

Validity of the CAGE questionnaire for screening alcohol-dependent inpatients on hospital wards

Validade do questionário CAGE para rastrear pacientes com dependência ao álcool internados em enfermarias clínicas

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Abstract

Objective: To verify the validity of the CAGE questionnaire in screening inpatients with alcohol dependence. **Methods:** In a transversal study, 747 medical inpatients hospitalized on general medical wards in the Federal University of Santa Catarina University Hospital were evaluated. Sociodemographic and clinical data were collected and the following instruments were used: the CAGE questionnaire and the Mini International Neuropsychiatry Interview (MINI), the latter being a semi-structured interview used as the gold standard for diagnosing alcohol dependence (according to DSM-IV criteria). Validity indices (sensitivity and specificity) were assessed for the different possible CAGE cut-off points. The ROC curve was used to determine the best cut-off point. **Results:** The sample was composed of 747 patients. Most were men (66%), white (85%) and married (61%). Mean age was 50 ± 17 years, and mean level of education was 6 ± 4 years. According to the MINI, 48 patients (6.6%) were diagnosed as having alcohol dependence. The CAGE questionnaire presented its highest sensitivity (93.8%) when the cut-off point of 0/1 (one or more "positive" responses indicating a positive test) was used. The specificity for this cut-off point was 85.5%. **Conclusion:** Using the 0/1 cut-off point, the CAGE questionnaire presented good sensitivity (93.8%) and specificity (85.5%) for use in general hospital ward patients. Since it is an easily applied, rapidly executed and inexpensive instrument, it could be useful in screening such patients for alcohol dependence.

Keywords: Hospitals, General; Questionnaires; Substance-related disorders; Alcoholism; Inpatients

Resumo

Objetivo: Verificar a validade do questionário CAGE para rastrear pacientes com dependência ao álcool internados em enfermarias de clínica médica. **Métodos:** Trata-se de um estudo transversal, no qual foram selecionados 747 pacientes internados na clínica médica do Hospital Universitário da Universidade Federal de Santa Catarina. Foram colhidos dados sociodemográficos e clínicos e aplicados os seguintes instrumentos: o questionário CAGE e uma entrevista semi-estruturada – Mini International Neuropsychiatric Interview (MINI), utilizada como padrão-ouro para diagnóstico de dependência ao álcool (de acordo com os critérios do DSM-IV). Foram obtidas medidas de validade (sensibilidade e especificidade) do CAGE para os diferentes pontos de corte possíveis. Para análise do melhor ponto de corte, foi utilizada a curva ROC. **Resultados:** A amostra foi composta de 747 pacientes, a maioria homens (66%), brancos (85%), com média de idade \pm Desvio Padrão (DP) = 50 ± 17 anos, estado civil casado/amasiado (61%), com escolaridade média \pm DP = 6 ± 4 anos. Através do MINI, foram diagnosticados 48 pacientes (6,6%) com dependência ao álcool. O CAGE apresentou a melhor sensibilidade (93,8%) com ponto de corte igual a um (CAGE positivo para uma ou mais respostas afirmativas). Com este ponto de corte, a especificidade foi de 85,5%. **Conclusão:** Aplicado em pacientes clínicos internados em hospital geral, o questionário CAGE mostrou bons índices de sensibilidade (93,8%) e especificidade (85,5%), utilizando como ponto de corte 0/1. Por ser de fácil e rápida aplicação e ter baixos custos, poderia ser utilizado para rastreamento de casos de dependência ao álcool neste contexto.

Descritores: Hospitais gerais; Questionários; Transtornos relacionados ao uso de substâncias; Consumo de bebidas alcoólicas; Pacientes internados

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Introduction

Disorders related to the use of alcohol are common in general hospitals¹ and are associated with higher morbidity² and mortality.³⁻⁴ However, between 37% and 49% of the patients suffering from alcohol-related disorders and admitted to general hospitals due to physical illnesses are not identified as such.⁵⁻⁶ This is partially due to time constraints, fear of discrimination, and lack of awareness of the importance of the diagnosis on the part of the patient and the attending physician. Therefore, to facilitate the screening of such patients, diagnostic instruments should be brief, simple, easy to apply, unthreatening and designed for use in wards other than the psychiatric ward. In view of these considerations, the CAGE⁷ questionnaire may be a viable option. Some authors suggest its use for early identification of alcoholism on hospital wards⁸ or for identifying patients at risk for developing alcohol withdrawal syndrome.⁹ However, in a review of the MEDLINE and LILACS databases, we found no studies involving inpatients in Brazil and evaluating the validity of this instrument in comparison to semi-structured interviews, which use the DSM-IV criteria to diagnose alcohol dependence.

Recently, other instruments have been developed. Among these is the Alcohol Use Disorders Identification Test (AUDIT),¹⁰ which was developed by the World Health Organization in order to screen inpatients with alcohol-related problems. This test was used in a Brazilian study evaluating the prevalence of alcohol-related problems in such patients.¹¹ However, a recent study evaluating 1133 patients in a general hospital showed that the CAGE questionnaire was more efficacious than the AUDIT.¹²

The use of CAGE in general hospitals is controversial regarding the best cut-off point to be used. A number of studies, such as that by Liskow et al,¹³ which evaluated patients in clinical triage, and that of Bush,⁶ which evaluated patients in orthopedic clinics and on hospital wards, have suggested that the cut-off point for case definition be one positive response. However, other authors, such as Hearne et al,¹² who evaluated patients interned on all wards of a general hospital, and Paz Filho et al,¹⁴ who studied emergency room patients in the city of Curitiba, have suggested a two-positive-response cut-off point. Therefore, in order to use the CAGE questionnaire, an evaluation of its validity is warranted, depending on the prevalence of alcohol dependence in, and specific characteristics of, the sample.

This study aimed to determine both the validity of the CAGE questionnaire, in the version suggested by Masur et al,⁸ and the best cut-off point for screening alcohol-dependent inpatients on the wards of the University Hospital of the Federal University of Santa Catarina (UFSC).

Methods

In this transversal study, all patients consecutively admitted to hospital wards were registered, and 1,234 were randomized. Of these 1,234 patients, 505 were excluded for various reasons, including being below the age of 18, incapacity (intense dyspnea, aphasia, cognitive loss, etc.) affecting their ability to complete the questionnaire, and unwillingness to be included. All 729 patients involved in the final sample gave written informed consent and were interviewed within the first week of admission. The UFSC Ethics in Human Research Committee approved the study. Sociodemographic data was collected and the CAGE questionnaire⁸ was applied. Another observer, blinded as to the results obtained with CAGE, conducted the Mini

International Neuropsychiatric Interview (MINI) semi-structured interview.¹⁵

Instruments

The CAGE questionnaire was first proposed for use in screening suspected cases of alcoholism in psychiatric inpatients.⁷ The name CAGE is derived from the initials of key-words in four brief questions on the use of alcohol: Cut down (C), Annoyed (A), Guilty (G) and Eye-opener (E). In Brazil, Masur and Monteiro¹⁶ validated the Brazilian version of the CAGE questionnaire for the use in patients admitted to psychiatric hospitals. In the present study, the version suggested by Masur et al⁸ was used. In this version, 10 intermediate questions are added to the specific CAGE questions. These intermediate questions, despite lacking discriminative value, are useful for introducing the subject, as well as making the interview less intimidating.⁸

The diagnosis of alcohol dependence was made through the application of a semi-structured interview (the MINI, Portuguese version),¹⁵ which is based on diagnostic criteria suggested by the DSM-IV.¹⁷

Statistical analysis

The CAGE questionnaire was validated through comparison of CAGE results with those obtained using the MINI,¹⁵ which is considered the gold standard. Sensitivity, specificity, positive predictive value and negative predictive value for all possible CAGE cut-off points (1, 2, 3 and 4 positive responses) were all calculated. For the analysis of the best cut-off point, a receiver operating characteristic (ROC) curve was built.¹⁸

Results

We observed that patients did not feel intimidated by the questionnaire, which was well accepted and understood. Of the 729 patients interviewed, 486 (66.7%) were male. Ages ranged from 18 to 96 years (mean: 50.4 ± 17 years). The level of education ranged from none to 22 years of schooling (mean: 6 ± 4.0 years).

A total of 48 alcohol-dependent patients (6.6%) were diagnosed through use of the MINI. When a cut-off point of one (one or more "positive" responses indicating a positive test) was used, the CAGE questionnaire presented higher sensitivity (93.8%). Using this same cut-off point, CAGE specificity was 85.5% (Table 1). This information was confirmed by the ROC curve, since the cut-off point 0/1 was the closest to the upper left corner of the graph (Figure 1).

Discussion

The Brazilian version of the CAGE questionnaire proposed by Masur et al⁸ showed favorable indicators of validity (sensitivity of 93.8% and specificity of 85.5%), when used on general hospital wards. In this context, the best cut-off point for screening cases of alcohol dependence was 0/1 (one positive response). The cut-off point 1/2, despite presenting higher specificity (smaller number of false-positive results), was rejected for two reasons: first, the 0/1 cut-off point presented the best ROC curve performance and second, since this is an instrument aimed at screening, the cut-off point with the highest sensitivity (smallest number of false-negative results) was favored.

In accordance with our findings, other authors have suggested the use of only one positive response in order to indicate a positive test.^{6,13} The choice of using one affirmative

Table 1 – CAGE validation values compared to those obtained using the MINI* gold standard for different cut-off points in the sample (n = 729)

CAGE score [†]	Alcohol dependence based on MINI (n) [*]		Sensitivity (%) [‡]	Specificity (%) [§]	Positive predictive value (%)	Negative predictive value (%) [¶]
	Present	Absent				
0	3	582	-	-	-	-
1	5	44	93,8	85,5	31,3	99,5
2	14	34	83,3	91,9	42,1	98,7
3	20	18	54,2	96,9	55,3	96,8
4	6	3	12,5	99,6	66,7	94,2

*MINI¹⁵: instrument used as the gold standard in diagnosing alcohol dependence according to DSM-IV criteria¹⁷

[†]CAGE score⁷: total of four items (Cut down; Annoyed; Guilty and Eye-opener).

[‡]Sensitivity = True-positive results/(true positives + false negatives)

[§]Specificity = True-negative results/(false positives + true negatives)

^{||}Positive predictive value = True-positive results/(true positives + false positives)

[¶]Negative predictive value = True-negative results/(false negatives + true negatives)

response, rather than two affirmative responses, as the cut-off point results in an increase in sensitivity (more true-positive results), to the detriment of specificity (more false-positive results). Therefore, higher case detection power is achieved and, in a second post-screening stage, it can be determined whether this patient is, in fact, alcohol-dependent.

Other studies, however, have suggested the use of a cut-off point of two positive responses in order to consider CAGE results positive. These studies used samples of patients in psychiatric hospitals¹⁶ or patients admitted to emergency services¹⁴ in a general hospital, where there is a higher prevalence of alcoholism cases. In such cases, it is necessary to use

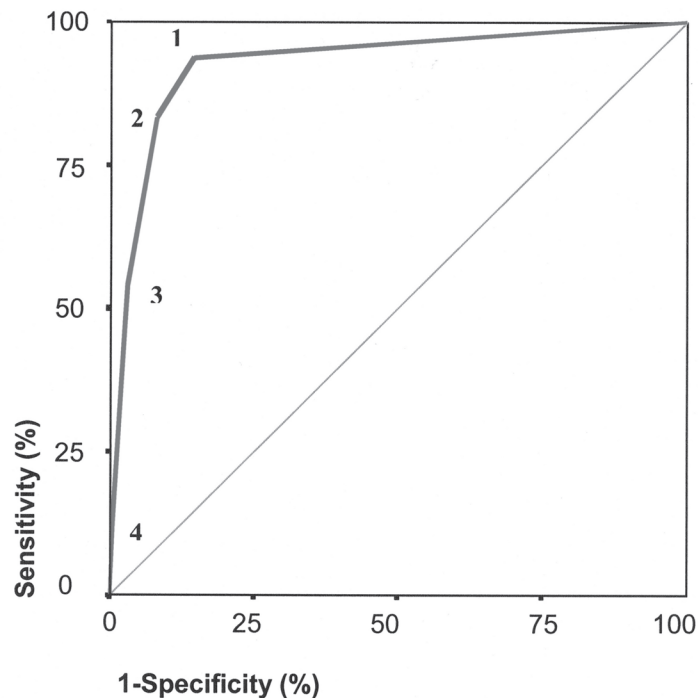


Figure 1 – ROC Curve: CAGE sensitivity and 1-specificity for four different cut-off points

instruments that have a higher discriminating power for identifying patients not presenting the disease (in whom specificity is favored). Therefore, comparisons between such studies and the present study are problematic.

Some limitations of this study deserve merit mention. First, individuals with cognitive impairment were excluded for not being able to participate in the interview in a reliable way, and patients presenting *delirium* as a consequence of alcohol abstinence were therefore not included in our sample. However, our aim was to screen, meaning to call attention to potential cases, and generalist physicians are accustomed to investigating patients who present signs and symptoms suggestive of *delirium tremens*. Second, it should be emphasized that CAGE is only a screening instrument and does not have the aim of making diagnoses. Therefore, an interview with a licensed professional is essential to making the diagnosis.

Considering the importance of this study to clinic treatment, we should emphasize that hospitalization for other physical illnesses provides an auspicious moment for the identification and initiation of treatment of alcohol-dependent patients, since it is easier to clearly demonstrate the detrimental effects of alcohol abuse the patient. Therefore, patient treatment can be more thorough, improving patient quality of life and preventing unfavorable evolutions. In addition, greater understanding of the validity and the best cut-off point for this instrument may be very useful in teaching and prevention programs, as well as in research conducted in general hospitals, since it is easy to use and had been modified in order to be less intimidating.

ANNEX

CAGE questionnaire adapted for Brazilian patient samples by Masur et al:⁸

- Do you have a good appetite?
- What kinds of foods do you typically eat in your main meals?
- What is your drink of preference?
- 1. Have you ever felt that you should reduce the amount that you drink or stop drinking altogether?
- Do you make friends easily?
- Do you have good relationships with your family members?
- 2. Does it annoy you when people criticize your drinking?
- Do you sleep well at night?
- At what time do you normally wake up?
- 3. Do you often drink in the morning to calm down or as a hangover remedy?
- Do you change jobs frequently?
- 4. Do you feel guilty about your drinking habits?

Add 1 point for each positive response

- 1: ____
 2: ____
 3: ____
 4: ____

CAGE score: _____

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