patients with renal impairment. This meta-analysis cannot answer these questions, but we need to remember we never had all the answers when we were using multiple daily doses.

It is proving difficult to change entrenched prescribing behaviours. I believe we do not need further studies of efficacy and safety. Nor need we wait for

evidence that allocating resources to implement a once daily dosing policy is worth while. What we need is a commitment to change now.

- 1 Oxman AD, Cook DJ, Guyatt GH. Users' guides to the medical literature VI. How to use an overview. *JAMA* 1994;272:1367-71.
- 2 McCormack JP, Jewesson PJ. A critical reevaluation of the "therapeutic range" of aminoglycosides. *Clin Infect Dis* 1992;14:320-39.

Compliance therapy in psychotic patients: randomised controlled trial

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Abstract

Objective—To determine whether compliance therapy, a cognitive-behavioural intervention, could improve compliance with treatment and hence social adjustment in acutely psychotic inpatients, and if so, whether the effect persisted six months later.

Design—Randomised controlled trial of compliance therapy and non-specific counselling, each comprising 4-6 sessions lasting 10-60 minutes.

Setting—Acute psychiatric admissions ward serving an inner London catchment area.

Subjects—47 patients with psychosis.

Main outcome measures—Informant and observer reported measure of compliance; observer assessed global functioning after intervention and three and six months later; self rated attitudes to drug treatment after the intervention and one month later; symptom scores after intervention and six months later.

Results—25 patients received compliance therapy and showed significantly greater improvements in their attitudes to drug treatment and in their insight into illness and compliance with treatment compared with the control group. These gains persisted for six months. The intervention group was 5.2 times more likely than the control group to reach a criterion level of compliance (95% confidence interval 1.5 to 18.3). Global functioning showed a tendency to improve more in the intervention group after a delay (odds ratio 3.0 (0.8 to 11.5) to reach the criterion level at six months). Four subjects given compliance therapy and six in the control group were readmitted during follow up (odds ratio 2.0 (0.48 to 8.2)).

Conclusions—Compliance therapy is a pragmatic method for improving compliance with drug treatment in psychotic inpatients and its gains persist for at least six months. Overall functioning may also be enhanced.

Introduction

Up to 80% of psychotic patients fail to comply with their treatment.¹ Given the established efficacy of neuroleptic drugs in psychotic disorders,² and the potentially devastating consequences of relapse,³ non-compliance is one of the major preventable causes of psychiatric morbidity⁴ and a research priority for the NHS. Among the most powerful predictors of compliance are attitudes to treatment and insight into illness.^{5,6} Other possible determinants include culture and ethnic group,⁷ response to treatment, side effects, symptoms—for example, delusions about drug treatment or of grandeur^{8,9}—and the relationship between patient and health professional (treatment alliance).¹⁰

Many strategies to improve compliance have been suggested,^{11,12} but few have been systematically evalu-

ated. Seltzer *et al* found improved compliance in a controlled study of a psychoeducational package in 67 inpatients, but their study was not randomised.¹³ A similar investigation in outpatients with various psychoses who were attending a rehabilitation unit found gains in knowledge and attitudes, but these were not evident at the six month follow up examination and compliance was not enhanced.¹⁴ A small study that compared a behavioural with an educational intervention found an advantage for the behavioural intervention at three months.¹⁵ Eckman *et al* studied an intensive (80 hours), comprehensive, behaviourally oriented programme on how to manage drug treatment.¹⁶ A multicentre field trial showed the programme's effectiveness in acquiring such skills and in improving compliance from 60% to 80%; a smaller controlled trial confirmed these results, though the data on compliance were not provided.¹⁷ These studies encouraged us to investigate a generalisable psychotherapeutic technique for improving compliance in patients with acute psychosis.

Our intervention—compliance therapy—borrows extensively from motivational interviewing,¹⁸ which is a technique used in a number of medical settings.¹⁹ It aims to help people change their behaviour while avoiding the confrontation and stalemate of many conventional doctor-patient interactions. Modifications were added for use with psychotic patients, with a more active therapeutic stance, guided problem solving, and an increased educational component. A pilot study showed the feasibility of the approach but pointed towards some necessary adjustments.²⁰ These included increasing the number of sessions and adding cognitive approaches to psychotic symptoms, especially when they impinged on compliance.²¹ In its final form, which we call compliance therapy, the approach is brief and pragmatic, being applicable to acutely psychotic patients in a standard inpatient environment.

We report the first results of a controlled trial of its efficacy, both immediate and after six months. The primary outcome measure was compliance with neuroleptic treatment; secondary outcome measures were symptom scores, insight and attitudes, and global social functioning.

Patients and methods

The study population was drawn from consecutive patients aged 18-65 who were admitted with acute psychosis over eight months to a ward of the Maudsley Hospital, which serves an inner London catchment area. Non-English speakers and subjects with a low intelligence quotient (IQ), deafness, or organic brain disease were excluded, leaving 68 eligible patients from whom consent to enter the trial was sought. Patients were assessed within one week of admission, or, in a

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few cases, after they had spent some time in an intensive care unit. The non-participation rate was 31% because 12 patients refused to take part and nine were discharged rapidly. The remaining 47 subjects suffered from schizophrenia; severe affective disorders; schizophreniform, schizoaffective, delusional disorders; and psychotic disorder not otherwise classified (see table 1). All diagnoses were according to the criteria of the *Diagnostic and Statistical Manual of Mental Disorders*, third edition, revised (DSM-III-R). Most subjects were in relapse. All were receiving neuroleptic drugs, and 16 were also receiving antidepressants or lithium.

INTERVENTION

Patients were randomly assigned by means of a table of random numbers to compliance therapy or control treatment. The intervention consisted of 4-6 sessions (mean 5.1) of compliance therapy, as described above, lasting 20-60 minutes roughly twice a week. The control treatment consisted of a similar number of sessions (mean 4.9) of supportive counselling in which the same therapists listened to the patients' concerns but declined to discuss treatment. Most of the therapy was carried out on the ward by a research psychiatrist (RK), with additional help from a clinical psychologist (PH).

In the first two sessions of compliance therapy patients were invited to review their history of illness and conceptualise the problem. In the next two sessions discussion became more specific, focusing on symptoms and the side effects of treatment. The benefits and drawbacks of drug treatment were considered, the patient's ambivalence was explored, and the therapist highlighted discrepancy between the patient's actions and beliefs, focusing on adaptive behaviours. In the last two sessions the stigma of drug treatment was tackled by considering that drugs are a freely chosen strategy to enhance the quality of life. Self efficacy was encouraged and the value of staying well and thus the need for prophylactic or maintenance treatment was emphasised. The therapist encouraged the use of metaphors such as "protective layer" and "insurance policy."

After discharge from hospital, all subjects received routine aftercare as determined by the clinical teams responsible for their care.

ASSESSMENTS

Before the intervention all patients completed a battery of assessments, which included the brief psychiatric rating scale for the main psychiatric symptoms (range 24-168)²²; the global assessment of functioning scale (range 0-100, with 10 defined anchor points relating to social competence)²³; the national adult reading test, an estimate of IQ before the development of illness²⁴; the drug attitudes inventory, a self reported scale predictive of compliance.²⁵ Semistructured interviews included the expanded schedule for assessment of insight (with scores expressed as a percentage of maximum insight)^{10 26} and our own attitudes to medication questionnaire (available from us).²⁰ Adverse effects of drug treatment were measured on the Simpson-Angus scale for extrapyramidal side effects²⁷ and on the Barnes akathisia scale.²⁸

OUTCOME MEASURES

Initial compliance was rated blind to intervention by the patients' primary nurses on a seven point rating scale. Complete refusal was scored as 1. Partial refusal—for example, refusing depot drugs or accepting only the minimum dose—was scored as 2. Reluctant acceptance—accepting only because treatment is compulsory or questioning the need for treatment often (every two days)—was scored as 3. Occasional reluctance about

treatment—questioning the need for treatment once a week—was scored as 4. Passive acceptance was scored as 5. Moderate participation—some knowledge of and interest in treatment and no prompting needed to take the drugs—was scored as 6. Active participation, ready acceptance, and taking some responsibility for treatment was scored 7.

All ratings were repeated before discharge and after the intervention. Three months later social functioning was evaluated on the global assessment of function scale.²³ A composite compliance measure was obtained by using our seven point scale and was based on corroboration from as many sources as possible (mean 2), including relatives, the psychiatrist at the outpatient clinic, the community psychiatric nurse, and the general practitioner. The evaluations at three months were all repeated at six months with the addition of an abridged brief psychiatric rating scale of seven items (including main psychosis items, negative symptoms, and depression). The evaluations at six months were carried out by an independent assessor (GA, a community psychiatric nurse) blind to intervention.

ANALYSIS

The BMDP:5V program was used to construct models for repeated measures analyses for each response variable of interest. The program makes maximum use of data, taking account of missing variables.²⁹ Apart from intervention, time, and the interaction of group and time, the appropriate preintervention score, age, IQ, and chronicity were considered for possible inclusion in the fitted models. Such an analysis is more powerful than simply examining the change in scores before and after intervention.³⁰ The final models take into account baseline data. They do not include effects found to be non-significant in the preliminary model fitting process.

Results

CHARACTERISTICS OF PATIENT SAMPLE

The characteristics of the sample are shown in table 1. Thirty three patients had a non-affective psychosis. Sociodemographic variables were similar in the two groups. Of the 21 patients who refused to enter the study, 14 were women, 16 were non-white, and 16 were detained under the Mental Health Act.

Before intervention the compliance therapy group had significantly higher symptom scores than the control group—that is, they were more ill—on the brief psychiatric rating scale (64.1 v 55.4, $t=2.09$, $P<0.04$). This was reflected in non-significantly higher doses of neuroleptic drugs (mean (SD) 977 (797) mg v 698 (521) mg in chlorpromazine equivalents). Twelve

Table 1—Characteristics of groups receiving compliance therapy and non-specific counselling. Values are numbers of patients unless stated otherwise

	Compliance therapy (n=25)	Non-specific counselling (n=22)
Mean (SD) age (years)	35 (12.0)	39 (12.2)
Ethnic group (non-white)	16	13
Women	13	11
Mean (SD) No of years of illness	8.4 (6.4)	12.6 (10)
Mean (SD) No of admissions	4.7 (3.9)	4.3 (5.1)
Affective disorder	7	7
Schizophrenic (DSM-III-R)	14	10
First admission	3	5
Mean (SD) length of index admission (weeks)	5.5 (4.2)	6.8 (4.8)
Detained under Mental Health Act	13	12
Mean (SD) national adult reading test	108 (8.0)	107 (7.4)

Table 2—Results of outcome measures before and after intervention

Measure (time (months))	Compliance therapy		Non-specific counselling	
	Mean (SD) score	No of patients	Mean (SD) score	No of patients
Brief psychiatric rating scale				
Full:				
Before intervention	64.1 (14.8)	25	56.2 (14.7)	22
After intervention	38.7 (10.5)	25	35.4 (6.90)	22
Seven item version:				
Before intervention	21.7 (7.8)	25	19.1 (7.4)	22
After intervention	12.4 (5.3)	25	11.0 (2.7)	22
At 6 months	14.5 (7.6)	22	15.1 (6.1)	18
Global assessment of function				
Before intervention	36.2 (10.2)	25	40.2 (9.8)	22
After intervention	51.6 (14.6)	25	51.7 (11.5)	22
At 3 months	53.5 (16.9)	21	46.6 (9.8)	18
At 6 months	48.6 (15.8)	22	43.7 (8.3)	18
Drug attitudes inventory				
Before intervention	45.5 (7.1)	25	45.6 (7.5)	22
After intervention	52.3 (6.2)	25	47.6 (8.1)	22
At 1 month	50.8 (5.6)	24	46.2 (8.5)	19
Attitudes to treatment questionnaire				
Before intervention	14.4 (4.4)	25	14.1 (6.9)	22
After intervention	19.6 (3.8)	25	16.0 (6.1)	22
Schedule for assessment of insight				
Before intervention	37.7 (21.1)	25	38.3 (34.2)	22
After intervention	59.3 (24.6)	25	43.2 (35.8)	22
At 6 months	63.5 (23.4)	20	42.7 (32.3)	17
Compliance				
Before intervention	3.4 (1.3)	25	4.0 (1.3)	22
After intervention	5.5 (1.0)	25	4.3 (1.6)	22
At 3 months	5.4 (1.4)	24	4.4 (1.9)	20
At 6 months	5.6 (1.4)	22	4.0 (1.9)	18

Table 3—Odds ratios (95% confidence intervals) for improvement in compliance and global assessment of function scores comparing compliance therapy with non-specific counselling

Outcome measure	After intervention (n=47)	At 6 month follow up (n=40)
Compliance:		
Any improvement	64.0 (7.0 to 584)	31.5 (6.2 to 160)
Improvement to criterion level*	6.3 (1.6 to 24.6)	5.2 (1.5 to 18.3)
Global assessment of function:		
Any improvement	8.5 (0.8 to 80.6)	8.0 (1.5 to 42.6)
Improvement to criterion level†	0.9 (0.3 to 2.9)	3.0 (0.8 to 11.5)

*Score ≥ 5 .

†Score ≥ 50 .

patients in each group were receiving intramuscular depot antipsychotics. The two groups had similar scores for insight, attitudes to treatment, and compliance. Compliance was 3.4 in the group receiving compliance therapy and 4.0 for the control group ($z=1.35$, $P=0.18$), indicating rather poor initial compliance.

OUTCOME IMMEDIATELY AFTER INTERVENTION

Both groups had substantially improved symptom scores over the two assessments. The mean changes were 38.7 (10.5) and 35.4 (6.9), with no significant difference between them (table 2). Insight and compliance improved by about 10% in controls and by about 40% in the intervention group ($P<0.001$).

FOLLOW UP

Eight subjects were lost to follow up, four from each group. The background characteristics and ratings before intervention did not differentiate subjects who dropped out from those who completed the trial. Five patients refused to continue, one patient was uncontactable, one patient had moved out of the area, and one 65 year old man with hypertension had died of a stroke. Four patients in the intervention group and

six in the control group were readmitted during the follow up period (odds ratio 2.0 (95% confidence interval 0.48 to 8.2)).

PSYCHIATRIC SYMPTOMS

Total scores on the brief psychiatric rating scale improved significantly after intervention, but scores for the abridged version of seven items deteriorated slightly in both groups by six months. Analysis with schizophrenia diagnosis as a covariate showed no differences in outcome in any of the main outcome variables.

COMPLIANCE WITH AND ATTITUDES TO TREATMENT

For compliance a significant effect was found for intervention, and it was sustained during follow up. The mean difference between the intervention group and controls on the seven point compliance scale was 1.6 (1.2 to 2.4), which is equivalent to a 23% improvement. IQ was found to exert a small but significant effect on compliance—the higher the IQ the better.

For the symptom scores, group and the interaction between group and time had no effect. The drug attitudes scores showed an effect for group, with a mean difference of 4.7 (2.4 to 9.2) in favour of the intervention group. Scores in both groups fell slightly but at the same rate at the one month follow up. Age exerted a significant influence on scores on the drug attitudes inventory, with older patients tending to have better scores, though length of history and IQ exerted no influence. Similar results were found for the other attitudes to medication scale, which showed a significant advantage for the intervention group immediately after compliance therapy (mean difference 3.6 (95% confidence interval 2 to 6)). The results are illustrated in figure 1.

There was no significant difference between the two groups in dose of antipsychotic drugs; both showed large reductions over the six months of follow up.

INSIGHT

For the expanded schedule for the assessment of insight scale there was again a significant effect for group but no significant effect of time or of the group by time interaction at follow up. Therefore, patients who received compliance therapy had significantly greater insight after intervention (mean difference 16.1% (15% to 33%)) and retained this improvement six months later.

GLOBAL FUNCTION

Global function scores were not significantly better immediately after the intervention. However, there was a significant group by time interaction, with the intervention group tending to improve more as time went by (fig 2).

To further highlight the efficacy of compliance therapy, table 3 shows odds ratios calculated on an intention to treat basis, with patients who dropped out being assigned the worse outcome. The compliance results were highly significant (χ^2 , $P<0.005$) when a stringent criterion outcome score of at least 5 on our

Fig 1—Attitudes to treatment (drug attitudes inventory) and compliance over time in patients receiving compliance therapy or non-specific counselling (controls)

Fig 2—Global functioning over time in patients receiving compliance therapy or non-specific counselling

compliance scale (passive compliance or better) was considered. When improvement was defined categorically as a score of 50 or more on the global assessment of functioning scale the odds ratio was 3.0 but failed to reach significance at the 5% level.

PREDICTORS OF OUTCOME

To establish which measures were most predictive of compliance at six months in the group given compliance therapy we performed stepwise linear regression with backward elimination, entering the preintervention scores for psychiatric and other symptoms, IQ, age, detention under the Mental Health Act, insight, and attitudes to treatment. This showed significant effects of detention under the Mental Health Act (voluntary patients complied better; $\beta=0.38$, $t=2.71$, $P<0.02$), extrapyramidal symptoms (more symptoms, worse compliance; $\beta=-0.38$, $t=2.83$, $P<0.02$), and attitudes to treatment ($\beta=0.35$, $t=2.64$, $P<0.02$ for drug attitudes inventory scores). These variables accounted for 62.5% of the variance in compliance.

Discussion

The application of several cognitive-behavioural techniques to the treatment of psychosis is being seen increasingly.²¹ We sought to tackle the wider problem of poor treatment adherence in patients with psychotic disorders. We targeted compliance with drug treatment, generally neuroleptics, since these drugs are undoubtedly effective in most patients and are the mainstay of routine treatment.² The results show the effectiveness of compliance therapy in improving insight, attitudes, and compliance in the short term. These gains are maintained without significant erosion for six months. We could not establish that the gains translated into substantially improved functioning when we set a minimum criterion, and further follow up will be required to establish if there is a reduction in relapse rates. Similarly, we do not yet know if the gains

described will repay the cost of the intervention when subjected to a cost-benefit analysis.

We cannot be sure whether improvements in overall functioning, however slight, resulted directly or indirectly from our intervention. The seriousness of symptoms did not differ between the groups. The therapy, by combating stigma and fostering insight, may be beneficial in its own right regardless of improved compliance with drug treatment.

Our analyses suggest that attitudes to treatment have a bearing on compliance, as do the extrapyramidal side effects of neuroleptic drugs. Involuntary admission predicted poorer compliance six months later, independently of psychiatric illness, which confirms earlier reports.^{31,32} Other studies,^{8,33} but not all,^{5,6} have suggested that extrapyramidal side effects reduce compliance, although akathisia did not emerge as important in our study.

METHODOLOGICAL CONSIDERATIONS

Several points require additional clarification. The first deals with the measure of compliance. This was an indirect composite measure based on information from a number of sources. There are problems associated with more direct measures such as urine tests since these may overestimate compliance when drugs have a long half life.³⁴ Serum assays, when available, are invasive and are of limited value in assessing partial compliance.³⁵ Pill counts are widely considered a useful measure,⁴ despite the potential for dissimulation and inaccuracy. We used an observer rated measure of compliance, which correlated strongly at each time point with self reported measures of attitudes to drug treatment ($r>0.68$), lending it some concurrent validity.

Observer bias was another potential problem. Most of the ratings of functioning and compliance initially and at three months were made by a research psychiatrist (RK), who was not blind to intervention group. However, the compliance ratings were based on information from impartial sources, including community psychiatric nurses and outpatient doctors on the clinical teams. By contrast, the ratings at six months were carried out by a researcher (GA) trained in the use of all the ratings, who was blind to intervention group. The results show consistency between ratings at the two time points. We believe that, despite these shortcomings, compliance therapy does have a measurable and positive effect on adherence to treatment.

IMPLICATIONS

Are these findings generalisable? Around a third of the sample refused to enter the study and some dropped out. However, these figures must be interpreted in the light of the minimal selection criteria and the severe illness in our patient population. We believe that compliance therapy is eminently suited for adaptation to typical busy clinics, and we intend to examine the ease with which the technique may be taught to a range of health professionals. Psychotic patients, largely because of their illness, are often reluctant to acknowledge the need for the very treatment that might give them some relief. Given the high human and social costs of relapse and persisting symptoms, any proved means of counteracting this reluctance has important implications for management.

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1 Corrigan PW, Liberman RP, Engel JD. From noncompliance to collaboration in the treatment of schizophrenia. *Hosp Community Psychiatry* 1990;41: 1203-11.

Key messages

- Compliance with neuroleptic treatment is an important determinant of recovery, rate of relapse, and illness in patients with psychosis
- Compliance is strongly related to attitudes to treatment and to insight
- The study found that such attitudes may be influenced by a simple and brief intervention known as compliance therapy
- Compliance therapy compared with non-specific counselling leads to improved compliance
- The improvement is sustained for at least six months and may lead to improved social functioning

- 2 Davis JM, Andruikaitis S. The natural course of schizophrenia and effective maintenance drug treatment. *J Clin Psychopharmacol* 1986;6(suppl 1):2-10.
- 3 Coid JW. The Christopher Clunis enquiry. *Psychiatric Bulletin* 1994;18:449-52.
- 4 Kane JM. Problems of compliance in the outpatient treatment of schizophrenia. *J Clin Psychiatry* 1983;44:3-6.
- 5 Marder SR, Mebane A, Chien CP, Winslade WJ, Swann E, Van Putten T. A comparison of patients who refuse and consent to neuroleptic treatment. *Am J Psychiatry* 1983;140:470-2.
- 6 Kelly GR, Mamon JA, Scott JE. Utility of the health belief model in examining medication compliance among psychiatric outpatients. *Soc Sci Med* 1987;11:1205-11.
- 7 Sellwood W, Tarrier N. Demographic factors associated with extreme non-compliance in schizophrenia. *Soc Psychiatry Psychiatr Epidemiol* 1994;29:172-7.
- 8 Van Putten T. Why do schizophrenic patients refuse to take their drugs? *Arch Gen Psychiatry* 1974;31:67-72.
- 9 Van Putten T, Crumpton E, Yale C. Drug refusal in schizophrenia and the wish to be crazy. *Arch Gen Psychiatry* 1976;33:1443-6.
- 10 Kemp R, David A. Insight and compliance. In Blackwell B, ed. *Compliance and the treatment alliance in serious mental illness*. Newark, NJ: Gordon and Breach Publishing Group (in press).
- 11 Falloon IRH. Developing and maintaining adherence to long-term drug-taking regimens. *Schizophr Bull* 1984;10:412-7.
- 12 Goldstein MJ. Psychosocial strategies for maximising the effects of psychotropic medications for schizophrenia and mood disorder. *Psychopharmacol Bull* 1992;28:237-40.
- 13 Seltzer A, Roncari I, Garfinkel P. Effect of patient education on medication compliance. *Am J Psychiatry* 1980;25:638-45.
- 14 Streicker SK, Amdur M, Dincin J. Educating patients about psychiatric medications: failure to enhance compliance. *Psychosoc Rehab J* 1986;4:15-28.
- 15 Boczkowski JA, Zeichner A, DeSanto N. Neuroleptic compliance among schizophrenic outpatients: an intervention outcome report. *J Consult Clin Psychol* 1985;53:666-71.
- 16 Eckman TA, Liberman RP, Phipps CC, Blair KE. Teaching medication management skills to schizophrenic patients. *J Clin Psychopharmacol* 1990;10:33-8.
- 17 Eckman TA, Wirshing WC, Marder SR, Liberman RP, Johnston-Cronk K, Zimmerman K, et al. Technique for training patients in illness self-management: a controlled trial. *Am J Psychiatry* 1992;149:1549-55.
- 18 Miller WR, Rollnick S. *Motivational interviewing: preparing people to change*. New York: Guilford Press, 1991.
- 19 Rollnick S, Heather N, Bell A. Negotiating behaviour change in medical settings: the development of brief motivational interviewing. *Journal of Mental Health* 1992;1:25-37.
- 20 Hayward P, Chan N, David A, Kemp R, Youle S, David A. Medication self-management: a preliminary report on an intervention to improve medication compliance. *Journal of Mental Health* 1995;4:511-7.
- 21 Garety PA, Kuipers L, Fowler D, Chamberlain F, Dunn G. Cognitive behavioural therapy for drug-resistant psychosis. *Br J Med Psychol* 1994;67:259-71.
- 22 Lukoff D, Lieberman RP, Neuchterlein KH. Symptom monitoring in the rehabilitation of schizophrenic patients. *Schizophr Bull* 1986;12:578-602.
- 23 Endicott J, Spitzer RL, Fliess JL, Cohen J. The global assessment scale. A procedure for measuring overall severity of psychiatric disturbance. *Arch Gen Psychiatry* 1976;33:766-71.
- 24 Nelson HE. *National adult reading test (NART): test manual*. Windsor: NFER-Nelson, 1982.
- 25 Hogan TP, Awad AG, Eastwood R. A self-report scale predictive of drug compliance in schizophrenics: reliability and validity. *Psychol Med* 1983;13:177-83.
- 26 David AS. Insight and psychosis. *Br J Psychiatry* 1990;156:798-808.
- 27 Simpson GM, Angus JWS. Drug-induced extrapyramidal disorders. *Acta Psychiatr Scand* 1970;45(suppl 212):11-9.
- 28 Barnes TRE. A rating scale for drug-induced akathisia. *Br J Psychiatry* 1989;154:672-6.
- 29 Everitt BS. The analysis of repeated measurements: a practical review with examples. *Statistician* 1995;44:113-35.
- 30 Frison L, Pocock SJ. Repeated measures in clinical trials: analysis using mean summary statistics and its implications for design. *Stat Med* 1992;11:1685-704.
- 31 McEvoy JP, Appelbaum PS, Apperson LJ, Geller JL, Freter S. Why must some schizophrenic patients be involuntarily committed? The role of insight. *Compr Psychiatry* 1989;30:13-7.
- 32 David A, Buchanan A, Reed A, Almeida O. The assessment of insight in psychosis. *Br J Psychiatry* 1992;161:599-602.
- 33 Hoge SK, Appelbaum PS, Lawlor T, Beck JC, Litman R, Greer A, et al. A prospective, multi-center study of patients' refusal of antipsychotic medication. *Arch Gen Psychiatry* 1990;47:949-56.
- 34 Churchill DN. Compliance—how to measure it. *Modern Medicine of Canada* 1985;40:1068-70.
- 35 Babiker IE. Noncompliance in schizophrenia. *Psychiatric Developments* 1986;4:329-37.

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Absence of dyspeptic symptoms as a test for *Helicobacter pylori* eradication

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Eradication of *Helicobacter pylori* changes the course of duodenal ulcer disease and effectively cures it.¹ One issue that limits the more widespread use of eradication treatment, however, is whether patients should undergo a test to confirm successful eradication. Many of the tests necessitate endoscopy and are therefore invasive, time consuming, and expensive. The carbon-13 or carbon-14 labelled urea breath test has been suggested as probably the best method of follow up after eradication treatment.² This test is non-invasive, well tolerated, and easy to perform, but widespread use is limited by availability, expense (in the case of ¹³C) or problems with radioisotope handling (¹⁴C). We have previously shown that eradication of *H pylori* results in a highly significant reduction of dyspeptic symptoms in patients with duodenal ulcer disease.³ In this study, we assessed the absence of dyspeptic symptoms as a measure of *H pylori* eradication, using the ¹³C-urea

breath test as the gold standard for measuring the presence of *H pylori*.

Methods and results

Data were collected prospectively on all patients positive for *H pylori* with endoscopically proved duodenal ulcer disease who were given eradication treatment at this hospital in 1991-4. Patients with a history of ulcer haemorrhage or perforation and those taking non-steroidal anti-inflammatory drugs were excluded. Whether *H pylori* was present was determined by histology or the ¹³C-urea breath test⁴ before treatment. Treatment was with: colloidal bismuth subcitrate, tetracycline, and metronidazole for seven days; omeprazole, colloidal bismuth subcitrate, tetracycline, and metronidazole for seven days; omeprazole and amoxicillin for 14 days; or lansoprazole and clarithromycin for 14 days. Patients were advised not to take any acid suppressing medication after treatment.

All patients were reviewed one and six months after completion of treatment, when the urea breath test was performed and data collected on dyspeptic symptoms using the gastrointestinal symptom rating scale.⁵ Patients were asked to grade epigastric discomfort, heartburn, nausea, vomiting, and wind on a severity scale of 0-3 (nil, mild, moderate, severe). Patients were unaware whether *H pylori* was still present or not until after their six month review.

One hundred and twelve patients (mean age 48 years, range 23-75; 71.4% men; 33% smokers) had undergone eradication treatment, and in 80 (71.4%) *H pylori* had been eradicated, as defined by a negative urea breath test. Table 1 shows the correlation of dyspeptic symptoms with the breath test result. With absence of all symptoms as a measure of successful eradication, the sensitivity was 87.5% at one month and 97.5% at six months, with specificity being 56.3% and 90.6% respectively. The figures for sensitivity were improved when only absence of epigastric discomfort was used for assessment (88.8% and 100%), with little change in specificity (50% and 90.6%).

Table 1—Correlation of dyspeptic symptoms with results of ¹³C-urea breath test after *H pylori* eradication treatment. Results are numbers (and percentages) of patients

Dyspeptic symptoms	Breath test negative (n=80)		Breath test positive (n=32)	
	1 month	6 months	1 month	6 months
Epigastric discomfort	9 (11.2)	0 (0)	16 (50)	29 (90.6)
Heartburn	3 (3.8)	2 (2.5)	5 (15.6)	6 (18.8)
Nausea	1 (1.3)	0 (0)	8 (25)	10 (31.3)
Vomiting	0 (0)	0 (0)	5 (15.6)	6 (18.8)
Wind	1 (1.3)	0 (0)	7 (21.9)	10 (31.3)
All symptoms	10 (12.5)	2 (2.5)	18 (56.3)	29 (90.6)