

Applying different scales for calculating the patient's anticholinergic load – five case examples

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Objectives

The risk for physical and cognitive adverse events caused by the patient's anticholinergic drugs is referred to as anticholinergic load. Due to varying identification and scoring criteria for anticholinergic drugs [1], the patient's anticholinergic load calculated as the sum of the drugs' scores differs with the scale used.

→ To illustrate the extent of variation, we applied 12 scales to five exemplary medication samples.

Methods

- Five exemplary medication samples were set up each containing between two and four anticholinergic drugs like ... regularly prescribed drugs (e.g. amitriptyline, doxepin, furosemide) ... as-needed medication (e.g. cetirizine) ... specific dosage forms (e.g. fentanyl patch)
- Each drug was assigned a score according to the 12 scales.
- Total anticholinergic load for each medication sample was calculated as the sum of the drugs' scores.

Results

	Applied scale											
	Ancelin et al. [2]	Boustani et al. [3]	Cancelli et al. [4]	Carnahan et al. [5]	Chew et al. [6]	Han et al. [7]	Rudolph et al. [8]	Sittironnarit et al. [9]	Pharm. Index [10]	Clinical Index [10]	Aizenberg et al. [11]	Whalley et al. [12]
Medication sample 1												
Amitriptyline	3	3	3	3	3	3	3	3	10	47		
Metoprolol	0	1	0	0	0	1	0	0	0	0		
Oxycodone	0	0	0	1	0	1	0	1	0	0		
Anticholinergic load	3	4	3	4	3	5	3	4	10	47		
Medication sample 2												
Doxepin 50 mg	0	3	0	3	3	3		3	41	50		
Doxepin 100 mg	0	3	0	3	3	3		3	41	50		
Metformin	0	0	0	0	1	0		1	0	0		
Furosemide	3	1	2	0	1	0		0	0	0		
Anticholinergic load	3	7	2	6	8	6		7	82	100		
Medication sample 3												
Cetirizine	0	1		0		2	2	2				
Clomipramine	3	3		3		0	0	0				
Anticholinergic load	3	4		3		2	2	2				
Medication sample 4												
Fentanyl patch		1		1	1	1	0					
Cimetidine		1		2	0	0	2					
Pramipexole		0		0	0	0	1					
Mirtazapine		0		1	1	0	1					
Anticholinergic load		2		4	2	1	4					
Medication sample 5												
Tiotropium		0						0				
Venlafaxine		1						1				
Oxazepam		0						1				
Anticholinergic load		1						2				

The 12 scales included between 17 and 154 drugs with scores ranging from 0.7 to 1470 (most scales: score 1-3).

Scales were only applied, if they included at least one drug of the medication sample (blank spaces indicate that the respective scale was not applied). A score of zero was assigned, if the drug was not contained in the applied scale. The scales introduced in [11] and [12] were not published.

On average, the anticholinergic load was calculated for each medication sample with 6 (of 12) scales as the drugs were not considered in all scales.

Amitriptyline was one of the few drugs rated similarly by 8 of 12 scales (score of 3).

Commonly, the drugs' scores varied extensively (e.g. furosemide 0-3). As shown for doxepin, the scales did not consider the drug's dosage (same score for doxepin 50 mg and 100 mg).

The over-the-counter drug cetirizine was not included in all scales. Generally, as-needed medication was neglected in several studies applying the scales.

The scales usually did not differentiate between specific dosage forms. In this example, the fentanyl patch was not rated equally (score 0-1).

The anticholinergic drug tiotropium was not (yet) considered in any scale, indicating how crucial a predefined update process is.

Discussion

Applying commonly used scales to exemplary medication samples illustrated how the extensive differences in identifying and scoring anticholinergic drugs may translate in diverse load values. Hence, this project confirmed the need for a uniform list implying as-needed medication and specific dosage forms.

In a first attempt, Durán et al. compiled a new list including all drugs rated similarly in available scales [13]. However, further information like the drug's actual dosage [14] or patient-specific characteristics are required to estimate the total anticholinergic load.

Conclusion

The anticholinergic load strongly depends on the used scale and further research must clarify which concept of calculation predicts the anticholinergic load best.

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References:

- [1] Mayer T et al. Eur J Clin Pharmacol 2015;71:1299-314.
- [2] Ancelin et al. BMJ 2006;332:455-9.
- [3] Boustani et al. Ageing Health 2008;4:311-20.
- [4] Cancelli I et al. Clin Pharmacol Ther 2008;84:63-8.
- [5] Carnahan et al. Psych Bull 2002;36:14-9.
- [6] Chew et al. J Am Geriatr Soc 2008;56:1333-41.
- [7] Han et al. Arch Intern Med 2001;161:1099-105.
- [8] Rudolph et al. Arch Intern Med 2008;168:508-13.
- [9] Sittironnarit et al. Dement Geriatr Cogn Disord 2011;31:173-8.
- [10] Minzenberg MJ et al. Am J Psychiatry 2004;161:116-24.
- [11] Aizenberg D et al. Int Psychogeriatr 2002;14:307-10.
- [12] Whalley LJ et al. J Alzheimers Dis 2012;30:253-61.
- [13] Durán CE et al. Eur J Clin Pharmacol 2013;69:1485-96.
- [14] Hilmer SN et al. Arch Intern Med 2007;167:781-7.

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