essential, training simulations do not represent real practice.

Thus, it could be argued that an apparently perfect-looking system could be over-stretched, and the clearest and best laid-out guidelines not complied with, when a patient or several patients with suspected VHF or smallpox are hospitalised.

However, in the past two decades INMI has efficiently dealt with the impact of the HIV epidemic and has cared for several patients with multi-drug resistant tuberculosis. Moreover, experiences from hospitals in other countries have demonstrated that a well-prepared system can manage sporadic cases of VHF [15-19]. Within this scenario, the anthrax and SARS emergencies we have dealt with represent important tests with substantially positive results. Based upon this, due to our consistent application of infection control practices, we feel sufficiently prepared to adequately care for these patients and to protect public health.

A key point to be addressed in the near future is the surge capacity. This is a healthcare system's ability to rapidly expand beyond normal services to meet the increased demand for qualified personnel, medical care, and public health in the event of the release of biological agents or other large-scale public health emergencies or disasters. To build an effective surge capacity, INMI is currently developing innovative educational programs to create and maintain the readiness of an appropriately trained workforce. Its goal is to help healthcare workers change their focus from the traditional clinical oriented view of infectious disease treatment to a more integrated, problem solving, infection control management approach that should be relevant during a large scale emergency response situation.

Finally, we strongly believe that uniting as is the case for INMI, the people and facilities involved with clinical care and those that promote public health in a single institution, enhances cooperation, encourages the interchange of information and provides high quality clinical care to all patients.

Acknowledgment

Performed within the Ministero della Salute Ricerca Finalizzata 01.102 e Ricerca Corrente IRCCS. The authors wish to thank Dr. Andrea Stoler for the editing of the manuscript.

References

1. Jernigan JA, Stephens DS, Ashford DA, Omenaca C, Topiel MS, Galbraith M, et al. Bioterrorism-related inhalational anthrax: the first 10 cases reported in the United States. Emerg Infect Dis. 2001;7:933-44.
2. Lee N, Hui D, Wu A, Chan P, Cameron P, Joynt GM, Ahuja A, et al. A major outbreak of severe acute respiratory syndrome in Hong Kong. N Engl J Med. 2003;348:1986-94.
3. Crowcroft NS, Morgan D, Brown D. Viral haemorrhagic fevers in Europe effective control requires a co-ordinated response. Euro Surveill 2002;7:31-2.
4. CDC. Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response. MMWR. 2000;49 RR4.
5. Henderson DA, Inglesby TV, Bartlett JG, Ascher MS, Eitzen E, Jahrling PB, et al. Smallpox as a biological weapon: medical and public health management. Working Group on Civilian Biodefense. JAMA. 1999;281:2127-37.
6. Borio L, Inglesby T, Peters CJ, Schmaljohn AL, Hughes JM, Jahrling PB, et al. Hemorrhagic fever viruses as biological weapons: medical and public health management. JAMA. 2002;287:2391-405.
7. Petrosillo N, Puro V, Ippolito G. Border screening for SARS. Med J Aust. 2004;180:597.
8. Garner JS. Guideline for isolation precautions in hospitals. The Hospital Infection Control Practices Advisory Committee. Infect Control Hosp Epidemiol. 1996;17:53-80.
9. Puro V, Nicastri E. SARS and the removal of personal protective equipment. CMAJ. 2004;170:930.
10. Puro V, Magnavita N, Ippolito G. SARS and masks.J Hosp Infect. 2004;56:73-4.
11. WHO/CDS/CSR/LYO/2003.4 WHO guidelines for the safe transport of infectious substances and diagnostic specimens 1997 (WHO/EMC/97.3).
12. World Health Organization. Transport of Infectious Substances. Background to the amendments adopted in the 13th revision of the United Nations Model Regulations guiding the transport of infectious substances, 2004. WHO/CDS/CSR/LYO/2004.9
13. World Health Organization. Laboratory Biosafety Manual, 2nd (revised) edition. Interim guidelines 2003. WHO/CDS/CSR/LYO/2003.4
14. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention and National Institutes of Health. Biosafety in Microbiological and Biomedical Laboratories (BMBL) 4th Edition, 1999.
15. Centers for Disease Control and Prevention. Imported Lassa fever New Jersey, 2004. MMWR Morb Mortal Wkly Rep. 2004;53:894-7.
16. Swaan CM, van den Broek PJ, Kampert E, Berbee GA, Schippers EF, Beersma MF, Wijnands S.Management of a patient with Lassa fever to prevent transmission. Hosp Infect. 2003;55:234-5.
17. Crowcroft NS. Management of Lassa fever in European countries. Euro Surveill 2002;7:50-2.
18. Cooper CB, Gransden WR, Webster M, King M, O'Mahony M, Young S, Banatvala JE.A case of Lassa fever: experience at St Thomas's Hospital. Br Med J. 1982;285:1003-5.
19. Crowcroft NS, Meltzer M, Evans M, Shetty N, Maguire H, Bahl M, Gair R, Brink N, Lockwood D, Gregor S, Jones J, Nicoll A, Gopal R, Brown D, Bannister B. The public health response to a case of Lassa fever in London in 2000. J Infect. 2004;48:221-8.

ORIGINAL ARTICLES

Surveillance report

SUSPECTED SARS PATIENTS HOSPITALISED IN FRENCH ISOLATION UNITS DURING THE EARLY SARS EPIDEMIC: THE FRENCH EXPERIENCE

B Issartel[1], O Lesens[2], C Chidiac[1], Y Mouton[3], D Christmann[2], D Peyramond[1] and members of the French SARS study group*

During the SARS epidemic, many patients were screened according to WHO criteria but never went on to develop SARS. In May 2003, early in the epidemic, we conducted a retrospective study to describe suspected SARS patients hospitalised in France and compared them with documented cases of patients with SARS to evaluate the screening strategy. A total of 117 patients were studied. Only 3.4% had been in close contact with a SARS patient but 73.5% came from an affected area. 67.5% had fever and respiratory symptoms on their admission to hospital. 49.6% had fever and non specific symptoms. Clinical symptoms that were significantly more common among patients with SARS were fever, myalgia, dyspnoea, and nausea or vomiting. Presumed viral fever and respiratory tract infection were the most common diagnosis. Symptoms cannot be distinguished from an early stage of SARS confirming the usefulness of the WHO case definitions in isolation decision to avoid further transmission

1. Department of Infectious and Tropical Diseases, Hôpital de la Croix Rousse, Lyon, France
2. Department of Infectious and Tropical Diseases, Hôpitaux universitaires, Strasbourg, France
3. Department of Intensive Care and Infectious Diseases, Centre Hospitalier de Tourcoing, Tourcoing, France.

*Members listed at the end of the paper

Euro Surveill 2005;10(3):39-43 Published online Mar 2005

Key words: diagnosis, infection control, patient care management, SARS virus, screening

Introduction

Severe acute respiratory syndrome (SARS) is an emerging infectious disease associated with a novel coronavirus [1]. The SARS epidemic, during which the disease spread to more than 30 countries within a few weeks in March 2003, affected 8098 people and caused 774 deaths [2]. Several reports described the clinical features of confirmed cases [3-6]. Later reports have described the epidemiology and progression of the illness in greater detail [1,7]. On the basis of early findings in hospitals, in March 2003, the World Health Organization (WHO) produced case definitions for suspected and probable cases of SARS that may be used for screening patients before admission to hospital [8,9].

The SARS epidemic ended in July 2003 [2]. The success of containing transmission was attributed to traditional epidemiologic work [10]. Source cases and contacts were identified and isolated. A lot of suspected cases were screened over the world. We have to learn from this first SARS epidemic to ensure better and more accurate screening with less sociological and economical impact, should this ever reoccur. The large population of ultimately excluded suspected SARS patients, which partly reflects the screening strategy, should be studied. Indeed, little information is available about this population as well as on criteria used for screening and isolation.

On 12 March 2003, in response to the SARS outbreak, the French General Health Department (Direction Générale de la Santé, DGS) required reference infectious disease departments throughout the country to set up SARS emergency screening and isolation clinics and to evaluate all suspected cases of SARS according to the WHO guidelines. This centralised organization in France enabled the study of the epidemiological, clinical and biological features, management and final diagnosis of suspected SARS patients hospitalised in France who did not develop SARS. We also rapidly initiated a retrospective study in May 2003, during the SARS epidemic, to characterize suspected SARS patients hospitalised in our units, in order to compare them to SARS patient populations. With these results, we discuss the accuracy of the WHO screening guidelines and report the safety of our strategy to prevent SARS spreading among the French population.

Methods

Study design

In May 2003, during the SARS outbreak, we conducted a retrospective case investigation in newly opened SARS screening and isolation clinics designated by the DGS. There were 12 reference infectious disease departments, and 18 second line infectious disease departments from regional university teaching hospitals soon opened, which had to hospitalise all suspected SARS patients as defined by WHO guidelines [Table 1].

Table 1

WHO Definitions

WHO (World Health Organization) definition for affected area [9].

An area in which local chain(s) of transmission of SARS is/are occurring as reported by the national public health authorities.

WHO case definitions for suspected and probable SARS [9].

SARS is suspected in patients with:

- High fever (> 38°C)
- One or more respiratory symptoms (such as cough, shortness of breath, or breathing difficulty), and
- Close contact with a person previously diagnosed with SARS (having cared for, lived with, or had direct contact with bodily secretions of a person with SARS).

SARS is probable when a patient meets the criteria of a suspected case and there is radiological evidence of infiltrates consistent with pneumonia or respiratory distress syndrome.

Data collection and measurement

In May 2003, physicians in charge of each of the 30 newly opened SARS screening and isolation clinics were asked to complete a questionnaire for all suspected SARS patient hospitalised from 12 March to 15 May 2003 in order to present this data to the French national Congress on Infectious Diseases held on the 12 and 13 of June 2003. The following data were recorded for each patient: gender, age, affected areas and contact exposure, symptoms, biological abnormalities, radiological monitoring, evolution and final diagnosis [Table 2]. Biological abnormalities were defined according to normal value range of each laboratory.

Characteristics of French suspected SARS patients were compared to those of SARS patients from Greater Toronto area [11] and from Hong Kong [7,12] Published at the time.

Table 2

Characteristics, management and diagnosis of people hospitalized for suspected SARS in France

Characteristic	Patients without SARS (n= 117)
Mean (SD) age (years)	44.7 (1.9)
No (%) of men	61 (52%)
Status	
Tourism travelers	61 (52.1%)
Business travelers	21 (17.9%)
Crew or airport workers	3 (2.6%)
Travel in "affected area"	86 (73.5%)
Contact with	
SARS patient	4 (3,4%)
Not identified SARS ill patient	2 (1.7%)
Healthcare workers	3 (2,6%)
Disposal	
Mean No of days (SD) of hospitalization	4,3 (0.44)
Discharged after 48 hours without fever	97 (82.9%)
Median No of chest X-ray (interquartile; range) during hospitalization	1 (1-2; 8)
No of CT scan performed	3 (2.6%)
Follow up visit after discharged	43 (36.8%)
Final diagnosis	
Presumed viral isolated acute fever	30 (25.6%)
Respiratory tract infection (no pneumonia)	56 (47.9%)
Pneumonia	7 (6%)
Acute gastroenteritis	5 (4.3%)
Microbiological diagnosis	No./no. with results
Mycoplasma	0/54
Chlamydia	0/54
Influenza	6/60
Adenovirus	0/56
Respiratory Syncytial Virus	1/53

Inclusion and exclusion criteria

Patients were included in the study if they had been admitted to an isolation unit of a hospital for at least 48 hours. Patients diagnosed with SARS by the French National Public Health Institute were excluded.

Statistical analysis

We used the χ^2 test or Fisher's exact test for categorical data. We used SPSS software, version 10.0 (SPSS Inc, Chicago, IL, USA). All analyses were two tailed. P values of < 0.05 were considered statistically significant.

Results

Patients

Between 12 March and 15 May 2003, 117 suspected SARS patients were hospitalised for at least 48 hours in isolation units of infectious disease departments. Ten of the 12 reference infectious disease departments and 13 of 18 second line infectious disease departments participated in the study and each department sent a mean of 8.7 (n= 87) and 2.3 (n=30) questionnaires respectively. The mean (±SD) age of the patients was 44.7 (±1.9) years , 52% were men and 48% were women [Table 2].

Contact history and travel exposure

Table 2 summarised the purpose of the trip and the contact history of patients. Only 4 patients, including 2 with no symptoms, had close contact with a patient previously diagnosed with SARS. Eighty-six (73.5%) patients came from a SARS affected area [Table 2]. Eight other patients (6.8%) came from mainland China (n=5) or an Asian country (n=3) never declared as affected areas.

Clinical and other features

Table 3 shows the clinical and biological features of the 117 patients hospitalised in France compared to the SARS patients hospitalised in Hong Kong [7,12] and in the greater Toronto area [11]. Patients were admitted into an hospital at a mean (±SD) of 3.1 days (±0.38) after the onset of symptoms. Seventy nine patients (67.5%) had fever and respiratory symptoms (cough or sputum production or dyspnoea) upon admission. Eighteen patients (15.4%) did not have any respiratory symptoms (cough or sputum production or dyspnoea) on their admission. Fifty eight (49.6% of the 117 patients and 67% of feverish patients) had fever and at least one of the following non specific symptoms: malaise, myalgia, chills, headache or dizziness. Among patients who reported to be feverish before admission, 29.7% (27 of 91 patients) did not develop a fever (< 38°C) during their hospital admission. When the highest temperature during hospitalisation was taken into account, the mean temperature was 38.2°C.

The symptom that was more common (though not significantly) among French suspected SARS patients than in patients with confirmed SARS in Hong Kong or Greater Toronto area was a cough [Table 3]. Clinical symptoms that were significantly more common among patients with SARS were fever, myalgia, and nausea or vomiting. Of the common upper and lower respiratory tract symptoms, only dyspnoea was significantly more common among patients with SARS.

Seventy four patients (63.2%) were hospitalised for more than 2 days. Symptoms that were more common (though not significantly) among those 74 patients than in patients hospitalised only 2 days were chills, myalgia, malaise, cough. Only headache and dyspnoea were significantly more common (Pearson Chi-square p= 0.03, for each).

In peripheral blood tests, lymphopenia, thrombopenia, lactodehydrogenase and increased creatine kinase were less frequently recorded than in SARS patients [Table 3]. For patients who had lymphopenia less than 1500 /µL during hospitalization (n= 56), the median (±SD) lymphocytes count was 1000/µL (±310).

Radiological assessment

Only one patient with febrile diarrhoea did not have a chest radiography and 67 (57.3%) patients had only one chest radiography. The median (±SD) number of chest radiographs per day of hospitalisation was 0.5 (±0.32). Only 3 (2.6%) patients had high resolution computed tomography [Table 2].

Discharge and final diagnosis

Only 18 (15.4%) patients were advised to remain quarantined after discharge. Only 43 (36.8%) went back to hospital after their discharge. These 117 suspected SARS patients resulted in 501 days of hospitalization. Presumed viral fever and respiratory tract infection were the most final diagnosis [Table 2]. Microbiological diagnosis was rare because use of microbiological diagnostic tools was restricted [Table 2].

Discussion

To date, we don't know if the SARS epidemic is definitely over. Lessons must be learned to develop the best global strategy against a new SARS epidemic. In France, only 7 patients were confirmed with definite SARS-coV infection [2] but 426 suspected cases were notified to the national Public Health Institute as of 27 May 2003 [13]. Our study described the clinical and biological features and management of patients hospitalised at least 48 hours in French SARS isolation units.

As for patients without SARS in a SARS clinic in Hong Kong [14], non-specific signs of benign upper respiratory tract infection were the most clinical presentation in our study. These symptoms have shown to be indistinguishable from those of the early stage of SARS [11,14]. Also, we showed that France has faced the same issue of screening strategy as high SARS incidence countries.

Systemic symptoms such as fever, chills, malaise, and myalgia, have shown to be better discriminators for SARS [14]. Nevertheless, most of suspected SARS patients hospitalised in French isolation units experienced such systemic symptoms. Fever alone can also be wrong [11,14]. Early studies have shown that lymphopenia and thrombocytopenia were common among patient with SARS and most

Table 3

Clinical characteristics of people hospitalized for suspected SARS in France compared to SARS patients in Hong Kong and Greater Toronto area

Characteristic (%)	Patients without SARS	Patients with SARS		P value	
Clinical features	France (n= 117)	Hong Kong (n=1425) [7]	Greater Toronto Area (n=144) [11]	France vs Hong Kong	France vs Toronto
Fever	77.8	94	99	<.001	<.001
Chills	23.1	65.4	27.8	<.001	NS
Myalgia	34.2	50.8	49.3	<.001	<.002
Malaise	43.6	64.3	31.2	<.001	NS
Anorexia	12	54.6	-	<.001	-
Headache	26.5	50.1	35.4	<.001	NS
Dizziness	1.7	30.7	4.2	<.001	NS
Cough	84.6	50.4	69.4	<.001	<.01
Sputum production	19.7	27.8	4.9	NS	<.001
Dyspnoea	13.7	30.6	41.7	<.001	<.001
Running nose	25.6	24.6	2.1	NS	<.001
Sore throat	27.4	23.1	12.5	NS	<.01
Nausea or vomiting	5.1	22.2	19.6	<.001	<.001
Diarrhoea	13.7	27	23.6	<.001	NS
Laboratory variables		(n=157) [12]			
Leucopenia	17.1	2.5		<.001	
Lymphopenia	34.2	98	85		<.001
Thrombocytopenia	9.4	55		<.001	
Raised alanine aminotransferase (> * 1.5)	10.3				
Raised lactodeshydrogenase	5.1		87		<.001
Raised creatine kinase	4.3		39		<.001

patients had a normal lymphocyte and platelet count at the onset of the disease [1,3,5,15]. 34.2 % of the patients had lymphopenia in our study, confirming that biological data were not useful for screening.

Therefore, early on French infectious disease specialists in charge of screening took into account the epidemiological data indicating the non specific presentation of SARS as well as the explosive transmissibility of SARS-CoV, notably before hospitalisation, in the community or health care setting. Indeed, we showed that the WHO criteria for suspected cases were variably interpreted in France. Presence of only one of the two clinical criteria (e.g., fever, respiratory symptoms) was enough to define a suspected case in case of exposure. Travel in an affected area, even without a close contact with a person previously diagnosed with SARS was considered as an exposure. French infectious disease specialists probably kept in mind that five of the seven French SARS cases were contaminated during an airplane flight.

Despite of rapid development of SARS biological diagnostic tools, a screening based only on these would presume a rapid bed test and a sufficient negative predictive value not existing today at the early stage of any infectious disease. Therefore, only evolution to SARS may predict a SARS-CoV infection.

The main question remains how, where and which suspected cases should be screened and isolated before being hospitalised as probable cases.

We are in agreement with Tambya [16] to consider that WHO case definitions were meant to lay down inclusion criteria for hospitalization and further investigation of a suspected case. Indeed, sensitivity of the WHO criteria for screening was estimated only over 27% [14,16], because they were with reference to hospitalised patients. In Singapore and Hong Kong, the positive predictive value was estimated at 10.6% and 54.3% respectively [14,16]. Given the lower prevalence of SARS in France, we could expect a lower positive predictive value but we considered that it was necessary to avoid SARS epidemic spreading in our country. With respect to the great number of suspected SARS who never develop the illness, suspected SARS patient must also be isolated from each other and from probable or definitive SARS cases to avoid cross contamination as was the case in Singapore [17]. Indeed, SARS was very localised in terms of transmission, at home with households or in emergency departments. That is why the French General Health Department asked all ill patients suspected to have had contact with a SARS patient, to phone the emergency mobile medical service (SAMU-SMUR) for a first phone screening. Suspected SARS patients were then directly take by specialist ambulance to the SARS isolation unit for a secondary screening. This strategy reduced exposure of healthcare workers at home or for general practitioners or emergency departments in the waiting rooms and corresponded to a priority of shortening the onset-to-admission interval [7] and of introducing early infection control measures.

Infectious disease teams are used to manage isolation of highly contagious diseases as air transmitted tuberculosis or handled transmitted diseases. Strict isolation procedures were also better understood, achieved (e.g. well fitted facemask) and accepted by the healthcare workers and also by patients. This strategy provided a better chance to avoid further transmission too, particularly in healthcare setting.

Retrospectively, we could have had a more specific screening if we had strictly respected SARS patient exposure definition. Indeed, contact exposure seems to be one of the best criteria for suspected SARS [7]. Nevertheless, precise contact exposure could be difficult to appreciate during the panic of an epidemic or because of mistrust in epidemiological data available, as was the case at the early stages of the epidemic. This emphases the need for an effective global alert system and to entrust the screening to infectious disease specialists, who are experts in epidemiological investigation and contact tracing.

Patients hospitalised in the French isolation units at the early stage of the worldwide SARS epidemic of the 2003 winter had mostly benign upper respiratory tract infection which can not be distinguished from an early stage of SARS. Screening and isolation have to be performed by infectious disease professionals. WHO case definitions have to lay down inclusion criteria for hospitalisation and further investigation of a suspected case. Only strict observation of SARS exposure may reduce the hospitalisation rate and the cost of SARS screening strategy but epidemiological data have to be exhaustive, true and available in real time. This emphasizes the need to support the WHO Outbreak Alert and Response Network and the necessity for worldwide co-operation.

Contributors:

B. Issartel, O. Lesens, C. Chidiac, Y. Mouton, D. Christmann and D. Peyramond are co-principal investigators. B. Issartel and O. Lesens were responsible of the study design, analysis, and writing of the paper. All the members of the French SARS study group were responsible for patient management and were involved in collection of the clinical data.

*Members of the French SARS study group:

Pr J Beytout and Dr F Gourdon, Hôtel Dieu, Clermont Ferrand. Pr F Bricaire, Dr P Bossi and Dr A Guihot, G.H. Pitié -Salpêtrière, Paris. Pr F Caron and Dr P Abdoud, Hôpital Charles Nicolle, Rouen. P D Christmann and Dr O Lesens, Hôpitaux universitaires, Strasbourg. Pr Choutet and Dr D Garot, CH Tours. Pr Dellamonica, Dr E Bernard and E Cua, Hôpital de l'archet, Nice. Pr J Delmont, P Brouqui, Dr C. Foucault and P. Parola, Hôpital Nord de Marseille, Marseille. Pr M Dupon and H Dutronc, Hôpital Pellegrin, Bordeaux. Pr MGarre and Dr R Le Berre, Hôpital de la cavale blanche, Brest. Pr BHoen and Dr L Hustache-Mathieu, Hôpital Saint Jacques, Besancon. Pr Lenoir and Dr L Aaron, Hôpital Necker, Paris. Pr F Lucht and Dr A Frésard, C.H.U St Etienne, St Etienne. Pr T May, Ch Rabaud, Dr S Bevilacqua and M Stenzel, C.H.U de Brabois, Vandoeuvre-Les-Nancy. Pr C Michelet and Dr C Arvieux and P Tattevin, Hôpital Pontchaillou, Rennes. Pr Y Mouton, B Guery and Dr V Baclet, Centre Hospitalier de Tourcoing, Tourcoing. Pr D Peyramond, C Chidiac, Dr B Issartel, Hôpital de la Croix Rousse, Lyon. Pr E Pichard, Hôpital de l'Hôtel Dieu, Angers. Pr H Portier, P Chavanet and Dr MC Guillemot, Dijon. Dr Prazuck, Hôpital de la Source, Orléans. Pr Raffi and Dr D Boutoile, Hôpital de l'Hôtel Dieu, Nantes. Pr J Reynes and Dr C Lechiche, Hôpital Guy de Chauliac, Montpellier. Pr J P Stahl and Dr P Pavese, Hôpital Michalon, Grenoble. Pr P Weinbreck and Dr E Denes, Hôpital Dupuytren, Limoges.

Acknowledgements

We express our thanks to F. Gonzalez, clinical research assistant, who supervised the study.

We are indebted to public health physicians and health care workers who treated patients with suspected SARS or provided clinical materials for evaluation for their assistance and cooperation.

References

1. Peiris JS, Chu CM, Cheng VC, Chan KS, Hung IF, Poon LL, et al. Clinical progression and viral load in a community outbreak of coronavirus-associated SARS pneumonia: a prospective study. Lancet 2003;361(9371):1767-72.
2. Summary of probable SARS cases with onset of illness from 1 November 2002 to 31 July 2003. In: World Health Organization. 2003.
3. Lee N, Hui D, Wu A, Chan P, Cameron P, Joynt GM, et al. A major outbreak of severe acute respiratory syndrome in Hong Kong. N Engl J Med. 2003;348(20):1986-94.
4. Chan-Yeung M, Yu WC. Outbreak of severe acute respiratory syndrome in Hong Kong Special Administrative Region: case report. BMJ. 2003;326(7394):850-2.
5. Poutanen SM, Low DE, Henry B, Finkelstein S, Rose D, Green K, et al. Identification of severe acute respiratory syndrome in Canada. N Engl J Med. 2003;348(20):1995-2005.
6. Tsang KW, Ho PL, Ooi GC, Yee WK, Wang T, Chan-Yeung M, et al. A cluster of cases of severe acute respiratory syndrome in Hong Kong. N Engl J Med. 2003;348(20):1977-85.
7. Donnelly CA, Ghani AC, Leung GM, Hedley AJ, Fraser C, Riley S, et al. Epidemiological determinants of spread of causal agent of severe acute respiratory syndrome in Hong Kong. Lancet. 2003;361(9371):1761-6.
8. Ho W. Guideline on management of severe acute respiratory syndrome (SARS). Lancet. 2003;361(9366):1313-5.
9. Case definitions for surveillance of severe acute respiratory syndrome (SARS). In: World Health Organization. 2003.

10. Drazen JM. SARS--looking back over the first 100 days. N Engl J Med. 2003;349(4):319-20.
11. Booth CM, Matukas LM, Tomlinson GA, Rachlis AR, Rose DB, Dwosh HA, et al. Clinical features and short-term outcomes of 144 patients with SARS in the greater Toronto area. JAMA. 2003;289(21):2801-9.
12. Wong RS, Wu A, To KF, Lee N, Lam CW, Wong CK, et al. Haematological manifestations in patients with severe acute respiratory syndrome: retrospective analysis. BMJ. 2003;326(7403):1358-62.
13. Bonmarin I. Investigation du SRAS en France. Bulletin Epidémiologique Hebdomadaire 2003;24-25:112-113.
14. Rainer TH, Cameron PA, Smit D, Ong KL, Hung AN, Nin DC, et al. Evaluation of WHO criteria for identifying patients with severe acute respiratory syndrome out of hospital: prospective observational study. BMJ. 2003;326(7403):1354-8.
15. Ksiazek TG, Erdman D, Goldsmith CS, Zaki SR, Peret T, Emery S, et al. A novel coronavirus associated with severe acute respiratory syndrome. N Engl J Med. 2003;348(20):1953-66.
16. Tambyah PA, Singh KS, Habib AG. SARS: Understanding the coronavirus: accuracy of WHO criteria was similar in a «non-SARS» hospital in Singapore. BMJ. 2003;327(7415):620.
17. Singh K, Hsu LY, Villacian JS, Habib A, Fisher D, Tambyah PA. Severe acute respiratory syndrome: lessons from Singapore. Emerg Infect Dis. 2003;9(10):1294-8.

VARICELLA ZOSTER VIRUS VACCINATION POLICIES AND SURVEILLANCE STRATEGIES IN EUROPE

A Pinot de Moira, A Nardone*

The incorporation of varicella zoster virus (ZVV) vaccination in childhood immunisation schedules is becoming an increasingly common option in Europe. The current study forms part of the European Sero-Epidemiology Network 2 (ESEN2) organisational analysis for VZV and describes current passive immunisation policies, as well as current and proposed active immunisation strategies, and existing surveillance systems for diseases caused by the varicella zoster virus in ESEN countries.
A questionnaire was compiled and distributed to 23 participating countries. A VZV vaccine is currently licensed in 14 of the 20 participating ESEN countries. Germany is the only country to have incorporated VZV vaccination into its routine childhood immunisation programme. Three further countries currently recommend vaccination of children against VZV and five countries are also considering introducing routine immunisation against VZV for children. However, of the eight countries with or considering introducing childhood VZV immunisation, only six have case-based mandatory notification of varicella, and only two countries have primary care surveillance data available for herpes zoster.

Euro Surveill 2005;10(1):43-45 Published online Jan 2005
Key words: Europe, surveillance, vaccination, Varicella Zoster Virus

Introduction

Varicella is a self-limiting and relatively mild disease of childhood, although it is frequently more severe and complicated amongst neonates (severe neonatal varicella), adults, pregnant women (potentially leading to congenital varicella syndrome in the child) and the immunocompromised. In addition, after an initial infection, the varicella zoster virus (VZV) lays dormant in dorsal root ganglia and may reactivate with declining cellular immunity to cause herpes zoster, particularly in the elderly and immunocompromised [1].

There are two methods of varicella infection control using immunisation: post-exposure passive antibody prophylaxis in the form of varicella zoster immunoglobulin (VZIG or VARITECT) and active vaccination. The varicella vaccine, which was developed in the early 1970s using a live attenuated form of the varicella zoster virus [2], has been licensed for use in some countries since the mid 1980s and has been part of the routine childhood immunisation schedule in the United States (US) since 1995 [3]. The cost-effectiveness of mass vaccination against varicella has, however, been questioned [4,5]. Universal vaccination programmes may cause an increase in the average age of infection, which may lead to increased adult morbidity and incidence of congenital varicella syndrome (CVS) and severe neonatal varicella. Studies have also suggested that re-exposure to exogenous varicella zoster virus protects against herpes zoster [6,8], thus, a reduction in the transmission of VZV (through vaccination) could result in an increased incidence of zoster.

Many European countries have already introduced targeted VZV vaccination for risk groups, and others are considering recommending either targeted vaccination or routine mass childhood immunisation. Only Germany has recently introduced VZV vaccination into the routine vaccination schedule. This is, therefore, an opportune moment to catalogue current passive immunisation policies, as well as current and proposed active immunisation strategies, and existing surveillance systems for diseases caused by the varicella zoster virus.

Methods

The European Sero-Epidemiology Network 2 (ESEN2) is a network of 22 European countries and Australia that aims to coordinate and harmonise the serological surveillance of immunity to a variety of vaccine preventable diseases in participating countries, including VZV [9]. This study formed part of the ESEN2 organisational analysis for VZV, the aim of which was to collate information regarding immunisation strategies and surveillance systems for the diseases under investigation.

A descriptive questionnaire was compiled, querying current and proposed VZV vaccination strategies and current surveillance of VZV. The questionnaire was split into three sections:

1. Current licensing of a VZV vaccine plus vaccine contraindications, current targeted vaccination of risk groups and mass vaccination, and also current use of VZIG.
2. Proposed mass childhood immunisation and targeted vaccination of specific groups. Questions included details of vaccination schedules, age and risk groups targeted, and catch-up campaigns being considered.
3. Current surveillance strategies for varicella, herpes zoster, congenital varicella syndrome and neonatal varicella, in particular mandatory notification, national hospital morbidity data and national primary care databases.

The questionnaire was distributed in February 2004 to lead epidemiologists in all 23 countries participating in the ESEN2 project. After three weeks a reminder was sent to participants to improve the response rate. Responses were received from 20 countries (87% of countries contacted) with a representative spread across Europe. Results were discussed at a one day workshop and returned to all participants for validation and feedback.

Immunisation Department, Health Protection Agency, CDSC, London, United Kinkdom
On behalf of the ESEN2 group*