

Understanding non-compliance with treatment in adults with cystic fibrosis

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INTRODUCTION

The majority of patients with cystic fibrosis (CF) now survive into adult life¹. This improved survival has been attributed to advances in the medical management of the disease. However, they rely upon the input of a life-long complex programme of self-care by the patient. We discuss the requirements and intricacies of the prescribed treatment, the benefits and consequences of that self-care and the patient's response to recommended treatments in terms of compliance or non-compliance.

DEFINING COMPLIANCE

The term compliance is defined as 'the extent to which the patient's behaviour coincides with medical advice'², and implies the concept of 'following doctors' orders'. In CF this definition in the 1970s coincided with a treatment regimen which was mainly passive and was prescribed for children with limited survival. The term compliance lost favour in the late 1980s as healthcare became viewed as a partnership between the patient and the provider. Compliance was replaced with 'adherence' and a 'cooperation approach' began to emerge in treatment planning. At this time, significant numbers of CF children were beginning to reach adolescence and adulthood. The concept of a normal life, education and independence emerged and in response, treatment became a more active process. Predominant hospital care was transferred into the home, where patients were able to undertake intravenous antibiotic treatment. Complexity of CF care was in its infancy (Table 1). At the present time, the regimen of self-care continues to increase and now encroaches into the night-time. More of our patients survive into adult life, are totally independent and have become parents themselves. Concordance, which is defined as 'the point below which the preventative or therapeutic result is unlikely to be achieved'³, has replaced the term adherence. It implies a tailored, consensual regimen and the idea of agreement. As the Millennium approaches, compliance with a prescribed treatment can no longer be taken for granted as the concordance approach develops. (Although the terms

compliance and adherence may have different implications they tend to be used interchangeably.)

THE COMPLEXITY OF TREATMENT

Self-treatment in CF encompasses many aspects of the disease, resulting in a complexity of treatments prescribed by a multidisciplinary team (see Table 1). The daily management of the disease can include treatment for the lungs with oral, inhaled and nebulized drugs, and the active treatment of chest clearance. Malabsorption requires the intake of oral pancreatic enzymes with meals and snacks and daily vitamins. Malnutrition may be corrected with oral supplements during the daytime and tube feeding at night-time. Tailored exercise programmes have many beneficial effects and are now recommended. As survival improves an increasing number of patients develop CF-related diabetes with the requirement for insulin. As the need for transplantation approaches, patients are kept alive with overnight oxygen and nasal intermittent positive pressure ventilation (NIPPV). This time-consuming programme can be up to 3 hours of daily care. In their study Conway *et al.* described a mean of seven daily treatments from a possible 12 commonly prescribed treatments⁴. Inherent in this complexity are many daily treatment decisions; the type of drug to be delivered can be oral, inhaled, nebulized, intravenous, intramuscular, by tube, a ventilator or cylinder. Some drugs have a specific order of administration and the frequency varies from once a day to four times a day, or, in the morning and at bedtime. Daily decisions of dosage have to be assessed for enzyme and insulin requirements and the duration of chest clearance and exercise programmes determined. Administration of the drugs requires special techniques and cleaning practices to ensure safe and effective care. As the treatment burden has increased and become more intricate, the patients' lifestyle has become more complex. More adults with CF are in higher education, full-time work and have careers and families. They are involved in outside activities and often live independently. They experience increased exacerbations and more complicated disease. More treatments means less time for work and pleasure. This complexity of care and lifestyle provides the background for compliance or non-compliance with treatment.

Table 1 Changes in self-care and lifestyle for patients with cystic fibrosis at three time points from 1960s to 1999

1964	1982	1999	
		Daytime	Night-time
Nebulized antibiotics Mucolytics	Nebulized antibiotics Bronchodilators	Nebulized antibiotics Bronchodilators DNase	
Oral antibiotics	Oral antibiotics	Oral antibiotics Bronchodilators Inhaled steroids Bronchodilators	Nasogastric or gastrostomy feeding Oxygen
Pancreatic supplements	Intravenous antibiotics Pancreatic supplements	Intravenous antibiotics Pancreatic supplements	NIPPV*
Vitamins	Vitamins	Vitamins	
Diet (low fat)	Diet (high fat)	Diet supplements	
Chest clearance (passive)	Chest clearance (active)	Chest clearance (active)	
	Exercise	Exercise Nebulizer/compressor care Porta Cath Insulin	
Children special school	Insulin Children/adolescents Further education INDEPENDENCE		Children/adolescents/adults Further education, work, home owners, parents NORMAL LIFE

*Nasal intermittent positive pressure ventilation

BENEFITS OF COMPLIANCE AND CONSEQUENCES OF NON-COMPLIANCE

A prescribed treatment implies some benefit for the patient. However, in the overall package of complex care which we ask patients to undertake, it is unclear which component of treatment improves survival or prevents disease progression, for any particular patient, at any particular stage of life or disease severity. We do not know what level of adherence for any treatment is required to maintain health and prevent disease progression. The debate continues on when to institute treatment for asymptomatic children who have sub-clinical disease. The use of antibiotics for prophylaxis or exacerbation remains controversial. A particular example is the prophylactic and long-term use of anti-staphylococcus treatment⁵. There is no evidence available that the clinician can guarantee that compliance with treatment will result in good health, improved survival or even a better quality of life. In fact, concern has been expressed that complete compliance may be detrimental to the social functioning of the family⁶. Treatments which provide immediate relief of symptoms such as bronchodilators, exercise and pancreatic enzymes are seen to be beneficial and are likely to enhance compliance^{7,8}. However, patients are unwilling to comply with treatments like chest clearance and nebulized antibiotics which offer little short-term benefit. These treatments are frequently prescribed with the promise of longer-term benefit.

Considerable motivation and reinforcement is required to maintain compliance with these treatments.

The benefits of compliance are probably less clearly defined than the consequences of non-compliance. The probable outcomes of poor compliance include increased infective exacerbations and weight loss, leading to faster disease progression⁹. This results in increased hospitalizations, time off school and work, and poor morale. Poor compliance with a recommended treatment leads to inconclusive evidence of possible beneficial effects. There is a paucity of evidence directly evaluating the long-term benefits and consequences of compliance to treatment. Patterson *et al.* linked adherence with chest clearance and regular clinic follow-up with a significant positive trend in forced expiratory volume in 1s (FEV₁) over a 10-year period¹⁰. More recently, in a 4-year study of ibuprofen an adherence rate of 470% was associated with a slower decline in FEV₁, forced vital capacity, ideal body weight and chest X-ray score¹¹. In the future, we await the outcomes of the long-term benefit of dornase alpha from the Epidemiologic Study of Cystic Fibrosis (ESCF).

LEVELS OF COMPLIANCE

Studies of chronic diseases have shown that generally one-third of patients adequately comply, one-third partially comply and one-third fail to comply, resulting in an overall

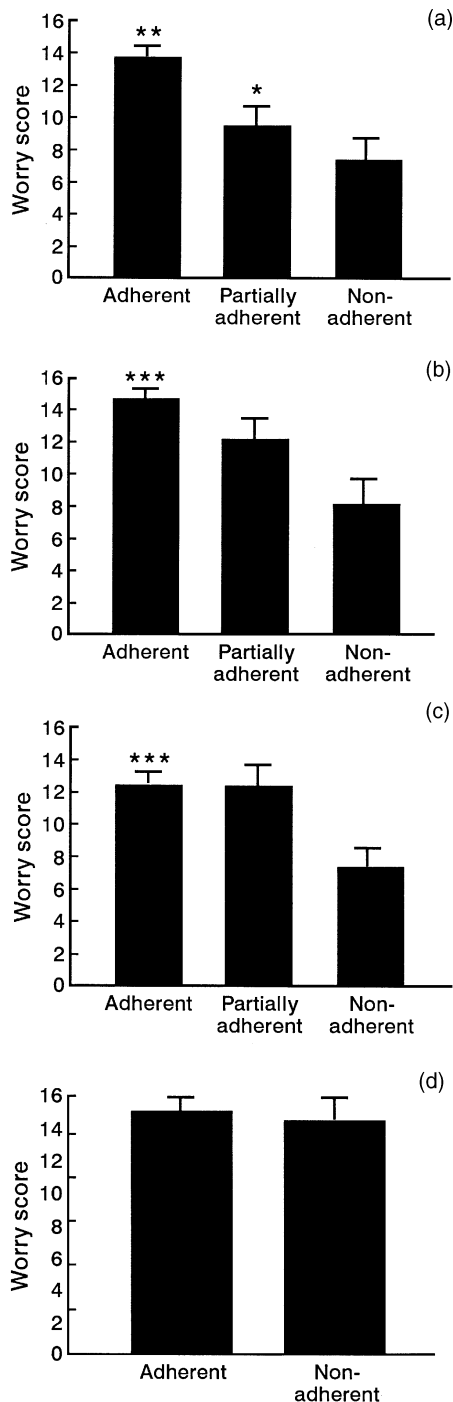


Figure 1 Mean worry scores for the adherence groups to (a) physiotherapy, (b) enzymes, (c) vitamins and (d) exercise regimens. [Thorax 1996;51:1233-8, with permission from the BMJ Publishing Group (see Ref 23)]
 ***P50.001, **P50.01, *P50.05 when compared with the non-adherent group

exercise, enzymes and diabetic care is higher at 80%^{4,7}. Any global score of compliance in CF is therefore inappropriate. Despite the introduction of various new therapies, the high rates of non-compliance with chest clearance have slightly improved over the years, from 41%¹³ to around 30%^{4,7}. Perhaps this is a surprising finding considering that chest clearance has been reported to be the most disliked of all treatments⁴ and only half of the patients in the study by Abbott *et al.* reported that their chest felt better following chest physiotherapy. Treatments requiring time and effort with no immediate benefit like chest physiotherapy, nebulized antibiotics and dietary supplements, appear to have the lowest compliance rates, ranging from 65%–41%⁴. A recent study which used objective measures of compliance with nebulized dornase alpha in adults reported a mean compliance of 84%¹⁴. This high rate of compliance with nebulized dornase alpha has been noted by others¹⁵. It possibly reflects the immediate benefit of the treatment with dornase alpha compared with nebulized antibiotics which offer no immediate relief and may even cause immediate adverse symptoms such as chest tightness¹⁶.

Compliance with treatment may be perceived differently by the prescriber and the patient. Abbott *et al.* reported that although 53% of patients were judged to be compliant with chest physiotherapy, 67% of patients considered their daily amount of chest clearance to be adequate. In contrast, 75% of patients exercised to a beneficial level, but only 37% considered this to be sufficient. This perception of compliance and understanding of self-treatment may influence levels of compliance. Overall compliance with CF care is considered to be higher than with other chronic diseases^{4,7,13,17,18} probably as a result of focusing on the short-term benefits of treatment and the consequences of the unpleasant symptoms of non-compliance.

REASONS FOR NON-COMPLIANCE

The reasons for non-compliance with treatment are many and varied and it is difficult to determine why patients decide to adopt the behaviour of compliance or non-compliance. Abbott and Gee grouped the reasons for missing treatment into four categories; health, time, social and emotional⁹. The major reasons appeared to fall into the health (I feel well without treatment, I'm not as serious as others, I don't feel any benefit) and time (not enough time, I am too busy, I forget) categories. The social reasons (interferes with social life, embarrassing taking enzymes in public or doing physiotherapy) were less important and the emotional factors (I resent it, I can't be bothered) were the minor reasons for non-compliance. Koocher and colleagues have described non-adherence in three groups based on knowledge and beliefs: (1) inadequate knowledge; (2)

compliance rate of around 50%¹². In CF it is recognized that compliance is treatment specific and compliance with one treatment is unrelated to compliance with other treatments^{4,7,13}. Compliance with chest clearance is frequently reported at 50%^{4,7,13} whereas compliance with

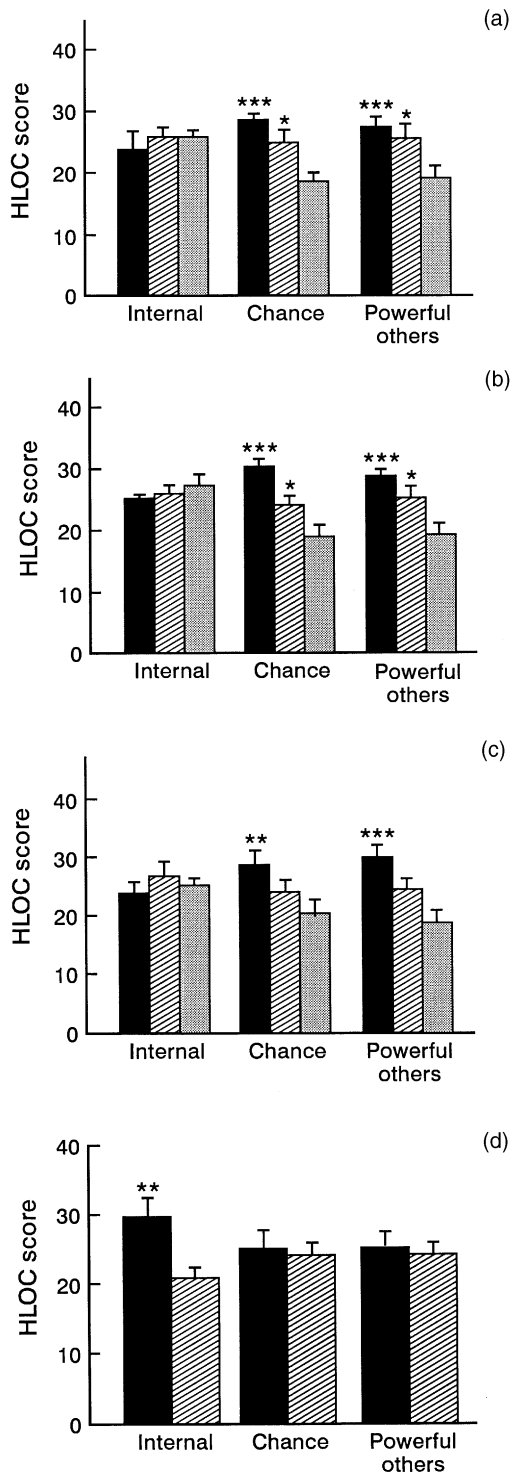


Figure 2 Mean Health Locus of Control (HLOC) scores for the adherence groups to (a) physiotherapy, (b) enzymes, (c) vitamins and (d) exercise regimens. Internal control indicates the extent to which patients perceive themselves to be in control of their cystic fibrosis; the chance scale reflects the degree to which patients believe that chance factors such as fate and luck influence their health; and the powerful others scale measures the extent to which they believe their disease is controlled by health professionals and/or family. ■ Adherent; ▨ part adherent; ▩ non-adherent [Thorax 1996;51: 1233-8, with permission from the BMJ Publishing Group (see Ref 23)] ***P50.001, **P50.01, *P50.05 when compared with the non-adherent group

psychosocial resistance; and (3) educated non-adherence¹⁹. It is important to assess these beliefs in order to widen our understanding of non-compliant behaviour and formulate strategies to improve compliance.

Knowledge is considered to be an important precursor to compliance, although high levels of knowledge will not guarantee compliance with treatments. The association between knowledge and compliance in CF is controversial^{6,8,20}. These studies often relate to knowledge of the disease rather than specific knowledge of the treatments. If compliance with treatment is to be improved, we should appraise the state of knowledge of that particular treatment and address any misunderstandings. One study used a questionnaire to test the knowledge and understanding of an airway clearance technique used by a group of adult CF patients²¹. Although 30/51 patients perceived they understood the technique, only 20 patients answered 480% of the questions correctly. Individualized teaching specific to each patient's lung disease improved knowledge and reported compliance increased from 56% to 80% following teaching. This improvement remained at 73% at long-term follow-up. Clearly, from that study, perceived knowledge did not match actual knowledge of treatment and correction of those misconceptions improved reported compliance in the short term. Knowledge and understanding of treatments should therefore be updated and reinforced with changes in disease and lifestyle, if compliance is considered to be a prerequisite for effectiveness of treatment.

Psychosocial resistance includes the theories of struggle for control, peer pressure, difficult home circumstances, denial and depression. Educated non-adherence implies that patients will make a choice between the obvious costs of a treatment and the benefits of non-compliance on their lifestyle. These cognitive processes can possibly be recognized when patients' perceptions and health beliefs are examined in relation to compliance. Adults who worried about their health were shown to adhere to their physiotherapy, enzymes and vitamin treatments to a greater extent than those who were unconcerned (Figure 1)^{22,23}. Patients who were shown to have internal control over their disease complied to a lesser extent than those with less control over their disease (Figure 2)²². This outcome is contrary to the expectation that patients with internal control would adhere to treatments. Presumably those patients have made a reasoned decision that the benefits of adherence outweigh the costs in terms of quality of life. Exercise was perceived differently from other treatments and, in contrast, those with internal control beliefs had higher levels of adherence. Exercise was not associated with higher worry scores. This may be explained by the concept that exercise is a 'normal' activity rather than a treatment.

It is recognized that the objective measures of disease severity bear no relationship to compliance⁷. It is perhaps

for this reason that the physician and patient ratings of disease severity and level of self-care differ²⁴. Compared with the physician, patients underestimate their disease severity and overestimate their level of self-care. It may be concluded that patient perception of disease severity may influence compliance. However, Abbott *et al.* demonstrated that patients' perception of past, current, or future disease severity, or susceptibility to recurrent infection had no association with compliance²². Patients with CF are known to minimize their disease severity by denial²⁵. Therefore, it may be that this educated non-compliance with treatment is an adaptive way of coping with the seriousness of their disease.

Compliance and non-compliance have been linked to styles of coping behaviour using The Manchester Cystic Fibrosis Coping Scale²⁶. The scale identified two types of coping: (1) hopefulness (acting, thinking and feeling in a positive, determined and optimistic way); and (2) resignation (acting, thinking and feeling in an avoidant, passive and helpless way). Compliance with physiotherapy, exercise and enzyme treatments were associated with the style of hopefulness and optimism. Similar findings of optimism and compliance with treatment have been reported by other authors^{8,27,28}. In contrast, the non-compliant patients scored higher on the resignation scale. This association of non-compliance and an avoidant passive style of behaviour may have a negative effect on health. However, it may simply be the best way for the patient to cope with their CF rather than be a rebellious attitude to medical advice.

MEASURES OF COMPLIANCE

Measures of compliance are either subjective or objective. Subjective measures include self-report methods of recall (at interview and in questionnaires) and diary or chart observations. Objective measures can be direct and indirect. Direct measures include blood or urine assays and indirect measures are capsule counts, prescription collection and mechanical devices. The conclusions of most studies of compliance are based on self-report methodology. It is well recognized that self-report is overestimated when compared with objective measures—CF is no exception¹⁴. Lask categorized non-adherence into behaviour patterns which reflect honesty of reporting²⁹. The groups are described as: (a) refusers who readily admit to non-adherence and appear similar to educated adaptive groups who feel they do not need the treatment or the treatment is worse than the symptoms; (2) procrastinators who will admit to only occasional misses with treatment; and (3) deniers who do not admit to non-adherence. These three groups were identified in a recent study which compared self-report data with data of prescription collection¹⁴. If the

Table 2 Factors associated with compliance and non-compliance

Increased compliance	Decreased compliance
Immediate relief of symptoms	No perceived benefit
Help and support with treatment	Loneliness and isolation
Encouraging self-management	Complexity of treatment regimen
Personal control of the disease	Fear of, and adverse side effects
Worrying about the disease	Pessimistic way of coping
Optimistic ways of coping	
Individualized teaching of specific treatments	

prescription data showed compliance to be 570%, the physician questioned the patients about their prescription collection and the patients were made aware of the prescription information during the interview. Some patients admitted to their non-adherence, whereas others denied the accuracy of data and reported 100% adherence. When these data were cross-checked with general practitioner records, they confirmed the validity of the prescription data. The use of objective measures of compliance allows us to identify these patterns of behaviour and may be useful in choosing interventions which enhance compliance and are specific to individual patients. However, it gives rise to concern when the information is used to influence financial contracts for healthcare¹⁴.

MANAGEMENT OF NON-COMPLIANCE

Although studies have provided us with an insight into non-compliant behaviour, many questions remain as to its

Box 1 Considerations for improving compliance

- Recognize that 100% compliance is unrealistic
- Accept that non-compliance is normal behaviour
- Encourage openness with self-reporting by adopting a non-judgmental approach
- Simplify treatments
- Provide individualized treatment specific education
- Address barriers to non-compliance through careful and effective communication
- Accept compromise
- Agree treatment planning and decisions
- Tailor treatments to daily lifestyle
- Encourage self-management and self-efficacy
- Give support and praise efforts

management. Factors not associated with compliance in CF include age, gender, socio-economic status, clinic contacts and disease severity⁷. Factors more likely to influence compliance are: symptomatic disease, fears of side effects, the complexity of the treatment and duration (Table 2). Any intervention should address individual needs and a self-management approach to care. Self-monitoring of symptoms and interpreting the significance, through communication with the multidisciplinary team, has been suggested to enhance compliance^{30,31}. Psychological influences, patient beliefs and coping styles are important factors influencing compliance and may facilitate our ability to manage non-compliance. Care is required with any intervention to ensure that a beneficial outcome is achieved. It would appear harmful to foster the idea of worrying about disease severity in order to motivate compliance. Changing a passive coping style to improve adherence may alter the ability to cope with the disease and interfere with quality of life. Being a large sputum producer, feeling better following the treatment and help with treatment were significant factors influencing compliance with chest physiotherapy⁷. It has been stated that independence with treatment may be a mixed blessing as patients often feel lonely and isolated^{28,32}. The significance of support has been emphasized in the development of a recent Quality of Life Questionnaire³³. Respondents considered that a supportive family and partner were the most important items of 117 items relating to quality of life. It is accepted that non-compliance is normal and inherent in everyone's behaviour. A non-judgmental approach and empathy with care by the team will encourage patients to be open about their compliance with treatment. Education specific to individual treatments and clear communication are relevant strategies in the overall picture of improving compliance (Box 1).

THE FUTURE

As our knowledge of the disease evolves and the consequences of an ageing disease emerge, new therapies will develop and the burden of self-care will continue to increase. For example, reduced bone mineral density has recently been identified as a prevalent complication of CF³⁴ and although strategies to prevent and treat its progression are unclear, experience suggests that it will require an intervention which is lifelong. Stress incontinence is an example of another newly recognized complication affecting female patients³⁵, and requires time-consuming treatment. The burden of self-care is continually increasing. Scientific evidence of care must now be balanced with patient acceptability³⁶, and the initial prescription should be considered as a trial of both treatment effectiveness and the feasibility of taking it³⁷. The medical team has to be

prepared to adopt a non-judgmental approach and must assess each patient's perceptions and beliefs, consider their treatment burden and lifestyle, and accept the challenge that concordance offers the promise of a change in non-compliant behaviour.

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