

# The 2009 A/H1N1 Pandemic Influenza and the Nursing Home

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## CASE (PART 1)

One Saturday morning, October 2, 2009, the nursing home ward nurse reported that one of our patients developed new respiratory symptoms: a dry cough and sneezing but no fever. At age 84, her medical history included heart failure, diabetes, osteoporosis and dementia—the reason for her institutionalization. The previous night, new onset restlessness made it difficult to get her to stay in bed. She repeatedly got up to wander or find a new seat, intermittently sleeping in a chair by the nurses' station or by her bed. Her pulse oximeter showed 95% saturation, and she was tachycardic at a rate of 100 beats per minute. Blood pressure remained in her usual range. She did not complain of breathlessness, with her respiratory rate of 18.

## CLINICAL PRESENTATION OF INFLUENZA

The immediate differential appears broad, but the clinical information reported by the nurse remains incomplete without the epidemiologic context. Knowing which pathogens are circulating in the community can help in ranking certain viral and bacterial diseases in the differential diagnosis. Influenza presents with a variety of symptoms. In a healthy

younger population, fever plus respiratory symptoms can clinch the diagnosis in 80% of adults, when influenza is known to be circulating in the community.<sup>1</sup> By October 2, 2009, the Rhode Island Department of Health had already reported local circulation of the new pandemic A/H1N1 influenza strain, similar to that reported by the **Centers for Disease Control and Prevention (CDC)** for much of the rest of the country.<sup>2</sup> Epidemiologists described symptomatic presentation for this strain as typically affecting young, rather than old patients, and new risk factors for complicated disease included obesity and pregnancy, but not age *per se*. In children, diarrhea and abdominal symptoms were sometimes the main presenting symptoms.

Because of both the apparent predilection of this new virus for illness and more severe disease in younger adults and the initial limited availability of vaccine, the pandemic A/H1N1 vaccination of older adults, especially institutionalized older adults, was a low priority. But could this patient's symptoms be influenza? (Table 1)

The presence of fever adds specificity to the diagnosis of influenza, but can also substantially reduce the sensitivity: the greatest reduction in sensitivity occurs in

frail elderly adults, where the majority typically do not develop an oral temperature greater than 99°F during the course of their illness, (Figure) In addition, elderly nursing home residents have multiple morbidities, and the presenting influenza symptoms may take the form of exacerbations of pre-existing conditions. Typically more than half of the residents in US nursing homes have dementia and may be unable to report the complaints we typically associate with an influenza-like illness, such as malaise, dyspnea or chest discomfort.

In the US people aged 65 or older represent about 13% of the population. Yet influenza causes more than 90% of the overall influenza-related mortality annually in this group. Indeed, the risk of influenza-related death increases after the age of 50 years and exponentially after the age of 65.<sup>7</sup> However, to reflect on influenza mortality or even the 200,000 plus hospitalizations<sup>8</sup> grossly understates the impact influenza has on older individuals, especially the frailest old. Influenza can produce significant functional decline in elderly patients.<sup>9</sup> Over one-third of hospitalized patients age 70 or older leave the hospital more disabled than when they arrived;<sup>10</sup> older patients endure more

**TABLE 1. Influenza Symptoms in Adults.** Adapted from references 3 and 4.

Symptom	SEASONAL INFLUENZA			PANDEMIC INFLUENZA		
	Young	Old	Frail old	Young	Old	Frail old
Cough or chest discomfort	Common, can become severe	Common, often lasts 2 weeks	Often lasts 2-3 weeks	Common, can become severe	Less common	Less common, can become severe
Fever	Common, often high, abrupt onset, 3-4 days	Common, often with oral temperature	Usually less than 99°F orally	Common	Uncommon	Uncommon over 100°F
Sneezing	Often	Sometimes	Sometimes	Often	Sometimes	Sometimes
Malaise	Can be extreme, lasting 3 weeks	Common	Common, may precede vascular event	Often	Sometimes	Sometimes
Gastro-intestinal	Rare	Occasional	Not unusual	Not unusual	Rare	Not common
Symptom duration	2-10 days	1-2 weeks	2-4 weeks	2-10 days	2-5 days	1-2 weeks
Incidence	3-10 week period in late Fall to early Spring			All year; more severe in Winter		

frequent and longer influenza-related hospitalizations; thus influenza likely contributes significantly to this functional loss. (Table 2) Influenza vaccine can protect individuals from influenza and influenza-related morbidity, such as pneumonia, and still reduce the occurrence of fever when it fails to prevent infection. (Figure) However, and more importantly, the vaccine reduces the likelihood of other complications such as cardiac and cerebrovascular collectively, even better than preventing pneumonia.<sup>11</sup>

In the context of our case, we have insufficient information to propose influenza as the likely diagnosis. The nonspecific symptoms of our patient could represent a variety of conditions, including any one of a number of respiratory viruses.

### CASE (PART 2)

Questions posed to the nurse calling for direction on our patient included the following:

- 1) Is the patient the only one who is newly sick (respiratory or other symptoms) in the past week; if others are ill, have they had close contact (share a room, activities, dining table, sit together) with our patient?
- 2) Have any other residents gone to the hospital for evaluation for cardiac, cerebrovascular, pulmonary, or fever issues in the last few days?
- 3) Are there concomitant behavior changes in other residents? If so, do some or most of them come in close contact with each other or our case patient?
- 4) Do any staff have new respiratory symptoms, or did staff call in sick?
- 5) Is the nurse reporting about the patient symptomatic (is there hoarseness, sniffing, sneezing or other audible respiratory abnormality present)?
- 6) Has the caller noticed if tissue boxes are now on the medication cart, or facial tissues in the trash containers in the rooms or nurse's station?

The caller indicated another resident was taken to the emergency department the night before for evaluation of chest pain; that patient was admitted for an acute myocardial infarction; another had received a chest radiograph which the radiologist read as consistent with a pulmonary infiltrate. The resident who usually sits next to our patient has taken to bed in the last day, and two other residents who sit together had mild coryza, one with di-

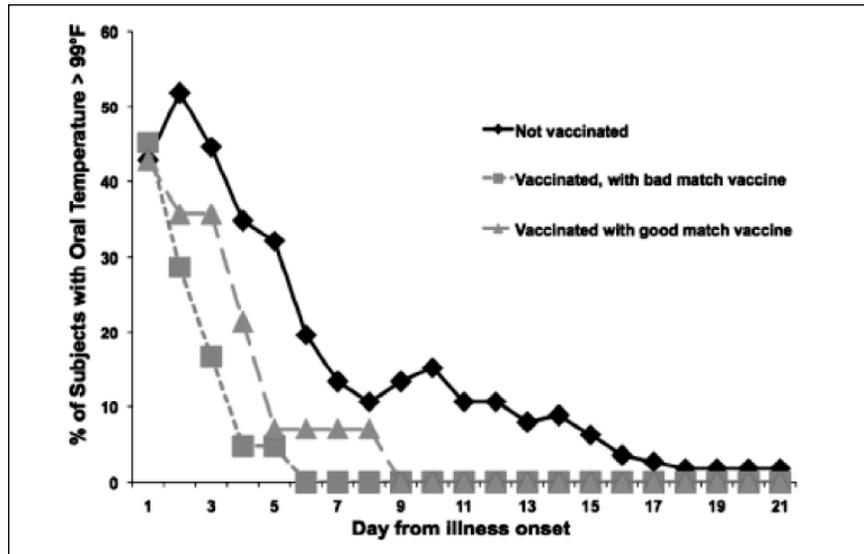


Figure legend. Proportion of residents with laboratory-confirmed influenza who have an oral temperature over 99°F by number of days following symptom onset. Two groups of 400-500 nursing home residents were prospectively monitored over three years (1997-2000) for the onset of new clinical symptoms occurring when A/Sydney/5/97 [H3N2]-like influenza was known to be circulating in the community. When such symptoms were detected, the individual was tested for influenza by culture and PCR, and was clinically monitored daily until symptom abatement. Influenza was detected 1/4 as frequently among the group who received the vaccine that was well-matched to the circulating strain than the two comparator groups. (Previously unreported, these data are drawn from the populations monitored that included participants of two influenza antiviral prophylaxis trials,<sup>5,6</sup> and reported in abstract form).

arrhea; neither of these two typically sit with the resident our caller has reported on. The caller also sniffled twice while giving this report on the phone. No other staff members had reported in sick, and the caller denied being ill, explaining she had seasonal allergies. The residents had received their seasonal influenza vaccine

the week before but not the pandemic vaccine because it was unavailable to them.

### INFLUENZA IN NURSING HOMES

Our case is ensconced with others who have taken ill. Any one of the other residents, or even the audible symptoms of the staff member reporting on our

**Table 2: Biologic changes with age related to clinical presentation and consequences of influenza.**

Biologic change with age	Clinical Consequence
Reduced IL-6	Reduced fever, less efficient viral clearance
Impaired mucociliary function in respiratory tract	Reduced cough, less efficient viral clearance and mucous clearance
Reduced TNF-α	Less malaise
Delayed increase in inflammatory cytokines	Fewer symptoms at disease onset
Delayed decline in inflammatory cytokines	Greater area-under-the-curve during which inflammatory cytokines produce a pro-thrombotic state (risk for thrombo-embolic stroke, myocardial infarction)
Reduced T-cell help	Reduced protection from vaccine; reduced longevity of protection from vaccine
Reduced nutrition	Reduced physiologic reserve, more difficult rehabilitation
Brain aging	Greater likelihood of delirium, sleep and appetite disturbance with cytokine storm

patient alone would hardly raise the index of suspicion about influenza in our patient, let alone an influenza outbreak. The CDC had not reported seasonal influenza, but showed the pandemic A/H1N1 strain circulating widely throughout the country, including Rhode Island. No other viruses were reported to in wide circulation in Rhode Island at that time.

Collectively, this presentation suggests a disease outbreak. As the only widely circulating virus appears to be the pandemic strain of influenza, it moves to the top of the differential diagnosis for our patient. In our case, a specimen was ordered for PCR confirmation of pandemic influenza in our patient and several other residents. Antiviral prophylaxis with a neuraminidase inhibitor was initiated for those without signs or symptoms of new illness, and antiviral treatment in those who were symptomatic, both residents and staff willing to receive medication.

Nursing home residents run a greater risk of influenza complications than their younger counterparts. The residents are most susceptible to influenza, given their multi-morbidities and greater exposure risk through close-living quarters and shared caregivers. Clinicians have under-appreciated the context of pandemic influenza and the risk to residents of nursing homes.

In contrast to seasonal influenza, the majority of symptomatic infections during pandemic influenza have been reported in young adults. Experts have offered persistent immunological memory from prior exposure to similar viruses decades earlier as an explanation; 1/3<sup>rd</sup> of the adults born before 1950 had cross-reactive antibodies to the pandemic H1N1 virus at the beginning of the 2009 pandemic.<sup>12</sup> Nevertheless, absence of recognized influenza symptoms with the pandemic strain have not kept elderly individuals from getting infected and seroconverting to it. In a small study of elderly people in Shanghai, the seropositive rate climbed from 9.4% to 42.5% from April to September in 2009, although none of these elderly subjects had any influenza-like symptoms during the study time. The observation is intriguing, raising the possibility of an unrecognized reservoir of potential pandemic transmission among the elderly with sub-clinical influenza.<sup>13</sup>

Although disproportionately fewer elderly people developed clinical influenza, their mortality during the 2009 H1N1 pandemic remained substantial. For ex-

ample, an analysis of patients hospitalized with pandemic H1N1 virus in California found that persons  $\geq 50$  years of age had the highest influenza fatality rate (18-20%).<sup>14</sup> As with seasonal influenza, presence of underlying chronic diseases increased the mortality risk.<sup>14</sup> Also, several nursing home outbreaks with pandemic H1N1 influenza have been reported during the 2009-2010 influenza season, indicating that even if older patients harbor cross-protective antibodies, as with seasonal influenza following vaccination, they remain uniquely susceptible and continue to experience greater morbidity and mortality overall than their younger counterparts.

## SUMMARY

Seasonal and pandemic influenza clinically remain remarkably similar in long-term care populations. Clinicians cannot distinguish clinical influenza, whether seasonal or pandemic H1N1, from other respiratory viral infections in individual patients. Part of the difficulty in the clinical diagnosis relates to fewer clinical features that might help with diagnostic differentiation, such as fever. However, the nursing home provides an epidemiologic context that can prove helpful to clinicians who inquire—by considering illness patterns among others in the facility, both staff and residents. This can lead to more timely diagnosis and treatment in the resident, and prophylaxis—an opportunity to protect the remaining residents and staff. Check out the treatment guidelines posted on the CDC website to be sure to select the best agents, because antiviral resistance patterns have been rapidly changing.

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