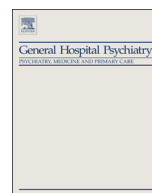




ELSEVIER

Contents lists available at ScienceDirect

General Hospital Psychiatry

journal homepage: <http://www.ghpjournal.com>

Influenza outbreaks management in a French psychiatric hospital from 2004 to 2012[☆]

Philippe Gaspard, M.D., Ph.D.^{a,b,*}, Anne Mosnier, M.D.^c, Dominique Gunther, R.N.^a, Céline Lochert, R.N.^a, Sabrina Larocca, R.N.^a, Pascale Minery, M.D.^d, Françoise Stoll-Keller, M.D., Ph.D.^e, Xavier Bertrand, M.D., Ph.D.^b, Daniel Talon, M.D., Ph.D.^b

^a Equipe Inter-établissement d'Hygiène Hospitalière, coordination GROG Géroto-Alsace - Centre Hospitalier de Rouffach, 68250 Rouffach, France

^b UMR 6249 Chrono-environnement, Université de Franche-Comté, Besançon, France

^c Coordination nationale des GROG (Groupe Régionaux d'Observation de la Grippe), 75018 Paris, France

^d Laboratoire de biologie médicale, Centre Hospitalier de Rouffach, 68250 Rouffach, France

^e Laboratoire de Virologie, Hôpitaux Universitaires de Strasbourg, 67000 Strasbourg, France

ARTICLE INFO

Article history:

Received 27 September 2012

Revised 13 January 2013

Accepted 15 January 2013

Keywords:

Influenza
Psychiatry
Geriatrics
Prophylaxis
Nosocomial

ABSTRACT

Objective: Influenza epidemics can have consequences in terms of morbidity and mortality for the patients. This work assesses influenza outbreaks in order to validate and optimize alert and control measures in a psychiatric hospital.

Method: The prospective monitoring of influenza episodes was conducted for 8 years in 19 units of a mental health hospital. Rapid influenza diagnostic tests were used. The study of the episodes with confirmed influenza cases was carried out.

Results: Influenza monitoring and alert were essential with information and laboratory-confirmed cases. Influenza was common with a total of 20 episodes for the studied period. A maximum of 25% (5/20) of the units were affected in 2008–2009. Rapid influenza diagnostic tests allowed a quick identification with an average time of 1.5 days. Mainly, control measures limited the spread of the influenza virus in units with patient not at high risk of complications. On the other hand, antiviral curative treatment and chemoprophylaxis are essential in units with patients at high risk of complications.

Conclusion: In a psychiatric hospital, influenza management has to take into account the exposed patient's risks for influenza complications and to adapt the strategy according to the risks identified.

© 2014 Elsevier Inc. All rights reserved.

1. Introduction

Nosocomial influenza epidemics occur in all kinds of units with significant implications in terms of morbidity, mortality and costs. Investigating the epidemics should help us to understand the outbreaks in order to limit their impacts [1].

The epidemics in long-term care units or geriatric hospitals are common and well known, and acute respiratory infections and viral gastroenteritis are the most frequent ones [2]. In psychiatry wards, such epidemics are probably nonidentified and underreported, that is why validating alert and control measures is difficult, even if some data show the impact is significant in this kind of units [3–6]. The network of the regional influenza monitoring groups (Groupes Régionaux d'Observation de la Grippe) developed an experimental

study in a psychiatric hospital for 8 years from 2004 to 2012 in the period of the influenza epidemic [7,8].

The goal of this study is to develop the monitoring in the units of a psychiatric hospital in order to improve our knowledge and validate the alert and control measures in that kind of units.

2. Methods

2.1. Setting

A total of 19 units were included with 17 hospitalization units [4 geriatric psychiatry (GP) and 13 clinical psychiatry (CP)] and 2 residential homes [1 specialized care home (SCH) and 1 medical-care home (MCH)]. Each unit consisted of independent care teams, which do not share the dining area and the other places to live. The 4 GP units consisted of 75 beds, and 277 beds were in the 13 CP units for adults. The SCH was for adults with physical and mental disabilities (45 then 56 beds in 2010), and the MCH accommodated adults with psychiatric illnesses (43 beds). For the study, two types of practices

[☆] Conflict of interest: none.

* Corresponding author. Tel.: +33 03 89 78 74 47; fax: +33 03 89 78 70 00.

E-mail address: ph.gaspard@ch-rouffach.fr (P. Gaspard).

have been identified: units (named Type 1) with the majority of persons not at risk of complications (CP and MCH) and units (named Type 2) where all or the majority of the persons were at high risk of complications from influenza (GP, SCH).

2.2. Surveillance

Every year, before the winter, every care units were informed of the acute respiratory infections' risks in the framework of the influenza immunization awareness campaign for the staff and the patients. An information meeting was organized for the doctors to present rapid diagnostic tests for the detection of influenza. At the time of the community epidemic, alert messages were sent by e-mails to every unit. If epidemics were noticed in some units of the institution, all other units were informed about them.

The reporting of influenza cases or of the cases of all sorts of respiratory infections to the hygiene team was organized. Some alerts were made on the computers by the doctors, and/or the hygiene team was called by the care services or by the virological testing laboratory.

Eight epidemic seasons were monitored, each season between November and April, from 2004 to 2011. The national data of the regional influenza monitoring groups were used to define the epidemic periods.

2.3. Case definitions

As soon as cases of influenza or of respiratory infections of all sorts were reported, the hygiene team immediately intervened. Rapid diagnostic or virological laboratory tests were performed for patients that met the clinical case definition, and only episodes with influenza confirmed cases were included.

The clinical criteria also used to define the cases were a fever above 38°C and three of the following symptoms at least: chills, headache, eye pains, muscle pains, asthenia, anorexia, sore throat and coughing. For the elderly and mentally disabled people and in the context of the outbreaks with influenza confirmed cases, variable clinical presentations blending general symptoms (high fever, weakness/fatigue, mental confusion and anorexia) and respiratory symptoms (from rhinitis to pneumonia) were assessed case by case, and those without another causes (urinary infections, bacterial pneumonia, etc.) were included in the number of influenza-infected patients.

The cases were listed with the date when the first symptoms appeared and with the vaccinal status against influenza. In residential services, the global vaccination rate was recorded. Health worker infections were not recorded.

2.4. Control measures

Preventive measures around those cases included « contact » and « droplet » precautions lasting for 5 to 7 days at least or finishing 48 h after the fever disappeared. The measures were supported by information: about the flu to the health workers (transmission, treatment and risks), alert of the hospital manager and meeting with all the patients of the units in the case of outbreaks with more than three infected patients (influenza infection, risks and control measures).

In some situations, patients were suggested to wear a mask (Type 2, European norm 14683) to enable them to get out of their room. Airing the rooms and the unit (10 min three times a day) was recommended, and infected staff were sent home for a minimum of 5 days. Hand hygiene was reinforced, and a curative treatment with oseltamivir could be prescribed by the doctors of infected patients or by family doctor for the health workers. The events were suspended, but the assembly of noninfected patients during meals and in the rest areas with television were not prevented in those units.

At least, one laboratory-confirmed case among patients was necessary to initiate the chemoprophylaxis for all the patients in the unit. Other criteria (patients at risk or not, outbreak, severity of the infection, death, difficulties to implement control measures, etc.) should be taken into account to make the final decision about the chemoprophylaxis. For health workers, information was given to contact their doctors for a potential prophylaxis, particularly those at high risk of complications from influenza. Following the detection of the first case in one unit, the daily monitoring of the temperature of all the patients and residents was also implemented in order to identify the cases quickly in the concerned unit.

2.5. Influenza virus identification

The rapid immunoassay diagnostic tests for detection of influenza were: QuickVue® from 2004 to 2007 (without the virus Type A or B) and Clearview® Exact Influenza A and B from 2007 to 2012 (with the differentiation of Influenza A and B virus). Both have been approved by the US Food and Drug Administration with similar sensitivities and specificities [9]. The tests were essentially prescribed to identify the epidemiological context with the presence or the absence of the influenza virus in the unit and then to adapt the chemoprophylaxis with oseltamivir. Given the low sensitivity of rapid tests, they were not used any longer once the control measures had been implemented and had enabled to control the influenza outbreak. Clinical criteria were used to evaluate the outbreak evolution. Doctors could also prescribe a test for a specific patient to make a precise diagnosis and then to adapt his treatment.

2.6. Statistical analysis

The software XL Stat 2006 was used for the univariate analyses. The comparison of infection percentages according to the control measures and to the Type 1 or 2 activities was made according to the univariate method thanks to the chi-square test. The selected significance threshold was $P < .05$.

3. Result

The total number of rapid influenza diagnostic tests varied from 1 year to the other (8 (2004–2005), 7 (2005–2006), 8 (2006–2007), 38 (2007–2008), 22 (2008–2009), 13 (2009–2010), 25 (2010–2011), 34 (2011–2012).

A total of 20 episodes with at least one laboratory-confirmed case were included for the eight seasons (Table 1). A maximum of 25% of the included units were affected in 2008–2009. Eighteen out of the 20 outbreaks were identified in the epidemic periods (90.0%). The attack rate varied widely by episode, ranging from 2.3 to 44.4 cases per 100 patients with no death observed during these episodes.

The influenza episode rate was 0.59 episodes a year for 100 beds in the psychiatry wards (13 outbreaks for 277 beds included during 8 years). In the other units, the yearly rate for 100 beds was 0.50 (GP, 3/600), 0.79 (SCH, 3/382) and 0.29 (MCH, 1/344).

The average time between the first case and the intervention of the hygiene team was 1.5 days [confidence interval (CI) of 95%, 0.8–2.2]. The average number of cases at the time of the intervention was 2.5 infected patients (CI 95%, 1.4–3.6). The rapid influenza diagnostic test was positive at the time of the intervention for 100% of the outbreaks (20/20). The mean duration of the episodes was 3.7 days (CI 95%, 2.7–4.7). At the intervention time, 33 clinical cases underwent a rapid testing; out of which, 23 were influenza positive. No test was performed for 10 cases, particularly if the durations between the beginning of the clinical signs and the days of the intervention were superior at 96 h.

The vaccination of the staff was globally known for the whole institution. The percentages of vaccinated members of staff

Table 1
Chronology, influenza vaccination, virology and attack rate of the different outbreaks

Outbreak number–unit number (type of activity)	Number of exposed and monitored patients (lost to follow-up)	Average age of patients (years)	Year (number of the week of the first case)	The time between the first case and the intervention (days)	Number of clinical cases (number of positive rapid diagnostic tests/total number of rapid diagnostic tests)	Number of cases after the intervention (number of positive rapid diagnostic tests/total number of rapid diagnostic tests)	Durations of the episodes (days)	Number of infected people (vaccinated/nonvaccinated/unknown status)	Global vaccination rate in the department (number of vaccinated people/total number)	Virus type	Attack rate (number of infected patients/number of exposed patients) (number of deaths of infected patients)
2004–2005											
1–15 (CP)	20 (3)	36.9	2005 (5)	0	1 (1/1)	0 (0/0)	1	(0/1/0)	8.6 (2/23)	A	5.0 (1/20) (0)
2–18 (SCH)	45 (0)	48.1	2005 (10)	5	12 (2/3)	0 (0/0)	7	(12/0/0)	100.0 (45/45)	A/B	26.6 (12/45) (0)
3–9 (GP)	18 (0)	75.5	2005 (10)	0	1 (1/1)	3 (2/2)	4	(4/0/0)	–	A/B	22.2 (4/18) (0)
2007–2008											
4–7 (CP)	17 (5)	46.5	2007 (52)	1	1 (1/1)	1 (1/2)	5	(0/2/0)	–	B	11.8 (2/17) (0)
5–13 (GP)	14 (3)	78.6	2008 (2)	3	3 (2/2)	3 (0/1)	6	(4/1/1)	–	B	42.8 (6/14) (0)
6–5 (CP)	19 (2)	41.5	2008 (4)	0	1 (1/1)	0 (0/1)	1	(0/1/0)	–	B	5.3 (1/19) (0)
2008–2009											
7–5 (CP)	23 (1)	40.6	2009 (2)	2	1 (1/1)	0 (0/0)	3	(0/1/0)	–	A	4.3 (1/23) (0)
8–19 (MCH)	43 (0)	48.5	2009 (4)	1	1 (1/1)	0 (0/1)	1	(1/0/0)	62.8 (27/43)	B	2.3 (1/43) (0)
9–11 (GP)	14 (3)	72.9	2009 (4)	2	2 (1/1)	0 (0/1)	3	(1/1/0)	70.6 (12/17)	A	14.3 (2/14) (0)
10–8 (CP)	19 (1)	44.1	2009 (5)	1	1 (1/1)	0 (0/0)	1	(0/1/0)	–	A	5.3 (1/19) (0)
11–6 (CP)	20 (2)	43.4	2009 (5)	4	3 (1/2)	3 (0/1)	7	(0/3/3)	–	A	30.0 (6/20) (0)
2009–2010											
12–14 (CP)	22 (3)	37.3	2009 (47)	1	1 (1/1)	1 (0/1)	3	(0/2/0)	–	A	9.1 (2/22) (0)
13–14 (CP)	21 (4)	40.7	2009 (51)	1	2 (1/2)	0 (0/0)	2	(0/2/0)	–	A	9.5 (2/21) (0)
2010–2011											
14–8 (CP)	18 (9)	30.7	2011 (4)	2	2 (1/2)	6 (0/0)	9	(0/8/0)	–	B	44.4 (8/18) (0)
15–17 (CP)	19 (6)	40.1	2011 (4)	3	3 (2/6)	1 (0/0)	5	(0/4/0)	–	A	21.1 (4/19) (0)
16–18 (SCH)	56 (1)	51.7	2011 (4)	0	1 (1/1)	12 (2/3)	6	(13/0/0)	98.2 (56/57)	A	23.2 (13/56) (0)
2011–2012											
17–17 (CP)	24 (2)	46.4	2012 (9)	1	1 (1/1)	1 (0/1)	3	(0/2/0)	–	A	9.1 (2/22) (0)
18–10 (CP)	20 (2)	50.2	2012 (9)	1	1 (1/1)	0 (0/0)	3	(0/1/0)	–	A	5.6 (1/18) (0)
19–12 (CP)	23 (2)	46.6	2012 (9)	4	2 (1/2)	0 (0/1)	1	(0/2/0)	–	A	9.5 (2/21) (0)
20–18 (SCH)	56 (0)	51.9	2012 (11)	0	3 (1/2)	3 (0/0)	2	(6/0/0)	100.0 (56/56)	A	10.7 (6/56) (0)
					43 (23/33)	34 (5/15)		(41/32/4)			15.2 (77/505) (0)

Table 2
Types of activities, control measures and attack rates for the influenza episodes

Types of activities	Episodes and departments	Curative treatment with oseltamivir ^e (yes/no)	Prophylaxis with oseltamivir for exposed patients in the units Close contacts: All the other patients in the units: yes/no [duration between the first hygiene team intervention and the prescription (days)]	Criteria for the prophylaxis prescriptions to all the unit patients	Mask wearing for the infected patients when they are authorized to go out of their room (yes/no/not applicable)	Attack rate at the time of the intervention (%) [number of infected people (Ni)/number of exposed people (Nexp)]	<i>P</i> univariate (chi-square)	Attack rate after the intervention (%) [number of infected people/(Nexp–Ni)]	<i>P</i> univariate (chi-square)	Total attack rate (%) (number of infected people/Nexp)	<i>P</i> univariate (chi-square)	
Units with the majority of persons not at risk of complications (Type 1)	1 ^a , 6 ^a , 13 ^a	No	Yes	No (–)	–	No	6.7 (4/60) (0.3–13.0) ^h	.92 ⁱ	0.0 (0/56)(–)	0.07 ⁱ	11.3 (34/302) (7.7–14.9)	.002 ^j
	4 ^a , 7 ^a , 8 ^b , 10 ^a , 11 ^a , 12 ^a , 14 ^a , 15 ^a , 17 ^a , 18 ^a , 19 ^a	Yes	Yes ^f	No (–)	–	Yes	7.0 (17/242) (3.8–10.2)		5.8 (13/225) (2.8–8.9)			
Units where all or the majority of the persons were at high risk of complications (Type 2)	9 ^c	No	Yes ^g	No (–)	–	Not applicable	14.3 (2/14) (0.0–32.6)	<.0005 ⁱ	0.0 (0/12)(–)	0.03 ⁱ	21.2 (43/203) (15.6–26.8)	
	2 ^d , 5 ^c	No	Yes	Yes (0)	2 positive rapid diagnosis tests (PRDT) within 72 h	Not applicable	25.4 (15/59) (14.3a–36.5)		6.8 (3/44) (0.0–14.2)			
	3 ^c	No	Yes	Yes (3)	2 PRDT within 72 h	Not applicable	5.6 (1/18) (0.0–16.2)		17.7 (3/17) (0.0–35.8)			
	16 ^d	Yes	Yes	Yes (2)	2 PRDT within 72 h	Not applicable	1.8 (1/56) (0.0–5.3)		21.8 (12/55) (10.9–32.7)			
	20 ^d	Yes	Yes	Yes (0)	1 PRDT and difficulties to make tests and to implement hygiene measures	Not applicable	5.4 (3/56) (0.0–11.5)		5.6 (3/53) (0.0–11.8)			
							8.5 (43/505) (6.1–10.9)		7.3 (34/462) (4.9–9.7)		15.2 (77/505) (12.1–18.3)	

- ^a CP.
^b MCH.
^c GP.
^d SCH.
^e Persons at risk of developing complications with laboratory-confirmed or highly suspected influenza virus infection or persons not at risk of developing complications with laboratory-confirmed influenza infection (medical decision).
^f Two patients at high risk of complications also received prophylaxis (outbreak 14).
^g Three nonvaccinated patients also received prophylaxis (outbreak 9).
^h CI of 95%.
ⁱ Comparison of the attack rates according to the outbreak management in the same type of units (units with patients at risk or not at risk).
^j Comparison of the global attack rates according to the Types 1 and 2 units.

were as follows: 19.5% (260/1336, 2004–2005), 25.6% (350/1369, 2005–2006), 19.4% (275/1422, 2006–2007), 23.2% (306/1318, 2007–2008), 20.6% (275/1336, 2008–2009), 24.9% for the seasonal vaccination (341/1369) and 7.7% for the AH1N12009 (106/1369) (2009–2010), 15.1% (214/1422, 2010–2011), 10.9% (159/1462, 2011–2012).

In the CP units or in the MCH (Type 1), the management of influenza outbreaks only consisted of hygiene barriers around the cases and of the prescription of a prophylactic treatment for roommates or close friends. A curative treatment was also prescribed during some outbreaks and patients at high risk of complications from influenza were prescribed a prophylactic treatment (Table 2).

In the GP units and in SCH (Type 2), hygiene barriers and the prophylaxis of roommates or close friends were not considered to be sufficient to control the epidemic phenomenon in 5 out of 6 outbreaks (83.3% of the epidemics) with extended prescription of prophylaxis for every patients or residents. Criteria for the antiviral chemoprophylaxis to all the unit patients have been: two positive rapid influenza diagnosis tests (PRDT) within 72 h for four outbreaks and one PRDT and difficulties to make tests and to implement hygiene measures for one outbreak in the SCH.

For Outbreaks 3 and 16, chemoprophylaxis was prescribed for every contact subsequently to the reassessments done 3 and 2 days, respectively, after the first intervention. The attack rates after the intervention for those 2 outbreaks were the highest. At the beginning of this work (2004–2011), the main criterion to initiate the chemoprophylaxis was two positive rapid tests with, in some episodes, a waiting period to obtain the second positive test. In 2011–2012, because of failures to control outbreaks in units with patients at high risk of complications, only one positive test was necessary to prescribe the prophylaxis with other criteria defined in the method and the discussion.

Moreover, attack rate in the units with patients at high risk of complications was higher than the one observed in the CP units and in the MCH.

4. Discussion

This work showed the importance of influenza monitoring in all psychiatric units and the necessity to develop alert and control measures related to the types of practices in the settings: units with the majority of persons not at risk of complications (Type 1, CP and MCH) and units where all or the majority of the persons were at high risk of complications from influenza (Type 2, GP and SCH) [10,11].

First, 90% of the influenza infections in the hospital occurred during the community influenza circulation. Consequently, the diagnosis of influenza should be considered in the hospitalized patients (regardless of the vaccination status) and in the health care personnel mainly during these periods.

Moreover, communicating information about national and local epidemiology was justified and could help to improve the attention of health professionals.

In Type 1 units, fever and acute onset of respiratory signs and symptoms could lead to influenza research. In Type 2 units, other symptoms should also take into account as defined in the method.

Nevertheless, infection control measures (« contact » and « droplet » precautions) should be developed around patients with all types of respiratory tract infections to prevent transmissions in the units whatever the negative result or the absence of the influenza researches.

In CP, MCH and GP units, infected patients should be encouraged to stay in their rooms for 5 to 7 days. Nevertheless, for psychiatric patients, this infection control practice was difficult to follow, and in CP and MCH, wearing a mask to leave their room was possible with a control of the outbreaks in this work. In Type 2 units, it was difficult for the patients to wear the mask, and other control measures should be developed.

Influenza testing was required for the other measures and particularly treatment and chemoprophylaxis.

In this work, rapid diagnostic tests enabled to identify the virus quickly and to implement the appropriate measures. The biological results mentioned information about the sensitivity and the specificity of the rapid tests with the risks of false-negative results [12–14]. At the beginning of this work, the tests were not well known. Over the years and the experiences, the prescriptions were more frequent, and an impact on the number was probable. Hygiene team gave, to the health worker teams, information about the local influenza circulation and control measures to apply around infected patients (positive or negative rapid tests). The viral research through molecular biology may also be justified in case of an epidemic with negative rapid diagnostic tests or/and to characterize the strain.

The influenza identification led to different practices in Type 1 and 2 units. For information about guidance on the use of influenza antiviral medications, national differences exist, and season antiviral medications change in response to viral resistance. Consequently, antiviral used should refer to the country guidelines if they exist and to the summary of product characteristics [10,11,15].

In units Type 1 with the majority of persons not at risk of complications (CP and MCH), influenza vaccination was different in CP and MCH with low or unknown rates in the first units and around 60.0% in the second type of ward. In CP units, influenza vaccination should be considered for hospitalized patients at high risk of complications and could be checked at the admissions. In case of confirmed influenza infections in these Type 1 units, chemoprophylaxis for the close contacts (roommates and close friends) was evaluated with the contact patient (at risk or not at risk of complications). Moreover, in psychiatric units, a single room was proposed to the infected person. In other patients at high risk of complications who are in the unit with the influenza infection (psychiatry units often accommodate patients with comorbidity), antiviral chemoprophylaxis should also be discussed.

For persons with laboratory-confirmed or highly suspected influenza virus infection, curative treatments were recommended for those at high risk of developing complications. The decision to prescribe antiviral treatments to patients not at high risk of complications was very variable. Shortening the duration of illness and reducing the relatively low risks of complications were the criteria for the possible curative treatment within 48 h after onset of symptoms. Nevertheless, these indications were also discussed in the units with moderate benefits compared to possible but rare adverse effects. Adverse neuropsychiatric events in patients given oseltamivir are reported, particularly in children and adolescents [16]. For that reason, antiviral curative treatment and chemoprophylaxis were given only to adults, and prescriptions were not systematic with an individual evaluation for each patient. During this work, no particular neuropsychiatric effect has been observed, and further research will have to resolve this debatable issue.

Antiviral treatment can also reduce the risks of transmission, but this indication was not a criterion of treatment with only a collective benefit in hospital wards [17]. All the control measures had to protect other patients with or without antiviral curative treatments for the infected patients. The last point to consider was the antiviral chemoprophylaxis for all the patients in a Type 1 unit with a high attack rate or with severe influenza infections and/or deaths. These scenarios are not developed in the guidelines and did not occur in this work. They should be considered as an exceptional situation. With the experiences of this work, a general prophylactic use of oseltamivir could be initiated in the context of severe infections or death. For the high attack rate outbreak, a strict respect of the previous control measures would be the first alternative, but the possible chemoprophylaxis would be discussed at the institutional level (manager and doctors).

In Type 2 units, vaccination rates were higher for the patients and around 100% in the SCH. No mortality was noticed in the outbreaks

and particularly in GP units [18]. Influenza in the SCH (2005, 2011 and 2012) showed that vaccinations do not prevent totally influenza outbreaks in those communities, and the immune response to vaccination and vaccine efficacy might be less in these patients like in the geriatric units [19,20].

All or the majority of the persons were at high risk of complications in these units, and antiviral treatment for the infected patients and chemoprophylaxis for the others should be used regardless of influenza vaccination status. In our work, this recommendation was partially applied for the 2004–2009 period with an absence of curative treatment or chemoprophylaxis used only for the close contacts in one cluster. Medical information was made with a positive evolution of the practice. Difficulties occurred to define exactly when patients should receive antiviral chemoprophylaxis. After the first positive test, institutional patients with compatible symptoms were tested. At the beginning of this work, two laboratory-confirmed cases within 72 h of influenza among patients were necessary to initiate the chemoprophylaxis for all the patients in the unit. This criterion was too strict and prohibited rapid intervention with higher attack rates in the units. Because of the lack of sensitivity, a negative rapid test result does not rule out influenza virus infection. Since false-negative results can occur, if clinical suspicion of influenza is high in a patient who tests negative, influenza outbreak should be suspected in the institution.

The indications of the prophylaxis medications should be assessed not at the second positive test but at the first one with other criteria: severity of the infection, death, difficulties to implement control measures (dementia and insane patients or residents, meals in the dining and rest area) and difficulties to do tests on the insane patients, sensitivity of the rapid tests (possible negative rapid test with influenza clinical symptoms), high attack rate at the first intervention, the possible antigenic mismatch between outbreak strain and that used for vaccination, low vaccination rate or unvaccinated patients or residents. In these situations, a neuraminidase inhibitor medication should be started as early as possible to reduce the spread of the virus [21]. In these Type 2 units, the question of the adverse neuropsychiatric events in patients given oseltamivir was less acute because of the severity of the infection for the concerned patients.

How difficult implementing preventive measures may be, the quick alert and the quick identification of the virus associated with the use of prophylaxis with oseltamivir were significant factors of the control of the outbreaks in the psychiatric hospital with average attack rates lower to those in the literature [2–6]. This strategy allowed also limited durations of the episodes with a mean value close to 4 days. Even in the special features of psychiatric units (Type 1 units), mobility around the unit has had limited impact on the attack rate when the infected patients wore a mask in the units. Permissions were also given for going outside in the park. Nevertheless, in Type 2 units, control measures were more difficult to implement with the management of patients with dementia. Patients in these units were at an increased risk of various health problems including lower immunity and poorer immune response to vaccine. Higher attack rate was also observed in these Type 2 units, and antiviral medications and chemoprophylaxis were essential with rapid decision to give the treatment to all the patients of the unit. Nursing homes and long-term care facilities are regularly confronted with influenza outbreaks, and the population in the Type 2 units are very similar to those in these institutions: aged, dementia and at high risk of complications [22–25]. Consequently, comparable outbreak management has to be developed.

For the health care workers (HCWs), the surveillance of influenza was a part of a global hygiene and infection control program in the institution. HCWs education program regarding the care activities that can result in cross-transmission of microorganisms is developed (multidrug resistant bacteria, scabies, tuberculosis, gastroenteritis and influenza). For the vaccination against influenza, indicators

(vaccination rate of the HCWs and number of vaccines for patients) were regularly transmitted to the doctors in all the units and discussed in the various committees of the institutions. Nevertheless, the average vaccination rate (close or inferior to 20%) was low and insufficient, notably for the units of patients at high risk of complications [26,27]. Various factors are involved in vaccination and in psychiatry. HCWs often considered that the majority of patients were not at high risk of complications. This fact reinforces the necessity of a strict surveillance to develop the hygiene control measures. The impact of the staff on the progress of epidemics has not been studied, but it can be a strong vector during care. The lack of staff, the impact of absenteeism on annual bonus and the underestimated risks for the patients lead the members of staff with marks of influenza infection to go to work. In this context, wearing a mask should become compulsory and systematic in the units for health workers with marks of respiratory infections even in psychiatry units.

Influenza monitoring and alert are essential in health facilities and especially with information and laboratory-confirmed cases. Quickly implementing the preventive measures significantly limits the impact of epidemics. Outbreak management has to take into account the exposed patient's risks for influenza complications and to adapt the strategy according to the risks identified. Antiviral curative treatment and chemoprophylaxis were considered differently according to the units, especially when patients at high risk of complications from influenza were accommodated in the concerned unit.

Thanks to the management of the institution, the professionals who took part in monitoring and investigating the outbreaks.

References

- [1] Voirin N, Barret B, Metzger MH, Vanhems P. Hospital-acquired influenza: a synthesis using the Outbreak Reports and Intervention Studies of Nosocomial Infection (ORION) statement. *J Hosp Infect* 2009;71:1–14.
- [2] Utsumi M, Makimoto K, Quroshi N, Ashida N. Types of infectious outbreaks and their impact in elderly care facilities: a review of the literature. *Age Ageing* 2010;39:299–305.
- [3] Strihavková M, Havlíčková M, Tümová B. An epidemic of type B influenza in the geriatric psychiatry department of a psychiatric hospital. *Cas Lek Cesk* 1990;129:1129–32.
- [4] Sugaya N, Kusumoto N, Suzuki Y, Nerome R, Nerome K. Large sequential outbreaks caused by influenza A (H3N2) and B viruses in an institution for the mentally handicapped. *J Med Virol* 1996;50:120–5.
- [5] Atkinson WL, Arden NH, Patriarca PA, Leslie N, Lui KJ, Gohd R. Amantadine prophylaxis during an institutional outbreak of type A (H1N1) influenza. *Arch Intern Med* 1986;146:1751–6.
- [6] Giménez Duran J, Galmés Truyols A, Nicolau Riutort A, Reina Prieto J, Gallegos Álvarez Mde C, Pareja Bezares A, et al. Outbreak of pandemic virus (H1N1) 2009 in a residence for mentally disabled persons in Balearic Island, Spain. *Rev Esp Salud Publica* 2010;84:665–70.
- [7] Cohen JM, Mosnier A, Grog I, Groupes Régionaux d'Observation de la Grippe. Influenza surveillance in France. *Med Sci (Paris)* 2003;19:239–42.
- [8] Dab W, Quenel P, Cohen JM, Hannoun C. A new influenza surveillance system in France: the Ile-de-France "GROG". 2. Validity of indicators (1984–1989). *Eur J Epidemiol* 1991;7:579–87.
- [9] Centers for Disease Control and Prevention (CDC). Rapid diagnostic testing for influenza information for clinical laboratory directors. Available at: <http://www.cdc.gov/flu/professionals/diagnosis/rapidlab.htm>. Accessed 08/01/2013.
- [10] Harper SA, Bradley JS, Englund JA, File TM, Gravenstein S, Hayden FG, et al. Seasonal influenza in adults and children—diagnosis, treatment, chemoprophylaxis, and institutional outbreak management: clinical practice guidelines of the Infectious Diseases Society of America. *Clin Infect Dis* 2009;48:1003–32.
- [11] Tappenden P, Jackson R, Cooper K, Rees A, Simpson E, Read R, et al. Amantadine, oseltamivir and zanamivir for the prophylaxis of influenza (including a review of existing guidance no. 67): a systematic review and economic evaluation. *Health Technol Assess* 2009;13:1–246.
- [12] De la Tabla VO, Antequera P, Masiá M, Ros P, Martin C, Gazquez G, et al. Clinical evaluation of rapid point-of-care testing for detection of novel influenza A (H1N1) virus in a population-based study in Spain. *Clin Microbiol Infect* 2010;16:1358–61.
- [13] Angoulvant F, Belletre X, Houhou N, Dexpert JB, Morin L, Siriez JY, et al. Sensitivity and specificity of a rapid influenza diagnostic test in children and clinical utility during influenza A (H1N1) 2009 outbreak. *Emerg Med J* 2011;28:924–6.
- [14] Sakai-Tagawa Y, Ozawa M, Tamura D, Le MQ, Nidom CA, Sugaya N, et al. Sensitivity of influenza rapid diagnostic tests to H5N1 and 2009 pandemic H1N1 viruses. *J Clin Microbiol* 2010;48:2872–7.
- [15] Haut Conseil de la Santé Publique (France). Avis relatif à l'utilisation des antiviraux en période de circulation du virus grippal A(H3N2) - Hiver 2011–2012. 2012.

- Available at: www.hcsp.fr/explore.cgi/hcspa20120305_antivirh3n2.pdf. Accessed 27/09/2012.
- [16] Urushihara H, Doi Y, Arai M, Matsunaga T, Fujii Y, Iino N, et al. Oseltamivir prescription and regulatory actions vis-à-vis abnormal behavior risk in Japan: drug utilization study using a nationwide pharmacy database. *PLoS One* 2011;6:2011.
- [17] Pebody RG, Harris R, Kafatos G, Chamberland M, Campbell C, Nguyen-Van-Tam JS, et al. Use of antiviral drugs to reduce household transmission of pandemic (H1N1) 2009. United Kingdom. *Emerg Infect Dis* 2011;17:990–9.
- [18] Centers for Disease Control and Prevention (CDC). Estimates of deaths associated with seasonal influenza –United States, 1976–2007. *MMWR Morb Mortal Wkly Rep* 2010;59:1057–62.
- [19] Sagawa M, Kojimahara N, Otsuka N, Kimura M, Yamaguchi N. Immune response to influenza vaccine in the elderly: association with nutritional and physical status. *Geriatr Gerontol Int* 2011;11:63–8.
- [20] Baldo V, Baldovin T, Pellegrini M, Angiolelli G, Majori S, Floreani A, et al. Immunogenicity of three different influenza vaccines against homologous and heterologous strains in nursing home elderly residents. *Clin Dev Immunol* 2010;2010:517198.
- [21] Fiore AE, Fry A, Shay D, Gubareva L, Bresee JS, Uyeki TM, et al. Antiviral agents for the treatment and chemoprophylaxis of influenza -- recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep* 2011;60:1–24.
- [22] Bush KA, McAnulty J, McPhie K, Reynolds R, Boomer M, Clarkson LM, et al. Antiviral prophylaxis in the management of an influenza outbreak in an aged care facility. *Commun Dis Intell* 2004;28:396–400.
- [23] Vaux S, Poujol I, Bonmarin I, Lévy-Bruhl D, Desenclos JC. Surveillance of lower respiratory tract infections outbreaks in nursing homes in France. *Eur J Epidemiol* 2009;24:149–55.
- [24] Gaillat J, Denettièrre G, Raffin-Bru E, Valette M, Blanc MC. Summer influenza outbreak in a home for the elderly: application of preventive measures. *J Hosp Infect* 2008;70:272–7.
- [25] Castilla J, Cia F, Zubicoa J, Reina G, Martínez-Artola V, Ezpeleta C. Influenza outbreaks in nursing homes with high vaccination coverage in Navarre, Spain, 2011/12. *Euro Surveill* 2012;17 [pii:20141].
- [26] Carman WF, Elder AG, Wallace LA, McAulay K, Walker A, Murray GD, et al. Effects of influenza vaccination of health-care workers on mortality of elderly people in long-term care: a randomised controlled trial. *Lancet* 2000;355:93–7.
- [27] Potter J, Stott DJ, Roberts MA, Elder AG, O'Donnell B, Knight PV, et al. Influenza vaccination of health care workers in long-term-care hospitals reduces the mortality of elderly patients. *J Infect Dis* 1997;175:1–6.