Assertive community treatment across the Atlantic: comparison of model fidelity in the UK and USA

MATTHEW FIANDER, TOM BURNS, GREGORY J. McHUGO and ROBERT E. DRAKE

Background The significant reductions in hospital admission demonstrated in US assertive community treatment (ACT) studies have not been replicated in the UK. Explanations cite poor UK 'model fidelity' and/or better UK standard care. No international model-fidelity comparisons exist.

Aims To compare high-fidelity US ACT teams with a UK team.

Method The UK700's ACT team (n=97) was compared with high-fidelity US ACT teams (n=73) by using two measures: a forerunner of the Dartmouth Assertive Community Treatment schedule (to assess adherence to ACT principles) and 2-year prospective activity data.

Results The UK and US teams had similar high-fidelity scores. Although significant differences were found in the amount and type of activity, practice differences in areas central to ACT were not great.

Conclusions The failure of UK ACT studies to demonstrate the outcome differences of early US studies cannot be attributed entirely to the lack of ACT fidelity.

Declaration of interest None.
Two of the authors rated each programme on each criterion on a scale from 1 (low fidelity) to 5 (high fidelity) in half-point steps (Teague et al., 1998). Anchor points were defined for each end-point, with values for intermediate points being allocated proportionally. Their ratings were made independently at one time-point towards the end of the study and were based on a variety of sources but principally their day-to-day knowledge of the programmes and clinicians’ activity logs. They were then discussed by all three authors and these discussions ‘yielded a final consensus rating for each team’ (Teague et al., 1995). Overall scores for each programme were the mean of individual scores on all criteria.

St George’s team (UK-ACT)

This team replicated the New Hampshire protocol as closely as possible. Two psychiatrists working clinically with the team (including T.B.) rated it on each of the items independently. M.F. also rated the team, although three components were rated exclusively on event-recording data (services provided in vivo, intensity of service and working closely with support networks).

Practice comparison

Sample: patients and staff. Seventy-eight patients randomly allocated to the four US-ACT teams were recruited over 25 months from June 1989. The inclusion criteria were similar to those used in the UK700 trial, except that the US patients had a second diagnosis of substance misuse disorder. The UK-ACT data are based on 97 patients. Substance misuse was not measured in the UK700 study, but a year after the study ended 23% of patients on the case-load had a co-occurring substance misuse diagnosis (Laugharne et al., 2002). Psychiatrists’ activity data were not recorded in the US-ACT study, so UK psychiatrists’ data were excluded to allow a more direct comparison. Staff from other disciplines participated in recording their activities at both sites (n=25 for US-ACT and n=49 for UK-ACT).

Process recording: US-ACT data. Activity was recorded for one week in six throughout the study. Staff completed a log sheet for each study patient for whom they performed any service in the sampled week. This recorded the time (in minutes) spent with each patient by ten categories of activity: (a) Activities of daily living. (b) Family (all family contacts). (c) Financial. (d) Hospitalisation. (e) Housing. (f) Legal. (g) Medical/psychiatric. (h) Personal growth. (i) Substance misuse. (j) Vocational.

For each category, staff recorded the location (‘centre’ or ‘community’) and the mode of the intervention (‘direct’ or ‘indirect’) (Teague et al., 1995). ‘Centre’ was defined as ‘in the mental health centre’, and ‘community’ as ‘anywhere else’. ‘Direct’ activity was defined as ‘activities done with or by the patient. ‘Indirect’ activity was defined as ‘time spent on behalf of the client without the client present (doing paperwork, calling other agencies, driving time, etc.)’. Individual contacts or care events were not recorded, only the total time.

Activity data were used only for periods when the patient was in a position to receive care. Five patients were excluded and the analyses were based on 73 patients, two with truncated study periods.

For comparison with UK-ACT data, only each US-ACT patient’s first 2 years in the study were utilised. Because the US-ACT data were collected only for one week in six, they were adjusted for comparison with the continuous UK-ACT data. An individual factor was calculated for each patient in order to inflate the proportion of their care for which activity-recording had taken place to 2-year totals.

Comparison variables. Differences in data collection protocols meant that inter-site comparison was possible on only nine composite process variables (Table 1), reflecting five ACT components.

Variables are based on the duration of the activities performed in relation to each patient. ‘Duration’ variables are expressed as a mean rate (in minutes) per patient per 30 days. ‘Proportions’ express either the time spent (in minutes) on a specific type of activity as a proportion of total time performing all activities or of all ‘direct’ activities calculated for each individual patient. The first two duration variables (‘direct contact’ and ‘career activity’) are

Statistical methods

To test for differences between these nine variables, group comparisons were made. Two-sample t-tests were performed to compare means for each variable. Within-group distributions were examined and skewness and kurtosis statistics were calculated. Where either the skewness or kurtosis statistic was significantly different from zero (at the 5% level), a non-normal distribution was assumed and the t-test was validated by bootstrap techniques. Levene’s test of equivalence was used to indicate variables where it was appropriate to assume equivalence of variance. In the event, no variables were normally distributed and bootstrap analyses were used to check the validity of the t-test results (Efroim & Tibshirani, 1994) for each of the nine variables. The bias-corrected accelerated confidence interval yielded by the bootstrap method was compared with that of the t-test. Where the two intervals were similar, the two-sample t-test results were presented. Where the t-tests were not appropriate, the bias-corrected (accelerated) confidence intervals produced using the bootstrap analyses were used.

RESULTS

Model-fidelity scores

Table 3 shows the model-fidelity scores for UK-ACT, assessed by each rater, and Table 4 shows the aggregate score along with scores for the seven US-ACT teams. The US-ACT teams A–D were the ‘strong-ACT’ teams and E–G the ‘weak-ACT’ teams. It can be seen that the UK-ACT score rates as ‘strong ACT’ (i.e. it has high model fidelity as measured on the early Dartmouth ACT schedule).

Practice data

Group comparisons

The results of the group comparison of care activities performed in the UK-ACT and (strong) US-ACT sites are presented in
Table 1  The components of assertive community treatment (ACT) and associated comparative variables

<table>
<thead>
<tr>
<th>Components</th>
<th>Variable no.</th>
<th>Comparative variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Face-to-face care</td>
<td>1</td>
<td>Duration of direct contact</td>
</tr>
<tr>
<td>B. Carers and support networks</td>
<td>2</td>
<td>Duration of carer activity</td>
</tr>
<tr>
<td>C. In vivo treatment</td>
<td>3</td>
<td>Proportion of direct activity performed in vivo</td>
</tr>
<tr>
<td>D. Assisting with basic needs</td>
<td>4</td>
<td>Duration of basic-needs activity</td>
</tr>
<tr>
<td>E. Increasing patients' functioning</td>
<td>5-9</td>
<td>Proportion of activities to increase patients' functioning (total and direct)</td>
</tr>
</tbody>
</table>

The US-ACT teams recorded more activity than the UK team in all four of the activity-rate areas measured. There is strong evidence of a difference between US and UK teams in the headline variables ‘duration of direct contact’ and ‘duration of carer activity’, as well as in ‘duration of activities to increase patients’ functioning’, but there is no significant difference in ‘duration of basic-needs activity’. The average US-ACT patient received more than 400 min of ‘direct’ contact in each 30-day period, compared with 249 min in the UK-ACT patients (P < 0.001). This is a difference of 36 min per week. The US-ACT patients received 37 min of carer activity, compared with 15 min for the UK-ACT patients (P < 0.001). Because UK-ACT carer activities were recorded only when a single event lasted for 15 min or more, this represents a maximum of only one carer visit per 30 days.

Proportion of types of activity

The proportion of activities concerning three ACT areas (in vivo care, basic-needs activity and activities to increase patients’ functioning) were measured using five variables. A greater proportion of all these types of activity was recorded for the UK-ACT team than in the US-ACT teams. There is strong evidence of an increase in the UK in the proportion of direct activity performed in vivo, the proportion (total and direct) of basic-needs activity and the proportion of direct activities to increase patients’ functioning. There was some evidence also of an increase in the

Table 2  Composition of comparative process variables for US v. UK assertive community treatment (ACT): operational definitions with reference to local terminology

<table>
<thead>
<tr>
<th>Variable</th>
<th>US-ACT</th>
<th>Local definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Duration of ‘direct’ contact</td>
<td>‘Direct’ contacts performed at the ‘centre’ or in the ‘community’</td>
<td>‘Face-to-face patient contacts’ and ‘telephone contacts’</td>
</tr>
<tr>
<td>2. Duration of carer activity</td>
<td>Any activity recorded as ‘Family (all family contacts)’</td>
<td>Any activity with a primary focus of ‘carers and significant others’ and all ‘carer contact’ types of event</td>
</tr>
<tr>
<td>3. Proportion of direct activity performed in vivo</td>
<td>‘Direct’ contacts performed in the ‘community’ expressed as a proportion of all ‘direct’ activity</td>
<td>The proportion of ‘face-to-face patient contacts’ and ‘telephone contacts’ performed outside a ‘service setting’</td>
</tr>
<tr>
<td>4. Duration of basic needs activity</td>
<td>Any activity recorded as ‘Financial’ or ‘Housing’</td>
<td>Any activity with a primary focus of ‘Finance’ or ‘Housing’</td>
</tr>
<tr>
<td>5. Proportion of basic needs activity (total)</td>
<td>Any activity recorded as ‘Financial’ or ‘Housing’ expressed as a proportion of all activity</td>
<td>Any activity with a primary focus of ‘Finance’ or ‘Housing’ expressed as a proportion of all activity</td>
</tr>
<tr>
<td>6. Proportion of basic needs and activity (direct)</td>
<td>The proportion of ‘direct’ contacts recorded as ‘financial’ or ‘Housing’</td>
<td>The proportion of ‘face-to-face patient contacts’ and ‘telephone contacts’ with a primary focus of ‘Finance’ or ‘Housing’</td>
</tr>
<tr>
<td>7. Duration of activities to increase patients’ functioning</td>
<td>Any activity recorded as ‘Activities of daily living’ or ‘Vocational’</td>
<td>Any activity with a primary focus of ‘Daily living skills’ or ‘Occupation and leisure’</td>
</tr>
<tr>
<td>8. Proportion of activities to increase patients’ functioning (total)</td>
<td>Any activity recorded as ‘Activities of daily living’ or ‘Vocational’ expressed as a proportion of all activity</td>
<td>Any activity with a primary focus of ‘Daily living skills’ or ‘Occupation and leisure’ expressed as a proportion of all activity</td>
</tr>
<tr>
<td>9. Proportion of activities to increase patients’ functioning (direct)</td>
<td>The proportion of ‘direct’ contacts recorded as ‘Activities of daily living’ or ‘Vocational’</td>
<td>The proportion of ‘face-to-face patient contacts’ and ‘telephone contacts’ with a primary focus of ‘Daily living skills’ or ‘Occupation and leisure’</td>
</tr>
</tbody>
</table>
proportion of total activities to increase patients’ functioning.

In the UK-ACT site a far higher proportion of all direct activity (83%) was performed in vivo, compared with only 58% in the US-ACT sites. The two pairs of variables, addressing the proportions of basic-needs activities and of activities to increase patients’ functioning, followed similar patterns in each site, with the proportion of each being higher in the UK-ACT site. The proportion of activities to increase patients’ functioning accounted for 19% (total) and 20% (direct) in the UK-ACT site, compared with 12% (total) and 14% (direct) in the US-ACT site.

**Table 3** The model-fidelity score for the UK assertive community treatment team (UK-ACT)

<table>
<thead>
<tr>
<th>Components</th>
<th>A</th>
<th>B</th>
<th>M.F.</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuity of staffing</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Multidisciplinary staffing</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Community locus (in vivo)</td>
<td>5</td>
<td>5</td>
<td>5.5</td>
<td>5</td>
</tr>
<tr>
<td>Assertive engagement</td>
<td>4.5</td>
<td>4</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Continuous responsibility</td>
<td>4.5</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>Intensity of service</td>
<td>4.5</td>
<td>3.5</td>
<td>2.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Small case-load</td>
<td>4</td>
<td>4</td>
<td>4.5</td>
<td>4.3</td>
</tr>
<tr>
<td>Team approach</td>
<td>4.5</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>Work with support networks</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>Mean</td>
<td>4.7</td>
<td>4.1</td>
<td>3.8</td>
<td>4.2</td>
</tr>
</tbody>
</table>

M.F., Matthew Fiander.  
1. Score based solely on event-recording data.

**In vivo activity**

An additional variable was created (termed ‘duration of direct in vivo activity’) by taking all ‘direct’ activity that was performed at the patient’s home or neighbourhood. The distributions were non-normal, and bootstrap analyses were implemented to verify the t-test result. The US-ACT patients received 32.1 min more direct in vivo activity every 30 days than did the UK-ACT patients (95% CI = -28.0 to 92.2, \( P = 0.29 \)). The mean duration of direct in vivo activity was 244.2 min (s.d. = 120.0) for US-ACT patients and 212.1 min (s.d. = 266.3) for UK-ACT patients.

**DISCUSSION**

**Model-fidelity comparison**

Although the model-fidelity measure was applied rigorously in both sites, different raters were used and this may have biased the results. Three items, however, were based entirely on relatively objective activity-recording data. The similarity on model-fidelity measures suggests that practice was broadly similar. Although only the aggregated ‘consensus’ score of all three raters was available for each component for the US-ACT teams, it was possible to take the lowest score of any rater for the UK-ACT team. Using this conservative approach, it scored as having high fidelity. We would conclude that, despite the absence of 24-h direct care, UK-ACT falls well within the range of acceptable model fidelity.

**Process of care**

Despite having similar model-fidelity scores, there were major differences in the level of contact and proportion of the time spent on different activities. The average US-ACT patient received 62% more direct contact than the average UK-ACT patient (the equivalent of 36 extra minutes weekly). Such a large difference has the potential to accommodate real clinical advantages.

Stein & Test’s descriptions of ACT (Stein & Test, 1978) stress four areas of patient need, a deficiency in any of which may result in hospitalisation: ‘motivation to remain in the community’, ‘freedom from pathological dependent relationships’, ‘material resources’ and ‘coping skills’. The last two of these are addressed in this study. ‘Material resources’ equates to activity focused on basic needs and ‘coping skills’ equates to increasing patients’ functioning. For Stein & Test, ‘material resources’ refers to food, shelter, clothing, medical care, recreation, etc. (Stein & Test, 1978), which equates to the housing and finance elements of the ‘basic-needs activity’ variables (variables 4, 5 and 6). Stein & Test’s ‘coping skills’ equate to the daily living skills and occupation and leisure elements of the ‘patients’ functioning’ variables (variables 7, 8 and 9).

Despite the UK-ACT team’s lower overall activity levels, a greater proportion of their activity was focused on patients’ basic needs and on increasing their functioning. This may suggest that the UK-ACT team...
was in fact adhering to a pattern of care specifically intended and expected to enhance patients’ community tenure. Indeed, by combining the duration of direct activity (variable 1) with the proportion of direct activity that is focused on basic needs (variable 6) or patients’ functioning (variable 9) we can obtain an approximate mean duration rate for each of these focuses of activity. This calculation indicates that very similar amounts of time were allocated to these activities on both sides of the Atlantic. For the direct basic-needs activity this was 40.13 min for the US-ACT (10% of 249 min). For patient functioning activities the amounts were 54.98 min for US-ACT (14% of 303 min) and 50.35 min for UK-ACT (20% of 249 min). In both of these key areas the differences amount to less than 5 min per 30 days.

The additional variable, ‘duration of direct activity performed in vivo’, is at the core of Stein & Test’s accounts of ACT practice (Stein & Test, 1978, 1980). If activity rates are crucial to outcome, then one might expect to find a significant difference between this practice in US-ACT, which achieved limited substance misuse gains, and UK-ACT, which demonstrated no outcome differences. However, there was no real difference on this variable, although the estimate is imprecise and the wide confidence interval suggests that the difference could be as big as 92.2 min per 30 days.

Methodological considerations
The small number of variables used for the comparison resulted from differences in data collection in the two sites, which also meant that we could compare only the duration of contact and not the contact frequency. Even within the variables tested, five systematic differences and two biases arising from definitions were identified. All the systematic differences maximise the potential difference and all variables are affected.

General systematic differences
The following systematic differences affect activity rates but not proportions. Thus, differences in proportions are more robust than differences in total duration.

(a) Potential to over- or underrecord
UK-ACT staff recorded only specific ‘events’, making it impossible to identify how staff spent their working week. Consequently there was no incentive to inflate their recorded activities, but there was a risk that some contacts could be overlooked. The US-ACT staff were required to account for all their working time (e.g. for billing or performance management purposes) and this provided an incentive to ‘apportion’ the whole working week.

(b) Telephone contact, carer contact and care coordination
These activities were recorded in UK-ACT only when an event lasted for 15 min or more. The US-ACT data, however, include all activities of the same type (e.g. all telephone calls with a given patient, however short). The US-ACT data are thus more inclusive.

(c) Recording units
The US-ACT data were recorded in quarter-hour units. As a New Hampshire team leader explained:

‘Case management activity . . . is recorded in units equal to fifteen minutes, but they [case managers] may make four phone calls in a fifteen minute time frame and it would come out as four units.’

Thus, 15 min of activity would be recorded in US-ACT as a total of 1 h, whereas the same activity in UK-ACT would not have been recorded at all. In this respect, the US-ACT data are overstated and the UK-ACT data are understated.

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Table 5 Comparison of mean differences in activity for the UK v. the US assertive community treatment teams (US-ACT v. UK-ACT): duration and proportion

<table>
<thead>
<tr>
<th>ACT area</th>
<th>Variable</th>
<th>Measure</th>
<th>US-ACT</th>
<th>UK-ACT</th>
<th>Total n</th>
<th>Mean difference</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>n</td>
<td>Mean</td>
<td>s.d.</td>
<td>n</td>
<td>Mean</td>
</tr>
<tr>
<td>a</td>
<td>1</td>
<td>Duration of direct contact</td>
<td>73</td>
<td>402.9</td>
<td>286.1</td>
<td>97</td>
<td>249.2</td>
</tr>
<tr>
<td>b</td>
<td>2</td>
<td>Duration of carer activity</td>
<td>73</td>
<td>37.3</td>
<td>47.2</td>
<td>97</td>
<td>15.3</td>
</tr>
<tr>
<td>c</td>
<td>3</td>
<td>Proportion of direct activity performed in vivo</td>
<td>73</td>
<td>0.58</td>
<td>0.27</td>
<td>97</td>
<td>0.83</td>
</tr>
<tr>
<td>d</td>
<td>4</td>
<td>Duration of basic-needs activity</td>
<td>73</td>
<td>66.0</td>
<td>70.1</td>
<td>97</td>
<td>53.5</td>
</tr>
<tr>
<td>e</td>
<td>5</td>
<td>Proportion of basic-needs activity (total)</td>
<td>73</td>
<td>0.12</td>
<td>0.11</td>
<td>96</td>
<td>0.19</td>
</tr>
<tr>
<td>f</td>
<td>6</td>
<td>Proportion of basic-needs activity (direct)</td>
<td>73</td>
<td>0.10</td>
<td>0.11</td>
<td>96</td>
<td>0.18</td>
</tr>
<tr>
<td>g</td>
<td>7</td>
<td>Duration of activities to increase patients’ functioning</td>
<td>73</td>
<td>78.5</td>
<td>123.8</td>
<td>97</td>
<td>53.9</td>
</tr>
<tr>
<td>h</td>
<td>8</td>
<td>Proportion of activities to increase patients’ functioning (total)</td>
<td>73</td>
<td>0.12</td>
<td>0.11</td>
<td>97</td>
<td>0.19</td>
</tr>
<tr>
<td>i</td>
<td>9</td>
<td>Proportion of activities to increase patients’ functioning (direct)</td>
<td>73</td>
<td>0.14</td>
<td>0.14</td>
<td>96</td>
<td>0.20</td>
</tr>
</tbody>
</table>

1. The confidence interval presented for variable 7 was produced by bootstrap analysis.
(d) Special weeks

The US-ACT teams recorded data for one week in six, whereas the UK-ACT team recorded continuously. This could inflate the US-ACT recording because of a ‘Hawthorne effect’ (Arnold et al., 1991), or because more activity was kept for these ‘special weeks’.

(e) Indirect activity

In the US-ACT data all ‘indirect’ activity is identified as having a particular focus, whereas ‘attempted’ (but failed) face-to-face patient contact was not coded with a focus category in UK-ACT. Thus, ‘total’ activity for UK-ACT data, which comprises direct and indirect elements, will be understated.

Definitional differences

The following definitional differences introduce bias into results. Although it was not possible to quantify the effect of these biases, they all act in the same direction: to increase activity recorded for US-ACT and/or to decrease that recorded for UK-ACT. This means that we can confidently assume that the duration variables represent the maximum order of inter-site differences. In all but one of these, maximum rates of activity in the USA are no more than twice those in the UK.

(a) ‘Family’ activity

The US-ACT activities were classified according to their ‘predominant theme’ unless time was divided between several activities, in which case it was apportioned accordingly. However, any family activity ‘trumped’ (ranked higher than) any other activity, including the basic-needs activity (variables 4–6) and activities to increase patients’ functioning (variables 7–9). Consequently, the UK-ACT data for those variables may have been understated.

(b) ‘Service setting’

In vivo activity is defined as that performed outside of a service setting (UK-ACT) or outside the mental health centre (US-ACT). The UK definition is wider in that other (non-mental) health and social service settings are treated as service settings. Consequently, more US-ACT activities will have been classified as in vivo.

CLINICAL IMPLICATIONS

- Small differences in data collection procedures can exaggerate or distort perceived differences in clinical practice.

- Prospective collection of service data is possible and can yield improved understanding of team functioning.

- Failure of the St George’s assertive community treatment (UK-ACT) team to reduce hospitalisation cannot be explained entirely by poor model fidelity.

LIMITATIONS

- Data were collected using different procedures and different categories in the two sites.

- Model fidelity judgements in ACT are evolving and there is no scientifically validated consensus.

- The professional context in which care data are collected may have a significant, but unquantified, impact on accuracy.

Implications for UK practice

It has been proposed that differences in outcome between US-ACT and UK-ACT (Holloway et al., 1995; Marshall et al., 2001) may reflect failed model fidelity in the UK (Marshall & Creed, 2000). However, in the areas of practice central to ACT compared in this study, the maximum differences in practice between the high-fidelity US-ACT teams and the UK-ACT team are not great. If these small differences in activity rates do account for the failure of the St George’s arm of the UK700 trial, then the differences in practice between successful and unsuccessful ACT (or between successfully and unsuccessfully implemented ACT) in the UK context are very small.

The US authors have explained their failure to demonstrate differences in hospitalisation rates (between either high and low-fidelity ACT teams or between ACT or standard case management) by the quality of their control services. Mueser et al. (1998) point out that ‘almost all the controlled studies have compared the ACT or ICM models with “practice as usual”’ and Drake et al. (1998) point out that these usually comprise hospital- or clinic-based services or services with very high case-loads. In contrast, the US control groups were ‘exceptionally good’ (Drake et al., 1998), having incorporated ACT principles but with larger case-loads.

The same explanation has been proposed for the UK700 trial and UK studies generally (Tyrer, 2000). In light of this explanation, it is interesting that the two sites compared here differed most on the crude headline measure of intensity of service, yet almost not at all on the more ACT-specific ‘duration of direct in vivo activity’. There were also no discernible differences in in vivo direct activity focused on either ‘basic needs’ or ‘increasing patients’ functioning’. This suggests that the UK-ACT team was more ACT-like than not, and in terms of salient ACT activity that the failure of UK studies to
demonstrate the outcome differences of early US studies cannot be attributed entirely to lack of model fidelity.

REFERENCES


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Access the most recent version at DOI: 10.1192/bjp.182.3.248

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