A factor analytic evaluation of the World Health Organization Disability Assessment Schedule 2.0 among veterans presenting to a generalist mental health clinic

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ABSTRACT

The shift from a multiaxial system of diagnosis in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) brought forth the discontinuation of the Global Assessment of Functioning (GAF). DSM-5 proposes the use of a more reliable method for assessing and describing disability, the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0). The WHODAS 2.0 is widely-used within the Department of Veterans Affairs (VA) and the Veterans Benefits Administration to guide clinical decision making and assist in decisions pertaining to financial compensation. While the WHODAS 2.0 purports to be well-validated for adults cross-culturally in clinical and non-clinical samples, research is limited pertaining to the factor structure of the WHODAS 2.0 in non-compensation seeking U.S. Veteran populations. This study evaluated the factor structure of the WHODAS 2.0 in a sample of 464 Veterans receiving VA mental healthcare. Exploratory and confirmatory factor analyses of the WHODAS 2.0 data were conducted. Analyses confirmed the hardiness of the WHODAS 2.0 for use with Veterans. However, exploratory analyses pointed to several items that may reduce the functioning of the questionnaire in clinical Veteran samples. Exploratory and confirmatory analyses indicated better model fit can be achieved.

1. Introduction

Functional impairments are fundamental elements of mental health diagnostic criteria. However, with the change to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; American Psychiatric Association, 2013), the multiaxial system has been eliminated. Moving to a nonaxial diagnostic system signified the demise of the Global Assessment of Functioning (GAF) scale. In the absence of the GAF scale, DSM-5 proposes use of the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0; Ustun et al., 2010) to measure functional impairment and to guide clinical decision making in a more reliable manner. The WHODAS 2.0 is frequently employed within the VA and the Veterans Benefits Administration (VBA) to assist in informing treatment recommendations and disability assessments for determination of service connection associated with conditions caused or exacerbated by military service. However, the factor structure of the scale has yet to be evaluated among

clinical Veteran populations and warrants further evaluation to ensure the instrument is psychometrically robust with this population. Establishing the validity of the WHODAS 2.0 with VA utilizers is particularly salient given that in 2015, an estimated nine million Veterans were enrolled in VA care (Department of Veterans Affairs, 2017).

The widely used WHODAS 2.0 has the potential to be a gold-standard assessment of functional impairments and facilitate greater standardization and replicability of the construct of disability. Central to the development of the WHODAS 2.0 was the International Classification of Functioning, Disability, and Health (ICF) and reliance on item-response theory for item selection and interpretation. Through the utilization of the 'complex' version of scoring, the measure may be proxy, clinician- or self-administered to obtain a total score and comparative estimates of functioning within six domains: cognition, mobility, self-care, getting along, life activities, and participation in society. While reliability and several aspects of validity have been widely reported throughout 19 countries (Ustun et al., 2010), very few examinations replicating the

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original factor structure have been conducted.

In addition to the paucity of factor analytic studies that have been published, extant research has been mixed. For examples, Federici et al. (2009) did not confirm the originally proposed factor structure of the WHODAS 2.0 in 'normal' and rehabilitation patients, respectively. Similarly, a study of rural Ethiopian participants experiencing severe mental disorders (Habtamu et al., 2017) found the factor structure of the 36-item scale did not reach recommended levels to substantiate satisfactory goodness of fit. In contrast, Garin et al. (2010) research with chronic disease patients derived from seven European centers demonstrated a satisfactory model fit. Using a sample stratified for the presence or absence of mental health symptoms, Buist-Bouwman et al. (2008), demonstrated a reduced model of six factors and removal of four items provided the best fit though the version utilized in this research was a modified version of the WHODAS 2.0, the 30-item European Study of the Epidemiology of Mental Disorders World Health Organization Disability Assessment Scale (ESEMeD WHODAS).

To-date, only one study has examined the factor structure of the 36-item clinician-administered version of the WHODAS 2.0 with Veterans. Marx et al. (2015) utilized confirmatory factor analyses to contrast the performance of the WHODAS 2.0 and the Inventory of Psychosocial Functioning (IPF) among 177 U.S. Veterans pursuing compensation for Posttraumatic Stress Disorder (PTSD). They found an adequate fit for both measures with the WHODAS 2.0 scores explaining 55% of the variance, however, the authors caution that the incorporation of medical and mental disorder items may be of more limited utility in determining functioning secondary to military-related mental health problems in a population with notable medical morbidities. These inconsistent results, coupled with the absence of research of general mental health treatment-seeking VA clinical mental health patients rather than PTSD-specific compensation-seeking participants utilizing VBA services indicate further research is warranted prior to concluding that the original factor structure of the WHODAS 2.0 has been demonstrated for use with clinical Veteran populations.

To examine the robustness of the validity of WHODAS 2.0 among a clinical sample of Veterans seeking general mental health services, we aimed to evaluate the factor structure of this measure and to contrast the psychometric properties between the originally proposed factors identified by the scale developers with our empirically derived model.

2. Method

2.1. Participants and procedure

Participants were 464 Veterans referred for generalist Mental Health Clinic (MHC) services at a U.S. Veterans Healthcare Administration (VHA) hospital between January 2014 and June 2015. According to U.S. Code, Title 38, Veterans' Benefits (1958), a veteran is defined as "a person who served in the active military, naval, or air service, and who was discharged or released therefrom under conditions other than dishonorable." The Veterans Health Care Administration has been tasked with providing eligible veterans with healthcare benefits aimed at improving or restoring the health of Veterans. The Veterans Health Administration offers care to Veterans at 1243 facilities across the U.S., including medical center settings and community based outpatient clinic settings (U.S. Department of Veterans Affairs, 2018). Eligible Veterans select the healthcare facility of their choice from the available 1243 facilities. Most Veterans base their selections on factors such as, proximity of the healthcare facility to their home of record, facility reputation, recommendations from other Veterans, or other factors influencing personal preference. Once a Veteran selects the VHA healthcare facility of their choice, the Veteran must register for care at that facility. Once registered, the Veteran may choose whether they want to participate in mental health services. At the facility where the study was conducted, Veterans have the opportunity to select from one of three outpatient mental health services based on their clinical presentation and goals; including the general Mental Health Clinic, the specialty Substance Use Disorders Clinic, or the specialty Post Traumatic Stress Clinic. If the veteran prefers the general Mental Health Clinic, then Veteran is able to obtain an appointment within the Mental Health Clinic in one of two ways. One option is that the Veteran may self-refer to the Mental Health Clinic by directly calling the clinic and requesting an appointment. The second option is that the Veteran may be referred to the Mental Health Clinic for scheduling by another healthcare provider within VHA, such as a referral to the Mental Health Clinic from a primary care physician or other healthcare provider.

At their intake assessment in the Mental Health Clinic, Veterans completed self-report questionnaires including the WHODAS 2.0 and semi-structured and unstructured interviewed as part of the interview and treatment planning process. Veterans met with clinicians to complete the Mini Neuropsychiatric Interview (MINI) English Version, a semi-structured clinical interview for major psychiatric disorders frequently seen in mental health settings. Other diagnoses not included on the MINI were included through non-structured interview questions as clinically indicated and a determination was made regarding the clinicians' impression of the primary disorder for care. In addition to the MHC, this VHA had primary Posttraumatic Stress Disorder, Health Psychology, and Substance Use Clinics where cases with those suspected clinical diagnoses or concerns were generally referred. However, in some instances, clinicians in the MHC concluded that these were primary complaints following the evaluation (e.g. determination that an alcohol use disorder was primary in a Veteran referred for assessment of depression). Our research is restricted to Veterans seen in MHC for evaluation and does not include Veterans seen for evaluation in other specialty clinics. Consistent with other factor analytic research with this measure (i.e., Garin et al., 2010), missing data was imputed by using the Veteran's domain average to substitute the missing item(s). No items were missing. The hospital's Human Subject Committee approved this research including waivers of informed consent associated with information collected as part of standard practice of care within the clinic.

2.2. Measures

2.2.1. WHODAS 2.0

The World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0; Ustun et al., 2010) is a 36-item, self-administered survey of functional impairments during the past 30 days. Four items are completed only by those engaged in employment and were not utilized consistent the original factor analytic approach. The survey includes two scoring options ('simple' summed scoring and 'complex' weighted scoring). For the purpose of this research, the complex scoring algorithm was utilized. The WHODAS 2.0 yields a total disability score and six domain scores: cognition, mobility, self-care, getting along, life activities (home, leisure, and work), and participation in society. The overall and mental health disability internal reliabilities of the scale have been reported as 0.98 for the total score with subscales ranging from 0.94–0.96 for the overall norming sample and 0.92–0.94 for mental health norming samples (Ustun et al., 2010). The internal reliability of the original and modified scales in this research were good and 0.94 for both versions.

2.2.2. Mini-International Neuropsychiatric Interview (MINI)

The MINI (Sheehan et al., 1998) is a semi-structured clinical interview utilized for the assessment of DSM-IV diagnoses frequently seen in mental health settings. The MINI has robust psychometric characteristics (Sheehan et al., 1998).

2.3. Analytic strategy

All analyses were conducted in IBM SPSS version 22.0 including the AMOS 22.0 graphics version. Before data were analyzed, the original

sample (N = 464) was divided into two datasets (S1 and S2). Cases were split such that the resulting datasets were equal in size (N = 232 in each), and matched for distribution of gender (S1% male = 84.9; S2% male = 86.6), age (S1% over 65 = 17.7; S2% over 65 = 18.5) and service era (Vietnam vs. OEF/OND; S1% OEF/OND trauma = 68.8; S2% combat trauma = 64%). In light of the relative dearth of previous research concerning the structure of the WHODAS (as detailed above), the first analytic step was to run a Horn's parallel analysis to empirically-derive the number of recommended factors to retain followed by exploratory factor analysis (EFA). More specifically, we submitted the WHODAS 2.0 to EFA using sample 1. An oblique (oblimin) rotation was used in recognition of the fact that consistent with theoretical predictions given the nature of the constructs, previous research has shown the WHODAS 2.0 factors to be correlated. Solutions were examined using parallel analysis, fit statistics, and factor loading patterns (Kaiser, 1960).

In the second analytic step the selected model from step 1 (EFA) was submitted to CFA using the second, matched sample (S2), hereafter referred to as the Veteran-Derived Factor Model (VDFM). A second CFA was then conducted in S2 using the 6-factor structure originally specified for the WHODAS 2.0, hereafter referred to as the Original Factor Model (OFM). For both models, modification indices were examined to determine whether allowing the error terms of any items specified to load on the same factor to co-vary would substantially improve model fit (i.e. reduce model χ^2 value by 15 or more; citation). Where substantial improvement in fit was indicated and suggested paths made theoretical sense, modifications were made. Models were then re-run to confirm fit improvement (Schreiber et al., 2006). Finally, AIC values were compared to evaluate whether the EFA based or the original 6-factor WHO model provided a closer fit to the data (a difference in AIC scores of 10 or greater was interpreted as in indication of superior model fit; Hooper et al., 2008). Of note, because the models were not nested a direct comparison of model fit (chi-square difference test) could not be performed (Kline, 2011).

Individual items were used as indicators in all models. For all analyses, WHODAS items were treated as continuous in keeping with prior research. Fit indices for all CFA models were evaluated based on criteria for identifying fit (Hu & Bentler, 1999; Kline, 2011: non-significant χ^2 and RMSEA ≤ 0.06 and < 0.10 suggestive of good and adequate fit, respectively), with reference to all available fit statistics for each model (Kline, 2011). Modifications indices were used in CFA analyses when > 15 and permitting errors to co-vary was theoretically permissible. All participants included in analyses had complete data on the WHODAS. Domain 5.2 (Life Activities—Work/School) was not included in the analyses to ensure consistency with the original factor model evaluated due to non-completion in cases of non-working/non-student participants. Power analysis was conducted a priori referencing criteria established by MacCallum et al. (1996) for use in structural modeling. Both samples exceeded the identified minimum sample sizes required to achieve power of 0.80 for the degrees of freedom in each planned model. Of note, this fact was verified after the results of the EFA were evaluated and the planned specification for the CFA model became clear.

3. Results

3.1. Demographic and mental health characteristics

Veterans were primarily male, unmarried, and Caucasian. The average age was 48 years and 17.6% were 65 or older Those 65 and above endorsed significantly higher disability in the domains of self-care, non-work life activities, and total scores. A majority of the population was working or attending school (57%), although a substantial minority indicated non-work/non-student status. Persian Gulf War (including Operation Iraqi Freedom / Operation Enduring Freedom Veterans) were most frequently represented, though substantial

Table 1
Demographic and mental health characteristics (*N* = 464).

Characteristic	Mean (SD) or %
Sex	
Male	86%
Female	14%
Age	48 (17)
Marital status	
Married	43%
Unmarried	57%
Ethnicity	
Caucasian	80%
African American	9.5%
Other	2.5%
Declined to answer	8%
Employment status	
Working[a]	57%
Service era	
Vietnam era	27.2%
Persian Gulf era	53.7%
Post-Vietnam era	12.3%
Other	6.8%
Mental disorders	
Depressive disorders	43%
Anxiety disorders	6%
Bipolar disorder	7%
Psychosis	7%
Delirium/Dementia	8%
Substance use disorder	5%
Other[b]	18%

[a] Working Veterans were defined as those who were paid, non-paid, self-employed, or attending school.
[b] Other disorders occurred with limited frequency included personality, gender identity, adjustment, attention and eating disorders and those with partnership relational problems.

numbers of Veterans from active war and peacetime eras participated. Depressive disorders were the most common primary mental health diagnosis although other disorders were well represented consistent with a generalist mental health clinic. The average WHODAS 2.0 score was 36.4 (*SD* = 19.1). See Table 1 for full demographic and mental health characteristics.

3.2. Factor analyses

3.2.1. Exploratory factor analysis

WHODAS 2.0 items were first submitted to EFA in S1 (*n* = 232). The accepted 6-factor model (OFM) did not result in close fit based on evaluation of chi-square alone (χ^2 = 5821.816, df = 630, *p* < .001). All items in the accepted 6-factor model had salient loadings (parameter estimates > 0.4; Kline, 2011; see Table 2 for a full list of factor loading values) on at least one factor. One item had salient loadings on two separate factors. Item 3.1, *'washing your whole body'*, loaded on factor 3 (self-care;.65) and factor 2 (mobility;.42). Item 6.1, *difficulties joining in community activities'*, did not load as anticipated on factor 6 (participation in society; 0.14) and, instead, loaded on factor 4 (getting along with people; 0.57). A later poor loading was also observed with item 4.5 *'sexual activities'* . Each of the three items were excluded from the specified VDFM CFA. The total variance accounted for with the final EFA was 64%. Getting along with people accounted for the greatest variance (36.1%) followed by mobility (10.1%), life activities (5.4%), participation in society (4.8%), understanding and communicating (4.1%) and self-care (3.4%). Confirmatory analyses were subsequently run to contrast the original scoring model with the EFA-derived Veteran model that involved the removal of the three items above.

3.2.2. Confirmatory factor analyses

The correlated VDFM identified through EFA was then submitted to CFA using maximum likelihood estimation in S2 (*n* = 232). This model

Table 2
WHODAS 2.0 items OBLIMIN rotated factor loadings (EFA analyses).

Item	C	M	SC	GA	LAH	PS
1.1	**0.81**	0.05	0.06	0.04	0.04	0.13
1.2	**0.77**	0.06	0.10	0.01	0.14	0.15
1.3	**0.64**	0.02	0.06	0.01	0.12	0.18
1.4	**0.72**	0.07	0.12	0.01	0.10	0.14
1.5	**0.69**	0.09	0.17	0.17	0.08	0.14
1.6	**0.59**	0.01	0.04	0.44	0.06	0.12
2.1	0.06	**0.83**	0.02	0.04	0.02	0.02
2.2	0.06	**0.84**	0.12	0.05	0.08	0.01
2.3	0.03	**0.84**	0.04	0.02	0.01	0.09
2.4	0.05	**0.57**	0.23	0.03	0.01	0.16
2.5	0.07	**0.77**	0.10	0.06	0.10	0.05
3.1	—	—	—	—	—	—
3.2	0.02	0.39	**0.57**	0.03	0.09	0.06
3.3	0.15	0.13	**0.63**	0.01	0.03	0.09
3.4	0.04	0.08	**0.74**	0.01	0.15	0.07
4.1	0.27	0.03	0.10	**0.57**	0.01	0.10
4.2	0.01	0.02	0.14	**0.76**	0.15	0.01
4.3	0.05	0.01	0.13	**0.69**	0.21	0.06
4.4	0.19	0.02	0.02	**0.68**	0.06	0.08
4.5	—	—	—	—	-	—
5.1	0.01	0.01	0.16	0.08	**0.84**	0.04
5.2	0.01	0.01	0.19	0.04	**0.86**	0.11
5.3	0.13	0.13	0.11	0.01	**0.78**	0.12
5.4	0.10	0.13	0.15	0.04	**0.79**	0.07
6.1	—	—	—	—	—	—
6.2	0.09	0.11	0.08	0.35	0.04	**0.41**
6.3	0.01	0.08	0.04	0.33	0.11	**0.50**
6.4	0.17	0.20	0.05	0.26	0.07	**0.58**
6.5	0.08	0.11	0.02	0.01	0.07	**0.79**
6.6	0.08	0.28	0.04	0.12	0.01	**0.48**
6.7	0.11	0.04	0.13	0.18	0.10	**0.61**
6.8	0.01	0.12	0.31	0.16	0.17	**0.40**

PTCI, Posttraumatic Cognitions Inventory; EFA, Exploratory Factor Analyses; F1, Factor 1; F2, Factor 2; F3, Factor 3; F4, Factor 4; —, omitted during the preliminary EFA due to cross-loading or failure to load ≥ 0.4. Bold font indicates the factor each item was retained on for the CFA. C, cognition; M, mobility; SC, self-care; GA, getting along; LAH (life activities—household; and PS, participation in society domains.

initially resulted in adequate but not good fit ($\chi^2 = 750.69$ $df = 362$, $p < 0.001$; RMSEA = 0.068; CFI = 0.90). Modification indices suggested that allowing five pairs of error terms (all between items loading on the same factor) to correlate would substantially improve model fit. Each possible modification was examined to ensure theoretical justification existed for allowing the terms to co-vary. Modifications were then made one at a time and the model was re-run to ensure the predicted chi-reduction had occurred, and that in light of the changes allowing other identified error terms to co-vary would still substantially improve model fit. After each of the five modifications were implemented, the VDFM showed good fit to the data ($\chi^2 = 605.43$, $df = 357$, $p < 0.001$; RMSEA = 0.056; CFI = 0.94).

Next, the 6-factor OFM using the full WHODAS 2.0 items was submitted to CFA using S2. Identical procedures for evaluating modification indices and permitting error-covariance were utilized and six modifications were made (See Table 3 for factor loadings). The initial OFM ($\chi^2 = 896.58$, $df = 449$, $p < 0.001$; RMSEA = ..066; CFI = 0.90) was adequate, though the modifications improved the fit ($\chi^2 = 747.43$, $df = 443$, $p < 0.001$; RMSEA = 0.056; CFI = 0.93). Because the VDFM was not nested within the OFM, chi-square difference testing could not be conducted to compare fit. Rather, model AIC values were compared with a difference of 10 or greater considered to indicate superior fit. This comparison (VDFM AIC = 661.44; OFM AIC = 917.43) confirmed that the Veteran-derived factor model represented a significantly better fit to the data.

4. Discussion

The present study supports the psychometric robustness of the factor structure of the WHODAS 2.0 among a Veteran population presenting for general mental health services in a large sample. Our findings generally support prior factor analytic research with the WHODAS 2.0 (Ustun et al., 2010), and demonstrate that a suitable factor structure can be identified and replicated using exploratory and confirmatory analyses with Veterans. We provided additional evidence for its structure among Veterans, extending support and guidance for use of the measure as an index of disability among VA mental health service utilizers.

However, our results indicate that some scoring modifications may be useful. Specifically, while we confirmed good fit based on original scoring, our findings appear to parallel those of other researchers' (Federici et al., 2009; Habtamu, 2017; Chisolm et al., 2005) that modifications can improve the robustness of the factor structure. Of note, the items recommended for removal in our VDFM (3.1, 4.5, and 6.1) also demonstrated cross loading, or other issues in Federici et al., (2009) analyses. In our study, empirically-derived amendments including removal of some items and adjustment of factor loadings of specific items did yield a better-quality fit through EFA and CFA approaches using the VDFM. One possible reason that our findings differs from those of Ustun et al. (2010) is that U.S. military Veterans may be unique, and qualitatively different from those populations previously studied. Other authors have commented that the WHODAS 2.0 does not directly assess the impact of environmental factors on disability self-ratings (Goujon et al., 2014), and research pertaining to measurement invariance across demographic differences and cultures is limited (Federici et al., 2017). It is possible that Veterans' self-disability ratings maybe highly influenced by military-related environmental factors, thus making Veterans' disability ratings appear different that other populations or that the frequent co-occurrence of physical and mental health disability is more unique to this sample. Veterans may possess a unique subgroup of biopsychosocial factors that directly influence their environment, their own world-view, and their self-disability ratings. This research opens the possibility to further exploring whether the WHODAS 2.0 ought to be universalized across all populations or whether truncated versions for specific population sub-groups is more ideal.

Despite the novel use of a large treatment-seeking clinical Veteran sample, several limitations are worth noting. First, Veterans were presenting to a generalist mental health clinic and, therefore, findings may not generalize to those seeking specialty mental health care (PTSD, substance use, or health psychology interventions) or non-VHA users. Second, combining results from all available mental health diagnoses and working-Veterans and non-working Veterans may have obscured important differences in factor structure. As has been previously reported, (Lusk et al., 2016) WHODAS 2.0 norms vary significantly between working and non-working Veterans receiving mental health care. Similar to previous validation studies with Veterans (i.e. Marx et al., 2015), this study is also vulnerable to conflation of disability due to mental and physical health problems. However, we would argue that disability regardless of etiology could provide important information to treatment planning among clinicians. Finally, while this research details the results of our factor validity analysis and internal reliability parameters of both OFM and VDFM parameters, research is still needed to ascertain other dimensions of the reliability and validity of this tool among clinical Veterans. Since we did not have a control sample in this study, we cannot comment on whether the WHODAS 2.0 is able to distinguish healthy Veterans from those diagnosed with mental disorders.

Despite these limitations, this study is the first to investigate the use of the self-administered WHODAS 2.0 36-item assessment with Veterans and is further novel regarding the utilization of a clinical Veteran population. Overall, the OFM factors were replicated although we have provided modification recommendations to facilitate the

Table 3
WHODAS item CFA factor loadings.

Item	Original model C	EFA-derived veteran model M	SC	GA	LAH	PS	C	M	SC	GA	LAH	PS
1.1	0.67[a]						0.67[a]					
1.2	0.66[a]						0.66[a]					
1.3	0.75						0.75					
1.4	0.76						0.77					
1.5	0.64[a]						0.64[a]					
1.6	0.67[a]						0.66[a]					
2.1		0.71[a]						0.71[a]				
2.2		0.80						0.80				
2.3		0.86						0.86				
2.4		0.78						0.78				
2.5		0.71[a]						0.70[a]				
3.1			0.83						—			
3.2			0.86						0.74			
3.3			0.60[a]						0.70			
3.4			0.55[a]						0.67			
4.1				0.74						0.75		
4.2				0.79						0.79		
4.3				0.69						0.68		
4.4				0.82						0.82		
4.5				0.39						—		
5.1					0.91						0.91	
5.2					0.91						0.91	
5.3					0.88[a]						0.88[a]	
5.4					0.78[a]						0.78[a]	
6.1						0.71						—
6.2						0.73[a]						0.72[a]
6.3						0.65[a]						0.63[a]
6.4						0.61						0.63
6.5						0.69						0.70
6.6						0.57						0.59
6.7						0.59						0.60
6.8						0.66						0.67

Dashes included in the table (—) indicate that item loadings were fixed to 0 where specified.

C, cognition; M, mobility; SC, self-care; GA, getting along; LAH (life activities—household; and PS, participation in society domains.

[a] Items whose covariances were permitted to vary.

improvement of fit. Future research is required to ascertain the clinical and predictive utility of the WHODAS 2.0 with this population as well and further work to establish other psychometric properties specific to reliability and validity.

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Conflicts of interest

There are no conflicts of interest to disclose.

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