# Are Belgian hospitals prepared for an H5N1-pandemic?

Harald G. De Cauwer[a], Luc J.M. Mortelmans[b] and Vincent d'Orio[c]

***Objective*** **Virulent airborne diseases can be a real burden to a nation's health system. The most recent threat is the fear of a mutation-induced H5N1-influenza pandemic. We studied whether Belgian hospitals are able to deal with H5N1-influenza infected patients in the case of a pandemic. Many patients, including children, may require artificial ventilation within 48 h after admission.**

***Methods*** **A survey aimed at determining 'availability and preparedness' was sent by e-mail to the different Belgian Emergency Departments.**

***Results and discussion*** **Sixty-five hospitals were finally included. The amount of patients being potentially admitted is limited, owing to the reduced number of intensive care beds equipped with automatic ventilators. Furthermore, the number of available intensive care beds for children is still lower than for adult patients. The number of mortuary places, in the case of a catastrophe, is also insufficient. Although most hospitals set up a disaster plan on H5N1, there are only limited stocks of antiviral medication to protect the hospital staff in the acute phase. A separate triage area is only available in a limited number of hospitals. We conclude that Belgian hospitals and emergency departments are not equipped to deal with potential pandemic situations.** ***European Journal of Emergency Medicine*** **14:204–206 © 2007 Lippincott Williams & Wilkins.**

**European Journal of Emergency Medicine** 2007, **14**:204–206

**Keywords: hospital preparedness, H5N1-influenza, pandemic, public health system, survey**

[a]Department of Neurology, [b]Emergency Department, KLINA Regional Hospital, Brasschaat and [c]Emergency Department, University Hospital Liège, Liège, Belgium

Correspondence to Dr Luc J.M. Mortelmans, KLINA Regional Hospital Emergency Department, Augustijnslei 100 B2930 Brasschaat, Belgium
Tel: +32 3 6505045; fax: +32 3 6505082;
e-mail: luc.mortelmans@klina.be

**Received** 26 July 2006 **Accepted** 13 August 2006

## Introduction

In recent years, several viral infections caused endemics, for example, Ebola in Africa, SARS in the Far East and Canada [1,2].

H5N1-influenza is also considered to be a possible threat for public health: a pandemic of a mutated H5N1-influenza-strain could theoretically cause millions of deaths [3,4].

SARS displayed that our health systems/hospitals are not able to deal with a pandemic of highly virulent airborne diseases [2].

A shortage of well-equipped emergency department (ED) and intensive care facilities is found, to treat highly contagious people.

In Toronto during the first SARS episode, negative pressure/laminar flow rooms and sanitary ante-rooms had to be constructed on the spot.

A whole range of measures to reduce the spreading of SARS was successfully deployed.

Both SARS and H5N1-influenza may cause acute respiratory insufficiency and possible multiorgan failure. Children seem to be more vulnerable to H5N1.

As a result, a large number of infected patients may be expected to require intensive care and mechanical ventilation. Finally, mortality may be as high as 80% in children.

Recently, not only viral infections showed health systems to be ineffective, but also the 2003 heat wave in Europe (especially in France) raised concerns about hospital ability and the efficiency of the health system to care for an overwhelming amount of patients. Hospital staff rushed back from holidays to the emergency/intensive care departments. The large numbers of deaths (more than 19 times the death toll of the SARS epidemic worldwide), and shortage of available mortuary places, urged the government and undertakers to take over refrigerated warehouses, to call back vacationing workers and even the retired, and to extend the hours of crematoriums. The catastrophe had been particularly difficult for families because they were forced to bury their loved ones without the usual arrangements provided by undertakers [5–7].

We wanted to know to which extent our Belgian hospitals are prepared for a possible human H5N1 pandemic.

## Methods

A written survey was sent by e-mail to all Belgian EDs during the period of April–May 2006. Both regional and

university hospitals were asked to participate. The main question was to know if hospitals already had a disaster plan for H5N1-influenza, as well as if a sufficient number of protective clothing and N95-masks were available. Finally, we asked for antiviral medication availability for the hospital staff. Specific items were requested to evaluate the number of adult and paediatric beds in intensive care units (ICU), the number of intensive care beds equipped with isolation ante-rooms, including laminar flow or negative pressure systems, and the number of mechanical ventilators available in ICU.

Finally, we checked for the number of available mortuary places in hospitals.

Statistical analysis was performed using Statview 4.0 (Abacus concepts, Inc., Berkeley, California, USA) for the Macintosh computer.

## Results

A total of 65 hospitals completed the survey, 10 university and 55 regional hospitals. Table 1 depicts hospital size and admissions to the ED as well as ICU facilities.

A disaster plan for H5N1 is available in nine out of 10 university and in 34 out of 55 regional hospitals [$\chi^2$, $P = 0.08$ (not significant)].

Despite the existence of a disaster plan, only a minority of institutions hold a stock of antiviral medication to supply both patients and hospital staff (8/10 university and 14/55 regional hospitals – $\chi^2$, $P = 0.001$). This figure is probably overstated. It was noted that some hospitals replied that they have as little as three boxes of 10 pills of neuraminidase inhibitors. Most hospitals, however, did not mention the exact amount of antiviral medication.

Most EDs have protective clothing and masks, the proportion being 9/10 for university and 34/55 for regional hospitals ($\chi^2$, $P = 0.08$).

**Table 1 Hospital characteristics and potential intensive care management**

| | Range (min–max) | Mean | Median | Total number |
|---|---|---|---|---|
| Yearly admissions at ED | 0–72 000 | 21 684 | 17 000 | 14 09 458 |
| Number of hospital beds | 84–1580 | 426 | 336 | 27 697 |
| Number of ICU beds | 0–119 | 17.3 | 12 | 1122 |
| Number of ICU beds with isolation ante-room | 0–31 | 3.5 | 1 | 225 |
| Number of ventilators | 0–96 | 15.5 | 8 | 995 |
| Number of rooms equipped with laminar flow or negative pressure (not only at ICU) | 0–30 | 2.9 | 0 | 191 |

ED, emergency department; ICU, intensive care unit.

Only seven out of 10 university and 17 out of 55 regional hospitals have EDs with a separate triage area ($\chi^2$, $P = 0.02$).

A total of 758 (range 0–64, mean 11.8, median 9) in-hospital mortuary places in the $n = 65$ hospitals were reported. It should be noted that some hospitals are lacking mortuary facilities.

Table 2 displays the data related to ICU and paediatric ward capacity.

## Discussion

One of the concerns in dealing with a pandemic, is the overload of the public health system. Scenario analysis by a Dutch group revealed that (with a supposed attack rate of 30%) at least 10 000 hospital admissions would be influenza related. They also estimated that they would be confronted with more than 4000 influenza-related deaths (for a population of 15 million people) [8]. The Belgian Government estimated a pandemic would cause up to 22 000 deaths (population of 10 million inhabitants).

It is clear that the 758 mortuary places in hospitals are largely insufficient. Furthermore, the capacity of private undertakers is too small to deal with the large number of casualties during a pandemic.

The same Dutch group studied the effect of prophylactic treatment with neuraminidase inhibitors on hospital admissions and death toll. About 5000 hospital admissions would be prevented as well as 2000 deaths when treating 4.7 million people. The efficiency of prophylactic treatment is unknown, so the need to have a stock of antiviral medication is still being debated [9,10]. As some H5N1-strains are reported to be resistant to oseltamivir, the stocks of oseltamivir could be meaningless.

Most Belgian hospitals are not fully prepared to cope with a pandemic. University hospitals have made more preparations than regional hospitals, but even they are not fully equipped. Many EDs lack an operational separate triage room. So patients suspected of H5N1-influenza cause a higher risk of transmission of the virus to other patients admitted in the ED.

**Table 2 Availability in paediatric and specific paediatric ICU provided by hospitals included in the present study**

| | Range (min–max) | Mean | Median | Total number |
|---|---|---|---|---|
| Number of beds at paediatric ward | 0–145 | 25.8 | 22 | 1679 |
| Number of beds at paediatric ward with isolation ante-room | 0–16 | 2.9 | 2 | 183 |
| Number of paediatric ICU beds | 0–15 | 1.1 | 0 | 75 |

ICU, intensive care unit.

The number of ICU beds (especially paediatric ICU beds) is far too low to deal with a catastrophe, for example, an H5N1-influenza-pandemy, with a majority of patients requiring ventilatory support.

Prophylactic treatment of staff members and patients with neuraminidase inhibitors cannot be started on time because hospitals do not have stocks of antiviral medication (situation May–June 2006). Therefore, doctors and paramedics risk being part of the second wave of victims of the pandemic. Who will take care for the overwhelming amount of patients then?

We will be confronted with the mass casualty treatment priority dilemma. Can we decide which patients will be admitted to the ICU ward and which will be left untreated? Do we need to set up criteria to choose who could benefit most of ventilatory support? Do we need to consider which patients will be given palliative support only because of shortage of ICU-capacity? Should patients be treated on a first come first served basis, or only young urban professionals and children? But even then, how many of them can be treated, as hospital resources are largely insufficient?

The shortage of hospital facilities and protective measures for the hospital staff raises ethical considerations. Can we urge hospital employees to work in a highly contagious site without proper protective clothing and prophylactic treatment? Should only volunteers be used?

Although we could not obtain a complete set of data from the 142 EDs, we believe that the hospitals which collaborated with our study were probably those in the best position to deal with such a potential public health catastrophe.

In conclusion, despite the Belgian Government's optimism, we believe that our hospitals and EDs would not be able to cope with an H5N1-influenza pandemic.

## Acknowledgements

The authors thank An Rossau and Len Brookes for raising the ethical viewpoint, a critical review of the manuscript and the English corrections. This study was not financially supported.

## References

1 Cherry JD. The chronology of the 2002–2003 SARS mini pandemic. *Paediatr Respir Rev* 2004; **5**:262–269.
2 Loutfy MR, Wallington T, Rutledge T, Mederski B, Rose K, Kwolek S, *et al*. Hospital preparedness and SARS. *Emerg Infect Dis* 2004; **10**:771–776.
3 Belgian Royal Academy of Medicine. The expected flu-pandemy: a reason for special preparedness. Report for the medical corps [In Belgian]. *Belgian Journal of Medicine* 2005; **61**:1577–1582.
4 Avian influenza H5N1 outbreaks in Romanian and Danish poultry, and large H5N1 cluster in an Indonesian family. *Euro Surveill* 2006; **11**:E060525.1.
5 Dhainaut JF, Claessens YE, Ginsburg C, Riou B. Unprecedented heat-related deaths during the 2003 heat wave in Paris: consequences on emergency departments. *Crit Care* 2004; **8**:1–2.
6 Vandentorren S, Suzan F, Medina S, Pascal M, Maulpoix A, Cohen JC, *et al*. Mortality in 13 French cities during the August 2003 heat wave. *Am J Public Health* 2004; **94**:1518–1520.
7 Kosatsky T. The 2003 European heat waves. *Euro Surveill* 2005; **10**.
8 van Genugten ML, Heijnen ML, Jager JC. Pandemic Influenza and healthcare demand in the Netherlands: scenario analysis. *Emerg Infect Dis* 2003; **9**:531–538.
9 De Jong JC, Osterhaus AD. The threatening influenza pandemic: a national store of oseltamivir is necessary. *Ned Tijdschr Geneeskd* 2005; **149**:1618.
10 Bonneux L. The threatening influenza pandemic: a national store of oseltamivir is a waste of money. *Ned Tijdschr Geneeskd* 2005; **149**:1619.