



HEALTH CARE WORKERS WITH CYSTIC FIBROSIS

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Health care workers with CF

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Introduction

Health and Social Care Workers with CF

People with CF work in a variety of health-related professions including Medicine, Nursing, Physiotherapy and Dietetics. In the 1994 survey of adults with CF in the United Kingdom ¹ 6.6% of all responders worked in health care or closely-related professions. This study had a response rate of 57%. If we assume that non-responders worked in health care at a similar rate to responders, this could represent as many as 160 current or former health care workers with CF in the UK. These data are now 6 years old, and it is likely that the number of health care workers has grown.

The range of professions included doctors, dentists, pharmacists, pharmacy technicians, physiotherapy helpers, nurses and nursery nurses, health care assistants, health visitors, GP receptionists, medical secretaries and lab technician/MLSO's. However this document might also apply to any group coming

into contact with patients, such as Occupational and Speech Therapists, hospital catering and cleaning staff, medical records staff, voluntary workers in hospitals and health care settings etc.

There are potential health consequences of contacts between health care workers and patients, for both the patient and the person with CF themselves. These health consequences may involve the risk of the health professional with CF spreading infection to a patient, the risk of patients spreading infection to the health professional with CF, and finally non-infection health consequences of working in the health professions for people with CF.

Review of Literature

The literature was reviewed for descriptions and case reports of health care workers with CF, in particular in relation to spread of infection. This consisted of comprehensive searching of MEDLINE and EMBASE. Information on the spread of infection of specific relevance to people with CF was also sought, whether or not the health care workers involved had CF themselves.

An Internet search was also carried out for information about health care workers with CF.

Contact with other CF organisations

Contact was made with CF organisations around the World to determine whether any of them had considered the issue of health care workers with CF, and whether any policies were already in existence. The International Association of CF Adults (IACFA) was also contacted, and a message placed on their web site, requesting health care workers to contact the author about any experience they may have had in relation to infection control issues.

Risks to patients from health care workers with CF

Transmission of infection in health care settings

Infection may be transmitted to patients in health care settings directly from other patients, directly from health care workers who carry or are suffering from an infection, and indirectly via the hands of health care workers, instruments and equipment and the environment.

Potential Infection risks posed by health care professionals with CF

Because people with CF frequently carry pathogenic organisms in their respiratory tract, this may pose a potential risk to certain types of patients, and from certain types of activity or procedure.

The organisms frequently carried in the respiratory tract of people with CF include

- *Haemophilus influenzae*
- *Staphylococcus aureus* (non MRSA)
- MRSA
- *Pseudomonas aeruginosa*
- *Burkholderia cepacia*
- *Stenotrophomonas maltophilia*
- *Klebsiella* spp
- Non-tuberculous mycobacteria

- *Aspergillus* spp

All of these may pose a potential risk to certain groups of patients under the care of the health professional with CF, but some will pose a greater risk to specific groups than others.

Groups of patients who may be at particular risk from one or more of these infecting organisms include

- New born babies, particularly premature infants undergoing intensive care
- Elderly patients who are immunocompromised
- Immunosuppressed patients e.g. those with cancer undergoing chemotherapy, patients with HIV/AIDS, renal dialysis patients, patients with diabetes mellitus
- Patients with open wounds particularly burns (particularly *Pseudomonas aeruginosa* and MRSA)
- Patients who are severely ill for example on intensive care units
- Other patients with CF

Although some groups of susceptible patients are readily identifiable, it should be noted that health care workers with CF coming into contact with patients may not always know whether or not they are at risk. This could happen in primary care or emergency medicine or surgery, where patients often present with an unknown diagnosis. For example, a patient attending their GP with a sore throat may have a simple virus infection, or may have agranulocytosis and be much more susceptible to infection than normal.

Certain types of procedure may increase the likelihood of transmission of infecting organisms. These include

- Surgery
- Dental surgery
- Invasive medical procedures such as insertion of chest drains
- Insertion of a foreign body such as a stent or pacemaker
- Procedures involving extracorporeal circulation such as haemodialysis or cardiopulmonary by-pass
- Any procedure dealing with open wounds, either traumatic or surgical

The risk of transmission will also depend to some extent on the clinical state of the health care worker with CF, for example it may be greater if the health care worker coughs frequently or expectorates large volumes of sputum, which is known to act as a vehicle to enhance survival of organisms in the environment and on hands². Risk of transmission will also depend on the observation of routine hygienic precautions by all health care professionals, including those with CF.

Health care workers as sources of infection

There are no published cases of infection arising in patients as a result of contact with a health care worker with CF. Nevertheless it is reasonable to assume that a health care worker infected with an organism such as *Burkholderia cepacia* or *Pseudomonas aeruginosa* would pose a similar risk to other patients with CF as would contact between those patients in hospital or community settings, and these eventualities are covered in previous publications by the CF Trust^{3,4}. The difficulty arises in assessing the risk to patients *without* CF.

There are numerous published instances of nosocomial infection arising from health care workers (without CF). These publications cover both indirect transmission

between patients via the hands of health care workers, and transmission from an infected or carrier health care worker to patients. The majority of this literature concerns viral infections which are not specifically relevant to health care workers with CF.

Staphylococcus aureus

Outbreaks of MRSA infection known and documented to be associated with patients or health care workers who are asymptomatic carriers of MRSA on their hands, nose or perineum⁵ and the route of transmission is mainly via hospital staff⁶. However opinion is still divided as to whether health care workers should be routinely screened for carriage of MRSA⁷. Carriage of methicillin-sensitive *Staphylococcus aureus* (MSSA) is common among health care workers, reaching over 30% in one study, in which carriage of MRSA was also 13%⁸. In another study, 21% of patients admitted to an intensive care unit carried MSSA⁹. There is also evidence that asymptomatic carriers can act as transmitters of Methicillin-Resistant *Staphylococcus epidermidis*¹⁰.

Outbreaks of MSSA continue to be a problem, but are usually traced to contaminated equipment¹¹. In a recent community cluster of MSSA infection in Australia, the most important risk factor was presence of skin sores. Respiratory infection was not a risk factor in this cluster, suggesting that skin carriage and shedding is an important potential infection source¹². Skin lesions were also an important reservoir of infection in a community outbreak of MRSA¹³.

There is no information about whether health care workers who carry either MRSA or MSSA and who have a cough or cold are more likely to spread this to patients. However one outbreak of MRSA infection was attributed to a health care worker with sinusitis¹⁴. There is some evidence that people with CF are more likely to be carriers of MSSA if they have not received antibiotic treatment than either controls or treated CF patients¹⁵.

Pseudomonas aeruginosa

Infection with *Pseudomonas aeruginosa* in non-CF patients is relatively uncommon, and usually occurs in immunocompromised patients, or in patients with extensive burns. The usual source of infection is contaminated equipment^{16, 17, 18} or intravascular catheters¹⁹. Some large outbreaks of multi-resistant *P. aeruginosa* infection have been reported²⁰. The hands of health care workers have been responsible for nosocomial outbreaks of *Pseudomonas aeruginosa* infection²¹. Hand-washing and use of protective clothing and gloves is frequently ignored among health care workers, particularly doctors²².

An outbreak of *Pseudomonas aeruginosa* infection in patients with COPD has been reported, related to contaminated nebuliser equipment²³. However in this outbreak, direct respiratory spread did not appear to occur, the outbreak ceasing once nebulisers were adequately cleaned. There have been no outbreaks in non-CF patients reported as a result of direct respiratory spread.

Mycobacterium tuberculosis

The greatest evidence for direct spread of a respiratory pathogen exists for *Mycobacterium tuberculosis*, which may be transmitted from infected smear-positive health care workers to patients in hospital and other health care settings^{24, 25, 26}.

The majority of nosocomial outbreaks of non-tuberculous mycobacterial infection have been related either to water supply contamination or contamination of equipment²⁷. Infection due to health care workers has not been described. Patients

at risk include those with HIV/AIDS, patients with other forms of immunocompromise, and those who have recently had surgery.

Burkholderia cepacia

In the non-CF patient, *B. cepacia* infection is usually acquired by a susceptible individual from a contaminated common source^{28,29,30,31} and others. One extensive hospital outbreak has been described in which transmission of *B. cepacia* occurred between patients with CF and non-CF patients³². It was likely that the spread occurred in both directions in this outbreak, but infection only persisted in the CF patients. The source of this outbreak was probably a ventilated non-CF patient.

Other respiratory pathogens

There is relatively little literature on spread of other respiratory bacterial pathogens in a hospital setting. One outbreak of *Streptococcus pyogenes* infection has been attributed to a surgeon carrying the organism in his throat³³.

Measures to prevent transmission from respiratory tract

Face masks have been shown to reduce transmission of bacteria in patient contacts lasting less than 15 minutes³⁴. However failure to wear a face-mask was common among emergency room staff in one study (32% of procedures)³⁵.

Potential actions to reduce risk to patients

The potential actions to limit the risk that health care workers with CF might pose to patients include

- Preventing all health care workers with CF from patient contact – rather an extreme measure.
- Preventing health care workers with CF from working with certain “at risk” groups of patients. In practice this might be difficult because the diagnosis is not always clear when patients present to the health professional with CF, particularly doctors and nurses working in primary care and accident and emergency departments. However it would be possible to restrict access to burns units, HIV/AIDS units, neonatal intensive care units and so on.
- Preventing health care workers with CF from working in certain specialties e.g. Obstetrics, Surgery, Intensive Care, Neonatology, Radiology, Radiotherapy, Oncology, Haematology. It would be difficult for the health professional to complete their general training if this restriction were applied for example to doctors or nurses with CF. However it would be reasonable to limit exposure of health care workers with CF to other people with CF, although this may not be possible in an emergency situation, or where they would be covering a ward with CF patients.
- Education of the health professional with CF in the methods to prevent spread of infection and strict adherence to these e.g. handwashing, not coughing directly on patients, not coughing into hands and then touching patients, wearing gloves and masks when dealing with potentially vulnerable patients. Although this might prevent the majority of spread of organisms, mistakes are made when individuals are tired or under acute emergency situations. Wearing masks may impair the relationship between the health professional with CF and their patient. Responsibility for limiting infection spread in this way needs to be accepted by the person with CF.

- Preventing health care workers with CF from undertaking certain specific procedures such as major surgery, insertion of pacemakers or stents, cardiac catheterisation, bronchoscopy and so on. In practice this would limit the choice of specialties in which health care workers with CF could work.
- Imposing restrictions on health care workers with CF only if they are chronically infected with or carriers of specific organisms e.g. MRSA. Some organisms will not pose a risk to the vast majority of non-CF patients e.g. *B. cepacia*.

Decisions about which strategies to adopt must depend on

- The clinical status of the health professional with CF (many are extremely well, and hardly cough or produce sputum at all)
- The chosen specialty and the requirements of the job
- The nature of the patient group involved
- The procedures to be carried out
- Evidence of risk of transmission from other non-CF health care workers (e.g. health care workers who carry MSSA are not prevented from working in surgery or undertaking invasive procedures).
- The antibacterial resistance pattern of the organisms that the person with CF carries.

Ultimately the safety of the patients must be paramount, but unnecessary restrictions could debar people with CF from a rewarding career in health care.

Recommendations to reduce risk to patients

There has been no published case where a health care worker with CF has been responsible for sporadic infection or outbreaks of infection in any patients. CF is a very variable condition, and many people with CF are well and without symptoms most of the time. There is therefore no justification for a blanket ban on people with CF working as health care professionals, or to ban them from any form of patient contact.

CF is covered by the Disability Discrimination Act. This means that somebody with CF cannot be turned down for employment just because they have CF. There would have to be justification for this decision. Given the lack of reported transmission of infections from health care workers with CF to patients, arguing justification would be difficult, especially since it should be possible to place the health care worker with CF somewhere without susceptible patients. It is therefore important to take an approach that enables the person with CF to follow their chosen career, where possible.

Health care workers without CF are frequently responsible for transmission of infection from themselves to patients, and between patients either directly or via contamination of equipment. Health care workers frequently fail to observe standard hygienic precautions to prevent spread of infection.

It is clear that health care workers who carry or are infected with MRSA, and health care workers who have smear-positive *Mycobacterium tuberculosis* should not be allowed to come into contact with patients until the problem has been adequately treated. In this instance, health care workers with and without CF would be treated the same.

Presence of methicillin-sensitive *Staphylococcus aureus* is very common among patients and staff at hospitals, and it seems unlikely that health care workers with

CF would pose a greater risk to patients than those who carry the organism themselves, or who fail to observe normal hygienic precautions.

Presence of *Pseudomonas aeruginosa* in the respiratory tract is only likely to pose a risk to patients in certain specific circumstances. The degree of risk would depend on the clinical state of the health care worker with CF, production of sputum, and the extent to which the health care worker observes hygienic precautions applying to all health care workers in hospital or clinic settings. It would also depend on the antibiotic resistance pattern of the organism, multi-resistant and epidemic strains posing a greater risk to susceptible patients than less virulent or resistant organisms.

Health care workers with CF who have chronic colonisation with *Pseudomonas aeruginosa* may therefore need to be excluded from working with highly-susceptible groups, such as others with CF, immunocompromised patients, neonates and patients on intensive care units. They may also need to be excluded from undertaking certain procedures, or instructed to wear face masks when dealing with patients who may be at risk.

In general, health care workers with CF should not work either with CF patients, or other health care workers with CF. Health care workers with CF who have chronic colonisation with *Pseudomonas aeruginosa* should certainly not work with CF patients who are not infected with this organism. Health care workers with CF who have multi-resistant *P. aeruginosa* infection should certainly not work with other CF patients, nor with other patients for whom this organism may pose a risk.

Presence of *Burkholderia cepacia* in the sputum should normally mean that a health care worker with CF should not have contact with any other CF patients. This is in keeping with recommendations covering social and hospital contact between CF patients already issued by the CF Trust. It is not clear to what extent this poses a risk to other patients, but certain very susceptible groups, for example neonatal and paediatric intensive care patients, may be susceptible to infection. It is not clear whether in these circumstances, wearing of face-masks would be sufficient to prevent transmission but there is some evidence that they are effective in the short-term. It may therefore be necessary to exclude the health care worker with CF from contact with very susceptible patients.

There does not appear to be any evidence that would suggest health care workers with non-tuberculous mycobacterial infection pose a specific risk to the majority of patients. However it might be prudent to prevent contact with susceptible patient groups until treatment renders the sputum culture negative.

It is imperative that health care workers with CF observe recommended hygienic precautions when in contact with patients. This should include washing of hands before and after patient contact, use of disposable tissues when coughing, washing hands after coughing, and disinfection of personal medical equipment such as stethoscopes, otoscopes etc before use. Masks should be worn in the presence of any patient who is known or thought to be particularly susceptible to infection, and should always be worn when undertaking aseptic procedures. The use of aprons, gowns and gloves should follow local infection control procedures.

People with CF who want to work as health care workers should always declare their condition to the Occupational Health service. Decisions about where they can safely work should be made on the basis of an individual assessment, and liaison between the Occupational Health doctor and the doctor looking after the CF is vital. Health care workers with CF should also declare any change in their clinical condition, especially episodes of infection, or presence of chronic infection, to the Occupational Health doctor, to allow any necessary modifications to their working practice (e.g. they may need to avoid certain kinds of work until the infection is eradicated).

Risks to health care workers with CF from patients

Potential risks to health care workers with CF from patients

In addition to the potential risks to patients, patients or the hospital environment may themselves pose a risk to health care workers with or without CF. For health care workers with CF, the risk may be greater, either due to greater susceptibility to infection, or due to greater adverse consequences of infection than for non-CF health care workers. The risks posed by patients and the hospital environment to health care workers with CF include

- Carriage of bacteria that may be potentially harmful to people with CF, or which may prove more difficult to eradicate if transferred (e.g. *P. aeruginosa*, MRSA). The carriage status is often unknown at first contact with the health care workers, for example in accident and emergency, primary care, home visits or emergency medicine or surgery.
- Acute medical admissions may frequently be triggered by viral upper respiratory tract infections (e.g. bronchitis, pneumonia, bronchiolitis, asthma, exacerbations of COPD, influenza) and these viruses may themselves be responsible for the majority of respiratory exacerbations in people with CF should they be contracted. Similarly a high percentage of consultations in primary care are for acute respiratory infections, and a general practitioner, practice nurse or practice receptionist may be exposed.
- The hospital environment is frequently contaminated with organisms known to be a potential risk to people with CF. This includes *Pseudomonas aeruginosa*, *Burkholderia cepacia*, *Klebsiella* spp and non-tuberculous mycobacteria, some of which may be found in specific environments (e.g. intensive care units), and other in the water supply or more general ward environment.
- The consequences of contracting an occupational-related disease may be worse for people with CF e.g. mycobacterial infections, HIV/AIDS, Hepatitis B/C. Certain bacterial infections may be harder to eradicate from health care workers with CF, e.g. *B. cepacia*, MRSA.

Some of these risks can be minimised by good hygiene and wearing masks at first contact although this might impair the relationship between the professional and patient. However people with CF who enter the health professions may wish to limit their exposure to some kinds of patient, or take up a specialty that does not involve contact with patients with acute respiratory tract infections.

Risks to health care workers from patients and hospital environments

There is no reported case in the literature of a health care worker with CF acquiring an infection as a result of working in a hospital environment. However, unless the consequences of this were severe, it is unlikely that it would be reported in the literature, and therefore there may be undocumented cases. Anecdotally, there have been some cases of occupationally-acquired infection in health care workers with CF, including acquisition of MRSA infection, and possible acquisition of non-tuberculous mycobacterial infection.

There is substantial published evidence that health care workers without CF may be susceptible to acquisition of pathogens, including respiratory pathogens. This

review does not consider the risk of transmission of blood-borne viruses, rare infections, or infections where consequences to people with CF are similar to people without CF, such as *Helicobacter pylori*.

Mycobacterium tuberculosis

Tuberculosis has long been recognised as an occupational disease of health care workers³⁶. Despite the fall in incidence of tuberculous infection during the 20th century, health care workers remain at higher risk of developing skin-test conversion, or clinical disease³⁷. This is particularly notable in areas of high incidence, and where strains of unusual virulence³⁸ are responsible for hospital and community outbreaks³⁹. Risk is also higher among people working on respiratory wards, exposed to sputum-positive patients^{40,41}. However, in some areas of high risk, effective precautions have reduced the risk associated with health professions^{42,43,44,45}. In areas of low incidence, the risk of infection in health care workers may not be elevated⁴⁶. BCG immunisation does not always protect against acquisition of tuberculosis and may itself be responsible for transmissible infection in immunocompromised patients⁴⁷.

Tuberculosis transmission is also a risk for pathology staff, including those working in a mortuary and undertaking post-mortem examinations⁴⁸.

Respirators may protect health care workers against transmission of tuberculosis, but they are sometimes cumbersome to use, and their effectiveness depends on adequate fit⁴⁹.

Non-tuberculous mycobacteria (NTBM)

Although there were no published accounts of acquisition of non-tuberculous mycobacterial infection among hospital staff *via* the respiratory route, hospital water supplies are frequently contaminated with NTBM, as is hospital equipment²⁶.

Bordetella pertussis

Pertussis (whooping cough) can cause nosocomial outbreaks involving both patients and staff⁵⁰. Whooping cough can be a very serious illness, even in health individuals, and it would have more serious consequences were a health care workers with CF to contract it.

Influenza

Health care workers, particularly those with CF, may be susceptible to infection with new strains of influenza circulating in the community. Health care workers were infected with avian flu (H5N1) in Hong Kong, and may be particularly susceptible to new pandemic strains⁵¹. Influenza vaccine is 88-89% effective in reducing incidence of influenza A and B in health care workers, as well as sickness absence due to influenza, and its use is recommended for all health care workers, with or without CF⁵².

Other viral infections (excluding blood-borne viruses)

Hospital outbreaks of mumps⁵³, varicella zoster⁵⁴ and herpes simplex virus⁵⁵ have all been reported.

Staphylococcus aureus

MRSA can be transmitted from patients to staff, as well as between patients. Staff are usually asymptomatic carriers, but during an outbreak, staff can acquire clinical infections with MRSA as well⁵⁶.

Asymptomatic carriage of MRSA is also a problem in community nursing homes for the elderly, particularly where patients have poor hygiene, or open sores. In the UK, the prevalence of MRSA is 4-17% in residential nursing homes^{57, 58}. Nursing homes also have substantial environmental contamination with MRSA⁵⁷. Therefore health care workers with CF working in such homes may be at risk. High prevalence has also been reported in child day care centres⁵⁹, reaching 24% in one centre in the cited study, suggesting that nursery nurses, in particular those working with special needs children, may be at increased risk.

The carriage rate in the community may also be high, reaching over 3% in one study⁶⁰. In this study, a visit by a nurse at home was a risk factor for infection among patients, suggesting that nurses may be likely to encounter patients who carry or are infected by MRSA in the community.

Patients and staff are frequently carriers of MSSA, with up to 30% of staff and about 20% of patients carrying this organism^{8,9}. During outbreaks, high proportions of staff may also carry MRSA⁸. Patients with open and infected skin lesions pose a particular risk^{12,13}. MRSA status of patients may not be known upon admission to hospital.

Operating gowns provide some protection against strike-through of staphylococcal infection, but this is extremely variable depending on the type of gown, and is least effective in re-usable gowns⁶¹.

Burkholderia cepacia

A study in dental surgeons demonstrated a low risk of transmission of *B. cepacia* to the hands of dental surgeons and the environment⁶². Nevertheless, treating patients with CF infected with *B. cepacia* may be a risk for dentists with CF.

Although environmental contamination is less frequent than with *Pseudomonas aeruginosa*, *B. cepacia* can be found in the hospital environment, particularly where the hospital concerned cares for patients with CF⁵⁷. It may also present in sinks and upon equipment in intensive care units. Outbreaks of *B. cepacia* infection can occur among CF and non-CF patients, and it is clear that in one outbreak, non-CF patients acted as a source of infection for patients with CF³¹

Pseudomonas aeruginosa

P. aeruginosa is not normally an organism that poses a risk to immunocompetent health care workers. However for health care workers with CF, it may pose a risk, particularly since it is widespread in the hospital environment. *P. aeruginosa* can be found in damp, warm places in hospitals, such as sinks⁶³, and upon equipment^{15,16,17}, particularly respirators, nebulisers²², humidifiers and ventilators. It is particularly prevalent on intensive care units and burns units.

Strains that spread with unusual virulence in hospitals may also be resistant to many antibiotics¹⁹, which poses an additional problem for health care workers with CF should they contract a multi-resistant organism, which may be difficult to eradicate and therefore subsequently affect not only their health, but their working practices.

Recommendations to reduce risk from patients and hospital environments

Health care workers with CF need to ensure that they seek the advice of their doctor before choosing a career in health care. They should also consult with the Occupational Health doctor, who will be in a good position to recognise high risk areas, and arrange for the health care worker to avoid working in such areas. Liaison between the Occupational Health doctor and the doctor looking after the CF is vital. The Health care worker should always inform the Occupational Health doctor of any change in their condition which may affect their susceptibility to infection and therefore the areas in which it is safe to work.

Hospitals and health care institutions employing health care workers with CF need to ensure that they are employing adequate precautions to protect *all* staff from the acquisition of occupational infections of the respiratory tract, particularly tuberculosis.

Hospitals and health care institutions employing health care workers with CF need to ensure that they are well-trained and at all times observe hygienic precautions to prevent the transmission of infection to themselves, and from themselves to patients. They also need to ensure that equipment that poses a risk of infection is correctly and safely cleaned. This is important for patients as well as health care workers.

Health care workers with CF should always be immunised against measles, mumps, rubella, pertussis, tetanus, diphtheria, polio, tuberculosis (BCG) and influenza (annually).

Health care workers with CF should be aware that hospital environments may be relatively hazardous for their health. In particular they should be aware of potential reservoirs of infection. They may wish to remain in occupations that limit their exposure to hazardous environments, such as intensive care units, burns units and units where there is a high risk of contaminated aerosols, such as respiratory units.

Health care workers with CF may wish to consider employing additional hygienic precautions when encountering patients with unknown diagnoses or who pose a potential infection risk, such as those with unknown respiratory infections or skin lesions. This could include wearing a disposable apron or gown, gloves and mask.

Health care workers with CF may wish to consider choice of career that minimises exposure to risky infections and to patients with unknown infection status. High risk careers may include primary care (doctors, nurses, dentists, health visitors, receptionists), acute medicine or surgery, intensive care or anaesthetics, neonatal paediatrics and respiratory physiotherapy. Other careers and specialties at low risk may still need to enter high risk environments such as intensive care units on occasions or during their training e.g. cardiographers, radiographers, radiologists, pathologists, occupational therapists, receptionists, EEG technicians, pharmacists and medical records staff.

When choosing a career in health care, people with CF should be aware that the training may require them to work in high risk environments or with high risk patient groups. They should therefore take advice and relevant precautions to reduce their risk of acquiring infection, which will depend upon their own clinical and bacteriological status.

Health care workers with CF should generally not work with other patients with CF, and limit their contact as far as possible to unplanned contact only in emergency situations.

General advice to people with CF considering a career as health care workers

Careers in health care can be extremely demanding. The majority of health care professionals need to undergo a lengthy period of academic and practical training to reach high grades in a number of health professions. The requirement to study and take examinations rarely finishes when a qualification to practice is obtained, with the requirement to take postgraduate qualifications whilst still working. The job itself can be physically demanding, with long hours of work, high levels of stress, and shift work.

However, careers in health care can also be extremely rewarding, and therefore they are attractive to many, including people with CF.

People from whom advice should be sought

Before considering a career in health care, you should consult your CF specialist doctor and members of the CF team, particularly if they work in the chosen field. A doctor, physiotherapist, nurse, dietician, pharmacist, laboratory technician or health care assistant at the CF centre will be able to tell you what the training is like, and what the job is like, with some knowledge of you, and of cystic fibrosis.

You could also try and contact one or more health care worker with CF who has been through the training and works in the chosen field, but this would depend on whether they are able and willing to discuss career matters with you.

Even if you want to work in a hospital in another capacity (for example as a voluntary worker, catering assistant, cleaner, chaplain, librarian or secretary), it is worth discussing your plans and carefully considering the potential risks to patients and to yourself.

You must also consult the Occupational Health service of the institution in which you propose to train or work as a health care worker. Occupational Health doctors are trained to consider the risks to you from the job that you are proposing to do, and also the potential risk to patients. Occupational Health doctors must respect your confidentiality, and just because they know about your medical condition, does not mean it should become common knowledge. Their role is to advise about a person's fitness to work and about any necessary work restrictions or modifications. Because there are many reasons why a health care worker may have modified or restricted work patterns, CF does not need to be revealed as a reason for this.

Current and future health state

You also need to consider your current and future health status. You need to be physically fit to work in the health care field. Depending on the job, you may need to be able to walk long distances, stand for many hours at a time, run to emergencies and do without regular meals and occasionally manage without your regular treatment.

Remember, your health state may change, and therefore you need to consider this in choosing both a profession and a specialty. You need to think what your health status will be 20 to 30 years after commencing training, and ask whether you think you can cope with the demands of the job you will then be doing, as well as the immediate requirements of the training scheme and the job itself.

Requirements of training and for full registration

Training for health professions usually lasts 3 to 5 years for a basic qualification, but it does not stop there. You will then need to work under supervision for a period

of time to obtain full professional registration to allow you to work unsupervised. You will also need to take postgraduate qualifications while you are still working.

You need to consider the training programme itself. If you are required to work with a group of patients or in circumstances where you may pose a risk to patients, or they may pose a risk to you, it may not be possible for you to complete your training. This would depend to some extent on your own fitness, and the organisms you currently carry in your lungs. You would need to discuss this with your doctor, but also with the training institution.

Some medical and nursing schools may be reluctant to take on a person with CF on the grounds that although they may be able to complete the training, they would not be able to practice, or would be severely restricted in their areas of work. This is probably unreasonable, and there have been many people with CF who have successfully completed medical or nursing training and had a full and rewarding career in these professions.

Risk of infection and spectrum of possible jobs

If you can complete the requirements for training and full professional registration, you will then need to consider the area in which you will work. Again, this needs to be based on your clinical status and the organisms you carry in your lungs. It may be inappropriate for health care professionals with CF to consider working in certain specialties, such as neonatal paediatrics or intensive care, even if currently they are in good health and carry no organisms posing a risk to patients. This is because they may still be at risk of acquiring infection from the patients or equipment, and because their clinical status may change over the years.

Remember also that the risk to you from patients cannot always be controlled, particularly if you work in acute medicine, acute surgery or primary care. Patients present with unknown diagnoses, and may carry infections such as MRSA into hospital with them from the community. It may be several days before their risk to you, and their susceptibility to any infection you may carry, is known.

Working in the community is not without risk, since MRSA infections are common in nursing homes and child day care centres. Even working in primary care you may have to see or visit patients with infected skin lesions, or visit patients living in very unhygienic conditions.

This is something you will need to consider with your CF specialist, as well as with your employer. Remember that occupational health doctors are not always up to date with CF, but they are experienced at dealing with health care workers with all kinds of health problems, some of which are relevant.

Keeping up with treatment

Shift work, and on-call rotas sometimes mean that you cannot keep up with treatment. You will frequently be required to miss meals, and may miss your nebulised treatment, doses of oral antibiotics, vitamin pills and even IV antibiotic injections if you are working in an acute specialty where the demands of the job do not permit regular breaks.

Certain types of specialty and profession make taking regular treatment difficult. Long on-call hours for junior doctors, for example, make taking regular nebulisers difficult. Therefore medicine may not be a suitable career choice for somebody who is very dependent on regular nebulised medication or physiotherapy, and who would become ill if treatment is missed. However other health professions may still be very suitable when regular shifts are worked e.g. nursing, physiotherapy, radiography.

Therefore, you need to be sure that you can either negotiate with colleagues to ensure that these lapses in treatment are kept to a minimum. You also need to consider whether an acute specialty is right for you if you become extremely breathless if you miss a nebuliser or physiotherapy session.

You also need to consider whether you can choose a specialty within your chosen profession that allows you to take regular breaks. There are many professions and specialties in which regular hours are usually worked, and which may be less physically demanding. These include pathology, pharmacy, radiography/radiology, secretarial and medical records work, cardiography, physiotherapy, occupational therapy, speech therapy, EEG technician, medical equipment technicians, receptionists, health care management, public health and so on.

Alternative employment with health care qualifications

If your health does not remain stable over the years, you need to consider what else you might be able to do with a health care qualification. Some qualifications, such as nursing, would allow you to consider many other professions, because they are considered to be a useful background. However other, very specific qualifications, may not be very useful when considering an alternative career.

For example, a science degree would be more appropriate and flexible than a medical degree, if you subsequently decided to work in research rather than clinical settings.

Obtaining employment

People with CF often have difficulty obtaining and staying in employment, frequently because of perceptions by employers that they will always be ill. If your clinical state and infection risk means that severe restrictions to your activities would apply, this would further limit and reduce employment opportunities and may make employers even less likely to employ somebody with CF in a health profession, even when risks are minimal or can be controlled.

The Disability Discrimination Act applies to people with CF, so CF cannot be used as a reason for refusing employment. Previous sickness absence is, however, the best guide to future sickness absence, and therefore employers are concerned about this. However in the light of the Disability Discrimination Act, refusing employment on the basis of previous sickness absence has become more complicated.

Complications of CF

Certain complications of CF may make a job in health professions with irregular hours or on call duties difficult to cope with e.g. diabetes requiring insulin also requires regular meals, which cannot usually be had under these circumstances. Of course this difficulty is not confined to people with CF who have diabetes and affects health care workers without CF who also have insulin-dependent diabetes.

Transplant recipients

People with CF who have had a transplant are immunosuppressed, and the risks posed to them by direct patient contact may be increased. However their lungs are likely to be free from organisms, which would reduce the risks to patients. Considerations for transplant recipients would be different from non-transplanted professionals with CF.

Immunisation

People with CF who work in health professions should all be immunised against tuberculosis (BCG), influenza (annually) and Hepatitis B. They should also ensure that they have all been immunised against measles, mumps, rubella, diphtheria,

tetanus, poliomyelitis and whooping cough. The latter is particularly important in the light of outbreaks of this condition affecting staff. People with CF born during the 1970's may have missed out on this immunisation during childhood because of adverse publicity about the vaccine at that time.

Hygiene

Whether you work as a health professional, a voluntary worker, or in any kind of capacity where you have contact with patients, you will need to be sure that you are aware of and comply with any general guidance on hygiene. This is particularly important for people with CF who may cough more frequently than other people. Of particular importance is hand-washing, which should be undertaken before and after any contact with patients. If you regularly cough so frequently that you would need to cough in between washing your hands and contact with a patient, then a career in direct patient contact may not be appropriate.

You may also be asked to observe specific extra hygiene precautions, such as wearing of face-masks, when dealing with certain types of patients, and it is very important that you always observe these too.

Contact with international CF Associations

Contact was made with CF Associations and directors of prominent CF centres in Australia, France, Belgium, Sweden, the United States, Canada, South Africa, the Netherlands, Denmark and Ireland. Replies were received only from Belgium, Sweden, the United States and France. None of the associations who replied had a written policy on health care workers with CF.

The Cystic Fibrosis Foundation (US) reported one CF Centre Director with CF. They also reported a respiratory therapist whose only restriction was that she did not work with CF patients. They were not aware of any cases of a health care worker with CF infecting other patients (CF or non-CF), and after contact in connection with this document, they plan to raise the issue at an infection control conference in the near future.

The AFLM (France) reported 19% of adults working in the field of "services to people" which includes education, health and social care, and 45% were considering a career in this area. Patients are advised about infection risks before taking up a career in this field, but no restriction is placed upon them.

Health care workers with CF who made direct contact with the author through the IACFA web site usually reported no restriction other than that they were advised not to work with other patients with CF. One nurse with CF had specialised in intensive care, but moved from this job when she noticed an increase in frequency of respiratory infections.

An internet search revealed a single discussion group item about a doctor with CF who had *Burkholderia cepacia* infection. There is therefore very little information to hand about this issue.

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