

Introduction:

This submission consists of two key components: 1) An introduction to the methodology of clinicians-rated anticholinergic scores (CR-ACHS), along with a sample rating instruction and a data sheet. 2) A consolidated list of medications with assigned CR-ACHS based on our own studies. In addition, a simple SAS program and dataset were provided for use to generate the consensus rating of each drug. The purposes of the submission are two fold: 1) To provide a free-access tool of more than 300 medications with assigned anticholinergic scores for use by interested clinical, epidemiological and pharmacological researchers. 2) To describe the novel methodology and instruments that can be readily applied/adapted to new medications that are not rated for CR-ACHS by us, but are of interest to outside researchers.

Keyword Categories:

Clinical:	Anticholinergic risk score for medications
Genetics:	Not Applicable (N/A)
Statistical:	Measurements
Software:	SAS or other statistical package or a spreadsheet program such as MS Excel
Related:	Risk assessment method (epidemiology and clinical pharmacology)

References:

- 1) Han L, McCusker J, Cole M, Abrahamowicz M, Primeau F, Elie M. Use of medications with anticholinergic effect predicts clinical severity of delirium symptoms in older medical inpatients. *Arch Intern Med* 2001;161:1099-105.
- 2) Carnahan RM, Lund BC, Perry PJ, et al. The relationship of an Anticholinergic rating scale with serum anticholinergic activities (SAA) in elderly nursing home residents. *Psychopharmacol Bull* 2002; 36:14-19.
- 3) Han L, Agostini JV, Allore HA. Cumulative Anticholinergic Exposure is Associated with Poor Memory and Executive Function in Older Men. *J Am Geriatr Soc* 2008; 56:2203–2210.

Component Files:

a.	PDF file explaining entire example	Grasp_CRACH_Han.pdf (this file)
b.	Sample rating sheet and instruction for raters	Grasp_CRACH_Instrmnt.pdf
c.	Sample SAS program, dataset and outputs	Grasp_CRACH_sas.pdf
d.	A consolidated list of drugs with CR_ACH score	Grasp_CRACH_list.pdf

Optimal Use:

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|--|---------------------------|
| 1. Read this Summary file completely. | Component a listed above |
| 2. Read Instructions and sample rating sheet. | Component b listed above |
| 3. Run the SAS program in concert with the sample dataset. | Components c listed above |
| 4. Review the reference papers for further details. | See References. |

Prerequisites:

Basic understanding of the anticholinergic properties of drugs in blocking muscarin receptors of the brain, working knowledge of random number distribution theory and properties of key summary statistics, especially median, mean and standard deviations, will be helpful. In addition, basic SAS programming language such as data, proc means etc are recommended.

Potential Applications:

The CR-ACHS is an ordinal scale to evaluate the overall anticholinergic effects of medications, with score ranging from 0 (no ACH effect) to 3 (strong ACH effect). The scale was originally developed as a component of Dr Han's Master of Science Thesis from McGill University, Canada, based on consensus ratings of more than three hundred medications by three geriatricians [Han et al 2001]. It can be used as a template to assess total anticholinergic burden across medications used by individual patients or a group of patients over defined

exposure time windows. Since its publication in 2001, CR-ACHS has been used in several clinical and pharmacological studies of drugs' ACH potency [Carnahan et al 2002] or served as a prototype to develop such a tool. We hope this publically-accessible web version on GRASP will facilitate the research use of both the CR-ACHS and the underlying methodology and instruments to develop the scale.

Further Technical Notes:

1. Instead of following a clinical judgment-based approach to integrate different sources of evidence (clinical experience, pharmacology and pharmacokinetics of the drugs and research findings in literatures), more specific and explicit evidence bases (e.g., published serum SAA or other laboratory data) can be used to establish concrete validity criteria for the rating.
2. Instead of median, different statistical summary measures, such as mean, may be used to generate the consensus for individual medication, depending on the size of rating panel or number of raters involved.
3. The derived CR-ACH score can be used directly as an ordinal scale of medications' potential "anticholinergicity" or to define the medications as either "anticholinergic" (if scored above 0) or "not-anticholinergic" (otherwise).

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