surprises; when I worked on fowl plague we never contemplated that the virus could infect humans. Lethality never crossed our minds. Our main concern with the large amounts of virus that we slopped around the lab was not to get it on our clothes.

In the past 150 years rich countries have successfully controlled, and sometimes eliminated, infections: cholera and typhoid by clean water, tuberculosis by better diets and milk pasteurisation, and diphtheria, polio, measles, and rubella by immunisation. But for influenza, all countries in the world, rich or poor, remain equally at risk. Whether H5N1 becomes pandemic, or eventually enters the encyclopedia as another Fort Dix false alarm, no one can say. The only certainty is that there will be a flu pandemic, some time. The lesson from history is that making predictions about the virus is a fool's game. It will go on

evolving whatever we do. But my guess is that the best way forward is to focus on vaccines: to improve their immunogenicity, their breadth of protection, and the speed of manufacture.

Contributors and sources: THP worked for 15 years on viruses including influenza and smallpox before becoming a bacteriologist, developing a particular interest in using molecular biology to type pathogens such as *Staphylococcus aureus* and *Escherichia coli* 0157. He is currently chairing the public inquiry into the 2005 *E coli* outbreak in south Wales.

Competing interests: None declared.

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Hard decisions will have to be made: view from intensive care

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Human mortality from the H5N1 strain of influenza has been high even when antiviral drugs have been used. In most cases death has been due to respiratory failure leading to multisystem failure.¹ These conditions can be managed by mechanical ventilation and organ system support in intensive care units. Such treatments were not generally available during the previous influenza pandemics in 1918, 1957, and 1968, and they will hopefully reduce the excess mortality if the H5N1 strain produces a pandemic. This will be possible only if the limited critical care resources in the UK are used effectively.

Disappointingly, the Health Protection Agency's pandemic plan for influenza does not mention intensive care,² although the Department of Health has established a critical care contingency planning group. Critical care networks have also been asked to assess the scope for increasing critical care capacity in an emergency.

Demand for intensive care

We can estimate the extra demand for intensive care from predictions of the likely extent of the epidemic. The Health Protection Agency model assumes a mortality of 0.37% and a relatively low hospital admission rate of 0.55%, which suggests that only severely ill patients would be admitted to hospital and that a high proportion of these would potentially benefit from intensive care.² Of patients with influenza A (H5N1) admitted to hospital in Asia, between 44% and 100% have developed respiratory failure.¹ If pandemic influenza behaves similarly, a large district hospital serving a population of 330 000 could expect more than 10 extra requests for intensive care a day for several weeks at the peak of the epidemic.

The number of critical care beds needed to meet this demand would depend on the duration of care

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Who should get care?

required. In my hospital, patients with pneumonia have a median length of stay on intensive care of five days (unpublished data). If we assume that the flu patients would require a similar duration of mechanical ventilation and organ system support, more than 30 additional intensive care beds would be required to meet this demand. This is between four and five times the number of intensive care beds available in most general hospitals in the UK.

We are unlikely to be able to mobilise the equipment and staff to achieve such a temporary increase in the provision of intensive care. During an epidemic, elective surgery will be reduced to accommodate extra emergency admissions. Ventilators and other equipment from operating theatres and recovery areas could therefore be pressed into service, but staff-

ing will be a more difficult problem to overcome. It may even be difficult to maintain the normal level of intensive care because of a shortage of appropriately trained staff. It is predicted that 25-50% of the population will become infected with influenza during the epidemic, and experience from the epidemic of severe acute respiratory syndrome (SARS) has shown that critical care staff are at particularly high risk of infection.³ The numbers of experienced critical care staff will inevitably be depleted, and agency staff will be unable to make up the deficiency of trained staff.

Who should get care?

In normal circumstances most patients in the UK who require organ system support are admitted to the local intensive care unit. When this is not possible they are usually transferred to another unit within the local critical care network. During a pandemic these mechanisms will almost certainly be inadequate to cope with the extra demand, and some patients will have to be denied intensive care.

We will need to establish triage mechanisms to select those patients most likely to benefit from intensive care. It may also be necessary to introduce measures to limit the duration of care for patients who do not improve rapidly. The triage mechanisms will need to be robust and transparent to ensure that the limited resources are used equitably and to greatest effect.

Recent guidance for the provision of critical care in the event of bioterrorism or overwhelming epidemics

recommends that "Triage decisions regarding the provision of critical care should be guided by the principle of seeking to help the greatest number of people survive the crisis."⁴ However, it includes little specific advice on criteria for triage.

The triage is very different from the normal situation in the UK, where decisions about intensive care are based on what will benefit the individual patient. Decisions will be difficult and will require an unprecedented degree of cooperation between everyone caring for these patients to ensure that patients and relatives understand and that critical care staff have the support to cope with such a change from normal practice. Effective use of the available resources will be possible only if plans for triage are discussed and agreed in advance by intensive care specialists, other doctors, nursing staff, and administrators.

Contributors and sources: RM is lead clinician for critical care in a large district general hospital. This article arose from discussions of the local pandemic flu clinical support group which he leads.

Competing interests: None declared.

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Dealing with uncertainty: perspective from primary care

Anthony Harnden

Influenza A (H5N1) is worrying governments and public health experts. Something sinister about the label "bird flu" has also captured the attention of the public and the world media. News footage and stories occur almost daily. Although it seems inevitable that we will have another flu pandemic, many uncertainties remain, most of which will affect primary care. But general practitioners are experts in coping with uncertainty and are well placed to adapt and respond to an evolving public health emergency.

Dealing with uncertainty

The biggest uncertainty is the timing of the pandemic, which depends on the H5N1 virus changing so that it can spread between humans. Information will then start to emerge about the virulence and infectivity of the new virus. Clearly, a clinical attack rate of 25% will have a different effect on primary care than an attack rate of 50%. Once human to human transmission has been established, wherever in the world, general practitioners are likely to be the first to identify outbreaks in the United Kingdom. At this stage general practitioners will be on heightened alert for small clusters of patients with similar symptoms and common circumstances. After its

initial recognition, the virus is predicted to spread quickly, peaking six to eight weeks later.¹

Of concern to general practitioners will be the age range of the infected population in a new pandemic. The clinical assessment of young children is difficult given that symptoms can change so rapidly in this group. The timing of this assessment and use of antiviral and antibiotic drugs is likely to be crucial.¹ If older people are affected, the knock on effect on chronic disease such as diabetes, chronic obstructive pulmonary disease, and coronary heart disease will create important additional problems.

Planned response

We need to take action now to prepare our response. The clinical organisation of the practice requires thought. Patients with suspected influenza should not mix with other patients. Premises permitting, designated waiting and consultation areas could be used. Telephone triage will become more important as requests for home visits rise and out of hours services experience acute pressure. It may be necessary to suspend all non-urgent clinical activity during the peak of the pandemic. Pharmacists could take over repeat

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