Key messages

- There has been considerable progress towards the Health of the Nation target for reducing child accident death rates
- Government publications emphasise the role of accident prevention in reaching the targets, but the hospital care of seriously injured children might also make an important contribution
- Analyses of data from the major trauma outcome study show that, after severity of injury is controlled for, there has been a substantial decline in hospital case fatality for severe injury
- Over the seven year period 1989-95 the odds of death after severe injury declined by 16% a year
- The contribution of hospital care to the reduction of child accident mortality should be taken into account in decisions about the allocation of resources to preventive and curative services

the death of children with head injuries.[7] For children who died in hospital there was a high prevalence of potentially avoidable factors, including delayed diagnosis of intracranial haemorrhage and intra-abdominal injury, inadequate airway management, and poor management of transfers between hospitals.

The observed improvements in survival over the past seven years may be due to better initial assessment and resuscitation in hospital and the provision of integrated management from the scene of the incident through to intensive care and definitive surgery.

Although these results suggest that the care of patients with multiple injuries is improving in the United Kingdom, case fatality is a relatively crude measure of the outcome of trauma care. A measure of the extent of disability among those who survive is also required.[9] Nevertheless, the effectiveness of improvements in hospital care in the reduction of accident mortality should be taken into account when the allocation of resources to preventive and curative services is determined.

This paper is presented on behalf of the steering group of the major trauma outcome study, which includes J Adams, W Hulse, F Lecky, M Macrae, P Nee, B Nelson, M Woodford, and N Zoltie.

Funding: The major trauma outcome study is funded by the Department of Health.

Conflict of interest: None.

1 Department of Health. *The health of the nation*. London: HMSO, 1991.
2 Department of Health. *Fit for the future: second progress report on the health of the nation*. London: HMSO, 1995.
3 Yates DW, Woodford M, Hollis S. Preliminary analysis of the care of injured patients in 33 British hospitals: first report of the United Kingdom major trauma outcome study. *BMJ* 1992;305:737-40.
4 Baker SP, O'Neill B, Haddon W, Long WB. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. *J Trauma* 1974;14:187-96.
5 Baker SP, O'Neill B. The injury severity score: an update. *J Trauma* 1976;16:882-5.
6 Champion HR, WJ, Copes WS, Gann DS, Gennarelli TA, Flanagan ME. A revision of the trauma score. *J Trauma* 1987;27:370-8.
7 Sharples PM, Storey A, Aynsley-Green A, Eyre J. Avoidable factors contributing to death of children with head injury. *BMJ* 1990;301:1193-7.
8 Zoltie N, FT de Dombal, on behalf of the Yorkshire Trauma Audit Group. The hit and miss of ISS and TRISS. *BMJ* 1993;307:906-9.
9 Yates DW. Scoring systems for trauma. *BMJ* 1990;301:1090-4.

(Accepted 10 September 1996)

Incidence and recall of influenza in a cohort of Glasgow healthcare workers during the 1993-4 epidemic: results of serum testing and questionnaire

Alexander G Elder, Barbara O'Donnell, Elizabeth A B McCruden, Ian S Symington, William F Carman

Glasgow Occupational Health, Stobhill NHS Trust, Glasgow G1 1JA
Alexander G Elder, *senior registrar in occupational medicine*
Ian S Symington, *director and consultant in occupational medicine*

Department of Clinical Microbiology, West Glasgow Hospitals University NHS Trust
Barbara O'Donnell, *senior medical laboratory scientific officer*

Institute of Virology, University of Glasgow, Glasgow G11 5JR
Elizabeth A B McCruden, *senior lecturer in virology*
William F Carman, *senior lecturer in virology*

Correspondence to:
Dr Carman.

BMJ 1996;313:1241-2

The United States Centers for Disease Control and Prevention advocate annual influenza immunisation for all healthcare workers in contact with vulnerable patients.[1] The health departments in the United Kingdom, however, advise immunising only people with risk factors.[2] Little evidence exists to support or refute a policy of immunisation for such healthcare workers, and, although influenza outbreaks have been documented, epidemiological data concerning influenza in healthcare workers are lacking. We aimed principally to determine the incidence of influenza in a cohort of healthcare workers. As prevention of cross infection is one of the main arguments in favour of immunisation of healthcare workers, we also estimated the proportion of asymptomatic infection by linking recall of illness with serological results.

Subjects, methods, and results

The study population consisted of all 970 healthcare workers at four acute hospitals in Glasgow who had serum stored for a routine post-vaccination test for antibody to hepatitis B between 1 February and 26 October 1993. This group was likely to be representative of healthcare workers in contact with patients as internal audits have shown that over 80% of targeted staff complete the hepatitis B vaccination programme. After the influenza epidemic (late October 1993 to end of January 1994) we invited these healthcare workers to provide a further blood sample and complete a questionnaire on their history of influenza and respiratory infection between the end of October 1993 and 1 February 1994. In all, 163 subjects were excluded as they had resigned or were on long term sick leave or maternity leave. Of the remaining 807 subjects, 602 (75%) agreed to enter the study and provided the blood sample during six weeks beginning 1 February 1994.

Analysis of the 602 subjects showed that their age, sex, and occupation were consistent with those of staff offered hepatitis B vaccination, and over 90% of the subjects had regular contact with patients. Further exclusions from analysis were due to influenza vaccination (20 subjects), insufficient serum (25), and inability to trace first serum sample (39).

We matched the remaining 518 samples with baseline stored serum samples and tested for antibodies to influenza A and B by single radial haemolysis using the method of the National Institute for Biological Standards and Control, with antigens derived from the 1993-4 season. This test is known to compare favourably with the standard haemagglutination inhibition test[3]; a 50% increase in reactivity between two samples is diagnostic of infection. Questionnaire responses and serological findings were analysed with the χ^2 test.

Overall, 120 samples (23.2% (95% confidence interval 19.6% to 26.8%)) had a significant rise in titre due to influenza. Type A influenza occurred in 107 samples (20.7% (17.2% to 24.2%)) and type B in 18 samples

Table 1—*Serological results correlated (P<0.05 is significant) with questionnaire recall of illness and sick leave in 518 subjects. Values are numbers (percentages) of subjects unless stated otherwise*

Questionnaire recall	Respondents (n = 518)	Serological result		P value	Relative risk (seropositivity)
		Positive (n = 120)	Negative (n = 398)		
Influenza	161 (31)	49 (41)	112 (28)	0.006	1.53
Sick leave owing to influenza	120 (23)	42 (35)	78 (20)	0.0005	1.91
Any respiratory infection	351 (68)	87 (73)	264 (66)	0.209	1.25
Sick leave owing to respiratory infection	202 (39)	58 (48)	144 (36)	0.019	1.46
Doctor-diagnosis of influenza	53 (10)	22 (18)	31 (8)	0.0009	1.97

(3.5% (1.4% to 5.1%)), with both type A and type B occurring in five samples (1.0%). No significant associations were found between serological result and age, sex, occupation, or hospital site.

Table 1 shows the serological results correlated with questionnaire recall. Only 49/161 (30%) subjects recalling influenza had positive serological results, implying a high rate of self misdiagnosis. Of the 120 subjects with a seropositive result, 71 (59%) could not recall influenza and 32 (28%) could not recall any respiratory infection. Recall of sick leave owing to influenza (P = 0.0005, relative risk of seropositivity 1.91) and a doctor-diagnosis of influenza (P = 0.0009, 1.97) had the strongest associations with a positive serological result. In all, 42/518 (8%) subjects both had a seropositive result and recalled sick leave owing to influenza (median duration four days); this approximately represents the time lost from work that potentially could have been prevented by vaccination.

Comment

We found that 23% of healthcare workers in acute hospitals had serological evidence of influenza infection during a mild epidemic season. In comparison, clinical and virological reporting of influenza-like illnesses in primary care during this period estimated a peak incidence of between 0.15-0.2%.[4] If influenza among healthcare workers is such a common event, with between 28% and 59% of cases estimated as subclinical, cross infection risk to patients seems likely and sustains the argument for controlled trials of vaccination of healthcare workers. In fact we have subsequently shown a significant reduction in mortality of elderly patients in units where healthcare workers were vaccinated.[5]

Funding : The study was funded partly from departmental funds and partly from a donation by Medeva, a manufacturer of influenza vaccine, to the West of Scotland Influenza Study Group.

Conflict of interest: None.

1 Prevention and control of influenza. Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 1994;Apr 21:44.
2 Joint Committee on Vaccination and Immunisation. *Immunisation against infectious diseases*. London: HMSO, 1992.
3 Wood JM, Gaines-Das RE, Taylor J, Chakreverty P. Comparison of influenza serological techniques by international collaborative study. *Vaccine* 1994;12:167-74.
4 Fleming DM, Chakraverty P, Sadler C, Litton P. Combined clinical and virological surveillance of influenza in winters of 1992 and 1993-4. *BMJ* 1995;311:290-1.
5 Potter J, Stott DJ, Roberts MA, Elder AG, O'Donnell B, Knight PV, *et al.* Influenza vaccination of healthcare workers in long-term care hospitals reduces the mortality of elderly patients. *J Inf Dis* (in press).

(Accepted 16 October 1996)

Are British hospitals ready for the next major incident? Analysis of hospital major incident plans

Simon Carley, Kevin Mackway-Jones

Although major incidents are uncommon, they require careful planning and preparation if they are to be managed well.[1 2] In 1990 guidelines were issued for health service arrangements for major incidents.[2] These required regional health authorities to ensure that comprehensive plans were in place for all health service responses to an incident. We examined hospital major incident plans to assess the level of compliance with these guidelines.

Methods and results

The major incident plan was requested from all 224 British hospitals with an emergency department receiving more than 30 000 patients a year. Altogether 142 (63%) were received and analysed. The number of plans complying with different aspects of current guidance are shown in table 1.

Although 119 plans used action cards, in only 65 were these comprehensive enough to include all staff likely to be involved in the response to a major incident. In only 106 were cards for the hospital coordination team (senior nurse, senior manager, and senior doctor) available. Overall only six (4%) plans complied fully with health service guidelines.

Comment

Clear directions were given in 1990 for the formulation of hospital major incident plans,[2] but these findings, six years later, show that few plans conform to the guidance given. Action cards act as aides-mémoire and are essential to inform staff rapidly of their duties during a major incident. Although many hospitals used action cards, most had too few to instruct all staff. Concern at alerting procedures has been expressed following many major incidents in Britain.[1 3 4] The ambulance service will usually notify hospitals of a major incident using a specified form of words,[2] designed to avoid confusion between agencies. Yet the correct form of words was specified in fewer than half the plans analysed.

Many people may arrive at a hospital during a major incident. Plans were generally in place for the management of the press, relatives, and volunteers, but few arranged for the management of visits from people such as politicians or royalty; these may be disruptive to a receiving hospital in the days after an incident and should be planned for.[2]

As well as the actions specified in the official guidance plans also need to pay attention to practical matters such as the management of traffic flow, staff children, staff reporting areas, and ambulance communications. Few plans covered these subjects.

Major incidents require good interservice liaison.[1] This is provided through police and ambulance officers despatched to the receiving hospital. Although most plans cater for the police, few plans made arrangements for the ambulance liaison officer (who may be the only means by which the hospital can communicate with the scene).

Insufficient training and preparation have repeatedly been cited as problems in the preparation for major

Department of Emergency Medicine, Manchester Royal Infirmary, Manchester M13 9WL
Simon Carley, *Royal College of Surgeons of England Hillsborough research fellow*
Kevin Mackway-Jones, *consultant*

Correspondence to:
Dr Carley.

BMJ 1996;313:1242–3