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## Pandemic preparedness: is the UK ready for a pandemic that affects children?

There has been a lack of detailed planning for a pandemic that affects children, argue these authors

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Before covid-19, concerns were raised that the UK was unprepared for a pandemic that predominantly affected children.<sup>1</sup> The situation has not changed with a lack of granular pandemic planning for children since the planning for a potential H1N1 pandemic in the mid-2000s. This is of concern as a future global pandemic may result in a marked increase in critical illness and mortality in children compared to the covid-19 pandemic, where serious illness has been much lower than in adults.<sup>2</sup> For example, the emergence of a new virus with the pathogenicity and high transmissibility of measles would be devastating. From 2000 to 2018, it is estimated that measles vaccination prevented around 23 million deaths, mostly in children, showing the impact that a measles-like virus could have on children.<sup>3</sup> An immediate challenge is to develop pandemic preparedness for children that is immediately actionable, scalable, known about by front-line healthcare workers and cognisant of recent transformations in paediatric practice.

Children are extremely effective at transmitting respiratory viruses. For example, respiratory syncytial virus (RSV) infects almost all children by the age of two and infection rates of health workers caring for children with RSV, are very high.<sup>4</sup> Mitigating transmission is problematic as infants and young children have close physical contact with siblings and family members and, if admitted to hospital, with the staff caring for them. The social distancing of young children during play is difficult; they are far less likely to wash their hands and much more likely to smear oral and nasal secretions onto others and rarely cover their mouths and nose when coughing and sneezing. SARS-CoV-2 and other respiratory viruses such as RSV and influenza may also be transmissible in small aerosol particles.<sup>5-7</sup> Hospital-acquired infection among vulnerable children is a particular concern. A substantial risk of infection is seen with respiratory viruses that may be associated with longer hospital stays and increased morbidity.<sup>8</sup>

Fluid repellent surgical masks may give limited protection for those caring for children, as gaps between the mask and face combined with close proximity nursing serve as a potential route for inhalation of aerosolised virus-containing particles and also exhalation of infectious viral particles by those infected.<sup>9</sup> Eye protection during close contact is also important as pathogens can also enter via the eyes, reaching the nose via the nasolacrimal duct within five minutes and the pharynx within 15 minutes.<sup>10</sup> Although face shields and glasses may

reduce infection via the eyes<sup>11</sup> they do not offer the protection that goggles afford.<sup>12</sup>

The problems of sourcing adequate personal protective equipment (PPE) for health workers are dwarfed by the almost complete lack of availability of age-appropriate PPE for children at risk of hospital-acquired infection, whether in waiting areas, on hospital wards, or during transfers. Isolation facilities for children frequently become overwhelmed during usual winter peaks, with many infants in the UK nursed in open ward bays, some without the knowledge of the specific aetiology of their underlying viral infection. Even in intensive care, where the exchange of air happens 10 or more times per hour, infectious viruses may still be found in small aerosol particles.<sup>6</sup>

Staffing and critical care bed availability would also present major problems. Intensive care bed occupancy already ranges between 80 and 100% across the UK.<sup>13</sup> Opening additional intensive care and high-dependency beds and providing the necessary infrastructure, in addition to staffing issues, would be an immense challenge. There are currently limited numbers of paediatric doctors, nurses, and other health workers in the UK with the training and experience to care for very sick children. There is no clear path to widening this essential skill base. Staff numbers would be affected in a pandemic, as seen during covid-19, by absences due to isolation of those infected or exposed to infection, and in a truly devastating pandemic, fear of infection and of spreading the infection to family and friends.

Since H1N1 planning of the mid-2000s, paediatrics has also changed significantly. Nearly 60% of children in intensive care now have a life-limiting condition,<sup>14</sup> and there has been an exponential growth in the number of children living at home, but dependent on medical technology, e.g. home ventilation, and ventricular assist devices. These children usually need a paediatric intensive unit or high-dependency unit care during episodes of deterioration.<sup>15</sup> Far more children are also living with complex medical needs.<sup>16</sup>

A major question for any pandemic preparedness to tackle is who will choose children to prioritise for intensive care if resources are genuinely overwhelmed and what criteria will choices be based on? This discussion is essential as otherwise, the decision will be left to pressurised health workers, who will suffer the trauma of making such choices repeatedly in a crisis, the potential medico-legal fallout, and in some cases, direct physical threat. They may also not make decisions consistent with colleagues elsewhere or be

influenced by subconscious bias. The emergence of bioethical teams in the UK has been hugely welcomed by healthcare staff dealing with difficult decisions,<sup>17</sup> but in a pandemic that causes widespread critical illness in children, these teams would be overwhelmed. National professional guidance should be developed together with readily accessible ethics support teams familiar with complex paediatric situations to aid decision-making and ensure the optimal outcome for the patient population.<sup>18</sup>

Pandemic planning for children will be challenging and the aim of this article is to stimulate discussion and prompt action in the UK and other countries that consider recent transformations in paediatric practice, as even with the development of a novel successful vaccine, vulnerable children will remain at risk. We would encourage the development of national guidance, with input from nurses, doctors, infection specialists, other health workers and groups who interact with children, and experts in child healthcare law and bioethics in partnership with children and families. The involvement of major organisations that do so much for child health, such as the World Health Organisation, UNICEF, Save the Children and Médecins Sans Frontières will be crucial to foster pandemic planning worldwide.

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