Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

FACULTY OF PAEDIATRICS
ROYAL COLLEGE OF PHYSICIANS OF IRELAND

INTERIM GUIDELINE FOR THE MANAGEMENT OF SARS-COV-2 INFECTION IN PAEDIATRIC PATIENTS

02.04.2020

Clinical Design & Innovation
Person-centred, co-ordinated care

CONTENTS

Please note: This guidance is for doctors looking after children outside of the PICU setting and is subject to change with the emerging evidence

1.0 BACKGROUND

SARS-CoV-2 is a novel coronavirus and etiologic agent of COVID-19 disease. All ages can be infected however, infection rates in children are generally low accounting for just about 1-2% of reported cases[1, 2, 3] Symptoms in children, when present are generally mild[4], WHO reported a very low rate of severe (2.5%) or critical (0.2%) disease in children <19 years. Dong *et al.*, in a nationwide case series of 2143 paediatric cases (731 with laboratory confirmed disease) reported that 55% had asymptomatic or mild disease, 39% symptoms of moderate severity, 5.2% severe and 0.6% critical disease. Infants had the highest risk of severe disease, however, as most of the cases in this series were suspected rather than confirmed, it is likely that many of these were due to RSV or other pathogens[5].

2.0 CLINICAL PRESENTATION

In adults, SARS-CoV-2 infection typically presents with fever, cough and shortness of breath. Anorexia, fatigue, sweats, and diffuse myalgia are common. Presentation in children is more varied. Characteristic findings include fever, tachypnea, and cough. Diarrhoea and vomiting are less common [6, 7, 8]. Children more often present with non-specific symptoms rhinitis, pharyngitis, malaise, with or without cough and fever. Laboratory findings in children are non-specific; lymphopenia is less commonly seen than in adults, CRP is generally normal or mildly raised. Chest imaging is typically suggestive of a viral pneumonitis with bilateral ground glass opacities or patchy consolidation. Dense lobar consolidation or pleural effusions are not typical. Compared to adults, children are more likely to have simultaneous infection with SARS-CoV-2 and another respiratory pathogen (e.g. influenza, RSV, human metapneumovirus, etc.). In many cases, the child's respiratory and other symptoms may be primarily caused by this second pathogen, rather than SARS-CoV-2.

Severe illness can rarely occur across the age spectrum, including in previously healthy children. In adults, COVID-19 can follow a biphasic course with initial symptoms stabilising or improving only to be followed by clinical deterioration, attributed in part to an inflammatory reaction or cytokine storm, around day 7 – 10. It remains to be seen if children can follow a similar course. While severe disease has been reported in a child undergoing treatment for leukaemia, as yet immunocompromised status in children has not been identified as a risk factor for more severe disease[9]. Nonetheless, until we gain more experience with this condition, caution is recommended concerning the assessment of immunocompromised children at risk for SARS-CoV-2 infection.

2.1 CHILDREN AND ADOLESCENTS POTENTIALLY AT RISK FOR MORE A COMPLICATED COURSE AND FOR WHOM A LOWER THRESHOLD FOR ADMISSION IS INDICATED

The aim in these groups should be prevention of infection with scrupulous attention to infection control measures as advised by HSE - Physical distancing in so far as possible, hand-washing etc.

Age	Infants < 1 year of age
Patient with Co-morbidities	
Chronic pulmonary disease	Chronic lung disease of prematurity with oxygen dependency Cystic Fibrosis Childhood interstitial lung disease Severe Asthma Neurodisability with respiratory complications
Cardiac disease (cardiology to review)	Haemodynamically significant cyanotic congenital heart disease Pulmonary hypertension Post cardiac transplant or awaiting transplantation Recent post-operative patients
Immunocompromised patients	Primary immunodeficiency (exc. Isolated IgA deficiency) Post transplant patients Treatment of malignancy. Immunosuppressant or biological drugs [e.g The following are considered immunosuppressive • Prednisolone (or equivalent dose of other glucocorticoid) (Adults & children ≥10kg: ≥40 mg/day for >1 week, or ≥20 mg/day for ≥2 weeks. Children < 10 kg: 2mg/kg/day for ≥2 weeks) • Disease modifying anti-inflammatory drugs (DMARDs) such as azathioprine, cyclophosphamide, cyclosporine, hydroxychloroquine, leflunomide, methotrexate, mycophenolic acid preparations, sirolimus and tacrolimus • Biologics, such as TNFα blocking agents (adalimumab, etanercept, infliximab), and others including abatacept, anakinra, ecolizumab, rituximab and tocilizumab. • The following are not considered immunosuppressive: alternate day low dose steroids or hydrocortisone maintenance, topical calcineurin inhibitors (TCIs, e.g., tacrolimus and pimecrolimus) for atopic dermatitis]. Asplenia Trisomy 21 Poorly controlled HIV (detectable VL,CD4 decrease or CD4/CD8 inversion ratio)
Other	Chronic Kidney Disease, stages 4, 5 or on dialysis Sickle Cell Disease Inherited metabolic disorders with decompensation

It is quite likely that a child presenting with, or suspected to have COVID-19, may have an alternate diagnosis therefore it is key that, in focussing on COVID-19, other important paediatric diagnoses are not overlooked. Conversely, children who are primarily unwell for other reasons e.g. a surgical abdomen, may be coincidentally infected with SARS-CoV-2, which has significant implications for transmission. A high index of suspicion is therefore needed and underpins the COVID-19 assessment and testing pathway algorithms.

Much of paediatrics is acute and health services for children and adolescents must continue to be delivered in a timely and appropriate fashion.

3.0 MANAGEMENT

Paediatricians and those working in child health care should follow current National Guidelines with regard to the assessment and testing of children suspected to have COVID-19. https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/algorithms/.
(As this is a very dynamic area, always check the current guideline).

3.1 GENERAL PRINCIPLES

NB: Appropriate PPE must be worn in accordance with HSE National guidance

https://healthservice.hse.ie/staff/news/news-items/prevent-the-spread-of-coronavirus-in-the-workplace.html

- Reassure parents and involve them in caring for their child, keep up-to-date on changes as this is an evolving and dynamic situation, and communicate well with colleagues. Be mindful that families may be distressed due to illness, bereavement and financial hardship.
- Most children will have very mild illness and home management is the preferred option whenever clinically appropriate and feasible
- Be vigilant in children with pre-existing conditions but reassure parents that the risks of comorbidities are much greater in adults than children
- If a child with complex needs develops symptoms of SARS-CoV-2 or other infection, they should contact their paediatric services as usual for advice. Testing may be arranged in community if hospitalisation is not required
- Early communication with families is essential regarding the level of care offered to children with underlying diseases. Decisions may need to be made where resources are limited. The fairness of the decision making process should be in keeping with the national ethical framework (https://www.gov.ie/en/publication/a02c5a-what-is-happening/#ethical-framework-for-decision-making-in-a-pandemic)
- There is concern amongst clinicians that families may delay presenting to hospital due to anxiety about COVID-19. Families need to be reassured that paediatric services are on-going and available to give support and treatment as needed
- If parent of admitted child is ill, advise the parent to go home, self-isolate, contact GP for testing and a well relative should remain with the child.
- Make sure that the clinical assessment of children is not overshadowed by the very real concerns about COVID-19 and remember to consider other diagnoses as possible cause of symptoms and investigate accordingly e.g. blood glucose to rule out new-onset diabetes if tachypnoeic without other signs of LRTI

3.2 INVESTIGATION AND MANAGEMENT OF CHILDREN AND ADOLESCENTS WITH SUSPECTED OR PROVEN COVID-19

- Obtain a combined oropharyngeal/nasopharyngeal viral swab from children in whom COVID-19 is suspected in accordance with the current assessment and testing pathway algorithm (available at www.hpsc.ie). Avoid nasopharyngeal aspiration. For intubated patients, ET aspirates or BAL samples, if available, are likely to have the highest yield.
- Only examine the oropharynx of children if it is essential.
- If the throat needs to be examined, wear personal protective equipment (PPE), irrespective of whether the child has symptoms of COVID-19 or not. Use eye protection if splashing is anticipated
- Check oxygen saturations. Many children will require no specific laboratory investigations. For hospitalised children with mild to moderate disease, blood tests should be as per standard of care (FBC, U&E, CRP, blood culture etc). For more severe disease, or where there is concern for disease progression, additional monitoring should include LFTs, LDH, serum ferritin, serum save, coagulation screen, d-dimers, troponin and lactate. IL6 level may be considered if available and immunomodulatory therapy is under consideration
- Chest x-rays (CXR), bloods, and blood gases are not routinely indicated in all children. However, these should be monitored in children with persistent fever, altered fluid balance, signs of liver dysfunction, or respiratory failure. CXR, if required, should be portable. CT scans are not routinely indicated and should only be done to answer a specific question.
- Paracetamol is the first line antipyretic for use in COVID-19
- Caution is appropriate in the use of ibuprofen, which is best avoided, especially in children with poor fluid intake or acute kidney injury.
- Despite emerging concern about Angiotensin Converting Enzyme (ACE) Inhibitors, Angiotensin Receptor Blockers (ARBs), and non-steroidal anti-inflammatory drugs (NSAIDs), there is insufficient evidence to stop these if children have been taking them for pre-existing conditions and such an action may be harmful.
- Routine use of systemic steroids is not indicated. They may prolong viral shedding. Steroids may be considered for children who progress to ARDS.
- Bronchodilators are not routinely indicated for COVID-19 and should be reserved for those in whom there is strong suspicion of bronchoconstriction.
- For children with asthma, use bronchodilators via spacers rather than by nebulisation to minimise risk of droplet spread, is preferred.
- For children who are hypoxic, low flow nasal cannula oxygen (LFNC) is preferred, but if hypoxic despite LFNC, high flow can be tried (see below)
- Viral co-infections in children are common, it is less clear how common bacterial co-infection might be. Use antibiotics when clinically indicated. The threshold for commencing antibiotics is lower for children in the risk categories listed below
- There is no proven treatment of COVID-19 and management is supportive. Experimental treatments are undergoing evaluation however; there is no data in children. If consideration to specific treatment is being given, consultation with a paediatric infection specialist is strongly advised
- On receipt of a negative PCR test, re-evaluate PPE requirement. If high clinical suspicion for SARS-CoV-2 infection remains, repeat testing and continued use of PPE may be indicated
- A **single** family member or other companion, authorized by the parents, should accompany admitted patient, following the recommended isolation measures (e.g. surgical mask, frequent hand washing).

3.3 HOSPITAL ADMISSION CRITERIA

- Age less than 2 months with fever (rule out other possible causes)
- Age 2- <3 mos. Manage per local guidelines for febrile infant with low threshold for admission
- Age 3-12 months: This age group should be carefully evaluated. If mildly symptomatic they may be sent home with clear guidelines to parents and pathway for re-evaluation in event of progressive disease.
- Persistent Hypoxaemia (O2 saturation <92% in RA) or moderate/severe respiratory distress that does not improve with treatment
- A lower threshold for admission and investigations will apply to those in the higher risk groups listed above.

3.4 RESPIRATORY SUPPORT

INTERIM GUIDELINE ON THE USE OF OPEN CIRCUIT POSITIVE PRESSURE VENTILATION IN CHILDREN WITH SUSPECTED OR CONFIRMED COVID-19

3.41 RECOMMENDATIONS (WORLD HEALTH ORGANIZATION, 2020).

- For children with hypoxemic respiratory failure, the first line respiratory support is low flow unblended humidified oxygen. Target SpO2 > 92%
- Closely monitor patients with COVID-19 for signs of clinical deterioration and respond immediately with supportive care interventions
- Recognize severe hypoxemic respiratory failure when a patient with respiratory distress is failing standard oxygen therapy and prepare to provide advanced oxygen/ventilatory support
- Patients with severe hypercapnia, hemodynamic instability, multiorgan failure, or abnormal mental status should generally not receive high flow nasal cannula (HFNC) oxygen; rather proceed directly to invasive mechanical ventilation. NIV and HFNC oxygen should generally be avoided
- Evidence-based guidelines on HFNC do not exist, and reports on HFNO in other coronavirus-infected patients are limited. Limited data suggest a high failure rate of non-invasive ventilation (NIV) in patients with other viral infections such as MERS-CoV. Furthermore, given the pattern of alveolar consolidation reported to date in COVID-19 it is conceivable that there would be a high failure rate of NIV. The consensus recommendation is to proceed to intubation and ventilation when possible
- Patients receiving a trial of NIV for mild-moderate acute respiratory failure should be in a monitored setting and cared for by experienced personnel capable of endotracheal intubation

3.42 IN SITUATIONS WHERE MECHANICAL VENTILATION IS NOT AVAILABLE, AND A CHILD PRESENTS WITH SEVERE HYPOXEMIA, A TRIAL OF HFNO OR NIV MAY BE APPROPRIATE IN A RESOURCE LIMITED SCENARIO (WORLD HEALTH ORGANIZATION, 2020).

- Due to uncertainty around the potential for aerosolization, HFO, NIV, including bubble CPAP, should be used with airborne precautions (FFP2/3 mask. Eye protection, long sleeved gown, and gloves) until further evaluation of the safety can be completed.
- When there is ongoing community transmission of COVID-19, in the undifferentiated patient who presents with symptoms and signs of respiratory tract illness, for whom HFNO/NIV is being used for management of an alternative aetiology (e.g. acute asthma exacerbation, bronchiolitis) but whose COVID-19 status has not yet been confirmed, the risk of aerosolizing respiratory secretions should be managed as per the protocol for a confirmed case until deemed negative.

3.43 INFECTION CONTROL PROCEDURES FOR AEROSOL GENERATING PROCEDURES (AGP) – INCLUDING THE USE OF OPEN-CIRCUIT VENTILATION (HPSC, 2020).

- Some interventions may produce very fine aerosols of respiratory secretions that could result in airborne transmission. These include endotracheal intubation and extubation, cardio-pulmonary resuscitation, open airway suctioning (via ET tube), bronchoscopy (diagnostic or therapeutic), autopsy, sputum induction (diagnostic or therapeutic). Non-invasive positive pressure ventilation for acute respiratory failure (CPAP, BiPAP) and high flow oxygen therapy may also be considered AGP
- Minimise the number of people in the room during an AGP
- AGP should be undertaken in a negative-pressure room using airborne precautions, where available.
- If a negative pressure room is not available, AGP should be carried out using a process and environment that minimizes the exposure risk for HCWs, ensuring that patients, visitors, and others in the healthcare setting are not exposed e.g. single room with door closed, away from other patients.
- In addition to standard and contact precautions, a FFP2/FFP3 respirator mask should be used by all persons in the patient's room when AGP are being performed. Eye protection must be worn (prescription glasses do not provide adequate protection against droplets sprays and splashes)

3.44 HOME NON-INVASIVE VENTILATION (NIV)

There is a significant number of children on long-term home NIV for different chronic conditions. Acute NIV is currently discouraged in management of Covid-19 in the adult population due to aerosol generation and potential futility in avoiding intubation. Children on long-term NIV should continue on their NIV at home unless otherwise directed by their respiratory paediatrician. If a child on elective NIV at home is admitted to hospital, please contact the respiratory team or NIV clinical nurse specialist for further advice.

Detailed guidelines for general paediatricians for hospitalised children have been developed by the British Paediatric Respiratory Society:
https://www.rcpch.ac.uk/sites/default/files/202003/bprs_management_of_children_admitted_to_hospital_with_covid19_-_20200319.pdf

3.5 PICU REFERRAL

When a child may need intensive care referral: please follow usual referral pathways and call the national PICU referral line on **1800 222 378**. If a child with COVID-19 is deteriorating, please involve the PICU team early.

3.51 INDICATION FOR PICU EVALUATION

- O_2 Saturation <90% on supplemental O_2 >6L/min (with mask and reservoir bag).
- Acute respiratory acidosis (hypercapnia >55 mmHg and/or pH<7.30).
  Hypercapnia is rare. Hypoxemia is more frequent.
- Recurrent apnea
- Septic appearance, signs of shock, multiple organ failure
- Altered state of consciousness and/or suspected failure of the respiratory centre (central hypoventilation)

3.6 THERAPY

There is no proven therapy for COVID-19 as yet, nor consistent evidence of efficacy for any agent, although several are under investigation. However, data extrapolated from SARS and MERS, *in vitro* data, and limited clinical data in adults suggest that there may be benefit to antiviral and/or immunomodulatory therapy[a,b,c,d]. No co-morbidity has yet been shown to be a risk factor for severe diseases in children, although data is

accumulating. Ideally, children undergoing treatment for COVID-19 should receive antiviral therapy as part of a clinical trial, however as yet such are not available. Thus, for hospitalised children with proven COVID-19, and **with signs of progressive respiratory deterioration, especially hypoxia,** regardless of comorbidity, on a case by case basis, consideration of antiviral therapy should be given. **Paediatric ID/Micro guidance should be sought prior to institution of specifically targeted therapy**.

Tocilizumab is a humanised anti-IL6 antibody that may be of use to combat the cytokine release syndrome that is a complication of COVID-19. **Its use should only be considered following multidisciplinary (PICU, immunology and paediatric infectious disease/microbiology) specialist input** [e].

If specific treatment is being considered, please involve ID/Micro and Pharmacy as early as possible

3.61 TREATMENT INDICATIONS

Clinical Presentation	CXR	Treatment	Management Plan
Asymptomatic or Uncomplicated URTI	Not indicated	Symptomatic	Discharge for home isolation if facilities permit. If COVID-19 confirmed, phone follow up recommended to ensure no progression (e.g day 1, 3, and & 7 or longer if required)
MILD DISEASE Mild Pneumonitis No hypoxemia, no/mild respiratory distress	Not indicated	Symptomatic	Home discharge except risk groups If COVID-19 confirmed, phone follow up recommended to ensure no progression (e.g day 1, 3, and & 7 or longer if required)
MODERATE DISEASE: Mild Hypoxemia and/or moderate respiratory distress - not meeting criteria for severe	Normal Consider repeat CXR if progression	Symptomatic Supportive therapy	Admit Monitor. Be aware rapidly changing infiltrates on CXR may heald clinical deterioration
	Any infiltrate or Normal, but patient in risk group. Consider repeat CXR if progression	Empiric therapy for community acquired pneumonia per local guidelines if suspicion of bacterial infection Supportive therapy as required	Admit Close monitoring for disease progression Close monitoring of fluid balance Discuss antiviral treatment options with ID/Micro.
SEVERE DISEASE Mild to Moderate ARDS[f] i) Unventilated requiring FiO2 >40% to maintain saturation 88-97% ii)Ventilated -Oxygenation index:4 ≤ 16 -Oxygenation saturation index:5 ≤12.3	Bilateral opacities not fully explained by effusion, lung/lobar collapse or nodules	PICU Support Empiric therapy for community acquired pneumonia per local guidelines if suspicion of bacterial infection	Monitor for evidence of cytokine storm (FBC, Biochemistries, coags, d-dimers, ferritin, CRP) Targeted treatment (antiviral or immunomodulatory) should be considered.
CRITICAL DISEASE Severe ARDS[f] -Oxygenation index:≥ 16 -Oxygenation saturation index:≥12.3 Septic shock Altered consciousness Multi-organ failure	Bilateral opacities not fully explained by effusion, lung/lobar collapse or nodules	PICU support	Treatment with antivirals and/or immunomodulatory therapies should be considered

4.0 ADDITIONAL CONSIDERATIONS

4.1 EMERGENCY ASSESSMENTS AND SITUATIONS

In the ED, transfer from Triage to the Resuscitation bay should be based on clinical assessment of Triage category 1 and 2 discriminators and specific clinical scenario flowcharts as outlined in the Irish Children's Triage System (ICTS) document whilst taking all the appropriate IPC / PPE precautions if required.

ED triage:

https://www.hse.ie/eng/services/publications/clinical-strategy-and-programmes/emp-irish-childrens-triage-system.pdf

Paediatric Early Warning Systems (PEWS):

https://www.hse.ie/eng/about/who/cspd/ncps/paediatrics-neonatology/pews/implementation/

APLS aide-memoire:

https://www.alsg.org/home/pluginfile.php/40249/course/section/885/ALSG%20booklet.pdf

4.2 MENTAL HEALTH

Be mindful that children and their families may need mental health supports, families are very likely to be already distressed by illness, bereavement and financial hardship. The appearance of PPE can be terrifying for children, gentle introduction and explanation of same may help**.**

Some useful support links for children and families:

HSE supports: https://www.hse.ie/eng/services/list/4/mental-health-services/connecting-for-life/news/supports-and-services-during-covid-19.html

REMEMBER: Surviving the pandemic with your family – translated into multiple languages
https://iacapap.org/remember-surviving-the-pandemic-with-your-children/

Useful links for staff supports:

Explaining to a child that someone has died:

https://www.psych.ox.ac.uk/research/cap

Contacting relatives by phone:

https://www.psych.ox.ac.uk/research/cap

Mental health first aid for doctors:

https://www2.hse.ie/wellbeing/mental-health/minding-your-mental-health-during-the-coronavirus-outbreak.html

4.3 BREASTFEEDING

Breastfeeding should be continued, with support for expressing milk if the child is unable to latch to feed.

4.4 PARENTAL ILLNESS

- If parent is also unwell they will need to be referred to an adult ward/hospital and ideally another household member to come in to be with the child (as already exposed).
- If there is no adult available to safely care for child on discharge, the child may have to remain in hospital depending on local situation and discussions with social work dept
- If parent is mildly symptomatic and does not require hospitalisation, and child needs to stay in hospital then house in ensuite accommodation where possible

4.5 STAFFING:

It is likely that staffing shortages will put significant pressure on paediatric and neonatal services. It is essential that all is done to ensure children continue to receive appropriate and timely health care during this national crisis. Prioritisation is important and work practices must adapt. It is necessary that children's health continues as the main focus.

4.6 WORK ARRANGEMENTS:

Think about how your action today protects your patients and colleagues in the event that you develop COVID-19. Act now to protect them i.e. physical distancing, phone/email instead of person-to person handovers, digital platforms for meetings, etc.

4.7 SOCIAL DISTANCING/ISOLATION AND HAND HYGIENE:

THESE ARE THE TWO MOST EFFECTIVE COMPONENTS OF PREVENTION OF COVID-19. IT IS IMPORTANT THAT WE CONTINUALLY REINFORCE THIS MESSAGE FOR PATIENTS, PARENTS, AND COLLEAGUES, AND ACT AS ROLE MODELS IN THIS REGARD.

4.8 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Regard PPE as an important and precious resource to be used as recommended. Watch this video by Martin Cormican to ensure you know how to minimise the risk of transmission when donning and doffing PPE https://youtu.be/_4l7qvh5p80.

4.9 MILD SYMPTOMS AND CONCERNED THAT YOU MAY HAVE CORONAVIRUS YOURSELF?

Contact Occupation Health – check the HPSC website for the current algorithm
https://www.hpsc.ie/

4.10 KEEP IN TOUCH:

Our usual informal peer support settings and networks are being eroded, yet these will be essential in the weeks to come. So please do stay in touch with friends and colleagues by whatever means and if overwhelmed please ask for help. Social distancing is critical, but make sure it doesn't lead to social or professional isolation.

5.0 REFERENCES AND RESOURCES

BE AWARE THAT MANY PAPERS HAVE NOT UNDERGONE THE USUAL RIGOROUS PEER-REVIEW DUE TO THE NEED TO EXPEDITE SHARING OF INFORMATION.

5.1 COVID-19:

1. WHO. Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19)
2. Wu Z et al. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention JAMA Neetwork 2020
3. Ludvigsson JF, Systematic review of COVID-19 in children show milder cases and a better prognosis than adults. Acta Paediatr. 2020 Mar 23. doi: 10.1111/apa.15270.
4. Lu X, et al. Sars-CoV2 infection in children https://www.nejm.org/doi/full/10.1056/NEJMc2005073
5. Dong Y et al. Epidemiological characteristics of 2143 pediatric patients with coronavirus disease in China. Pediatrics 2020 doi:10.1542/peds.2020-0702 https://pediatrics.aappublications.org/content/pediatrics/early/2020/03/16/peds.2020-0702.full.pdf?utm_campaign=social&utm_source=twitter&utm_medium=pediatrics&utm_content=coronavirus_2020&utm_term=3_13_20
6. Zhou J et al Detection of Covid-19 in Children in early January 2020 in Wuhan, China, NEJM DOI:10.1056/NEJMc2003717
7. XIA W et al. Clinical and CT features in paediatric patients with COVID-10 infection. Pediatric Pulmonology 2020;1-6 https://doi.org/10.1002/ppul.24718
8. Zheng F et al. Clinical Characteristics of Children with Coronavirus Disease 2019 in Hubei, China. Current Medical Science DOI https://doi.org/10.1007/s11596-020-2172-6
9. D'Antiga L, Coronavirus and the immunosuppressed patient: The facts during the third epidemic doi:10 1002/LT.25756

5.2 RESPIRATORY SUPPORT:

1. Cheung JC (2020). Staff safety during emergency airway management for COVID-19 in Hong Kong. Lancet Respir Med.
2. Esquinas AM (2014). Noninvasive mechanical ventilation in high-risk pulmonary infections: a clinical review. Eur Respir Rev.
3. HPSC (2013). Interim Infection Prevention and Control Precautions for Possible or Confirmed 2019 novel Coronavirus (2019 nCoV), Middle East Respiratory Syndrome Coronavirus (MERSCoV) and Avian Influenza A in Healthcare Settings. Available at: https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/.
4. Ñamendys-Silva SA (2020). Respiratory support for patients with COVID-19 infection. Lancet Respir Med
5. World Health Organization (2020). 'Clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected', *WHO*.

5.3 ANTIVIRAL AND IMMUNOMODULATORY THERAPY FOR SARS-COV-2

a. Yao X, Ye F, Zhang M, et al. In Vitro Antiviral Activity and Projection of Optimized Dosing Design of Hydroxychloroquine for the Treatment of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), *Clinical Infectious Diseases*, , ciaa237, https://doi.org/10.1093/cid/ciaa237
b. Wang M, Cao R, Zhang L, Yang X, Liu J, Xu M, et al. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019- nCoV) in vitro. Cell Res 2020 Feb 4 [Epub ahead of print]. doi: 10.1038/ s41422- 020- 0282- 0.
c. Zumla A, Chan JF, Azhar EI, Hui DS, Yuen KY. Coronaviruses - drug discovery and therapeutic options. Nat Rev Drug Discov. 2016 May;15(5):327-47.
d. 3. Zhang L, Liu Y. Potential Interventions for Novel Coronavirus in China: A Systematic Review. J Med Virol. 2020 Feb 13. doi: 10.1002/jmv.25707. [Epub ahead of print]
e. HSE. Interim Recommendations for the use of Tocilizumab in the Management of Patients who have Severe COVID-19 with Suspected Hyperinflammation. https://www.hse.ie/eng/about/who/acute-hospitals-division/drugs-management-programme/interim-recommendations-for-the-use-of-tocilizumab-in-the-management-of-patients-with-severe-covid-19.pdf
f. Pediatric Acute Lung Injury Consensus Conference Group. Pediatric acute respiratory distress syndrome: consensus recommendations from the Pediatric Acute Lung Injury Consensus Conference. *Pediatr Crit Care Med*. 2015;16(5):428–439. doi:10.1097/PCC.0000000000000350
g. University of Michigan; Guidance for diagnosis and treatment of COVID-19 in adults and children, March 2020, http://www.med.umich.edu/asp/pdf/adult_guidelines/COVID-19-treatment.pdf [accessed 28/3/20]
h. RCPCH Draft Management Guidance for Novel coronavirus (SARS-CoV-2) infection in paediatric patients (personal communication, shared 28.03.2020)
i. GOSH: Treatment guideline for novel coronavirus (COVID-19) infection in paediatric patients for Children (shared 26.03.2003)

j. Medicine.ie (2020). *Plaquenil 200mg Film-coated Tablets – Summary of Product Characteristics.* Available at: https://www.medicines.ie/medicines/plaquenil-tablets-33380/smpc [Accessed 11 Mar 2020].
k. Medicines.org.uk (2020). *Avloclor 250 mg Tablets – Summary of Product Characteristics.* [online] Available at: https://www.medicines.org.uk/emc/product/5490/smpc [Accessed 10 Mar 2020].
l. Medicine.ie (2020). *Kaletra (80mg+20mg)/ml oral solution – Summary of Product Characteristics.* Available at: https://www.medicines.ie/medicines/kaletra-oral-solution-32561/smpc [Accessed 10 Mar 2020].
m. Medicine.ie (2020). Kaletra 200mg/50mg film-coated tablets– *Summary of Product Characteristics.* Available at: https://www.medicines.ie/medicines/kaletra-200-mg-50-mg-film-coated-tablets-32560/smpc [Accessed 10 Mar 2020]
n. Antiretroviral / HIV Drug Dosing for Children and Adolescents 2019-20 - Imperial College Healthcare NHS Trust. https://www.chiva.org.uk/files/5115/7486/6089/ICH_Paed_HIV_Dosing_2019_v5_-_for_external_distribution.pdf
o. CHI at Crumlin Drug Formulary available for iphone or android.
p. Tocilizumab spc. https://www.ema.europa.eu/en/documents/product-information/roactemra-epar-product-information_en.pdf
q. HSE: Specific Antiviral Therapy in the Clinical Management of Acute Respiratory Infection with SARS-CoV-2(COVID-19) https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/guidanceforhealthcareworkers/
r. https://www.hse.ie/eng/about/who/acute-hospitals-division/drugs-management-programme/interim-recommendations-for-the-use-of-tocilizumab-in-the-management-of-patients-with-severe-covid-19.pdf

5.4 ADDITIONAL READING

1. Thompson LA, Rasmussen SA. What Does the Coronavirus Disease 2019 (COVID-19) Mean for Families? JAMA Pediatr. Published online March 13, 2020. https://jamanetwork.com/journals/jamapediatrics/fullarticle/2763176?resultClick=24&utm_source=TrendMD&utm_medium=cpc&utm_campaign=JAMA_Pediatrics_TrendMD_1
2. RCPCH paediatric guidance https://www.rcpch.ac.uk/resources/covid-19-guidance-paediatric-services#paediatric-scenarios
3. Covid Trauma Response Working Group (UK) https://www.aomrc.org.uk/
4. Williams R, Murray E, Neal A & Kemp V. 2020 TOP TEN MESSAGES FOR SUPPORTING HEALTHCARE STAFF DURING THE COVID-19 PANDEMIC. https://www.rcpsych.ac.uk/docs/default-source/about-us/covid-19/top-ten-messages-williams-et-al.pdf?sfvrsn=990e3861_0
5. Mental Health Supports and Services during Covid-19. https://www.hse.ie/eng/services/list/4/mental-health-services/connecting-for-life/news/supports-and-services-during-covid-19.html
6. "REMEMBER": Surviving the Pandemic with your Children! https://iacapap.org/remember-surviving-the-pandemic-with-your-children/
7. Contacting Relatives by Phone to Communicate Death of a Patient. https://www.psych.ox.ac.uk/files/
8. How to tell children that someone has died. https://www.psych.ox.ac.uk/files/
9. Mental health and psychosocial considerations during the COVID-19 outbreak. https://www.who.int/

6.0 ACKNOWLEDGEMENTS

We are indebted the following who have generously shared their guidelines, that have informed this document

UK National Draft Management guidance for novel coronavirus (SARS-CoV-2) infection in paediatric patients (personal communication)
Great Ormond Street Children's Hospital (recommendations re antiviral therapy in COVID-19).
British Paediatric Allergy, Immunity and Infection Group (tonsillar examination in the era of COVID-19)
Michigan Medicine, University of Michigan (Guidelines for antiviral and immunomodulatory therapy of adults and children for COVID-19)
Spanish Paediatric Paediatric Infectious Diseases Group (Management of COVID-19 in the paediatric setting)
Italian Society for tropical and Infectious Diseases: Vade Mecum per la gestione terapeutica e di supporto per pazientecin infezione da coronavirus COVID-19. Ed 3.0 March 25, 2020.

7.0 CONTRIBUTORS

5.1 K Butler (lead author), P Gavin, R Leahy, – Paediatric Infectious Diseases
5.2 R Cunney, R Drew, N O'Sullivan – Clinical Microbiology
5.3 Des Cox, Fiona Ringholz – Paediatric Respiratory Medicine
5.4 M Healy – Paediatric Intensive Care Medicine
5.5 C Blackburn, C Martin – Paediatric Emergency Medicine
5.6 K Lavelle, R Shah, K Tedford, – Clinical Pharmacy
5.7 E Crushell – General Paediatrics
5.8 E Barrett – Liaison psychiatry

5.9 Paediatric Clinical Advisory Group