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9 Health System Response: Clinical Management of Patients with influenza like illness during an Influenza Pandemic

9.1 Scope and purpose

This chapter contains guidance for health professionals regarding the treatment of pandemic influenza. It covers treatment in hospitals and the community of both adults and children. It is intended for use in Ireland in event that the World Health Organisation declares that an influenza pandemic has started,⁽¹⁾ and cases of pandemic influenza have been identified within Ireland.

It has been adapted with kind permission from Guidance produced by the Department of Health, UK, British Infection Society, British Thoracic Society, and Health Protection Agency, in March 2006.^{(2) (3)} It has also been reviewed by the Infectious Diseases Society of Ireland in May 2009. It should be read in conjunction with the National Plan for Pandemic Influenza 2007. The chapter contains synopses on:

- Clinical management in the community (adults and children)
- Clinical management of adults referred to hospital
- Clinical management of children referred to hospital

To facilitate preparedness planning, this document has been written in advance of the emergence of the next influenza pandemic, at a time when the identity of the causative virus remains unknown.

These Guidelines are based on the best evidence available from previous pandemic and interpandemic influenza periods. An influenza pandemic will not be “business as usual” and the way the healthcare system functions will need to be altered to accommodate exceptional arrangements. The guidance may evolve as clinico-pathological information on the eventual pandemic virus emerges. **Once an influenza pandemic is**

underway, users are strongly urged to refer to the most up-to-date version of these Guidelines (from web-based access points).

9.2 *Who are these guidelines aimed at?*

These guidelines are offered for the guidance of all hospital doctors and primary care physicians. In the event of a pandemic, it is envisaged that all health care practitioners, regardless of individual specialisation, may be involved in the management of patients with influenza. It is intended that these guidelines will also be of value to health care practitioners who do not usually manage patients with influenza but may be called upon to do so in a pandemic situation. Modification of some recommendations at a local level may be necessary in specific instances.

These guidelines are not relevant for the management of patients affected by seasonal influenza, sporadic acute exacerbations of chronic obstructive pulmonary disease (AECOPD), lower respiratory tract infections or community-acquired pneumonia (CAP).

9.3 *Health care delivery modes*

Even though it is impossible to predict with certainty the impact of the next pandemic, based upon the available epidemiological and modelling information, it is clear that it will generate demands for health care which may saturate or overwhelm normal acute services for a period of time, perhaps several weeks or months. Accordingly, it should be anticipated that the Health Service Executive (HSE) (in common with all health systems around the world) will need to revert to emergency arrangements.

The aim will be to treat as many people as possible at home. The following care settings may apply:

- Self-care with appropriate advice and treatment from healthcare professionals
- GP treatment of community patients 'well' enough to be managed in the community

- Hospital care in acute medicine for persons considered too ill or lacking the social supports to be managed at home.
- Treatment of patients in the community (who would normally receive care from a GP) by other health care professionals (community health and public health doctors, nurses, paramedics, pharmacists etc.) following treatment guidance laid out in this publication
- Treatment of patients in their own homes or in temporary intermediate care facilities/ alternative care settings under the care of a GP or other healthcare professional, following treatment guidance laid out in this publication when, under normal circumstances, such patients would have been admitted for hospital care
- Using hospitals who normally deal with mainly elective work (e.g. orthopaedic hospitals) to treat patients who require hospital care but do not need High Dependency Unit care (HDU) or Intensive Care (ICU)
- Treatment of severely ill patients in hospital by medical and nursing teams who do not normally manage patients with influenza or community acquired pneumonia, in areas of the hospital not normally used for providing medical care (for example, surgical teams and bed space diverted from routine elective work towards pandemic response).

The aim will be to consider for treatment with antivirals (neuraminidase inhibitors) all patients if they have all of the following:

- 1) An acute influenza-like illness
- 2) Fever ($\geq 38^{\circ}\text{C}/100.4^{\circ}\text{F}$ in adults, or $\geq 38.5^{\circ}\text{C}/101.3^{\circ}\text{F}$ in children) and
- 3) Been symptomatic for 48 hours or less.

This is subject to having sufficient antivirals to treat all those clinically ill, and also demonstration that antivirals are effective against the pandemic strain.

9.4 General management and investigations in the community

Box 1.1 Clinical Case Definition

The presence of fever and new (or, in those with chronic lung disease, worsening) cough of acute onset when influenza with pandemic potential is circulating in the community.

(Important note - This definition may be modified once a pandemic occurs.)

9.4.1 Initial assessment and triage

Management decisions regarding patients with influenza should be based primarily on:

- an assessment of illness severity
- identification of whether the individual is in an at risk group
- age, if the patient is a child(children aged less than 3 years should be seen by a doctor)
- current advice from Health Protection Surveillance Centre (HPSC)/local Medical Officer of Health (MOH) based on the epidemiology of the pandemic

Patients (including children aged over 3 years of age) who are not considered to be at high risk and who have no features suggesting severe disease or complications may be seen in a community health facility staffed by healthcare professionals other than GPs.

Patients at high risk of complications (Appendix 1) should be seen and assessed by a GP or at the designated flu assessment centre of the acute hospital.

A series of algorithms have been developed to aid and summarise initial assessment and management of pandemic influenza. These are outlined in Appendices 2, 3, 4 and 6.

9.4.2 Criteria for Hospital Referral (Adults) (Appendices 2 and 3)

Patients with clinically defined uncomplicated influenza infection would be expected to make a full recovery. They require good symptomatic management, access to antiviral treatment, information about the natural history, and advice as to when to re-consult. Patients with **new or worsening symptoms** - particularly shortness of breath or recrudescent fever not responding to treatment - **should be examined to assess the presence and severity of influenza-related pneumonia.**

There is no validated severity assessment tool validated for influenza-related pneumonia, but the CRB-65 score has been validated for community acquired pneumonia. The **CRB-65 score** (Table 9.1) is recommended for use in the **community setting** to determine the management of influenza related pneumonia. It does not replace clinical judgment.

- Patients with influenza-related pneumonia who have a CRB-65 score of 2 are at increased risk of death and should be considered for hospital admission, or at a minimum, hospital supervised outpatient treatment
 - Patients with influenza-related pneumonia clinically, who have a CRB-65 score of 1 or 2 (particularly score 2) AND require oxygen, IV fluids, IV antibiotics, nursing care or NG tube feeding, BUT do not have a pre-existing co-morbid medical condition as outlined in Appendix 1, should be referred to hospital. If available locally, an elective, rather than an acute hospital should be used.
 - Patients with influenza-related pneumonia clinically, who have a CRB-65 score of 1 or 2 (particularly score 2) AND require oxygen, IV fluids, IV antibiotics, nursing care or NG tube feeding, AND have a pre-existing co-morbid medical condition as outlined in Appendix 1, should be referred to an acute hospital
- Patients with CRB-65 score of 3 or more should be referred to an acute hospital for urgent admission.

- Patients with worsening of pre-existing co-morbid medical conditions should be managed according to best practice for that condition with reference to published disease-specific guidelines, if available. If such patients have progression of their flu symptoms such that they require hospital treatment, they should be referred to an acute hospital.
- Patients with bilateral chest signs of pneumonia (crackles) should be referred to an acute hospital for further assessment regardless of CRB-65 score (Table 9.1).

Table 9.1 Severity assessment used to determine the management of influenza-related pneumonia in patients in the community (CRB-65 score)

CRB-65 score*	Recommended action
0	Likely suitable for home treatment
1 or 2	Consider hospital referral, particularly with score 2
3 or more	Urgent acute hospital referral
Any(0 to 4) in the presence of bilateral chest signs of pneumonia	Consider acute hospital referral

*Score 1 point for each feature present:

- **C**onfusion (Mental Test Score of ≤ 8 , or new disorientation in person, place or time.)
- **R**espiratory rate ≥ 30 /min
- **B**lood pressure (SBP < 90 mmHg or DBP ≤ 60 mmHg)
- Age ≥ 65 years

The Pandemic Medical Early Warning Score (PMEWS) is an alternative to CRB 65 which could also be used in the community. ⁽⁴⁾ It was developed in the UK for use in primary and secondary care, with the aim of identifying patients who need hospital admission. They modified an existing hospital Medical Early Warning score to include transcutaneous oxygen saturation and added supplementary scoring features of co-morbidity and social factors. The score adds an extra point for age over 65 years and another for any of social isolation, chronic disease or having a performance status of limited

activity or worse. The threshold score for admission can be altered locally, depending on demand.

9.4.3 *Criteria for Hospital Referral (Children) - (Appendix 4)*

- Children who are severely ill should be referred for assessment for admission to an acute hospital. Indicators of severe disease are any of these below:
 - 1) cyanosis
 - 2) severe dehydration
 - 3) altered conscious level
 - 4) complicated or prolonged seizures
 - 5) signs of sepsis such as extreme pallor, hypotension, a floppy infant
 - 6) persistent signs of respiratory distress such as markedly raised respiratory rate, grunting, intercostal recession or breathlessness with chest signs. (A useful severity assessment tool for respiratory distress taken from the BTS pneumonia guidelines is given in Appendix 5)
- Children who have progression of their flu symptoms AND require oxygen, IV fluids, IV antibiotics, nursing care or NG tube feeding BUT do not fit the criteria for acute hospital referral above, may be referred to an elective hospital.

9.4.4 *General Management of both adults and children in the Community*

9.4.4.1 Initial management

All patients presenting with symptoms suggestive of influenza (except perhaps those in whom urgent admission is required) should be given general advice and advice on antipyretics, fluids and infection control, and be considered for antiviral therapy.

There is little scientific evidence for most symptomatic and self-help treatment, but experience suggests that some of the following may help, and are unlikely to cause harm.

- Treatment of fever, myalgia and headache with paracetamol or ibuprofen
- Rest
- Drink plenty of fluids
- Avoid smoking
- Consider: steam inhalation, short course of topical decongestants, throat lozenges, saline nose drops

Aspirin is contraindicated in children less than 16 years of age

9.4.4.2 Investigations

- Where possible, **early** in a pandemic (i.e. when cases are not widespread throughout Ireland: WHO Phase 6, Irish Alert levels 2-3), nose and throat swabs, or nasopharyngeal swabs (in children), in virus transport medium should be submitted to the local laboratory.
- Once a pandemic is established (i.e. widespread cases throughout the country; WHO Phase 6, Irish Alert level 4), microbiological investigations are not recommended.
- General investigations, including a chest x-ray, are not necessary for the majority of patients managed in the community.
- Routine testing for bacterial pathogens is not recommended at any stage.

9.4.4.3 Use of antivirals

- Ideally, individuals should be considered for treatment with antivirals (neuraminidase inhibitors) if they have all of the following:
 - 1) An acute influenza-like illness
 - 2) Fever ($\geq 38^{\circ}\text{C}/100.4^{\circ}\text{F}$ in adults, or $\geq 38.5^{\circ}\text{C}/101.3^{\circ}\text{F}$ in children) and
 - 3) Been symptomatic for 48 hours or less.

The antiviral treatment of choice is oseltamivir (Tamiflu™). Liquid paediatric suspension is available for children and dilution of the capsules of Tamiflu can also be used to prepare the dose. **Note:** Paediatric capsules (30mg, 45mg) are also available.

Treatment Schedule:

Adults - Oseltamivir 75mg every 12 hours for 5 days

(Dose to be reduced by 50% if creatinine clearance is less than 30ml/minute i.e. 75mg once daily)

Children

Child aged < 1 year	Oseltamivir 2-3mg/kg twice daily for 5 days
Child aged ≥ 1 yr; body weight 15kg or lower (≥ 1 yr-<3yrs)	Oseltamivir 30mg 12-hourly for five days
>15-23kg (3yr-<7yrs)	Oseltamivir 45mg 12-hourly for five days
>23-40kg	Oseltamivir 60mg 12 hourly for five days
Child >40kg	Oseltamivir 75mg 12-hourly for five days

(Dose to be reduced by 50% if creatinine clearance is less than 30ml/minute)

The European Medicines Evaluation Agency's (EMA) Committee for Medicinal Products for Human Use (CHMP) recommends, in the case of pandemic influenza being declared by WHO in the context of the novel influenza A (H1N1) outbreak, treating children below 1 year of age with oseltamivir.⁽⁵⁾ Children below 1 year of age should be treated under medical supervision. It is strongly recommended that at least children below 3 months of age are treated under medical supervision in hospital.

Although there is no strong evidence to support antiviral use outside the above circumstances, antiviral treatment should be considered for:

- Patients who are unable to mount an adequate febrile response e.g. the immunocompromised or very elderly may still be eligible for antiviral treatment despite lack of documented fever.
- Hospitalised patients who are severely ill, particularly if also immunocompromised, may benefit from antiviral treatment started more than 48 hours from disease onset, although there is no evidence to demonstrate benefit, or lack of, in such circumstances.

9.4.4.3.1 Antivirals in Pregnancy

On 7th May, 2009, following a review of all the available data by its Scientific Committee (CHMP), the EMEA concluded that the benefit of using oseltamivir (Tamiflu) in pregnant or breastfeeding women outweighs the risk in the context of novel influenza A (H1N1) in a pandemic situation.⁽⁵⁾ Zanamivir (Relenza) has in animal studies been shown to cross the placenta and to be secreted in breast milk. The non-clinical data are not indicative of any relevant cause for concerns regarding the safe use of Relenza at recommended doses. Taken together, EMEA states that the overall data suggest that the benefit of using Relenza in pregnant or breastfeeding women outweighs the risk in the context of a novel influenza A (H1N1) in a pandemic situation.

9.4.4.4 Antibiotic management in adults with influenza managed in the community (see also Appendix 7)

The use of antibiotics in adults with influenza **not complicated by pneumonia** is determined by (a) the presence of any co-morbid illnesses (see Appendix 1) and (b) the timing of first consultation with respect to the onset of symptoms.

Table 9.2: Recommendations on use of antibiotics in adults with influenza managed in the community

Patient group	Recommendation
(A) Not complicated by influenza-related pneumonia	
Previously well	Antibiotics not routinely required
Previously well, but who have developed significant worsening of symptoms (particularly recrudescence fever or	Consider antibiotic use

increasing breathlessness)	
Patients at high risk of complications (see Appendix 1)	*Strongly consider a prescription for 'delayed prophylactic' antibiotics to be used if the illness is not starting to improve after 24 hours or there is worsening of symptoms (recrudescence fever or increasing breathlessness).
(B) Complicated by influenza-related pneumonia	
All patients	Antibiotics recommended

Table 9.3 below outlines the empirical antibiotic treatment regimens for adults with pneumonic and non-pneumonic lower respiratory tract infections (including exacerbations of COPD and acute bronchitis) complicating influenza managed in the community.

- Those with features of severe infection (i.e. bilateral chest signs or C-RB-65 score of 3 or more) should be urgently referred to hospital.
- For those referred to hospital, GPs should consider administering antibiotics immediately where the illness is considered life-threatening or where delays (>2 hours) in admission are likely.
- Reference should be made to a specialist text (e.g. IMF/BNF, or IPHA Compendium of Medicines, available at www.medicines.ie) for the antibiotic management of women who are pregnant or lactating and for those with renal or hepatic impairment.

Table 9.3. Empirical antibiotic treatment regimens for adults with pneumonic and non pneumonic lower respiratory tract infection complicating influenza managed in the community

Preferred	Alternative^a
Doxycycline ^b 200mg stat and 100mg orally, once daily for 1 week or Co-amoxiclav 625mg orally, 3 times daily for 1 week or Cefuroxime 500mg orally, 2 times daily for 1 week	Clarithromycin 500 mg orally, 2 times daily for 1 week Or Clarithromycin LA 500mg orally, once daily for 1 week

- a) An alternative regimen is provided for those intolerant of or hypersensitive to preferred regimen
- b) Doxycycline contraindicated in pregnancy

9.4.4.5 Antibiotic management in children with influenza managed in the community (see also Appendix 7)

Secondary bacterial infections particularly pneumonia and otitis media are common in children with influenza. *S pneumoniae*, *S aureus* and *H influenzae* are the most common pathogens encountered during influenza outbreaks.

- Children in any one of the following groups should be treated with an antibiotic that will provide cover against *Streptococcus pneumoniae*, *Staphylococcus aureus* and *Haemophilus influenzae*:
 - 1) those at risk of complications of influenza (see Appendix 1)
 - 2) those with one or more of the following adverse features
 - a. breathing difficulties
 - b. severe earache
 - c. vomiting > 24 hours
 - d. drowsiness, or
 - 3) those with disease severe enough to merit hospital admission during an influenza pandemic
- Empirical antibiotic treatment regimens recommended for children in the community in the above categories are detailed below:
- Reference should be made to a specialist text (e.g. IMF/BNF, or IPHA Compendium of Medicines, available at www.medicines.ie) for the antibiotic management of children with renal or hepatic impairment.

Preferred	Alternative^a
Co-amoxiclav orally for 1 week	Clarithromycin orally for 1 week Or Cefuroxime orally for 1 week

a) An alternative regimen is provided for those intolerant of or hypersensitive to preferred regimen

- For children less than 12 years co-amoxiclav is the drug of choice and is preferred for children up to 18 years

Co-amoxiclav (orally for 7 days)*

Age	Dose	Frequency	Formulation
0-12 months	0.25ml/Kg	3 times daily	of 125/31 suspension
1-6 years*	5mls	3 times daily	of 125/31 suspension
7-12 years*	10mls	3 times daily	of 125/31suspension
12-18 yrs	1 tablet	3 times daily	250/125

* Double the dose in severe infection

- Equivalent twice daily formulations of Co-amoxiclav (*Augmentin Duo*) are presented below:

Augmentin Duo* (orally for 7 days)

Age	Dose	Frequency	Formulation
2 months -2 years	0.15ml /kg	2 times daily	400/57 suspension
2-6 years (13-21 kg)	2.5mls	2 times daily	400/57 suspension
7-12 years (22-40kgs)	5 mls	2 times daily	400/57 suspension

* Double the dose in severe infection

- Clarithromycin or cefuroxime should be used in children allergic to penicillin.

Clarithromycin (orally for 7 days)

Age	Dose	Frequency	Formulation
<8kg	7.5mg/kg	2 times daily	125mg in 5ml suspension
8-11kg	2.5ml	2 times daily	125mg in 5 ml suspension
12-19kg	5ml	2 times daily	125mg in 5 ml suspension
20-29kg	7.5ml	2 times daily	125mg in 5 ml suspension
≥30kg	5ml	2 times daily	250mg in 5 ml suspension
>10years	250mg	2 times daily	Tablet

Cefuroxime (orally as cefuroxime axetil for 7 days)

Age	Dose	Frequency	Formulation
3-24 months	10mg/kg (up to a max. of 125mg)	2 times daily	125mg in 5 ml suspension
2-12 years	15mg /kg (up to a max. of 250mg)	2 times daily	125mg in 5 ml suspension
13-18 years	500mg	2 times daily	Tablet

- For children over 12 years, doxycycline 100mg orally daily is an alternative (should be swallowed whole with adequate fluids). Note: Doxycycline is contraindicated in pregnancy.

9.4.4.6 When should patients re-consult?

Examples of what should prompt patients to re-consult are given in table 9.4.

Table 9.4: Examples of what should prompt patients to re-consult

Examples of what should prompt patients to re-consult
➤ Shortness of breath at rest or while doing very little
➤ Painful or difficult breathing
➤ Coughing up bloody sputum
➤ Drowsiness, disorientation or confusion
➤ Fever for 4-5 days and not starting to get better (or getting worse)
➤ Starting to feel better then developing high fever and feeling unwell again
➤ If taking antiviral drugs, symptoms should start to improve within two days. Lack of any improvement after two days from starting antiviral drugs is an indication to re-consult
Note: This information may be modified once a pandemic occurs

To summarise:

- Any rapid deterioration following first consultation should prompt a patient to re-consult.

- Failure to improve 2 days after starting an antiviral agent is an indication to re-consult.
- If the first consultation did not involve contact with a physician, re-consultation should preferably involve a physician, usually a GP.

9.5 Clinical management of adults in the hospital setting

9.5.1 Severity assessment when presenting to hospital

- Patients with uncomplicated influenza infection would be expected to make a full recovery and do not require hospital care.
- In uncomplicated infection, the illness usually resolves in 7 days although cough, malaise and lassitude may persist for weeks.
- Patients with worsening of pre-existing co-morbid medical conditions should be managed according to best practice for that condition with reference to published disease-specific guidelines, if available.

9.5.1.1 Assessment of those with Influenza-related pneumonia

There is no validated severity assessment tool developed specifically for influenza-related pneumonia. The **CURB-65** severity assessment tool is recommended for the stratification of **hospital patients** with influenza-related pneumonia (see Table 9.5) into disease severity groups. In addition, the presence of diffuse bilateral lung infiltrates on chest radiography consistent with primary viral pneumonia is an adverse prognostic feature. Such patients should be treated as for severe pneumonia.

Table 9.5: Severity assessment used to determine the management of influenza-related pneumonia in patients admitted to hospital (CURB-65 score)

CURB-65 score*	Recommended action
0	Likely suitable for home treatment
1 or 2	Consider elective hospital stay, particularly with score 2, or hospital supervised outpatient stay
3 or more	Manage in acute hospital as severe pneumonia

*Score 1 point for each feature present:

- Confusion (Mental Test Score of ≤ 8 , or new disorientation in person, place or time.)
- Urea $> 7\text{mmol/L}$
- Respiratory rate $\geq 30/\text{min}$
- Blood pressure (SBP $< 90\text{mmHg}$ or DBP $\leq 60\text{mmHg}$)
- Age ≥ 65 years

***NOTE: New bilateral lung shadowing on CXR consistent with primary viral pneumonia should be taken as a feature of severe pneumonia regardless of CURB-65 score.**

9.5.1.2 High Dependency or Intensive Care Unit referral

- Patients with primary viral pneumonia or a CURB-65 score of 4 or 5 should be considered for HDU/ICU referral.
- General indications for HDU/ICU referral include:
 - 1) persisting hypoxia with $\text{PaO}_2 < 8\text{Kpa}$ despite maximal oxygen administration
 - 2) progressive hypercapnia
 - 3) severe acidosis ($\text{pH} < 7.26$)
 - 4) septic shock
- Patients with influenza admitted to Intensive Care Unit should be managed by specialists with appropriate training in Intensive Care, Respiratory Medicine and/or Infectious Diseases.

9.5.2 General Investigations for Adults in Hospital

- The following investigations are recommended in patients referred to hospital:

Test	Who this applies to
Full blood count	All patients
Urea and electrolytes	All patients
Liver function tests	All patients
Chest x-ray	All patients
Pulse oximetry	All patients. If $< 92\%$ on air, then arterial blood gases.
ECG	Patients with cardiac and respiratory complications or co-morbid illnesses.
C-reactive protein	If influenza-related pneumonia is suspected*

- In those patients who are subsequently followed up in a hospital outpatient clinic or by a general practitioner a repeat chest X-ray should

be obtained at around 6 weeks if respiratory symptoms or signs persist or where there is a higher risk of underlying malignancy (especially smokers and those over 50 years of age).

- Further investigations including a CT thoracic scan and bronchoscopy should be considered if the chest X-ray remains abnormal at follow up.

9.5.3 *Microbiological investigations*

9.5.3.1 Early in a pandemic (i.e. the virus has been isolated in Ireland and there are outbreaks, but there is not, as yet, widespread activity across Ireland: WHO Phase 6, Irish Alert level 3)

- All patients should have virological tests.
 - 1) Nose and throat swabs in virus transport medium.

If presentation is more than 7 days after onset of illness, an 'acute' serum (5-10mLs clotted blood) should be collected and a 'convalescent' sample (5-10mLs clotted blood) obtained after an interval of not less than 7days.
- Patients with influenza-related pneumonia should also have the following bacteriological tests:
 - 1) **Blood culture** (preferably before antibiotic treatment is commenced)
 - 2) **Pneumococcal urine antigen** (20 mls urine sample)
 - 3) **Legionella urinary antigen** (20 mls urine sample)
 - 4) **Sputum Gram stain, culture** and antimicrobial susceptibility tests on samples obtained from patients who:
 - i. are able to expectorate purulent samples, *and*
 - ii. have not received prior antibiotic treatment.
 - 5) **Paired serological examination for influenza/other agents.** Acute serum should be collected and a 'convalescent' sample obtained after an interval not less than 7days (both 5-10mLs clotted blood).

9.5.3.2 Once a pandemic is established (i.e. widespread activity across Ireland: WHO Phase 6, Irish Alert Level 4)

- Virological tests are not routinely recommended.

- Patients with influenza-related pneumonia should have bacteriological tests in accordance to the severity of illness.

a. Non-severe pneumonia (CURB-65 Score 0, 1 or 2)

No routine testing. In patients who do not respond to empirical antibiotic therapy, sputum samples should be sent for Gram stain culture and antimicrobial susceptibility tests.

b. Severe pneumonia (CURB-65 Score 3, 4 or 5, or bilateral CXR changes)

- **Blood culture**, preferably before antibiotic treatment is commenced
- **Pneumococcal urine antigen** (20mls urine)
- **Legionella urine antigen** (20mls urine)
- **Sputum Gram stain, culture** and antimicrobial susceptibility tests on samples obtained from patients who are able to expectorate purulent samples, *and* have not received prior antibiotic treatment.
- **Paired serological examination** for influenza/other agents. 'Acute' serum should be collected and a 'convalescent' sample obtained after an interval not less than 7 days (both 5-10mLs clotted blood).
- **Tracheal or endotracheal aspirate samples**, if available, should be sent for Gram stain, culture and antimicrobial susceptibility testing.

9.5.4 General Management of adults admitted to hospital

9.5.4.1 Initial management

- All patients should be managed in accordance with the infection control guidelines outlined in Guidance for Pandemic Influenza: Infection Control in Hospitals, Community and Primary Care settings
- Hypoxic patients should receive appropriate oxygen therapy with monitoring of oxygen saturations and inspired oxygen concentration with the aim to maintain $\text{PaO}_2 \geq 8 \text{ Kpa}$ and $\text{SaO}_2 \geq 92\%$. High concentrations of oxygen can safely be given in uncomplicated pneumonia.

- Oxygen therapy in patients with pre-existing chronic obstructive pulmonary disease complicated by ventilatory failure should be guided by repeated arterial blood gas measurements. Non-invasive ventilation may be helpful.
- Patients should be assessed for cardiac complications and also volume depletion and their need for additional intravenous fluids.
- Nutritional support should be given in severe or prolonged illness.

9.5.4.2 Monitoring in hospital

- Temperature, respiratory rate, pulse, blood pressure, mental status, oxygen saturation and inspired oxygen concentration should be monitored and recorded initially at least twice daily and more frequently in those with severe illness or requiring regular oxygen therapy.
- In patients who are not progressing satisfactorily a full clinical reassessment and a repeat chest radiograph are recommended.

9.5.4.3 Discharge and follow up

- Patients should be reviewed 24 hours prior to discharge home. Those with 2 or more of the following unstable clinical factors should be considered for continuing care in hospital:
 - 1) temperature $> 37.8^{\circ}\text{C}$
 - 2) heart rate $> 100/\text{min}$
 - 3) respiratory rate $> 24/\text{min}$
 - 4) systolic blood pressure $< 90\text{mmHg}$
 - 5) oxygen saturation $< 92\%$ on room air
 - 6) inability to maintain oral intake
 - 7) abnormal mental status or mental status not returned to baseline.
- Follow up clinical review should be considered for all patients who suffered significant complications or who had significant worsening of their underlying disease, either with their general practitioner or in a hospital clinic.

- At discharge or at follow up, patients should be offered access to information about their illness, take home medication and any follow up arrangements.
- **It is the responsibility of the hospital team to arrange the follow up plan with the patient and the general practitioner.**

9.5.5 Use of antivirals in hospitalised adult patients

Individuals should be considered for treatment with antivirals (neuraminidase inhibitors) if they have all of the following:

1. An acute influenza-like illness
2. Fever ($>38^{\circ}\text{C}/100.4^{\circ}\text{F}$) and
3. Are symptomatic for 48 hours or less.

Treatment Schedule:

Adults - Oseltamivir 75mg every 12 hours for 5 days
(Dose to be reduced by 50% if creatinine clearance is less than 30ml/minute i.e. 75mg once daily)

- Patients who are unable to mount an adequate febrile response e.g. the immunocompromised or very elderly, may still be eligible for antiviral treatment despite lack of documented fever.
- Hospitalised patients who are severely ill, particularly if also immunocompromised, may benefit from antiviral treatment started more than 48 hours from disease onset, although there is no evidence to demonstrate benefit, or lack of, in such circumstances.

9.5.6 Use of antibiotics in hospitalised adults (see also Appendix 7)

- Guidelines for inpatient management should be according to the existing hospital policy for the management of Community Acquired Pneumonia (CAP). Special attention should be made to ensure that adequate *S. aureus* coverage is included in the regimen. When a pathogen has been identified local microbiological advice should always be sought regarding specific therapy.

- Reference should be made to a specialist text (e.g. BNF, or IPHA Compendium of Medicines, available at www.medicines.ie) for the antibiotic management of women who are pregnant or lactating and for those with renal or hepatic impairment.

9.5.6.1 Bronchial complications without influenza-related pneumonia

- Previously well adults with acute bronchitis complicating influenza, in the absence of pneumonia, do not routinely require antibiotics.
- Antibiotics should be considered in those previously well adults who develop worsening symptoms (recrudescence fever or increasing dyspnoea).
- Patients at high risk of complications or secondary infection (see Appendix 1) should be considered for antibiotics in the presence of lower respiratory features.
- Patients with chronic lung disease, including COPD, should receive antibiotics in the presence of increased purulent sputum.
- Most patients can be adequately treated with oral antibiotics.
- The preferred choice includes:

Co-amoxiclav 625mg orally, 3 times daily for 7 days
or
Doxycycline* 200mg stat and then 100mg orally, 2 times daily for 7 days

*Contraindicated in pregnancy

- Alternatives include: Clarithromycin (500mg orally, 2 times daily for 7 days), cefuroxime (500mg orally, 2 times daily for 7 days), or a fluoroquinolone active against *S. pneumoniae* and *S. aureus* where required e.g. for those intolerant of penicillins (moxifloxacin 400mg orally, once daily for 5 days or levofloxacin 750mg orally, once daily for 5 days).

9.5.6.2 Non-severe influenza-related pneumonia

- Most patients can be adequately treated with oral antibiotics.
- Antibiotics should be administered within 4 hours of admission.

- Oral therapy with co-amoxiclav or a tetracycline as outlined above is preferred. Alternatives include: Clarithromycin (500mg orally, 2 times daily for 7 days), cefuroxime (500mg orally 2 times daily for 7 days), or a fluoroquinolone active against *S. pneumoniae* and *S. aureus* where required e.g. for those intolerant of penicillins (moxifloxacin 400mg orally once daily for 5 days or levofloxacin 750mg orally, once daily for 5 days).
- When oral therapy is contra-indicated, recommended parenteral choices include:

Co-amoxiclav 1.2g IV 3 times daily or Cefuroxime 1.5g IV 3 times daily

- If the above antibiotics are unavailable, ceftoxamine 1g IV 3 times daily, or ceftriaxone 1g IV once daily are acceptable alternatives, although they are less active against *S. aureus*.

9.5.6.3 Severe influenza-related pneumonia

- Patients with severe pneumonia should be treated immediately after diagnosis with parenteral antibiotics.
- The following is recommended:

Co-amoxiclav 1.2g IV 3 times daily or Cefuroxime 1.5g IV 3 times daily

PLUS

Clarithromycin 500mg IV/orally 2 times daily
--

- If co-amoxiclav or cefuroxime are unavailable, ceftoxamine 1g IV 3 times daily, or ceftriaxone 1g IV once daily are acceptable alternatives, although they are less active against *S. aureus*.
- In patients where outpatient antibiotic treatment has failed and patient requires hospitalization, an alternative regimen includes a fluoroquinolone with enhanced activity against pneumococci together with a broad spectrum β -lactamase stable antibiotic or a macrolide.

- In critically ill patients (i.e. ICU admission required) when Methicillin Resistant *S. aureus* (MRSA) is suspected (or confirmed), Vancomycin (15mg/kg IV 2 times daily) or linezolid (600mg IV or orally, 2 times daily) should be added.
- Antibiotic therapy should be directed at the pathogen and thus therapy should be modified once the results from cultures are obtained.

9.5.6.4 Route and duration of antibiotic

- Patients treated initially with parenteral antibiotics should be transferred to an oral regimen as soon as clinical improvement occurs and the temperature has been normal for 24 hours, providing there is no contra-indication to the oral route.
- For most patients admitted to hospital with non-severe and uncomplicated pneumonia, **7 days** of appropriate antibiotics is recommended.
- **For those with severe, microbiologically undefined pneumonia, 10 days treatment** is proposed. Longer therapy may be required depending on the patient's clinical response, especially where *S. aureus* or Gram negative enteric bacilli pneumonia is suspected or confirmed.

9.5.6.5 Failure of empirical antibiotic therapy

- If the patient fails to improve on empirical antibiotic therapy, the consultant medical microbiologist or infectious diseases physician should be consulted in all cases for advice on appropriate antimicrobial therapy
- For those with non-severe pneumonia in hospital on combination therapy, changing to a fluoroquinolone with effective pneumococcal and staphylococcal cover is an option.
- Adding further antibiotics effective against MRSA is an option for those with severe pneumonia not responding to combination antibiotic therapy. Consult with local Consultant Microbiologist or Infectious Disease Consultant.

9.6 **Clinical management of children presenting to hospital**

9.6.1 *Severity assessment in children (see Appendices 4, 5 and 6)*

- Coughs and mild fevers ---
Treat at home by parents with antipyretics and fluids
(Note: aspirin should not be used in children < 16 years)

- High fever (>38.5°C/101.3°F) and cough or influenza like symptoms ---
 - Seek medical advice.
 - If there are no features which put them at high risk of complications (Appendix 1 and below) they should be treated with oseltamivir, and given advice on antipyretics and fluids.
 - Children at risk of complications, and all children aged less than 3 years should be seen by a GP.

- High fever (>38.5°C/101.3°F) and cough or influenza like symptoms PLUS at-risk group. These children should be seen by their GP or in an Emergency Department.

Children may be considered at increased risk of complications if they have cough and fever (or influenza like illness) and temperature >38.5°C/101.3°F AND either chronic disease or one of following features:

- **Breathing difficulties**
- **Severe earache**
- **Vomiting > 24 hours**
- **Drowsiness**

These children should be offered an antibiotic as well as oseltamivir and advice on antipyretics and fluids.

Criteria for hospital referral for admission are any of the following:

- 1) Signs of persistent respiratory distress.
 - markedly raised respiratory rate
 - grunting
 - intercostal recession
 - breathlessness with chest signs
 - 2) Cyanosis
 - 3) Severe dehydration
 - 4) Altered conscious level
 - 5) Complicated or prolonged seizure
 - 6) Signs of septicaemia – extreme pallor, hypotension, floppy infant
- Most children admitted to hospital are likely to need oxygen therapy and/or intravenous support as well as antibiotics and oseltamivir.

Indications for referral to High Dependency or Intensive Care are:

- 1) the child is failing to maintain a SaO₂ of >92% in FiO₂ of >60%
 - 2) the child is shocked
 - 3) there is severe respiratory distress and a raised PaCO₂ (> 6.5 Kpa)
 - 4) there is a rising respiratory rate and pulse rate with clinical evidence of severe respiratory distress with or without a raised PaCO₂
 - 5) there is recurrent apnoea or slow irregular breathing
 - 6) there is evidence of encephalopathy
- When there are no PICU beds available, children will have to be triaged on the basis of the severity of their acute and co-existing disease, and the likelihood of their achieving full recovery.

9.6.2 General investigations for children in hospital

- A full blood count with differential, urea, creatinine and electrolytes, liver enzymes and a blood culture should be done in all severely ill children.
- A CXR should be performed in children who are hypoxic, have severe illness or who are deteriorating despite treatment.
- Pulse oximetry should be performed in every child being assessed for admission to hospital with pneumonia.

9.6.3 Microbiological/virological investigations in hospital

Early pandemic recommendations. (i.e. the virus has been isolated in Ireland and there are outbreaks, but there is not, as yet, widespread activity across Ireland: WHO Phase 6, Irish Alert levels 2 and 3)

A. **Virology – all children**

- 1) Nasopharyngeal aspirate or nose and throat swabs
- 2) If presentation is more than 7 days after onset of illness, an ‘acute’ serum (2-5 ml clotted blood) should be collected and a ‘convalescent’ sample (2-5 ml clotted blood) obtained after an interval of not less than 7 days.

B. **Bacteriology – children with influenza related pneumonia**

- 1) Blood culture (before antibiotic treatment is commenced)
- 2) Sputum samples obtained from older children
- 3) Paired serological examination for influenza/other agents.

Established pandemic recommendations (i.e. widespread activity across Ireland: WHO Phase 6, Irish Alert level 4)

A. **Virology** – not routinely recommended

B. **Bacteriology – children with influenza related pneumonia**

- 1) Blood culture (before antibiotic treatment is commenced)
- 2) Sputum samples obtained from older children
- 3) Paired serological examination for influenza/other agents

9.6.4 *General management of children admitted to hospital*

- All patients should be managed in accordance with the infection control guidelines outlined in Guidance for Pandemic Influenza: Infection Control in Hospitals, Community and Primary Care settings
- Patients whose oxygen saturation is 92% or less while breathing air should be treated with oxygen given by nasal cannulae, head box, or face mask to maintain oxygen saturation above 92%.
- When children are unable to maintain oral intake supplementary fluids should when possible be given by the enteral route. Intravenous fluids in those with severe pneumonia should be given at 80% basal levels.
- Children can be safely discharged from hospital when they
 - 1) are clearly improving
 - 2) are physiologically stable
 - 3) can tolerate oral feeds
 - 4) have a respiratory rate < 40/min (<50/min in infants)
 - 5) have an awake oxygen saturation of >92% in air.

9.6.5 *Antiviral therapy in children*

- In the setting of a pandemic, children should be considered for treatment with antivirals if they have all of the following:
 - 1) an acute influenza-like illness (see definition in clinical section)
 - 2) fever (>38.5⁰C/101.3⁰F) and
 - 3) been symptomatic for 2 days or less
- Oseltamivir is the anti-viral agent of choice.

Child aged < 1yr	Oseltamivir 2-3mg/kg twice daily for 5 days
Child aged ≥1yr; body weight 15kg or lower	Oseltamivir 30mg 12-hourly for 5 days
>15kg-23kg	Oseltamivir 45mg 12-hourly for 5 days
>23kg-40 kg	Oseltamivir 60mg 12-hourly for 5 days
> 40kg	Oseltamivir 75mg 12 hourly for 5 days

- In children who are severely ill in hospital oseltamivir may be used if the child has been symptomatic for <6 days (but there is no evidence to demonstrate benefit or lack of it in such circumstances)

9.6.6 Use of Antibiotics in hospitalised children (see also Appendix 7)

- Guidelines for inpatient management should be according to the existing hospital policy for the management of Community Acquired Pneumonia (CAP) in children.
- Preferred and alternative initial treatment regimens are summarised below.
- Children who are hospitalised during an influenza pandemic should be treated with an antibiotic that will provide cover against *S. pneumoniae*, *S. aureus* and *H. influenzae*.
- Reference should be made to a specialist text (e.g. IMF/BNF, or IPHA Compendium of Medicines, available at www.medicines.ie) for the antibiotic management of children with renal or hepatic impairment.
- Once susceptibility results are available the drug regimen should be rationalized if possible.

9.6.6.1 Non severe-secondary bacterial respiratory infection in children

- Where clinically appropriate, oral antibiotics should be given provided oral fluids are tolerated.

Preferred	Alternative ^a
Co-amoxiclav orally for 1 week	Clarithromycin orally for 1 week Or Cefuroxime orally for 1 week

a)An alternative regimen is provided for those intolerant of or hypersensitive to preferred regimen

- For children less than 12 years oral co-amoxiclav is the drug of choice and is preferred for children up to 18 years

Co-amoxiclav* (orally for 7 days)..

Age	Dose	Frequency	Formulation
0-12 months	0.25ml/Kg	3 times daily	of 125/31 suspension
1-6 years	5ml	3 times daily	of 125/31 suspension
7-12 years	10ml	3 times daily	of 125/31suspension
12-18 yrs	1 tablet	3 times daily	250/125

* Double the dose in severe infection

- Equivalent twice daily formulations of co-amoxiclav (Augmentin Duo) are presented overleaf:

Augmentin Duo* (orally for 7 days)

Age	Dose	Frequency	Formulation
2 months -2 years	0.15ml / kg	2 times daily	400/57 suspension
2-6 years (13-21 kg)	2.5mls.	2 times daily	400/57 suspension
7-12 years (22-40kgs)	5 mls	2 times daily	400/57 suspension

* Double the dose in severe infection

- Clarithromycin or cefuroxime should be used in children allergic to penicillin.

Clarithromycin (orally for 7 days)

Age	Dose	Frequency	Formulation
<8kg	7.5mg/kg	2 times daily	125mg in 5ml suspension
8-11kg	2.5ml	2 times daily	125mg in 5 ml suspension
12-19kg	5ml	2 times daily	125mg in 5 ml suspension
20-29kg	7.5ml	2 times daily	125mg in 5 ml suspension
≥30kg	5ml	2 times daily	250mg in 5 ml suspension
>10years	250mg	2 times daily	Tablet

Cefuroxime (orally as cefuroxime axetil for 7 days)

Age	Dose	Frequency	Formulation
3-24 months	10mg/kg (up to a	2 times daily	125mg in 5 ml

	max.of 125mg)		suspension
2-12 years	15mg /kg (up to a max. of 250mg)	2 times daily	125mg in 5 ml suspension
13-18 years	500mg	2 times daily	Tablet

- For children over 12 years, doxycycline 100mg orally daily is an alternative (should be swallowed whole with adequate fluids). Note: Doxycycline is contraindicated in pregnancy.

9.6.6.2 Severe secondary bacterial respiratory infection in children

- In children who require intravenous antibiotics, any one of the following schedules can be used.

Co-amoxiclav IV
or
Cefuroxime IV

- If co-amoxiclav or cefuroxime are unavailable, ceftoxamine IV or ceftriaxone IV are acceptable alternatives, although they are less active against *S. aureus*.
- Children who are severely ill with pneumonia complicating influenza should have a second agent added to the regime (e.g. clarithromycin) and the drugs should be given intravenously to ensure high serum and tissue antibiotic levels.
- Intravenous to oral switch should also be considered if the child has made sufficient clinical improvement.

Co-amoxiclav IV

Age	Dose	Frequency
< 7 days	30mg/kg	2 times daily
7-28 days	30mg/kg	3 times daily
1-3 months	30mg/kg	3 times daily
3-12 months	30mg/kg	3 times daily (4 times daily in severe cases)

12-18 years	1.2g 3 times daily	3 times daily (4 times daily in severe cases)
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Cefuroxime IV

Age	Dose	Frequency
< 7 days	25mg/kg	2 times daily*
7-21 days	25mg/kg	3 times daily*
21-28 days	25mg/kg	4 times daily*
1month-18 years	20-30mg/kg	3 times daily*

*Dose can be doubled in severe infection

Cefotaxime IV

Age	Dose	Frequency
< 7 days	25mg/kg	2 times daily*
7-21 days	25mg/kg	3 times daily*
21-28 days	25mg/kg	4 times daily*
1month-18 years	50mg/kg	3 times daily (4 times daily in severe infection)

*Dose can be doubled in severe infection

Ceftriaxone IV

Age	Dose	Frequency
Do not give to Neonates		
<50kg	50mg/kg	once daily
>50 kg	1g	once daily

Clarithromycin IV

- If possible give orally, but if it must be given intravenously

Age	Dose	Frequency
1 month-12 years	7.5mg/kg	2 times daily
12-18 years	500mg	2 times daily

In children who are critically ill (i.e. requiring ICU admission), when Methicillin Resistant *S. aureus* is suspected (or confirmed), Vancomycin IV or linezolid IV should be added. Expert advice should be sought from a medical microbiologist or infectious disease physician.

9.7 References

- (1) WHO. Pandemic influenza preparedness and response: a WHO guidance document. www.who.int. 2009. Available from URL: <http://www.who.int/csr/disease/influenza/PIPGuidance09.pdf>
- (2) British Thoracic Society, British Infection Society, Health Protection Agency for the Department of Health. Clinical guidelines for patients with an influenza like illness during an influenza pandemic. Version 10.5 March 2006. Available from URL: http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/DH_4121753
- (3) Lim WS. Pandemic flu: clinical management of patients with an influenza-like illness during an influenza pandemic. *Thorax* 2007 Jan 1;62(suppl_1):1-46.
- (4) Challen K, Bright J, Bentley A, Walter D. Physiological-social score (PMEWS) vs, CURB - 65 to triage pandemic influenza: a comparative validation study using community - acquired pneumonia as a proxy. *BMC Health Services Research* 2007. 7:33.
- (5) EMA. Opinion of the Committee for Medicinal Products for Human Use Pursuant to Article 5(3) of Regulation (EC) No 726/2004, on Novel Influenza (H1N1) outbreak Tamiflu (oseltamivir) Relenza (zanamivir). EMA 2009. Available from URL: <http://www.emea.europa.eu/humandocs/PDFs/EPAR/tamiflu/27883809en.pdf>

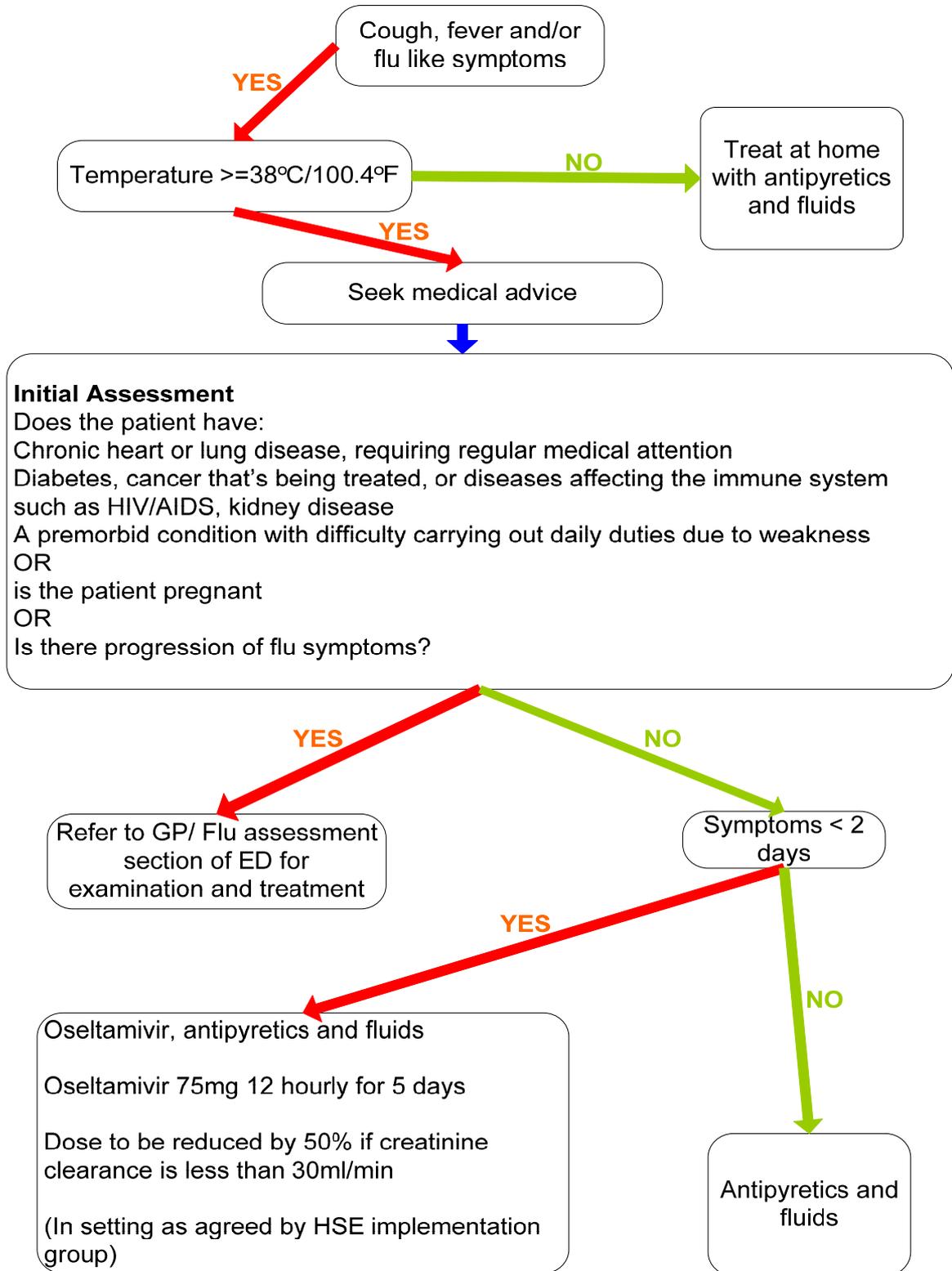
Appendix 1 Patients at high risk of influenza related complications

Clinical risk category	Examples
Aged 65 years or older	
Chronic respiratory disease, including asthma	This includes chronic obstructive pulmonary disease (COPD) including chronic bronchitis and emphysema and such conditions as bronchiectasis, cystic fibrosis, interstitial lung fibrosis, pneumoconiosis and bronchopulmonary dysplasia (BPD). Asthma requiring continuous or repeated use of inhaled or systemic steroids or with previous exacerbations requiring hospital admission. Children who have previously been admitted to hospital with lower respiratory tract disease
Chronic heart disease	This includes congenital heart disease, hypertension with cardiac complications, chronic heart failure and individuals requiring regular medication and/or follow up for ischaemic heart disease
Chronic renal disease	Including nephrotic syndrome, chronic renal failure, renal transplantation
Chronic liver disease	Including cirrhosis, inflammatory bowel disease
Diabetes and chronic metabolic disorders	Diabetes mellitus requiring insulin or oral hypoglycaemic drugs
Immunosuppression and malignancy	Due to disease or treatment. Including Asplenia or splenic dysfunction, HIV infection at all stages, malignancy. Patients undergoing chemotherapy leading to immunosuppression. Individuals on or likely to be on systemic steroids for more than a month at a dose equivalent to prednisolone at 20mg or more per day (any age) or for children under 20kg a dose of 1mg per kg per day
Long-stay residential care homes residents	This does NOT include prisons, young offender institutions, university halls of residence, boarding schools
Others	Doctors retain discretion in identifying additional individual patients who they recognize as at high risk of serious complications should they develop influenza; for example patients with haemoglobinopathies, neurological diseases with muscle weakness, cerebral palsy or children on long term aspirin who are at increased risk of Reyes syndrome

The high risk groups described in this appendix are largely based on data from interpandemic influenza. During the course of a pandemic, the definition of high risk groups may differ. If so, details of the high risk patient group will be altered according

to relevant clinico-epidemiological data. Users are strongly advised to refer to the latest edition of these guidelines at all times

Appendix 2 Initial assessment and management of adults with pandemic influenza



Appendix 3 Guidance on GP assessment and management of adults with pandemic influenza

GP should assess those with:

Chronic heart or lung disease, requiring regular medical attention

Diabetes, cancer that's being treated, or diseases affecting the immune system such as AIDS/HIV, kidney disease

A premorbid condition with difficulty carrying out daily duties due to weakness

OR

if the patient is pregnant

OR

Is there progression of flu symptoms (particularly shortness of breath or fever not responding to treatment)

Assess clinical severity using CRB-65 score

Score 1 point for each feature present:

Confusion (Mental test score ≤ 8 , or new disorientation in person, place or time)

Respiratory rate ≥ 30 /min

Blood pressure (SBP < 90 mmHg or DBP ≤ 60 mmHg)

Age ≥ 65 years

CRB-65 Score

0

1 or 2

3 or more

Any (in the presence of bilateral

Chest signs of pneumonia)

Recommended action

Likely suitable for home treatment

Consider hospital referral, particularly with score 2

Acute hospital referral

Consider acute hospital referral

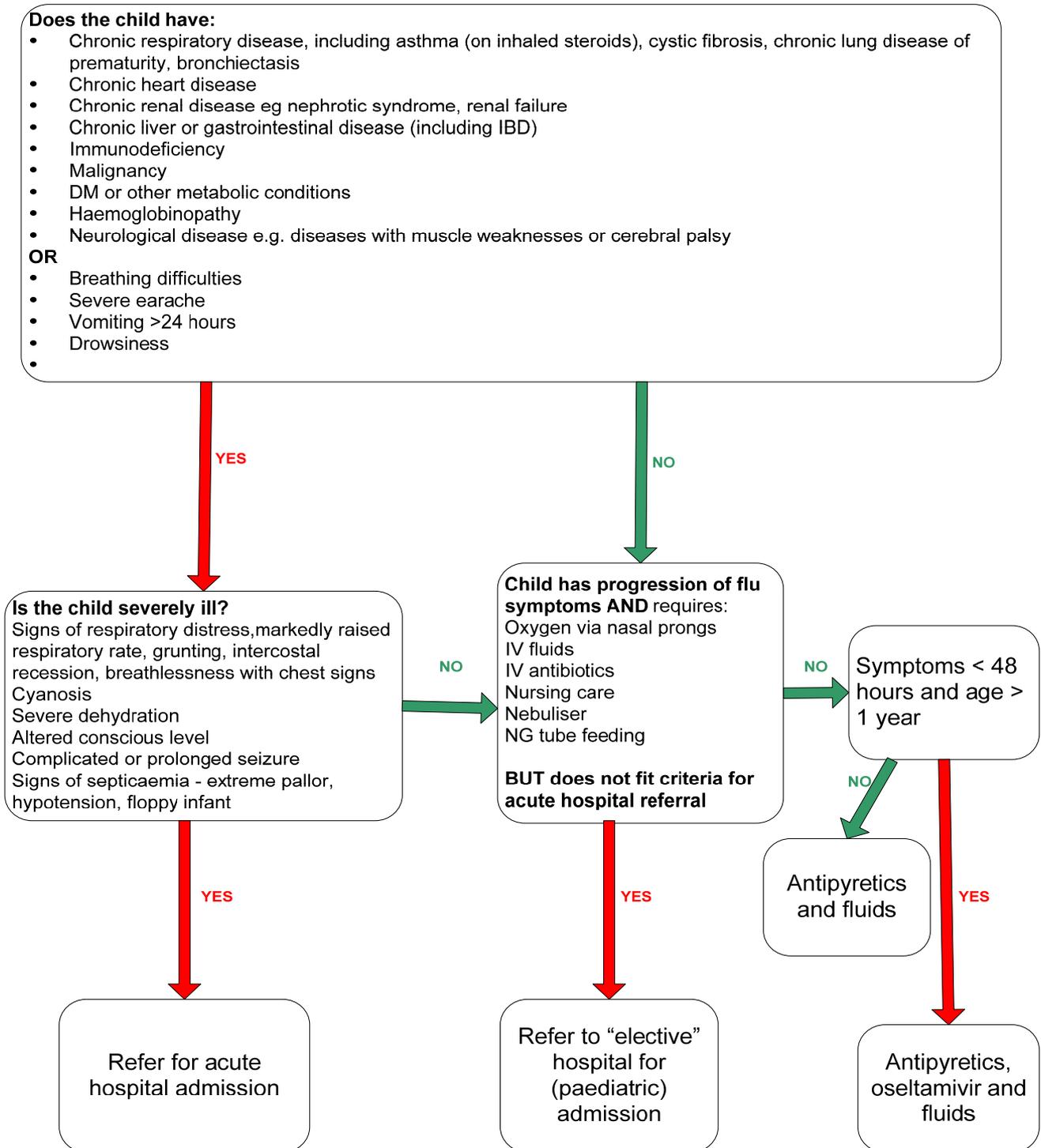
NOTE: Those with a pre-morbid medical condition and progression of flu symptoms should be referred to an acute hospital, rather than an elective hospital

For those suitable for home treatment:

- **Prescribe antivirals** if fever $\geq 38^\circ\text{C}/100.4^\circ\text{F}$ and symptomatic for < 48 hours: Oseltamivir 75mg every 12 hours for 5 days (Dose to be reduced by 50% if creatinine clearance is less than 30ml/minute)
- **Consider prescription for "delayed prophylactic" antibiotics** to be used if no improvement after 24 hours or there is worsening of symptoms: Doxycycline 200mg stat and 100mg od PO or Co-amoxiclav 625mg tds PO (for one week)
- **Provide advice** on infection control, use of antipyretics, when there is a need to re-consult and fluid intake

If medically suitable for home treatment, but inadequate social supports are in place, refer to HSE communal home

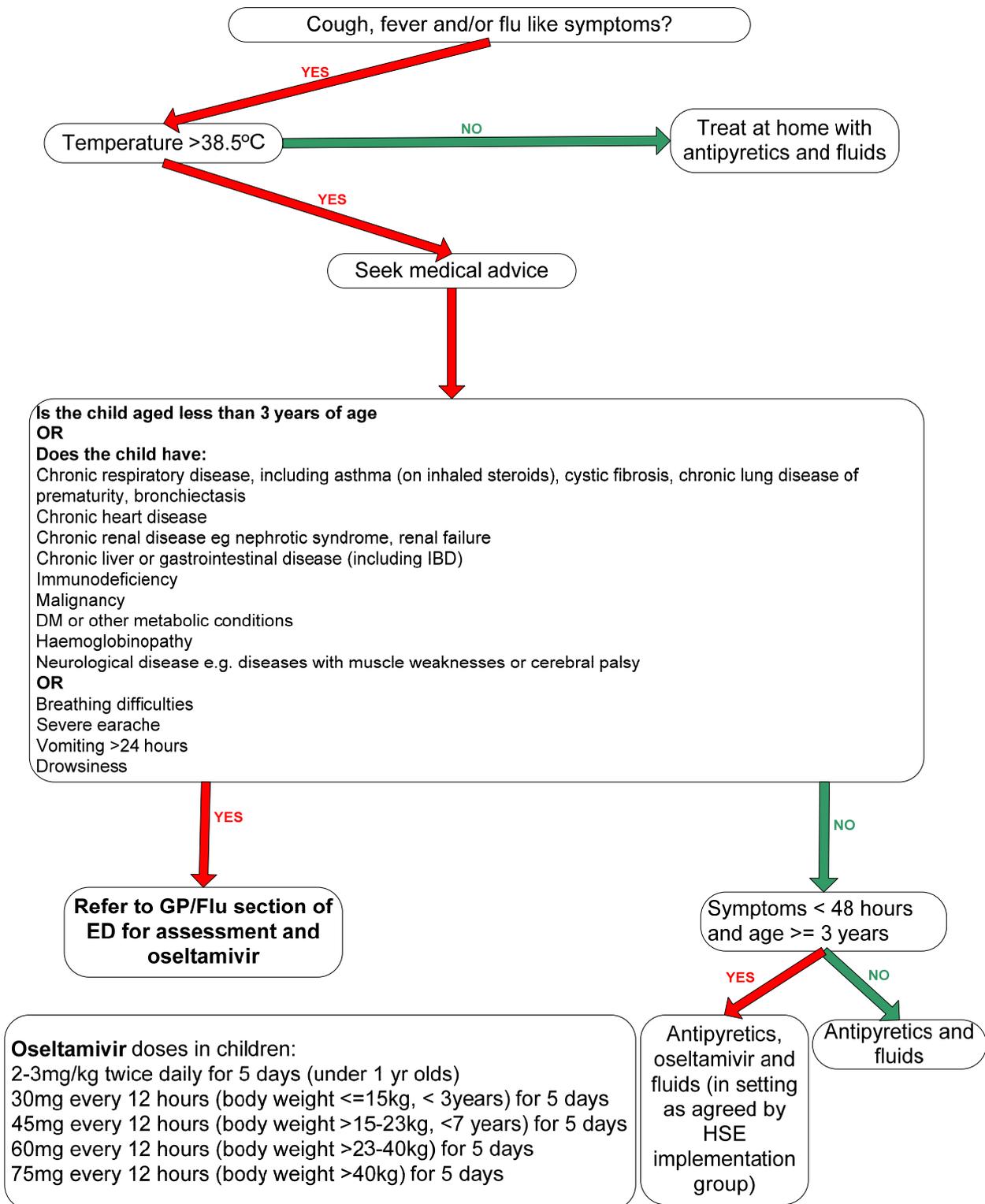
Appendix 4 GP/Emergency Department assessment and management of children



Appendix 5 Paediatric Respiratory Distress Severity Assessment

	Mild	Severe
Infants	Temperature <38.5°C	Temperature >38.5°C
	Respiratory rate <50 breaths per min	Respiratory rate >70 breaths per min
	Mild recession	Moderate to severe recession
	Taking full feeds	Nasal flaring
		Cyanosis
		Intermittent apnoea
		Grunting respiration
		Not feeding
Older children	Temperature <38.5°C	Temperature > 38.5°C
	Resp rate < 50 breaths per min	Resp rate > 50 breaths per min
	Mild breathlessness	Severe difficulty in breathing
	No vomiting	Nasal flaring
		Cyanosis
		Grunting respiration
		Signs of dehydration

Appendix 6 Initial assessment and management of children



Appendix 7 Summary of Antibiotic guidelines for adults and children

- The most common causes of secondary bacterial pneumonia in patients with influenza are *S. pneumoniae* and *S. aureus*. Other bacterial causes include *Haemophilus influenzae* and group A Streptococci.
- These are empirical guidelines only. When a pathogen has been identified, local microbiological advice should always be sought and therapy should be modified once the results from cultures are obtained.
- Reference should be made to a specialist text (e.g. BNF, or IPHA Compendium of Medicines, available at www.medicines.ie) for the antibiotic management of women who are pregnant or lactating and for those with renal or hepatic impairment.

In case of severe or complicated infection, expert advice should be sought.

1. Adult Recommendations

1.1 Oral Antibiotic management of adults in the community

One of the following:

- Co-amoxiclav 625mg orally, 3 times daily for 7 days
- Cefuroxime 500mg orally, 2 times daily for 7 days
- Doxycycline 200 mg stat and 100mg orally 2 times daily, for 7 days

Alternative (for those intolerant or hypersensitive to preferred regimen above)

Clarithromycin 500mg orally, 2 times daily for 7 days

1.2 Oral Antibiotic management of hospitalised adults:

Guidelines for inpatient management should be according to the existing hospital policy for the management of Community Acquired Pneumonia (CAP). Special attention should be made to ensure that adequate *S. aureus* coverage is included in the regimen.

Suggestions include the following:

- Co-amoxiclav 625 orally, 3 times daily for 7 days
- Doxycycline 200mg orally stat, then 100mg orally 2 times daily for 7 days.

Alternatives include:

- Clarithromycin 500 mg orally, 2 times daily for 7 days
- Cefuroxime 500mg orally, 2 times daily for 7 days
- Moxifloxacin 400mg orally, once daily for 5 days or
- Levofloxacin 750mg orally, once daily for 5 days.

1.3 Intravenous Antibiotic management of hospitalized adults

One of the following:

- Co-amoxiclav 1.2g IV, 3 times daily
- Cefuroxime 1.5g IV, 3 times daily
- Cefotaxime 1g IV, 3 times daily
- Ceftriaxone 1g IV, once daily

PLUS Clarithromycin 500mg IV or orally,
2 times daily

In critically ill patients (i.e. ICU admission) when Meticillin Resistant *S. aureus* (MRSA) is suspected (or confirmed) one of the following should be added:

- Vancomycin 15mg/kg IV, 2 times daily or
- Linezolid 600mg IV or orally, 2 times daily

2. Paediatric Recommendations

2.1 Oral Antibiotic management of children in the community

(* symbolises that you can double the dose in severe infections)

One of the following:

Co-amoxiclav (orally for 7 days)

- 0-12 months 0.25ml/kg of 125/31 suspension, 3 times daily
- 1-6 years 5ml of 125/31 suspension*, 3 times daily
- 7-12 years 10mls of 125/31 suspension*, 3 times daily
- 12-18 years one tablet of 250/125 strength, 3 times daily

Co-amoxiclav *Augmentin Duo* formulation (orally for 7 days)

- 2 months- 2 years 0.15ml/kg of 400/57 suspension*, 2 times daily
- 2-6 years (13-21kg) 2.5mls of 400/57 suspension*, 2 times daily
- 7-12 years (22-40kg) 5mls of 400/57 suspension*, 2 times daily

Clarithromycin (orally for 7 days)

- <8 kg 7.5mg/kg of 125mg in 5ml suspension, 2 times daily
- 8-11 kg 62.5mg of 125mg in 5ml suspension, 2 times daily
- 12-19 kg 125mg 125mg in 5ml suspension, 2 times daily
- 20-29 kg 187.5mg 125mg in 5ml suspension, 2 times daily
- ≥ 30 kg 250mg of 250mg in 5 ml suspension, 2 times daily
- >10 years 250 mg tablet, 2 times daily

Cefuroxime as *cefuroxime axetil* (orally for 7 days)

- 3-24 months 10mg/kg (to a maximum of 125mg) 2 times daily
- 2-12 years 15mg/kg (to a maximum of 250mg) 2 times daily
- 12-18 years 500mg tablet, 2 times daily

Alternatives (should be swallowed whole with adequate fluids)

Doxycycline (for those >12yo, orally for 7 days)

- 12-18 years 200mg on first day and then 100mg daily.

2.2 Oral Antibiotic management of children who are hospitalised:

Recommendations are as above.

2.3 Intravenous Antibiotic Management of children who are hospitalised:

- Guidelines for inpatient management should be according to the existing hospital policy for the management of Community Acquired Pneumonia (CAP).
- Special attention should be made to ensure that adequate *S. aureus* coverage is included in the regimen. Once susceptibility results are available the drug regimen should be rationalised, if possible.
- Intravenous to oral switch should also be considered if the child has made sufficient clinical improvement.

Any one of the following schedules can be used:

Paediatric intravenous dosing schedules

(* symbolises that you can double the dose in severe infection)

- Co-amoxiclav IV
 - < 7 days 30mg/kg, 2 times daily
 - 7-28 days 30mg/kg, 3 times daily
 - 1-3 months 30mg/kg, 3 times daily
 - 3-12 months 30mg/kg, 3 times daily (severe cases: 4 times daily)
 - 12-18 years 1.2g, 3 times daily (severe cases: 4 times daily)
- Cefuroxime IV
 - < 7 days 25mg/kg, 2 times daily*
 - 7-21 days 25mg/kg, 3 times daily*
 - 21-28 days 25mg/kg, 4 times daily*
 - 1 month-18 years 20-30mg/kg, 3 times daily*
- Cefotaxime IV
 - < 7 days 25mg/kg, 2 times daily*
 - 7-21 days 25mg/kg, 3 times daily*
 - 21-28 days 25mg/kg, 4 times daily*
 - 1 month-18 years 50mg/kg, 3 times daily (severe cases: 4 times daily)
- Ceftriaxone IV
 - Do not give to neonates
 - <50kg 50mg/kg, once daily
 - >50 kg 1g, once daily
- Clarithromycin IV
 - if possible give orally, but if it must be given intravenously
 - 1 month-12 years 7.5mg/kg, 2 times daily
 - 12-18 years 500mg, 2 times daily

In children who are critically ill (i.e. requiring ICU admission), when Methicillin Resistant *S. aureus* is suspected (or confirmed), Vancomycin or linezolid should be added. Expert advice should be sought from a medical microbiologist or infectious disease physician.