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Safeguarding Public Health at UK Airports: An Examination of Current Health Security Practices

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Abstract

In response to the H1N1 influenza outbreak and the role of air travel in facilitating the virus's rapid spread around the world, this paper contributes to debates concerning the governance of commercial aviation and infectious disease by examining the role of the Port Health Regulations and associated health security practices that are enacted at UK airports. Drawing on extensive action research and in-depth interviews that were conducted with key stakeholders in the aviation and health care sectors (including airport managers, 'front line' customer-facing airline staff, and public health clinicians) during the spring and early summer of 2009, we chart the development of sanitary regulations at UK airports and explore the challenges of performing health security screening at individual sites. In so doing, we identify a number of challenges that are associated with safeguarding public health against the dissemination of infectious diseases by air travel through UK airports. We also suggest that policy transfer may represent an effective mechanism through which best practice procedures from airports overseas could be adapted and incorporated in the UK.

Keywords: health security, international travel, UK airports, infectious disease, policy transfer.

Introduction

Owing to its status as one of the most aerially interconnected nations on earth, the United Kingdom is perhaps particularly vulnerable to the risk of infectious diseases being disseminated by airline passengers through its airports. In line with international trends, passenger air travel to and from the UK has grown significantly in recent years, simultaneously increasing the risk of overseas visitors importing 'foreign' diseases into the country and raising the risk of UK residents exporting infections abroad (HPA 2007, House of Lords 2007). In 2008, approximately 189 million international passengers used UK airports (CAA 2008a, 2008b). While the majority (125 million) travelled between the UK and countries of the European Union, significant numbers of people also travelled to and from destinations further afield. Figures from the UK Civil Aviation Authority (CAA) indicate that, in 2008, 5.4 million people flew to/from the Middle East, 5.1 million travelled between the UK and the Far East, and 3.6 million flew to/from destinations in North Africa (CAA 2008b), regions in which all manner of infectious diseases may be endemic. In addition to exposing UK residents who travel overseas to the risks of 'foreign' infectious diseases, UK travellers similarly represent an epidemiological threat to other countries as they may transport strains of infectious disease that originated in the UK abroad. Such high volumes of long-distance international aeromobility, combined with the emergence of new transborder disease threats and the progressive liberalisation of the air transport sector pose a number of challenges to airports, airline operators, and Government regulators and make the provision of effective health security practices at UK airports inherently challenging. Drawing on extensive empirical research with key stakeholders from the aviation and public healthcare sectors, this paper identifies the challenges associated with delivering effective Port Health safeguards at UK airports and makes recommendations for improved practice.

Developing sanitary measures for aviation

As the SARS outbreak of 2002-2003 and, more recently, the 2009 H1N1 'swine flu' pandemic, demonstrated, the movement of infectious diseases by air can have profound implications for human health and practices of international mobility (Royal and McCoubrey 1989, Gerard 2002, Pang and Guindon 2004, Mangili and Gendreau 2005, Singer 2005, Bowen and Laroe 2006, Ali and Keil 2006, Colizza et al. 2006, Tatem et al. 2006, and Tatem and Hay 2007; Warren et al. 2010). Yet, while the potential for air passengers to incubate disease and/or inadvertently carry vectors of infection (such as live insects or insect larvae in their baggage or clothing) between countries was first recognised in the early 1920s, it was not until the introduction of regular long-haul passenger services in the 1930s that any coordinated attempts were made to regulate the movements of air passengers and airfreight to safeguard (initially Western but, later, global) public health from the threat of 'foreign' infectious diseases being transmitted between different countries by air (Budd et al. 2009). These measures, which included spraying passenger cabins with chemical pesticides to eradicate insects (a practice known as 'disinsection') and disinfecting aircraft, the isolation or quarantine of individual travellers, and mandatory vaccination certificates, inevitably raised political as well as epidemiological considerations and individual nations often adopted very different prophylactic (protective) strategies to try and counter the same biological threats (Baldwin 1999). Crucially, as Budd et al. (2009) have shown, enforcement of these different (often location-specific) regulations was logistically and politically problematic as those who were ignorant of the rules, or deliberately chose to circumvent them, undermined their effectiveness.

In 1944, the international community, through the auspices of the recently formed International Civil Aviation Organization (ICAO), attempted to standardise the control of infectious diseases that were known to be transmitted by air through a package of internationally binding measures. Chapter II Article 14 of the resulting 1944 Chicago Convention on Civil Aviation stipulated that each contracting State must 'take effective measures to prevent the spread by means of air navigation of cholera, typhus (epidemic), smallpox, yellow fever, plague, and other communicable diseases' (ICAO 1944), while the International Sanitary Convention for Aerial Navigation (1944) called for 'special measures to prevent the spread by air across frontiers of epidemic or other communicable diseases' (United Nations 1948 p.250).

While the provisions in the Chicago Convention undoubtedly advanced efforts to standardise aviation health security at the international level, individual states continued to devise their own protocols and debate how best to enshrine international directives into national law. At the time of the implementation of the 'First Sanitary Convention for Aerial Navigation' in 1935, the relatively small number of long-haul air travellers to/from the UK and the limited number of UK airports hosting international air services meant that it was comparatively easy for UK-based airlines, airport personnel, immigration officials, and customs officers to comply with the new health regulations. In 1948, only eight UK airports (plus one marine air terminal) supported scheduled international air services, of which only two, London and Prestwick (the latter simply by virtue of the fact that all long-haul transatlantic flights had to stop there to refuel), handled regular long-haul international air traffic (Table 1).

** TABLE ONE ABOUT HERE ***

As the network of long-haul passenger services grew after the Second World War, the need to introduce specific public health interventions for air travel to/from the UK became increasingly acute. A dedicated Health Control Unit was established at London Airport (now Heathrow) in 1947 to deal with the public health risks international aeromobility posed to the UK. Initially, this facility comprised a medical examination room that was staffed by a dedicated team of health practitioners but, as medical technology developed, x-ray machines and other diagnostic equipment were progressively installed to screen arriving passengers for signs of disease. The 'moral panic' which arose from an alleged link between rising levels of immigration by air to the UK (particularly from former British colonies in the Indian subcontinent) and rising rates of tuberculosis infection resulted in the implementation of a Port of Arrival or Port of Entry health screening system. Under this regime, certain groups of travellers, who were believed to represent a heightened disease risk by virtue of their nationality, were targeted for additional screening and examination. The 1962 Commonwealth Immigrants Act and 1971 Immigration Act subsequently empowered immigration officials to refer certain categories of travellers for medical inspection before they were admitted to the UK. Yet while these Acts detailed the treatment and examination of potentially infected travellers, they did not explicitly concern health security measures at airports or on aircraft (Welshman and Bashford 2006).

By the mid-1950s, rising numbers of international airline passengers, combined with a growing number of airports offering international services, made the intensive surveillance and policing of individual travellers, which had been a cornerstone of international civil aviation health policy in the 1920s and 1930s, increasingly impractical and travellers were encouraged to take active responsibility for their own health and wellbeing (Tyrrell 1946; Turner 1971). Much of the health advice that was disseminated to airline passengers originated from research that was conducted in the field of 'travel medicine'. This specialised sub-discipline of medical practice developed, in its current form, from the late nineteenth century onwards in response to realisation that international travel and increased human mobility exposed growing numbers of people to 'exotic' diseases for which they often had no awareness of or natural immunity to (Zuckerman 2002). The regulatory framework for sanitary aviation, which was devised in the early-to-mid twentieth century, only compelled international airline passengers to be inoculated against particular diseases. However, airlines and national Governments increasingly provided additional guidance on how passengers could safeguard their health while overseas by, for example, seeking shade during the heat of the day and avoiding certain raw food products (BOAC 1952).

In England, the first specific national powers for applying health controls on commercial aircraft and at UK airports were contained within the Public Health (Aircraft) Regulations Act 1979 and the Public Health (Control of Disease) Act 1984. These regulations were revised and updated in 2007 to form the Public Health (Aircraft) (Amendment) (England) Regulations 2007. These regulations form one part of a package of legislative measures that are collectively termed the 'Port Health Regulations'. Similar legislation exists, or is planned, for the devolved administrations in Northern Ireland, Scotland, and Wales. The Port Health Regulations define the measures that should be taken at airports against both arriving and departing passengers, crew, and aircraft to limit any potential risks to public

health and reduce the spread of infection. These interventions include the medical examination of potential entrants to the UK, the grounding of aircraft and, if required, the detention of passengers, crew, cargo, and equipment until local health authorities are satisfied that no disease threat exists (HPA 2006a). Significantly, there are far fewer provisions for preventing UK-based travellers from exporting infectious diseases overseas and 'Port of Origin' health security at airports remains an area of commercial air transport policy that has received scant academic attention to date.

Safeguarding public health at UK airports: the regulatory context

The main statutory responsibility for implementing the Port Health Regulations at UK entry points, which include seaports, international railway stations, and airports, rests with the local authority in which the facility is sited. Some local authorities in areas of heightened transportation activity are specifically designated as Port Health Authorities (PHAs). These PHAs were created in the second half of the nineteenth century to perform Port Health functions at entry points to the UK with the aim of preventing the international dissemination of dangerous communicable diseases, initially by ships, but now also by international rail and air services (see Hawker et al. 2005). While maritime ports had been dealing with the threat of international disease transmission since the fourteenth century, the limited number of marine passengers, and the length of time they were at sea, meant that any symptoms of infection would develop during the journey and manifest themselves on arrival. In comparison, the speed of air travel enabled latently infected individuals to travel around the world without displaying visible signs of infection and so different health security techniques were required. In the UK, the task of providing or commissioning specialist staff to implement the Port Health Regulations at all (air/sea/rail) ports rests with the Local Authority, the local Primary Care Trust (a division of the NHS in England that provides some primary and community health services), or the national Health Protection Agency. The majority of personnel employed by these institutions are either registered medical practitioners or certified environmental health officers. In the case of airports, out-of-hours cover is usually operated on a rota basis with General Practitioners (GPs) being contracted to perform medical checks in the event of an out-of-hours public health incident.

As Budd et al. (in preparation) suggest, the recent introduction of regular international air services to and from UK regional airports has meant that some local authorities (simply by virtue of having an airport located within their administrative boundaries) have had to rapidly assume a Port Health function for which they often had no prior experience. Between 1948 and 2008 the number of UK airports handling international services increased from eight to 41, with the majority of these new services being inaugurated since 2002 (DfT 2005). This fundamental change in the spatial provision of international air services from the UK was the result of central Government policy that sought to promote the growth of UK regional airports by liberalising the bilateral air service agreements that had previously regulated the routes that could be flown from each individual airport (DfT 2003). As well as providing new route development opportunities for UK carriers, the UK Government also invited applications from foreign airlines that wished to operate new international services from regional airports (DfT 2005). As a result, Emirates of the UAE, Pakistan International Airlines, and Continental Airlines of the United States, now operate regular long-haul international services to/from a number of regional UK airports (CAA 2007). As a consequence of rapidly assuming this new role as sites of long distance international aeromobility, the provisions for safeguarding public health at some of the smaller regional airports in the UK are less well established. In subsequent sections of this paper we discuss the challenges associated with providing health security procedures at all these new points of entry.

Safeguarding public health at UK airports: an empirical investigation

Method

The empirical material that informs this research was obtained through sixteen in-depth interviews and associated action research with key stakeholders in the UK aviation and public healthcare sectors. The research was conducted over a five-month period between February and July 2009. Interviewees included members of the senior management team at airports, airline employees, front-line airport operations personnel, and healthcare

practitioners based at (or working with) airports in the Midlands and South East of England. These regions were selected for analysis because they provide a useful contrast between a region that has been a centre for long-haul aviation since the early 1920s (the south east) and a region that has only recently become a site of regular long-haul international aeromobility (the Midlands). Moreover, since the H1N1 influenza virus reportedly entered the UK through a Midlands airport, the need to examine the Port Health procedures that are in place in this region is acute. Interviewees were identified by their job title and then personally invited, by email and/or telephone, to participate in the research. Additional participants were recruited on the recommendation of these initial contacts.

Our sixteen interviewees were drawn from a range of professions and included airport operations directors and terminal duty managers at four UK airports (including a major facility in the southeast of England), airline personnel (including check-in staff, cabin crew, pilots, flight dispatchers, and base managers), and medical practitioners who had a Port Health responsibility (see Table 2). The latter group included both 'front line' nursing staff and senior managers/policy directors at regional health headquarters. At the request of our interviewees, no individual airports or staff members have been identified. All interviews, bar three telephone interviews, were conducted face-to-face and lasted a minimum of one hour. With the exception of the three telephone interviews, all other interviews were conducted by two members of the research team at the interviewee's place of employment. Many of these interviews were augmented with guided tours of, and action research in, airport Port Health facilities.

***TABLE TWO ABOUT HERE ***

Action research represents a systematic and interactive research technique that allows researchers to obtain detailed understandings of the actions, processes, and environment in which particular institutional or regulatory practices are performed and the ways in which different groups of people interact (Robertson 2000, Deutsch 2005). In the context of the present research, the opportunity to conduct action research in airport terminals enabled the research team to objectively observe the unique Port Health environment of different airports and understand how people work together to provide Port Health safeguards. This enabled us gain an appreciation of how existing health security practices are enacted at different sites and the daily challenges associated with delivering them.

The sixteen interviews and associated action research revealed three key areas of concern for stakeholders. The first relates to organisational complexity, which is reported to obfuscate clear lines of command and responsibility in the event of a public health incident. The second concerns perceived inadequacies in the communication channels between different agencies involved in Port Health provision, while the third arises from broader financial and practical constraints. Though these issues do not exist in isolation, indeed there is often considerable overlap and interaction between them, the following subsections detail the key research findings.

1. Organisation complexity

The privatisation of UK airports, combined with the outsourcing of health care providers in the UK, has meant that Port Health has become a highly complex undertaking with numerous local, national, and international public and private agencies involved in its provision. Many of the practitioners to whom we spoke indicated that this complexity stemmed, at least in part, from the 1974 reorganisation of the National Health Service and the eventual subsequent creation of Strategic Health Authorities, Primary Care Trusts, and the Health Protection Agency; interventions by the Home Office, the Departments for Health and Transport, the UK Border Agency, the police, and HM Revenue and Customs. In addition, the progressive deregulation, privatisation, and commercialisation of the UK's aviation sector has resulted in a proliferation of private companies operating within the airport industry. Scholars, including Humphreys and Francis (2002), have previously attested to the diverse pattern of airport ownership in the UK but, as far as we are aware, little or no research has investigated the implications of this changing corporate environment for practices of airport health security. At the time of writing, six UK airports are owned and operated by BAA, four are owned and operated by Manchester Airports Group, three major

facilities are owned and operated by the Peel Group, while the remainder are owned by a mixture of private enterprise and/or local authorities. As a consequence, airports that are not part of a bigger airport group have little or no access to 'best practice' frameworks and cannot easily benchmark their own Port Health protocols or evaluate their performance against similarly-sized facilities. Tellingly, several interviewees asked the research team how their own Port Health strategies and health security practices compared with those of other UK airports:

"Part of the problem is we've no real idea of what's being done at [a neighbouring airport] so we don't know how our own policies and procedures compare."
(Terminal Duty Manager, Midlands)

At the same time, other airport personnel spoke of their desire to facilitate dialogue between neighbouring facilities and of the need to improve the clarity of Port Health documents they received from healthcare and Government agencies.

The existence of numerous different external and internal airport departments and companies, each with their own priorities, acronyms and sets of working procedures, was a particular bone of contention with our interviewees. Many alleged that the jurisdiction and/or responsibilities of the (often new or restructured) regulatory and healthcare agencies was not always clear. This was particularly pronounced in respect of health service provision, with the acronyms NHS, SHA (Strategic Health Authority), PCT (Primary Care Trust), LHA (Local Health Authority), HPU (Health Protection Unit) and PHA (Port Health Authority), used interchangeably and often incorrectly by our interviewees. Our respondents also perceived there to be a lack of stability within these individual organizations. Several of our interviewees also expressed frustration that, in the event of an emerging Port Health incident, time was often wasted in trying to establish who they should be liaising with and verifying whether that individual had the necessary authority to take decisions. As one respondent commented:

"Often I don't know who it is I need to speak to [in the event of a public health incident at the airport] and it takes me ages to ascertain whether or not that person has the authority to take decisions. This wastes valuable time"
(Airport Operations Manager, Midlands)

2. Communication within airports

In addition to working within this complex organisational framework, several front-line airline staff claimed existing communication channels were convoluted and ambiguous. While some departments and organisations operating within individual airports had clearly prescribed and well-rehearsed checklists of Port Health procedures, this appeared to be the exception rather than the norm and we were struck both by the lack of understanding of the Port Health provisions and inconsistencies in their application within individual airports. Here, examples from our interviews and action research ranged from the mundane and procedural – for example, uncertainty as to whether UK nationals suspected of carrying tuberculosis had to consent to health screening on arrival at the UK border – to public health 'emergencies', including an incident where a passenger on an inbound flight was suspected of carrying an infectious disease. On that occasion, passengers were detained on the aircraft for a number of hours while the situation was assessed by medical practitioners. At the time of interview, we discovered a lack of alignment and understanding within the airport between the airport operator and the airline concerned, with each expressing the belief that the situation was the other company's responsibility.

Our interviewees suggested such confusion was often a consequence of poor information dissemination protocols which meant that details of critical health security practices, and appropriate responses to emerging incidents, were not being effectively shared with front line staff. Possible solutions, including making familiarity with Port Health security procedures a mandatory part of staff training programmes and ensuring that a named contact person regularly liaised with airlines, the airport, and healthcare providers, to provide updated advice to all staff, were advanced. While, in theory, the UK's Health Protection Agency has assumed the operational lead for ensuring that there is a single point of contact

for Port Health and medical inspection services at all UK airports, our interviewees indicated that further investment may be required to realise this goal.

3. Practical and financial constraints

Finally, and in addition to the issues discussed above, there are a number of practical and financial difficulties associated with safeguarding public health at UK airports that require further attention. The progressive privatisation and commercialisation of UK airports that resulted from the 1986 Airports Act has meant that airports are increasingly reliant on non-aeronautical revenue streams, much of which is derived from retailing (Humphreys 1999). While the implications of increased airport retailing on airport operators and the airline passenger experience have been widely commented upon (see, for example, Lloyd 2003, Freathy 2004, Kesselring 2008), the implications for Port Health and the provision of passenger health security have been overlooked. Indeed, though the provision of Port Health facilities is a statutory requirement for airports supporting international services, Port Health does not represent a revenue stream for the airport operator and many healthcare practitioners complained that insufficient space is reserved for Port Health activities as a consequence. Notwithstanding the fact that international airports have to have Port Health cover as a condition of their operating licence, some airports reportedly charge rent for the space Port Health providers occupy. One interviewee, based in the southeast of England, revealed that his organisation pays almost a quarter of its total annual budget in rent to the operator of the local airport in order to maintain a medical examination room in the passenger terminal. When asked to expand on this, he/she remarked that the legislative requirements only state that Port Health facilities have to be provided and, almost certainly reflecting the age in which they were drafted, they do not stipulate that airports have to provide these facilities rent-free.

In addition to issues of cost, certain practical problems also exacerbate the challenges of providing effective Port Health safeguards. The procedural architecture of airports means that there are only two funnelling points – immigration and customs – through which all arriving passengers must pass, and only one – the central security search area - for departing passengers. Consequently, any point of entry/origin health screening has to be performed at one of these locations. However, the immigration hall is designed to expedite the speedy processing of would-be entrants into the UK and the central security search area is designed to prevent terrorist attacks and very few airports have space in either location in which health screening technologies could be installed. Moreover, commercial agreements between airports and airlines stipulate the maximum time that passengers can be delayed in security queues. Introducing health screening measures would almost certainly cause these limits to be exceeded and result in financial penalties for the airport or the private screening company that is contracted to perform passenger searches. Having said that, some respondents suggested that there may be scope for introducing some sort of mobile screening technology that could be moved to different areas of the terminal building as required to screen either arriving or departing passengers.

Currently, the responsibility for identifying potentially infected/infectious travellers arriving at the UK border falls to the UK Border Agency. Individual immigration officers must evaluate not only the originality and veracity of immigration documents but also assess whether individual travellers pose a health risk. Existing protocols mean that travellers without EU, North American, Australian, New Zealand or other 'Western' passports will be subject to more scrutiny (from both an immigration and an epidemiological perspective) than those that do. Under this system, certain groups of travellers can be easily identified and referred for additional immigration and/or health checks before being admitted to the UK. At the time of writing, Department of Health guidelines require UK airports to screen potential entrants from tuberculosis prevalent areas using chest x-rays. However, only two UK airports – London/Heathrow and London/Gatwick – have the facilities to undertake chest radiography on site. At all other airports, information on new entrants is passed to the local Health Protection Agency office for follow up. However, this process is far from perfect as entrants may be 'lost to the system' or fail to attend follow-up appointments at local screening centres.

“I don’t know how many people get ‘lost’ to the system each year, but I know, anecdotally, from colleagues, that loads of people don’t attend their follow up checks at local hospitals”
(Director of Public Health, Midlands)

Not only does this have huge cost implications for the NHS, it also has important public health implications. Our research also discovered that the follow up procedures are inconsistent across the UK and the practices that are performed at one site may differ substantially from those at another.

At present, chest radiography represents the only medical screening technology that is routinely employed to safeguard public health at UK airports, but this is only available on-site at the UK’s two busiest airports. The benefits of introducing other screening technologies, most notably thermal imaging cameras, have been debated in response to different disease threats and some newspaper journalists have suggested that the UK should employ the same technologies as major airports overseas (Smith 2003, Wright 2003). However, the use of such screening technology invokes all manner of ethical, financial, technological, and practical concerns. Our research uncovered evidence of considerable disagreement between stakeholders, with positions being polarised between those who felt that all possible measures should be taken to prevent the transmission of infectious disease by air travel and others who felt that the proposed new screening technologies go far beyond what is reasonable and infringe the privacy of individual travellers. For example, the use of backscatter or ‘naked’ x-ray scanners at airports, deployed in the UK following the attempted detonation of a bomb on a passenger flight above the USA on Christmas Day 2009, had already been the subject of considerable debate (Murphy and Wilds 2001; Klitou 2008). At present, these machines are solely used to ‘see’ under clothing to detect concealed weapons, explosives, or contraband (Cavoukian 2009) and are not designed to detect overt or latent signs of infection. In the future, it may prove possible to incorporate some form of health screening technology, such as thermal imaging, into these systems. Yet, practitioners to whom we spoke indicated that an entirely separate technology, based on a different set of metrics, would need to be developed.

Finally, and as a consequence of recent terrorist attacks against commercial aircraft, almost all available space in the passenger security search area is now devoted to anti-terrorist security measures, leaving insufficient capacity for Port Health professionals to conduct exit screening. This situation requires closer investigation as, historically, the UK has been as much an exporter of infectious disease (such as foot and mouth disease and H1N1) as an importer (Parsons 2009, Green 2009, *Nottingham Evening Post* 2009, Bosely 2009).

Learning from others: the potential for policy transfer

We believe there would be considerable merit in assessing the health security practices performed at airports overseas. We foresee significant scope for future work with practitioners and policymakers in identifying lessons that can be applied in a UK context. Port Health practitioners already informally compare UK practices with those undertaken abroad. For example, two senior managers made unprompted reference to the health declaration questionnaire that the United States administer to some airline passengers alongside conventional landing cards, while four others gave informal assessments of the relative merits of different screening technologies and quarantine practices. For certain medical practitioners, antigen mediated nasal swabs and, ultimately, molecular testing, are the preferred means of screening for influenza, but they recognise that these procedures would: be expensive and time consuming to produce and process; require trained staff to administer the swabs and analyse the results; and raise ethical concerns. We advocate a policy transfer approach in order to assess more systematically the possibility of incorporating effective practice from other locations and jurisdictions. Policy transfer has been defined as:

‘[a] process by which actors borrow policies developed in one setting to develop programmes and policies in another’ (Dolowitz and Marsh 1996, p.357)

Variations of this concept – also known as ‘convergence’, ‘policy-oriented learning’ and ‘lesson-drawing’ - have been used to develop frameworks in a number of areas of public

policy, including environmental protection (Dolowitz and Marsh 1996), urban planning (Dolowitz and Medearis 2009), data protection (Bennett 1988, 1991, 1997) and regulation of the energy sector (Eberlein and Newman 2008). Successful policy transfer recognises the limits of 'vertical' modes of governance and can result in innovative approaches, often involving epistemic networks, to specific problems (Eberlein and Newman 2008; Dolowitz and Medearis 2009). Yet, to our knowledge, this process has not been fully utilised in the field of Port Health. There is scope to connect perspectives on Port Health in the UK airport setting in ways that explain why certain procedures work and develop them in a format that can be transferred to other jurisdictions. In the international policy context, it is vital that we appreciate how and why international directives for sanitary aviation are formulated and enacted in different countries and at individual airports. This would enable the implications of these variations in practice on global public health to be more rigorously examined.

Discussion and recommendations

Our interviews and action research – albeit from a small sample of UK airports - provide compelling evidence that stakeholders believe the efficacy of the existing Port Health system at UK airports is being compromised by institutional complexity, poor communication, and by practical and financial constraints. Indeed, the complexity of the existing Port Health regulations, combined with the multifaceted pattern of airport ownership and health service provision in the UK, renders the challenge of delivering effective Port Health safeguards considerable. We noticed a sense of frustration among stakeholders who strive to 'do the right thing' by both their employers and the travelling public, yet often perceive their impact to be restricted by inefficient working practices and outdated public health priorities. For example, and with respect to the latter point, medical practitioners expressed concern that the continued emphasis on the epidemiological risks associated with tuberculosis may mean the threats posed by new and emerging infectious diseases are not sufficiently prioritised. While there is a clear need for further research in this area, our findings identify: a clear need to improve the clarity of the existing Port Health documentation; a requirement to make explicit the responsibility of different agencies; and the necessity of fostering closer working links and dialogue between and among stakeholder groups. Taken together, these measures should alleviate some of the difficulties currently associated with the existing regulations. In the short to medium term, therefore, we suggest that the introduction of a structured three-tier system of health screening may (depending on the nature of the disease threat) be appropriate for use in UK airports (Table 3).

***INSERT TABLE THREE ABOUT HERE ***

Conclusion

Recent outbreaks of highly infectious human diseases, including SARS and the H5N1 and H1N1 strains of influenza, have illustrated the continued epidemiological vulnerability associated with mass international air travel to and from the UK. Drawing on extensive archival research and fieldwork interviews with key stakeholders in the aviation and health care sectors, this paper documented the development of sanitary regulations at UK airports and explored the current practices of health security that are performed at individual sites. In many cases, we noted that the Port Health procedures and individual staff responsibilities are not always well understood and not prioritised. As a result, airport and airline staff reported that they felt unfamiliar with the procedures and unsure what to do in the event of an emerging Port Health incident. In an effort to heighten awareness of the difficulties Port Health practitioners face in trying to ensure effective health security at UK airports, we have highlighted three areas of concern and offered a number of recommendations that may improve current procedures. In the longer term, it may be beneficial to adopt a policy transfer approach, in which UK airports learn from practices overseas to enhance not only health security practices in the UK but also internationally.

Acknowledgements

We would like to thank all our interviewees for their time and for giving us an insight into Port Health provision at UK airports. We are also grateful to the two anonymous reviewers for their helpful comments on an earlier draft of this paper.

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