilation

Infection Prevention and Control

1. Adhere to Standard, Droplet and Contact precautions
2. Place patient in a single room
3. To avoid unnecessary exposures, only those healthcare workers or caregivers needed to perform the procedure should be present in the room at the time the aerosol generating procedure is being carried out.
4. In the healthcare setting the following PPE should be worn for **all** aerosol generating procedures
 - a. Long sleeved gowns
 - b. FFP2 or FFP3 respirator masks
 - c. Eye protection (e.g., goggles)
 - d. Gloves (sterile gloves for some procedures)

Refer to [donning and removal of PPE document](#).

5. Community setting:
Caregivers should avoid being in the same room when a nebuliser treatment is ongoing. If entering the room is unavoidable, a surgical mask should be worn.

1. CDC-Infection Control in Healthcare, Home and Community Settings, 2002. <http://www.cdc.gov/ncidod/sars/guidance/i/pdf/healthcare.pdf>

2. WHO-Infection prevention and control of epidemic- and pandemic-prone acute respiratory disease in health care

http://www.who.int/csr/resources/publications/WHO_CD_EPR_2007_6/en/

Clinical Care Practice Points

Patients referred to ICU / HDU shall be the critically ill. This patient area has no surge capacity and cannot be used to cohort patients not requiring this level of dependency.

1. **Diagnosis** – clinical diagnosis supported by appropriate specimen sampling as per clinical context. Ensure nasopharyngeal swabs and (where intubated) tracheal aspirates are sent for viral culture. Ensure sample labelled correctly and specifically for H1N1.
2. **Anticipate** need for respiratory support such that as much as possible this can be in a managed context.
3. **Non-Invasive Ventilation** may be used where appropriate. In such circumstances FFP3 masks should be worn by staff, the ventilator should be turned on only after fitting to the patients face, and turned off before removal. If NIV strategy likely only to postpone invasive ventilation, consider earlier progression to elective intubation and mechanical ventilation. Bacterial/ Viral filter to expiratory circuit.
4. **Mechanical Ventilation / Equipment**
 - current ventilator set-up appropriate for these patients, including tubing, humidification, and bacterial / viral filter on expiratory circuit.
 - Change of ventilator tubing should be as per current practice.
 - Closed suctioning should be employed.
 - Ventilator circuit should not be broken unless necessary.
 - If circuit has to be broken, adopt aerosol generating procedure precautions.
 - If HFOV, adopt aerosol generating procedure precautions at all times.
5. **Mechanical Ventilation Strategies**
 - follow standard ICU protocols / strategies as for respiratory failure and ARDS
 - pulmonary compliance often good, and need to avoid overdistension.
 - Beneficial effect have been noted with Nitric Oxide and Proning
 - HFOV may be useful in poorly compliant cases
 - ECMO has been utilised in cases refractory to the above measures.

6. Antiviral Therapy

- Oseltamivir (Tamiflu®) 150mg NG BD for 10 days in the critically ill. This is higher than the recommended treatment dose of 75mg/kg in non-severe cases. The higher dose and duration has become common practice internationally in the critically ill, though there is no specific evidence to support this practice. Oseltamivir is not available in an intravenous format. GUT absorption may be an issue with critically ill.
- Dose adjustment required for Cr Clearance < 30ml/min
- Oseltamivir / ribavirin combination therapy – limited data
- Ribavirin Monotherapy – limited data
- Adamantanes – H1N1 resistant to adamantanes (Amantadine)
- Inhaled Zanamivir (Relenza) – no evidence in critically ill

7. Fluid Balance

- adopt a conservative fluid strategy.

8. Steroids

- evidence to date suggests that steroids may be detrimental.

9. Acute Kidney Injury

- approx 20% of critically ill H1N1 patients may require renal replacement therapy.

10. Thromboembolic prophylaxis

- Important to ensure prophylaxis prescribed

11. Bacterial Superinfection

- Secondary bacterial infections should always be considered and routine tracheal aspirate sampling and routine surveillance should be adhered to.
- Streptococcal, staphylococcal and pneumococcal secondary infections have all been reported

12. Disease Course

- Beware of rapid deterioration in hospitalised patients. International experience has observed such deterioration within 24hrs of hospital admission, followed by referral to ICU, a further 48hrs of clinical worsening, followed by the beginnings of improvement. ICU stays have tended to be quite long.

13. Duration of Isolation

- in consultation with Dept of Infection Control and microbiology

Audit

1. Maintain current audit dataset – responsibility of all doctors and nurses
2. Participate in ESICM Registry – awaiting further details
3. Consideration to SWIFT Registry in collaboration with ICNARC