

RESEARCH REPORT

Assessment of Alcohol Withdrawal: the revised clinical institute withdrawal assessment for alcohol scale (CIWA-Ar)

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Summary

A shortened 10-item scale for clinical quantitation of the severity of the alcohol withdrawal syndrome has been developed. This scale offers an increase in efficiency while at the same time retaining clinical usefulness, validity and reliability. It can be incorporated into the usual clinical care of patients undergoing alcohol withdrawal and into clinical drug trials of alcohol withdrawal.

Introduction

A reliable, brief, uncomplicated and clinically useful scale is needed to assess the severity of alcohol withdrawal, to monitor response to treatment and to use in research. Previous studies resulted in the development of a reliable and validated 15-item scale—the Clinical Institute Withdrawal Assessment for Alcohol (CIWA-A) (Shaw *et al.*, 1981). It was derived from scales devised by Gross and associates (1973, 1974), and could be applied every half-hour rather than once daily. Validation was achieved by correlation with global ratings of physicians experienced in the assessment of patients with the alcohol withdrawal syndrome. In addition, individual items scored by raters correlated with more objective measures, e.g. tremor rating correlated with accelerometer measures (Zilm *et al.*, 1979). If the 15-item CIWA-A scale could be shortened to the items which are the more reliable and clinically pertinent features of alcohol with-

drawal, without a significant loss of accuracy, the scale's efficiency, applicability and acceptance would be improved. The main purpose of our study was to improve the previous CIWA-A scale by eliminating redundant or ineffective items.

Methods

Since 1978 the CIWA-A has been routinely used for initial assessment as well as for ongoing monitoring of patients in alcohol withdrawal at the Addiction Research Foundation. Comprehensive research quality data are available from 137 subjects: 39 from a study of the efficacy of supportive care (Shaw *et al.*, 1981); 41 from a study of lorazepam (Naranjo *et al.*, 1983); 50 from a study of diazepam (Sellers *et al.*, 1983); and seven subjects who refused to be randomized for the diazepam study but opted for the diazepam treatment (Sellers *et al.*, 1983). These studies were all conducted at the Clinical Institute, Addiction Research Foundation. The Clinical Institute is a 61-bed specialty teaching hospital affiliated with the University of Toronto. Within a half mile radius, there are two other teaching hospitals and a

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20-bed detoxification unit that also treats alcoholic patients. A referral system for patients in alcohol withdrawal exists with these facilities as well as with other hospitals outside of the immediate area. Patients for the studies were referred to, or had presented at, our Emergency Room. The details on entry criteria are described in each of the original studies (Shaw *et al.*, 1981; Naranjo *et al.*, 1983; Sellers *et al.*, 1983). Cluster analysis was used to make sure that patients from different studies did not have different patterns of response.

To revise the original scale, the items on the original CIWA-A were examined for face validity. The 'seizures' item was judged unsatisfactory since the item simply adds a value of 7 to the score if the subject has had a seizure since the last CIWA-A administration, and 0 if he has not. There are several problems with this. First, if a subject is convulsing, he would not usually have the CIWA-A administered and the post-ictal state may influence the scoring. Second, the CIWA-A is usually administered every hour, and a seizure from two hours ago would not influence the score. This does not correspond to the way a clinical judgement is made. Finally, a seizure is such a rare event (two instances in 137 subjects) that there was insufficient data to derive any useful conclusions.

We next determined the inter-rater (usually nurses) reliability on pairs of observations from all subjects for each observation. The product-moment correlations between total scores, and between individual items were above 0.9 except for one item 'quality of contact'. This has proven to be more subjective than other factors.

The seizure and quality of contact items were eliminated and the remaining 13 items were examined to see which contributed most to the total score. The intention was to find the subset of items that would predict the total score of the original CIWA-A. The two patients who had had a seizure were not included. The sample of 135 patients was divided into a random sample of 100 patients and 35 patients. The subject characteristics in each sample were identical with respect to age, severity of withdrawal, alcohol use, etc. For the larger group all possible regressions of the individual items on the total score were performed. Once a subset of 10 items was identified, it was cross-validated on the remaining independent patient sample of 35 individuals.

Consideration was given to the inclusion of vital signs in the scale. To this end, the product-moment correlation of CIWA-A scores with the vital signs

(pulse and systolic and diastolic blood pressure) was tested.

Results

Using the randomly selected sub-sample of 100 subjects, all possible subsets regression of the 13 items of interest on the total score was performed with BMDP9R (1981). Mallow's C_p criterion (Draper & Smith, 1981) was chosen for comparing subsets. This criterion measures the adequacy of the subset of variables under consideration, and it allows for comparison of subsets containing different numbers of variables. The subsets with the 10 lowest C_p values were considered on their clinical merit. For these 10 scales, the length of the scale, the difficulty of scoring each item, the clinical relevance and the intuitive appeal of including of each item was taken into account. The subset selected in this way consisted of the following 10 items: nausea and vomiting, tremor, paroxysmal sweats, anxiety, agitation, tactile disturbances, auditory disturbances, visual disturbances, headache and clouding of sensorium (Appendix A). Since all the coefficients in the regression using the selected model were highly significant ($t > 15$), it is safe to conclude that there is no redundancy in the items included. Correlations of individual items with total CIWA-A score are presented in Table 1. The C_p criterion for this subset was 244, and the R -square was 0.978. Since the coefficient estimates were all within (0.9, 1.2), all items were weighted equally. Therefore the items dropped from the scale were: convulsions, quality of contact, hallucinations (since this was covered in other items), flushing of face and thought disturbances.

Table 1. Correlations (r values) of Individual Items With Total CIWA-A Score

Sweating	0.58
Anxiety	0.55
Tremor	0.49
Auditory disturbances	0.48
Visual disturbances	0.48
Agitation	0.41
Nausea	0.40
Tactile disturbances	0.39
Headache	0.30
Orientation and clouding of sensorium	0.12

To validate the scale, the remaining 35 patients' observations were used. The subjects were 'scored' using the new scale (by simply summing the relevant 10 items), and the score was regressed on the original CIWA-A total. Beta was 0.99, with

$t=36.72$ ($p<0.0001$), and R -squared 0.98 suggesting that the new score is a good predictor of the old score.

Systolic and diastolic blood pressure did not correlate with total CIWA-A ($r=0.14$, -0.04 respectively; not significant) thus, were not included in either the original or revised version. The contribution of the clouding of sensorium item to the revised score is small. We did not exclude it since the relationship was statistically significant. Pulse rate had a small ($r=0.27$) but significant ($p<0.005$) correlation hence is also collected on the CIWA-Ar form (see Appendix).

Discussion

The advantage of this revised scale is clinical utility. The brevity of the scale should increase its acceptability to physicians and nurses who look after patients in alcohol withdrawal. This improved efficiency has been achieved without any significant loss in accuracy ($r=0.99$). The items which were dropped included those with poor item-total correlations, e.g. flushing of face, and those which made less clinical sense, e.g. quality of contact. It is noteworthy that no single item taken alone had a high item-total correlation. The best predictors of a high withdrawal score included groups of symptoms rather than individual symptoms.

A surprising finding of the study was that pulse and blood pressure did not correlate at all with severity of withdrawal. This is not to say that elevations of pulse and blood pressure do not occur in alcohol withdrawal, but that other signs and symptoms are more reliable in the assessment of severity of withdrawal. This is a clinically important observation since physicians often prescribe drugs for alcohol withdrawal treatment based upon pulse and blood pressure measures. Indeed research studies are also carried out based upon these presumed reliable indicators of withdrawal (Kraus *et al.*, 1985).

The scale is of most use in the usual clinical care of patients in alcohol withdrawal. In our experience pharmacological treatment is not indicated for a score of <10 . Many patients in mild alcohol withdrawal outside of hospital are managed satisfactorily with supportive care alone (Shaw *et al.*, 1981; Naranjo *et al.*, 1983). However, drugs do prevent the occurrence of late complications in hospitalization patients (Sellers *et al.*, 1983). Clinical judgement will determine whether drugs should be given for scores of 10 to 20). Competent nurses can carry

out an evaluation in less than two minutes and the inter-rater reliability is high ($r>0.8$). Repeated scoring at hourly or other suitable intervals monitors the response to treatment and helps to determine if further pharmacotherapy is indicated. The scale is also extremely useful as a research tool in quantitating the efficacy of drugs used in the treatment of alcohol withdrawal. One of the problems in the interpretation of clinical trials of various drug treatments for alcohol withdrawal is that they do not use validated measures of the dependent variable. This withdrawal scale should be useful.

This new alcohol withdrawal scale offers an increase in efficiency while at the same time retaining clinical usefulness, validity and reliability. It should be incorporated into the usual clinical care of patients undergoing alcohol withdrawal in order that optimal pharmacotherapy can be instituted. The scale can also be used as a validated outcome criterion in clinical trials involving the alcohol withdrawal syndrome. Further validation in other settings is needed.

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Appendix: Addiction Research Foundation Clinical Institute Withdrawal Assessment for Alcohol (CIWA-Ar)

Patient _____ Date |_|_|_|
 y m d Time _____
 (24 hour clock, midnight=00:00)

Pulse or heart rate, taken for one minute: _____ Blood pressure: _____/_____

NAUSEA AND VOMITING—As “Do you feel sick to your stomach? Have you vomited?” Observation.
 0 no nausea and no vomiting
 1 mild nausea with no vomiting
 2
 3
 4 intermittent nausea with dry heaves
 5
 6
 7 constant nausea, frequent dry heaves and vomiting

TREMOR—Arms extended and fingers spread apart. Observation.
 0 no tremor
 1 not visible, but can be felt fingertip to fingertip
 2
 3
 4 moderate, with patient’s arms extended
 5
 6
 7 severe, even with arms not extended

PAROXYSMAL SWEATS—Observation.
 0 no sweat visible
 1 barely perceptible sweating, palms moist
 2
 3
 4 beads of sweat obvious on forehead
 5
 6
 7 drenching sweats

ANXIETY—Ask “Do you feel nervous?” Observation.
 0 no anxiety, at ease
 1 mildly anxious
 2
 3
 4 moderately anxious, or guarded, so anxiety is inferred
 5
 6
 7 equivalent to acute panic states as seen in severe delirium or acute schizophrenic reactions

AGITATION—Observation.
 0 normal activity
 1 somewhat more than normal activity
 2
 3
 4 moderately fidgety and restless
 5
 6
 7 paces back and forth during most of the interview, or constantly thrashes about

TACTILE DISTURBANCES—Ask “Have you any itching, pins and needles sensations, any burning, any numbness or do you feel bugs crawling on or under your skin?” Observation.
 0 none
 1 very mild itching, pins and needles, burning or numbness
 2 mild itching, pins and needles, burning or numbness
 3 moderate itching, pins and needles, burning or numbness
 4 moderately severe hallucinations
 5 severe hallucinations
 6 extremely severe hallucinations
 7 continuous hallucinations

AUDITORY DISTURBANCES—Ask “Are you more aware of sounds around you? Are they harsh? Do they frighten you? Are you hearing anything that is disturbing to you? Are you hearing things you know are not there?” Observation.
 0 not present
 1 very mild harshness or ability to frighten
 2 mild harshness or ability to frighten
 3 moderate harshness or ability to frighten
 4 moderately severe hallucinations
 5 severe hallucinations
 6 extremely severe hallucinations
 7 continuous hallucinations

VISUAL DISTURBANCES—Ask “Does the light appear to be too bright? Is its colour different? Does it hurt your eyes? Are you seeing anything that is disturbing to you? Are you seeing things you know are not there?” Observation.
 0 not present
 1 very mild sensitivity
 2 mild sensitivity
 3 moderate sensitivity
 4 moderately severe hallucinations
 5 severe hallucinations
 6 extremely severe hallucinations
 7 continuous hallucinations

HEADACHE, FULLNESS IN HEAD—Ask “Does your head feel different? Does it feel like there is a band around your head?” Do not rate for dizziness or lightheadedness. Otherwise, rate severity.
 0 not present
 1 very mild
 2 mild
 3 moderate
 4 moderately severe
 5 severe
 6 very severe
 7 extremely severe

ORIENTATION AND CLOUDING OF SENSORIUM—Ask “What day is this? Where are you? Who am I?”
 0 oriented and can do serial additions
 1 cannot do serial additions or is uncertain about date
 2 disoriented for date by no more than 2 calendar days
 3 disoriented for date by more than 2 calendar days
 4 disoriented for place and/or person

Total CIWA-A Score _____
 Rater’s Initials _____
 Maximum Possible Score 67

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