

# Unexpected cardiopulmonary arrest associated with influenza: our experience during the 2009 pandemic in Japan

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To the editor:

Our national survey of pediatric deaths associated with 2009 pandemic influenza A (H1N1) (pH1N1) infection revealed that unexpected cardiopulmonary arrest (CPA) was one of the leading cause of pediatric deaths in Japan.<sup>1</sup> Unexpected CPA associated with influenza can be underestimated due to difficulty in obtaining detailed information. We investigated the actual situation of unexpected CPA in association with pH1N1.

As of the end of March, 2010, 41 deaths associated with pH1N1 were identified among patients younger than 20 years old in Japan.<sup>1</sup> Unexpected CPA was defined as CPA without clear findings of respiratory failure, cardiomyopathy, or encephalopathy. We also excluded children with radiological findings consistent with encephalopathy and respiratory failure. Fifteen pediatric deaths were categorized as unexpected CPA.

There were nine boys and six girls. Median age was 43 months (range, 7–164 months). One patient had severe delay in psychomotor development. CPA occurred within the first 2 days after influenza onset in 12 patients. The site of CPA was home in 13 patients. One patient collapsed at a local outpatient clinic and the other had CPA during hospitalization. CPA was noticed in the daytime (7:00–18:00) in 11 patients. The interval between being witnessed alive and CPA was <30 minutes in seven patients. In four patients, CPA was noticed immediately after its occurrence. Emergency services transferred most patients to a hospital within 30 minutes after being called. Blood gas data on presentation were measured in 10 patients, and pH <7.0 was seen in nine patients and base excess <–20 mm in eight patients. Chest radiographs were obtained in 12

patients and showed mild infiltration in four and pulmonary edema in 1. Chest CT was performed in four patients but showed only mild and non-specific findings. Head CT was performed in eight patients; all were unremarkable.

Our study showed that unexpected CPA occurred mostly in previously healthy children without antecedent signs. This contrasts with pediatric deaths due to respiratory failure associated with pH1N1.<sup>2–5</sup> Thus, it is difficult to predict the occurrence of CPA. It is noteworthy that a majority of unexpected CPAs occurred during the daytime and the occurrence was noticed within a short interval. These results imply that CPA occurred within a few minutes and that their deaths cannot be attributable to a delay in the recognition. The cause of unexpected CPA in our patients is difficult to determine. Possible explanations may be latent myocardial involvement causing fatal arrhythmia or circulatory collapse,<sup>6–8</sup> and immune-mediated injury induced by hypercytokinemia.<sup>9</sup> An accumulation of post-mortem pathological findings is important to elucidate the cause of unexpected CPA in patients with influenza.

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## Authors' contribution

AO wrote the first draft of the manuscript. AO, SN, and HK were the chief members of collaborative study group and conducted the study, interpreted the data, and made consensus regarding the cause of death. TM, OS, JF, CT, SK, and TI were the members of the collaborative study group. They visited the hospital and interviewed the attending pediatricians of the patient in cooperation with the chief members. ST, NK and TM supervised the study and corrected the manuscript.

## Conflict of interest

All authors have no conflict of interest in relation to this manuscript.

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