A Controlled Trial of Home-Based Acute Psychiatric Services.
II: Treatment Patterns and Costs

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Treatment records of 94 patients treated in an experimental home-based psychiatric service and 78 control patients in standard care were collected over one year. There was a substantial reduction in in-patient care in the experimental group, both in terms of proportion admitted and duration of admissions, despite similar out-patient and general practice care. The total treatment costs were significantly larger (>50%) for standard care when controlled for by diagnostic grouping. Costs were further examined by including all specialist psychiatric care, and by excluding patients with primary diagnoses of brain damage or alcoholism. Sensitivity analysis explored the effects of increasing the cost of home visits. The relative cost effectiveness of the experimental service persisted. Clinical and social outcome was similar in control and experimental groups.

A prospective randomised controlled trial of a community-based outreach service for general adult psychiatric referrals was conducted in suburban London (Paper I, this issue). All referrals who had not been in recent contact with the services were allocated either to a control group of standard care (routine or urgent out-patient assessments or domiciliary visits, as clinically indicated) or to an experimental approach which emphasised prompt, multidisciplinary assessments in the patients' homes. The six clinical teams involved were equally re-sourced for both in-patient and out-patient services, and were free to admit or treat as they judged fit. In addition to the four cross-sectional assessments (Paper I), detailed records were obtained of the patients' treatment and these are reported in this paper.

Such a controlled trial has two major strengths. The first relates to cost. Costing National Health Service (NHS) care is exceptionally difficult, for historical reasons. Routine out-patient and in-patient costs vary nationally by over 100%, reflecting real differences in running costs (e.g. costs per patient day may be lower in a mental hospital than in a district general hospital) but also differing accounting systems (e.g. where psychiatric unit costs in district general hospitals are not separated from general medical costs). Conducting the study within a single district avoids differences in methods of costing specific care components. Although these unit costs are consistent, this does not necessarily mean they are absolutely correct. The margin of error in unit costs may vary for different items (e.g. out-patient contacts may in reality be much less expensive than

quoted, or day care attendances more so, etc.). Uncertainty persists for comparisons of treatment costs when patterns of treatment differ. The second strength is that, other than for a small excess of psychotic patients in the controls, we have well matched patients and essentially equal clinical and social outcomes in the treatment groups. Weighting of results was necessary only for the proportion of psychotic patients.

The method of costing followed quality standards in health economics (Drummond *et al*, 1987) by being comprehensive (data were collected on a full range of possible costs, both public and private), focused (on those aspects which differed between the two groups), and sensitive (to capital and revenue costs, to overhead costs, and to indirect costs). Average costs were employed, given that in the two models of service being compared there was no evidence of spare capacity. The robustness of the results was explored by sensitivity analysis. We were alert to the possibility of burden (or cost) shifting from health care to local-authority social services, the Department of Social Security, or to informal carers.

Method

Three paired catchment areas in suburban London were amalgamated for the duration of intake to the study. One team in each pair was designated experimental and one control. Each team was led by a consultant psychiatrist and contained a full-time trainee psychiatrist, a full-time community psychiatric nurse (CPN), and a joint-appointment social worker. Senior registrar and clinical psychology sessions were equally distributed across the two approaches and all teams had responsibility for active student teaching.

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Table 1
Mean duration of out-patient contacts and total treatment time

	n	Mean (s.d.) duration: min	t value	P value
Individual sessions				
Experimental session	516	42.36 (24.99)	6.74	<0.001
Control session	448	32.67 (19.60)		
Experimental travel	516	13.92 (10.73)	14.75	<0.001
Control travel	448	4.88 (8.25)		
Experimental combined	516	56.28 (30.11)	10.85	<0.001
Control combined	448	37.55 (23.39)		
Total treatment time				
Experimental session	94	242.89 (353.38)	1.23	NS
Control session	78	187.64 (220.58)		
Experimental travel	94	79.80 (142.96)	3.03	<0.01
Control travel	78	28.04 (71.29)		
Experimental combined	94	322.69 (485.09)	1.80	NS
Control combined	78	215.68 (270.84)		

All 172 patients who entered the study were subjected to a prospective longitudinal collection of treatment data recorded by the involved professionals in both primary and specialist care. Statistical tests appropriate to the distribution of each variable were chosen. Thus parametric testing was suitable for out-patient and general practitioner (GP) contacts, which displayed normal distributions. In-patient care was highly skewed and tested with non-parametric tests. Costing data were also highly skewed and were subjected to transformation before examination with parametric tests.

An uncoded form was attached to the out-patient clinical case notes to be completed by the mental health team member each time a study patient was seen. Information was requested on the dates and number of consultations, the name and designation of the therapists, length of consultation and any travelling time, and the nature of the intervention.

The GPs' notes were tagged to indicate that the patient was in the study and requesting the GP to record the duration of each contact.

Social work notes were similarly tagged. When clients were not registered, the social services computer record system was primed to impart this information were notes to be raised.

Case notes were examined to identify the extent of in-patient and day patient care.

Data were supplemented retrospectively on all psychiatric and social work contacts which could be identified by examination of the case notes at research follow-up. Some tertiary services collected data prospectively. In-patient and day hospital details were obtained from case notes, as were medical assessments for deliberate self-harm. Input from the voluntary sector was negligible and is not reported.

Data on income and employment were collected by questionnaire.

Results

Out-patient care

The distribution of out-patient contacts was remarkably similar in the two groups. Experimental patients received a mean (s.d.) of 5.5 (6.5) contacts and control patients 5.7 (5.5) (Table 1). The majority of patients had fewer contacts (experimental median = 2.7 and control median = 3.0) but 23 patients exceeded 10 contacts and 5 exceeded 20 (maximum 36). The duration of sessions (with and without travelling time) was significantly greater in the experimental group (Table 1). Travelling time was averaged across all contacts. Only a small proportion of control contacts were home visits, yielding an overall lower mean travelling time. The extra ten minutes of contact and ten minutes of travelling time per session (in both assessment and follow-up contacts) added up to a mean total treatment time (comprising the duration of each patient's initial assessment and subsequent visits) of 5 hours 23 minutes in experimental patients and 3 hours 36 minutes in control patients. This mean total treatment difference was not statistically significant.

The study protocol required experimental teams, where possible, to offer a conjoint assessment. Seventy-six experimental patients had them, but 18 were emergency assessments or direct admissions. Twenty-three experimental patients received at least one conjoint visit other than the initial assessment, and 11 control patients received a conjoint assessment (usually a treatment review). There were 110 conjoint assessments in total (experimental 99; control 11).

Substantial differences in the distribution of out-patient visits within the multidisciplinary team in the two treatments were observed. The proportion accounted for by medical staff was 76% in the control and 48% in the experimental group (Table 2) ($\chi^2 = 77.6$, $P < 0.001$). Conjoint sessions have been attributed to the medical members.

Doctors, on the whole, had shorter contacts with patients (ranging from a mean of 29 minutes for control consultants to 42 minutes for experimental registrars). Medical staff in control teams followed a pattern of 60 minutes for assessments and 30 minutes for follow-up and treatment contacts. The whole experimental team (apart from the consultant treatment sessions of 40 minutes including travel) followed a 60-minute appointment schedule, as did the non-medical members of the control teams.

Table 2
Distribution of professionals responsible for contacts

	Experimental	Control
Consultant	125	179
Senior registrar	67	37
Registrar/senior house officer	55	123
Subtotal	247 (47.9%)	339 (75.7%)
Community psychiatric nurse	202	91
Psychologist	49	15
Social worker	18	3
Subtotal	269 (52.1%)	109 (24.3%)
Total	516	448

Table 3
Unit cost data

Cost per:	England: £	Wandsworth: £	Wandsworth with capital charge: £
In-patient day	49.7	50.5	61.6
Day patient attendance	21.6	50.8	61.0
Out-patient attendance	42.0	39.9	48.7
Home visit	42.0	39.9	39.9

In-patient and day patient care

Eighteen (19%) experimental and 26 (33.3%) control patients were admitted during the study ($\chi^2 = 3.79$, $P<0.05$), occupying 633 bed days in experimental and 1073 in control care, which represents an overall mean of 6.7 days per experimental patient and 13.8 days per control patient (Wilcoxon $Z = 2.36$, $P<0.05$).

Readmission rates were also lower in the experimental group (4 patients against 10 in the control group), but not significantly so. The mean (s.d.) durations for admissions were 35.2 (46.7) days and 41.3 (29.8) days respectively. The arithmetic means for the entire groups are presented for information, but the Wilcoxon test was used to test statistical significance because of the high proportion of patients with no in-patient days.

Only seven patients in the experimental group and eight in the control group were admitted to the day hospital during the 12 months of follow-up, of whom only one and four respectively had not received previous in-patient care. There are no significant differences in the use of day patient care.

Specialist care

There was a marked difference in regional specialist in-patient care. The three patients in the control group who were admitted for such care used 50% more bed days (459) than did the six in the experimental group (305). This represented 3.2 days per experimental and 5.9 days per control patient overall. In addition, two experimental patients occupied 12, and three control patients 8, days in general hospital beds for some form of 'crisis'. These were for observation after overdoses, apart from one experimental patient investigated for panic symptoms in another general hospital.

The spread of specialist in-patient care in experimental patients was greater, with more use of specialist services for organic disorders; only one patient received in-patient psychotherapy. Long-term in-patient psychotherapy in two control patients, however, accounted for 445 days.

Nineteen experimental patients received 144 out-patient contacts with specialist services, most for various forms of specialist psychotherapy and assessment. Nine control patients received a total of 83 sessions between them, again mainly for various forms of specialist psychotherapy.

General practitioner and social services care

There were no significant differences in GP contact between the two groups. The GP notes of 91 (97%) experimental and 75 (96%) control patients were examined. In the experimental group 79 patients (87%), and in the control group 69 patients (92%), had consulted their GP during the study period, an average of 8.3 visits per experimental patient and 7.6 per control. The difference is not statistically significant.

Data collection on local authority social work contacts posed major problems. Duration of contacts could not be estimated even indirectly, and there was a degree of double recording, with client contacts in social work records as well as team case notes. Eighteen (19%) experimental and 22 (28%) control patients were registered as local authority social services clients during the 12 months, and generated 321 and 832 recorded activities (including telephone calls) respectively. Three experimental and nine control 'heavy users' (>30 contacts) were responsible for two-thirds of the total local authority social services contacts. These contacts were related to the presence of children in the households concerned, and not associated with significantly more contact with the mental health team. Given the likelihood that these differences reflected child-care concerns and the lack of usable unit cost data for the service, we omitted costing of social services. It should be noted, however, that inclusion of such costs (however estimated) would increase costs in the control group relative to that in the experimental group.

Treatment costs

This study was carried out between October 1987 and October 1989. Unit cost data for 1986/87 are available at district level through cost accounts and at regional and national levels through Health Service costing returns. Since these series were discontinued from 1986/87, the 1987/88 estimates were obtained by adjusting 1986/87 figures by 8.3% for inflation (based on Department of Health inflation estimates). These inflation-adjusted estimates for 1987/88 have been employed in this analysis (Table 3). Unit costs and service usage are presented separately, so that local unit costs can be compared.

Equal unit costs were applied to out-patient attendances and home visits – a deliberately conservative assumption. Analysis of staff grades and time (including travel) yielded

Table 4
Mean treatment costs: Wandsworth

	Experimental group (n = 94): £	Control group (n = 78): £
Arithmetical means		
routine	891	1281
total	1429	1696
Geometric means		
routine	299	520
total	414	637

equal labour costs. Data on costs of overheads for the home-visit service were not available, but out-patient overheads in the teaching hospital were around 40% (ignoring the costs to patients of attending). Lacking data on the overhead costs of the home-visit service (which was operating out of various temporary premises), the assumption of equal unit costs provided a reasonable starting point. The sensitivity of the overall results to this assumption was explored. Local estimates suggested low overhead costs for home visits relative to out-patient attendances.

Both routine and specialist psychiatric service use were costed. Local authority social work contacts have been disregarded in the costing analysis. GP unit costs (£10) are the estimated costs of psychiatric consultations based on the National Morbidity Study (Croft-Jeffreys & Wilkinson,

1989), although it is recognised that such costing is notional in that GPs are not paid per visit.

Income- and employment-related data showed no differences and are not reported here.

Statistical methods

The frequency distribution of total NHS service costs was highly skewed (because of the costly in-patient element), necessitating logarithmic transformations for parametric significance testing. Mean untransformed costs with their standard errors or confidence intervals are consequently not reported. The P values for total transformed costs are reported, as are the cost ratios and their 95% confidence intervals (CIs) in the experimental and control groups. 'Routine' indicates catchment-area service costs, and 'total' both catchment area and regional specialist service costs.

The geometric means generated by this log transformation are those for a 'representative patient' derived from the transformed distribution (Table 4). The data in Table 4 are not controlled for diagnosis. While these geometric means are the best representation of the comparative cost effectiveness of the two treatments, the arithmetical means must be used to calculate total service cost.

Because psychotic patients used more services and there was an excess of them among the controls, the final costing comparisons have been controlled for this imbalance by analysis of variance. Eight patients who were not administered the PSE at intake have been allocated

Table 5
Ratio of costs (control : experimental) standardised for diagnostic category

	Routine, no capital	Total, no capital	Routine, plus capital charging	Total, plus capital charging
Wandsworth				
Mean ratios	1.57	1.39	1.70	1.47
Upper 95% CI	2.33	2.13	2.63	2.36
Lower 95% CI	1.06	0.91	1.16	0.97
t value	2.30	1.54	2.55	1.74
P value	0.03	0.13	0.01	0.08
National				
Mean ratios	1.51	1.37	1.62	1.43
Upper 95% CI	2.18	2.02	2.36	2.13
Lower 95% CI	1.06	0.93	1.12	0.96
t value	2.25	1.59	2.55	1.74
P value	0.03	0.12	0.01	0.08
Home visits + 25%				
Mean ratios	1.45	1.29	1.56	1.38
Upper 95% CI	2.12	1.95	2.31	2.10
Lower 95% CI	0.99	0.86	1.06	0.90
t value	1.90	1.23	2.23	1.48
P value	0.04	0.22	0.03	0.14
Excluding organic states and alcoholism				
Mean ratios	1.55	1.61	1.67	1.72
Upper 95% CI	2.31	2.44	2.52	2.64
Lower 95% CI	1.04	1.06	1.10	1.12
t value	2.14	2.24	2.43	2.47
P value	0.03	0.03	0.02	0.02

after careful examination of their notes and included in the costing analysis. Table 5 displays the ratio of costs in control:experimental patients standardised for PSE categories. Control patients incurred 57% higher costs per patient in routine services ($P=0.027$). Inclusion of all specialist services reduced this excess to 39%, and the difference was no longer significant.

These cost ratios have been subjected to a series of sensitivity analyses. These have explored the effects of using national unit costs, of capital charging, of increasing home-visit unit costs by 25%, and of removing the costs incurred by brain-damaged and alcohol-dependent patients.

Cost ratios are essentially unchanged when national unit costs, as opposed to St George's Hospital costs, are used.

Capital charges under the NHS and Community Care Act 1990 will increase unit costs, especially in-patient and day patient but also out-patient contacts because of the cost of buildings and equipment. The final figure of Wandsworth capital charges amounted to 22% of the mental health budget in 1991/92. Inclusion of these charges makes routine services 70% more expensive in controls and 47% in total (routine and specialist) health costs, although this latter figure still fails to reach significance at the 5% level. Increasing the costs of home visits by 25% showed the same pattern, although with raised P values.

In all the major reference studies (Fenton et al, 1979; Stein & Test, 1980; Hoult et al, 1983; Muijen et al, 1992a,b), patients with primary diagnoses of brain damage or alcohol/drug abuse were excluded because they were judged to have different clinical needs and to be unlikely to respond to the experimental provision. To examine the effect of this restriction on our results, the eight patients with a primary diagnosis of alcohol/drug abuse or brain damage were removed and the above calculations repeated. While routine cost differences were not substantially affected, the total cost ratios shifted further in favour of the experimental treatment (61% excess and 72% excess with capital charging), with all the P values below 0.05. This is because 256 of the experimental groups' 305 in-patient specialist days used were for the care of one patient with bilateral frontal haemorrhages in a specialist brain damage unit, and for two patients with dementia. Specialist in-patient alcohol services used only 14 days in each treatment group.

Discussion

The most important finding in this study is the effect on treatment patterns (and hence costs) of adopting the experimental approach. With no increase in out-patient contacts, experimental teams used less in-patient hospital care than the control teams, no matter how this was assessed. They admitted fewer patients, for less time, with fewer repeat admissions. The same pattern was found in psychotic and non-psychotic subgroups separately, but this failed to reach statistical significance because of the small numbers in each cell. The (arithmetic) mean bed usage of the experimental group was half that of the control group.

These findings are particularly striking because of their consistency. There was no attempt, either explicitly or implicitly, to reduce hospital care. The reduced admission rate must reflect the experimental team helping the patient in alternative, less disruptive ways. The shorter hospital stays came as a surprise. We had anticipated fewer but longer admissions with the experimental teams' energies focused away from the ward and a more severely ill patient group admitted. This was not the case. The experimental teams' perceptions of which problems required hospital care, and which could be dealt with out of hospital, had changed.

Two features could account for this increase in confidence. Firstly, the experimental teams recognised that they could be much more flexible in their work practices – for example, if an initial assessment was inconclusive then the patient could be visited the next day to continue exploration. They did not have to use admissions for patients whose needs did not easily fit into rigid clinic schedules. Secondly, they became more used to joint working and consultation. The importance of this process should not be under-estimated. At the outset of the study there was considerable anxiety about shared assessments and working. Once this anxiety receded there was a marked increase in cross-discipline consultation and support within teams.

The low use of day hospital care in both groups is disappointing. Close examination of patients' notes yielded no consistent or recognisable indicators for such care. As day hospitals are often ascribed a major role in the planning of community-based services, these findings warrant further investigation.

Control teams relied more on in-patient specialist services, experimental teams more on out-patient specialist services. The use of specialist services struck us as high, although we have no norms for comparison. It is probable that this high usage is a Metropolitan London phenomenon and likely to be severely curtailed with cross-charging.

The experimental teams received no special training, but their work patterns showed a marked shift to a less medically dominated service and an increase in psychosocial interventions. Why this should be is unclear. The lower proportion of psychotic patients in experimental care can only partly account for it. The less multidisciplinary involvement of the control teams may reflect a failure by psychiatrists to fully appreciate the potential contribution of other team members. Alternatively, it may have resulted from patients' perceived resistance to being handed on early in treatment. The experimental groups' joint assessment permitted a choice of therapist without having to forfeit continuity of care.

The costing of this study has been undertaken in some detail, but is restricted to treatment costs. Unlike family and patient income, which showed no differences, treatment levels varied by group. Despite assertions (Knapp & Beecham, 1990; Weich,1992) that costing in mental health studies must always be fully comprehensive, a major advantage of random controlled trials is that only the differences between the two groups need to be costed. As clinical outcomes were so similar in the two treatments we are able to compare cost effectiveness without elaborate and questionable weightings of different outcomes.

Psychotic patients used more services than non-psychotic patients in both treatments, so the costing comparisons were controlled for the psychotic/non-psychotic balance in the two treatments. Whenever doubt existed about costing comparisons (e.g. the cost of home visits versus out-patient contacts) the alternative giving the cost advantage to the control service was chosen. Despite this there is a clear cost advantage to the experimental service.

Our conclusions are that improved use of the resources that already exist within the community mental health team can substantially improve care. Equal clinical improvement was achieved, with less recourse to admission to hospital and disruption of patients' and families' lives. These differences arise from the earlier involvement of non-medical team members and their subsequent higher profile in patient care. It lends support to the value of a key-worker approach even in relatively short-term treatments, and suggests that traditional patterns of working fail to fully utilise the potential of the multidisciplinary team.

What differences have been shown here developed in the absence of any sophisticated skills training or even careful refining of goals or ideology. The substantial cost savings found here cannot, however, be easily realised directly by local planners. Rather, these results suggest that adequate investment in funding expanded teams, able to operate in a truly multidisciplinary manner, will prove cost effective even in the medium term.

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