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## Clinimetric properties of the “FIND-NEEDS” to screen geriatric conditions

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### 3 **Abstract**

4 Background: Comprehensive geriatric assessment (CGA) is used to thoroughly assess and  
5 identify complex healthcare problems among older adults. However, administration of CGA  
6 is time-consuming and labor intensive. A simple screening tool with the mnemonic “FIND-  
7 NEEDS” (function, incontinence, nutrition, dementia, number of medications, eyes, ear,  
8 depression, and social interaction) was developed to quickly identify common geriatric

9 conditions. The objective of the present study was to evaluate the clinimetric properties of the  
10 FIND-NEEDS.

11 **Methods:** First-visiting older adults aged 65 years and above (and who were able to  
12 communicate by themselves or with the help of a caregiver) were assessed (October to  
13 December, 2021) using the FIND-NEEDS and CGA at geriatric outpatient clinics of a  
14 tertiary, referred medical center (n=114). The FIND-NEEDS was examined for its criterion-  
15 related validity and compared with the gold standard of CGA results. Two types of scoring  
16 (summed score and binary score) of FIND-NEEDS and CGA were analyzed using Spearman  
17 correlation, sensitivity and specificity, and area under receiver operating characteristic curve  
18 (AUC).

19 **Results:** The mean age of the 114 outpatients was 78.3 years (SD±7.6 years), and 79 were  
20 female (69.3%). The internal consistency was excellent when using all FIND-NEEDS items,  
21 and was acceptable when using FIND-NEEDS domain scores. Exploratory factor analysis  
22 results showed that most of the FIND-NEEDS domain scores had factor loadings higher than  
23 0.3. Intercorrelations of binary scores between domains of FIND-NEEDS and CGA showed  
24 most domains were moderately correlated. The overall correlation of summed scores between  
25 FIND-NEEDS and CGA was high. The FIND-NEEDS summed score was moderately  
26 correlated with CGA score ( $r=0.494$ ;  $p<0.001$ ). The FIND-NEEDS binary score showed

27 excellent correlation with CGA score ( $r=0.944$ ;  $p<0.001$ ) and showed excellent AUC (0.950),

28 sensitivity (1.00), and specificity (0.90) when using the CGA score as the gold standard.

29 **Conclusions:** The present study demonstrated that the FIND-NEEDS had acceptable

30 clinimetric properties to screen for geriatric problems among older adults. Further in-depth

31 assessment in specific domains and care plan can then be conducted afterwards.

32

33 **Keywords:** FIND-NEEDS; assessment; geriatric screening; screening; reliability; validity

34 **INTRODUCTION**

35 Comprehensive geriatric assessment (CGA)<sup>1</sup> is used to thoroughly assess and identify  
36 complex health and care problems among older adults. With the use of CGA, healthcare  
37 professionals can obtain a holistic overview of older people with complex needs, which is  
38 essential for the development of individualized, patient-centered care plans in geriatric care.  
39 Veronese et al. reviewed CGA on health outcomes and found that CGA reduces (i) nursing  
40 home admission, risk of falls, and pressure sores in hospital medical settings; (ii) the risk of  
41 delirium in hip fracture; and (iii) the risk of physical frailty among community-dwelling older  
42 adults.<sup>2</sup>

43 However, the administration of CGA is very time consuming and labor intensive  
44 because the CGA contains many tools and items.<sup>3,4</sup> The growing aging population  
45 exacerbates the workloads of healthcare providers who have insufficient time to conduct  
46 CGA. Moreover, CGA has to be conducted by trained professionals.<sup>5</sup> Such inconvenience  
47 often precludes healthcare providers in geriatric care from arranging CGA for holistic  
48 overview and thorough care management. Therefore, a series of easy-to-administer, office-  
49 based screening questions could be used quickly among older adults to identify common  
50 geriatric conditions which would reduce such problems.<sup>6</sup> Previous studies have found that an  
51 early comprehensive geriatric screening followed by CGA and management significantly

52 decreases admission and mortality among older patients visiting emergency departments<sup>7</sup> and  
53 reduces the 30-day readmission rate of older hospitalized adults.<sup>4</sup>

54 Several screening tools had been proposed in the literature to replace or to supplement  
55 CGA, such as the Vulnerable Elders Survey (VES-13),<sup>8</sup> DEEP-IN (**D**ementia, **d**epression,  
56 **d**rugs; **E**yes; **E**ars; **P**hysical performance, **p**halls [falls], **p**sychosocial; **I**ncontinence;  
57 **N**utrition),<sup>9</sup> Kihon Checklist,<sup>10</sup> Brief Risk Identification of Geriatric Health Tool  
58 (BRIGHT),<sup>11</sup> Targeted Geriatric Assessment (TaGA),<sup>12</sup> Rapid Geriatric Assessment (RGA),<sup>3</sup>  
59 and Geriatric 8 (G8).<sup>13</sup> Moreover, Integrated Care for Older People (ICOPE) corresponding  
60 to intrinsic capacity (concerning individuals' mental and physical capacities) have been  
61 proposed recently by the World Health Organization (WHO).<sup>14-19</sup> The clinimetric properties  
62 and clinical impact on relevant outcomes of these screening instruments have not been  
63 thoroughly examined.<sup>5</sup>

64 Moreover, some practical issues need to be addressed. First, most instruments have  
65 relatively limited spectrums of domains that affect the health status of older people. For  
66 example, some important conditions in geriatric care (e.g., polypharmacy, urinary  
67 incontinence, sensory impairment or social function) are not assessed. Second, some  
68 instrument items use a relatively intricate method or subjective rating (e.g., Whispered voice  
69 test), which needs additional training for the assessors. Third, some instruments focus on

70 specific conditions (e.g., frailty) or targeted populations (e.g., G8 Questionnaire for Cancer),<sup>5</sup>  
71 and some instruments are divided into several modules (e.g., ICOPE [Integrated Care for  
72 Older People])<sup>14</sup> which may cause administrative burden to the assessors in determining  
73 whether to conduct the further stage of evaluation and referral pathways. Moreover, using  
74 different modules by steps may result in some domains (e.g., falls, urinary incontinence,  
75 polypharmacy, social interaction) being overlooked or deferred unless the assessors screen  
76 the next module. Fourth, some screening questions are not based on the patient's  
77 perspectives. For example, old people may be reluctant to accept further advice or referred  
78 managements if the detected abnormality does not cause major discomfort or affect their  
79 daily life (e.g., visual or hearing impairment by tests). Therefore, geriatric care needs a  
80 screening instrument that has theoretical framework and is comparable to the major domains  
81 of CGA to quickly and easily understand the holistic and thorough health needs for older  
82 people.

83       Based on the literature review of screening tools of geriatric assessment and  
84 incorporating the theoretical concept of intrinsic capacity, key principles were considered.  
85 First, such a screening instrument should be able to be used by non-geriatric healthcare  
86 workers or volunteers with minimal training or by self-evaluation with assistance in only a  
87 few items. Second, domains should either be derived from the commonly used simple

88 screening tools or further condensed and modified from the core items of existing screening  
89 instruments. Third, the instrument should focus on how daily life of an older adult is affected,  
90 or how the symptoms/signs of an older adult’s health problems are captured). Finally, the  
91 instrument should include the 11 domains of potentially manageable conditions. This resulted  
92 in the development of the screening tool with mnemonic “FIND-NEEDS”, namely **F**unction  
93 (functional impairment, falls, and frailty), **I**ncontinence, **N**utrition, **D**ementia, **N**umber of  
94 medications, **E**yes, **E**ar, **D**epression, and **S**ocial interaction. The 11 domains also correspond  
95 with the intrinsic capacity framework<sup>14</sup> and the 4M model (what matters, medications,  
96 mentation, and mobility).<sup>20</sup> Detailed information regarding the development of the FIND-  
97 NEEDS is reported in the ‘*FIND-NEEDS development*’ subsection (in the **Methods** section).  
98 Although the FIND-NEEDS was developed by experts with good content validity, the  
99 clinimetric properties of the FIND-NEEDS have not been fully examined. Moreover, no  
100 previous empirical studies have examined if the FIND-NEEDS is comparable to the gold  
101 standard of CGA results in holistic assessment for older people. In order to provide useful  
102 and time-saving assessments for geriatric care in busy clinical settings, the present study  
103 evaluated the newly developed instrument (i.e., FIND-NEEDS) in assessing geriatric needs.

104

## 105 **METHODS**

106 ***Participants and data collection***

107 Between October 2021 and December 2021, data for the present study were collected at  
108 geriatric outpatient clinics of a tertiary, referred medical center. The participants comprised  
109 first-visiting older adults aged 65 years and above (who were able to answer the study  
110 questionnaire by themselves or with the help of a caregiver). Individuals excluded from  
111 participation included those who were institutionalized, could not mobilize with or without  
112 assisting devices, could not communicate, or had any acute or chronic condition that could  
113 affect the ability of answering the questionnaire and completing the objective evaluation.  
114 Written informed consent was obtained from participants or from their legal guardians if the  
115 patient had serious cognitive impairment.

116 The research assistants interviewed the participants to obtain the following information:  
117 age (in years), sex (male or female), educational level (illiterate, primary school, junior high,  
118 senior high or college/above), marital status (married, cohabiting, widowed, or other), living  
119 status (living alone or not), current cigarette smoking (yes or no), current alcohol drinking  
120 (yes or no), body mass index ( $\text{kg}/\text{m}^2$ ), and history of chronic diseases (including  
121 hypertension, diabetes mellitus, hyperlipidemia, stroke, cardiovascular disease, respiratory  
122 disease, liver disease, gastrointestinal disease, renal disease, musculoskeletal disease, eye  
123 disease, psychiatric disease, urological disease, and cancer).



124 In addition to the demographic and medical information of the patients, data were also  
125 collected regarding the FIND-NEEDS and CGA. The FIND-NEEDS was completed by the  
126 patients or their caregivers accompanied under assistance of research assistants, and CGA  
127 was performed by a geriatric care practitioner.

128

### 129 ***Comprehensive geriatric assessment***

130 The core measures of the CGA comprise metrics of physical function, falls, cognitive  
131 impairment, depression, visual and hearing impairments, nutrition, pain, urinary  
132 incontinence, medication-related problems, tubes, caregiver issues, and socioeconomic  
133 issues. The assessment tools involved physical function (assessed by the Katz Index of  
134 Activities of Daily Living, ADLs), cognitive impairment (defined as scores < 8 for the  
135 participants with a high school education on the Chinese version of the modified Short  
136 Portable Mental Status Questionnaire, SPMSQ,<sup>21</sup> depressive mood (defined as scores  $\geq 2$  on  
137 the Chinese version of the five-item Geriatric Depression Scale, GDS-5,<sup>22</sup> medication-related  
138 problems (defined as currently using >eight medications, poor adherence, adverse drug  
139 reactions and potentially inappropriate medications), malnutrition (defined as scores <12 on  
140 the Mini-Nutritional Assessment-Short Form, MNA-SF), requirements of social resources, as  
141 well as health-related quality of life (assessed by the Chinese version of the EQ-5D system).

142

143 ***Development of FIND-NEEDS screening tool***

144 The FIND-NEEDS was designed based on the following principles. First, some domains  
145 were derived from the well-established and commonly used screening tools, such as the  
146 Patient Health Questionnaire-2 (PHQ-2)<sup>23</sup> and Geriatric Depression Scale (GDS-5)<sup>24,25</sup> for  
147 screening depression, and the CSHA Clinical Frailty Scale (CFS)<sup>26</sup> for screening frailty.  
148 Second, some domains were further condensed and modified from the core items of existing  
149 screening tools. For example, two shared items from the Malnutrition Universal Screening  
150 Tool (MUST) and the Mini-Nutritional Assessment-Short Form (MNA-SF)<sup>27,28</sup> were selected  
151 for screening malnutrition. Items also included the “three-item recall” test from the Mini-Cog  
152 assessment with a simple question<sup>29</sup> for objective and subjective cognitive problems, and an  
153 item concerning high-risk medications from the 4Ms model as one of medication-related  
154 problems<sup>20</sup>. Third, some domains contained combination of several core items into a  
155 question. For example, core questions of the Practice Guideline for Prevention of Falls by the  
156 American Geriatrics Society and British Geriatrics Society<sup>30</sup> and those of incontinence  
157 proposed by Moore and Siu,<sup>31</sup> as well as selecting two items of activities of daily living from  
158 the Katz Index<sup>32</sup> for screening functional impairment. Fourth, the items concerning sensory  
159 impairment focused on affected daily life or identified symptoms/signs (e.g., memory

160 impairment, medication-related problems). The reason of focusing on affected daily life and  
161 identified symptoms/signs is because these are important factors associated with quality of  
162 life. Fifth, to easily and quickly understand the health status of older adults, the screening  
163 instrument was designed to be performed by non-geriatric healthcare workers or volunteers  
164 with minimal training or by self-evaluation with assistance on only a few items.

165       A total of 24 items were drafted to screen for common geriatric conditions, with frailty,  
166 falls, and disability being the very first items of “Function” in the FIND-NEEDS. Frailty,  
167 falls and disability are distinct with serial progression of decreased mobility and functional  
168 ability, with overlapping concepts that share common risk factors.<sup>5</sup> Screening for disability is  
169 suggested first to find out those with severe results of functional impairment,<sup>3</sup> which is  
170 directed to provision of care skills, supportive services, or long-term care. Falls is the  
171 geriatric condition that is an indicator of underlying frailty and a predictor of future disability.  
172 Further screening of falls and frailty for potential mobility problems is suggested among  
173 those without disability. More specifically, “Function” in FIND-NEEDS corresponds to  
174 locomotion and vitality in intrinsic capacity; “Dementia” in FIND-NEEDS corresponds to  
175 cognition in intrinsic capacity and mentation in the 4Ms; “Eyes and Ear” in FIND-NEEDS  
176 corresponds to the sensory components in intrinsic capacity; “Depression” in FIND-NEEDS  
177 corresponds to psychological components in intrinsic capacity and mentation in 4Ms;

178 Nutrition in FIND-NEEDS corresponds to vitality in intrinsic capacity; “Number of  
179 medications” in FIND-NEEDS corresponds to medications in 4Ms; “Falls, incontinence,  
180 social interaction in FIND-NEEDS corresponds to the second module of “falls, incontinence,  
181 social support” in intrinsic capacity. Previous study of the content validity of the FIND-  
182 NEEDS screening tool was based on the expert opinions after modification and amendment  
183 showed good Item-Level and Scale-Level Content Validity Index.<sup>33</sup>

184

### 185 ***Data analysis***

186 All the statistical analyses in the present study were conducted using the JASP Version 0.16.3  
187 (JASP Team, 2022; <https://jasp-stats.org/>). Descriptive statistics of the data comprised means  
188 (SDs) or frequencies (percentages). Internal consistency of the FIND-NEEDS was conducted  
189 using three methods: traditional Cronbach’s  $\alpha$ ,<sup>34</sup> McDonald’s  $\omega$ ,<sup>35</sup> and greatest lower bound  
190 (GLB).<sup>36</sup> Cronbach’s  $\alpha$  was used for calculating internal consistency;<sup>37</sup> McDonald’s  $\omega$  was  
191 used for adjustment of the tau-equivalence assumptions when this assumption is violated,<sup>38</sup>  
192 GLB was used because it is less impacted by skewed data (which is common for older  
193 people’s data) than  $\alpha$  and  $\omega$ .<sup>37,39</sup> Moreover, internal consistency of the FIND-NEEDS was  
194 examined for its item scores (i.e., 24 items) and its domains scores (i.e., 11 domains) by using

195 item analysis and item-total correlation test. The internal consistency value is interpreted as  
196 acceptable when larger than 0.6 and good when larger than 0.7.

197       Apart from internal consistency, the factor structure of the FIND-NEEDS was assessed  
198 using parallel analysis (PA) and exploratory factor analysis (EFA) on its domain scores. In  
199 PA, simulated datasets were generated to identify the random eigenvalue. Then, the  
200 eigenvalue derived from the present dataset was compared with the random eigenvalue.  
201 When the eigenvalue of a factor from the present dataset was higher than its random  
202 eigenvalue, the factor was considered to be real.<sup>40</sup> In EFA, Kaiser–Meyer–Olkin and  
203 Bartlett’s tests were conducted first to ensure that the data were suitable for EFA. Kaiser–  
204 Meyer–Olkin value larger than 0.6 and significant Bartlett’s test indicate that the data can be  
205 used for EFA.<sup>41</sup> Then, EFA with principal axis factoring extraction method is used if the data  
206 are suitable. Root mean square error of approximation smaller than 0.05 in the EFA further  
207 indicates that identified factor structure of FIND-NEEDS was supported.<sup>42</sup> Factor loadings of  
208 the FIND-NEEDS domain scores were calculated in the EFA and a factor loading larger than  
209 0.3 indicated good loading.<sup>43</sup>

210       Finally, the FIND-NEEDS was examined for its criterion-related validity with the gold  
211 standard of CGA results. Two FIND-NEEDS scores were used: (i) a summed score that  
212 added all the FIND-NEEDS domain scores, and (ii) a binary score using the FIND-NEEDS

213 summed score converted into 0 (no problems) or 1 (having problems). The two FIND-  
214 NEEDS scores were examined using the following statistical analyses: (i) Spearman  
215 correlation with CGA results; (ii) sensitivity and specificity; and (iii) area under receiver  
216 operating characteristic curve (AUC).

217

## 218 **RESULTS**

219 A total of 114 older adults were enrolled. Table 1 shows characteristics of the participants  
220 receiving screening and assessment. Their mean age was 78.3 years (SD±7.6), and 35 were  
221 males (30.7%). The majority of the participants were married or cohabiting (96.43%), and  
222 over half of them had an educational level at primary school or below (59.82%). Very few of  
223 the participants lived alone (7.14%).

224 Table 2 shows the percentages of participants having problems in each domain. More  
225 than 80% of the participants had potential problems in the domains of Function (functional  
226 impairment, falls, and frailty). More than a half of participants had problems in the domains  
227 of Dementia, Number of medications, and Depression. Nearly one-third of participants had  
228 problems in the domains of Incontinence, Nutrition, Eyes or Ear problems. In all internal  
229 consistency methods, the internal consistency was excellent when using all FIND-NEEDS  
230 items ( $\alpha=0.917$ ;  $\omega=0.922$ ;  $GLB=0.982$ ), and was acceptable when using FIND-NEEDS

231 domain scores ( $\alpha=0.616$ ;  $\omega=0.635$ ;  $GLB=0.760$ ). The unidimensionality of the FIND-NEEDS  
232 domain scores was supported by the PA (Figure 1). Moreover, Kaiser–Meyer–Olkin value  
233 (0.67) together with significant Bartlett’s test chi-square (110.56 [df=36];  $p<0.001$ ) supported  
234 that FIND-NEEDS domain scores were suitable for EFA. EFA results showed that most of  
235 the FIND-NEEDS domain scores had factor loadings higher than 0.3, except for Nutrition  
236 (0.240), Eyes (0.257), and Ears (0.154). Fit index of root mean square residual error of  
237 approximation (0.044) also supported the unidimensionality of the FIND-NEEDS.

238 Table 3 shows intercorrelations of binary scores between domains of FIND-NEEDS and  
239 CGA. Most domains showed moderate correlation between FIND-NEEDS and CGA, except  
240 for low correlation in dementia and weak correlation in social interaction. The overall  
241 correlation of summed scores between FIND-NEEDS and CGA was high.

242 Table 4 shows the intercorrelations between FIND-NEEDS domains. Depression was  
243 significantly correlated with most domains except for eyes and ears. Hearing impairment  
244 (ears) was not correlated with other domains of impairment, while visual impairment (eyes)  
245 and malnutrition were significantly correlated only with one other domain of impairment  
246 (i.e., dementia and depression, respectively).

247 Figure 1 shows parallel analysis of the FIND-NEEDS. The FIND-NEEDS summed  
248 score was moderately correlated with CGA score ( $r=0.494$ ;  $p<0.001$ ). After converting the

249 FIND-NEEDS summed score into a binary score (0=no problems, 1=having problems), the  
250 FIND-NEEDS binary score had a very high correlation with CGA score ( $r=0.944$ ;  $p<0.001$ ).  
251 Moreover, the FIND-NEEDS binary score showed excellent AUC (0.950), sensitivity (1.00),  
252 and specificity (0.90) when using the CGA score as the gold standard.

253

## 254 **DISCUSSION**

255 The present study evaluating clinimetric properties of the FIND-NEEDS showed that the  
256 validity and reliability were acceptable with excellent internal consistency ( $\alpha=0.616$  and  
257  $0.917$ ;  $\omega=0.635$  and  $0.922$ ;  $GLB=0.760$  and  $0.982$ ). Using the CGA as the gold standard,  
258 FIND-NEEDS binary scores showed moderate to very high correlations ( $r=0.494$  to  $0.944$ ;  
259  $p<0.001$ ) as well as excellent sensitivity (1.00) and specificity (0.90) with a satisfactory AUC  
260 (0.950).

261 Although the CGA has the huge benefit with regards to holistic assessment of older  
262 people, it has been criticized for its administration burden.<sup>3,5</sup> The FIND-NEEDS includes  
263 important domains of geriatric care to help healthcare providers efficiently assess geriatric  
264 needs for older people and is a feasible brief tool to screen for geriatric problems in busy  
265 clinical settings.



266           The present study showed that most domains had moderate correlations between FIND-  
267 NEEDS and CGA, except for a low correlation in dementia and a weak correlation in social  
268 interaction. Dementia screening in the CGA comprised the SPMSQ, which does not include  
269 direct testing of episodic declarative memory, and is more accurate in identifying individuals  
270 with moderate or severe impairment of dementia,<sup>44</sup> while the dementia screening in the  
271 FIND-NEEDS included directly asked presentation of memory impairment and three-item  
272 recall may detect individuals with mildly impaired dementia. Social interaction in FIND-  
273 NEEDS included directly asked about living alone or loneliness and social activities, while  
274 social conditions in CGA include living alone or social support needed. However, the FIND-  
275 NEEDS may identify more potential problems for further assessment of geriatric conditions.

276           Although the present study found that most clinimetric properties of the FIND-NEEDS  
277 (especially in its scale-level) were acceptable to satisfactory, some domains had relatively  
278 low associations with the entire FIND-NEEDS instrument. More specifically, Eyes, Ears, and  
279 Nutrition were the three domains with low factor loadings in the EFA. In 2007, these three  
280 domains were not considered as geriatric syndrome by Inouye SK, et al.<sup>45</sup> In fact, visual and  
281 hearing impairments were not listed as screening domains in most screening tools except the  
282 ICOPE or DEEP-IN.<sup>3,8,10-14</sup> Geriatric syndromes (geriatric conditions) are multifactorial  
283 conditions that are prevalent among older adults and are believed to develop when an

284 individual experiences accumulated impairments in multiple systems that compromise their  
285 compensatory ability. The low factor loadings of visual and hearing (sensory) impairments  
286 may be explained by the following reasons. First, in contrast to the other impairments, the  
287 causes of sensory impairments are usually due to aging-related organ-specific diseases (e.g.,  
288 cataract or glaucoma, age-related, noise-generated, drug-induced, or chronic otitis media),  
289 and multifactorial causes due to other impairments are not common. Second, sensory  
290 impairments may not directly lead to urgent health problems, unless the impairment is severe.  
291 Compared to impairments in other domains, individuals with mild to moderate sensory  
292 impairments may tolerate or accustom themselves gradually and live independently without  
293 progressively accumulated impairments in other systems for several years. As for nutrition  
294 screening, malnutrition risk is associated with the existing geriatric syndromes, which are  
295 also associated with poor nutritional status.<sup>46</sup> The nutrition screening items in the FIND-  
296 NEEDS were retrieved and modified from the core items of the commonly used screening  
297 tools in clinical practice, MUST and MNA-SF. However, the impacts of weaker associations  
298 between these three domains with the other FIND-NEEDS domains needs to be monitored in  
299 the future study. Nevertheless, from the viewpoint of intrinsic capacity and the 4Ms model,  
300 the domains of nutrition, eyes, and ears in the FIND-NEEDS need to be retained for  
301 comprehensive assessment.

302           The present study showed there were high percentages of older adults visiting geriatric  
303   clinics who had potential geriatric conditions, which would be ignored if no CGA was  
304   conducted. In fact, CGA was usually not considered by healthcare providers as routine  
305   assessment in primary geriatric care, because CGA is typically regarded as being carried out  
306   by geriatricians and/or trained gerontological nurses,<sup>5</sup> and usually takes more than an hour to  
307   complete.<sup>3</sup> However, the FIND-NEEDS is easier for administration and can reduce the heavy  
308   workload in the geriatric setting. Completion of the FIND-NEEDS takes an average of less  
309   than ten minutes, which is considerably less time than CGA.

310           The required time in assessment for conducting FIND-NEEDS screening or conducting  
311   CGA has not been clearly defined due to the difference in capacity (i.e., FIND-NEEDS  
312   focuses on brief screening whereas CGA focuses on comprehensive assessment), facilities  
313   (i.e., FIND-NEEDS relies on self-reports whereas CGA needs older adults to complete some  
314   physical tasks, such as walking to check the person's balance) and staff (i.e., FIND-NEEDS  
315   can be administered by the older adults or their caregivers with assistance from research  
316   assistants whereas CGA needs to be performed by trained geriatric care personnel). In fact,  
317   not all older adults can have CGA because CGA takes a lot of time to administer. A previous  
318   quasi-experimental study reported only about 10% of admission patients in control group  
319   received CGA (usually administered to patients with frailty and recent functional decline).<sup>4</sup> In

320 addition to community-dwelling older population, geriatric screening is suggested for all  
321 older adults visiting outpatient clinics, or inpatients hospitalized within first 48-72 hours after  
322 admission, usually at a relatively stabilized condition of acute diseases, so that team staff  
323 have enough time to manage geriatric problems during a hospital stay. As to geriatric  
324 screening in the emergency room (ER), one study showed that a screening program for  
325 geriatric conditions during routine ER care increased the compliance of follow-up  
326 maintenance instead and did not result in negative attitudes toward the ER process among  
327 older patients.<sup>47</sup>

328       There are some limitations in the present study. First, the sample was recruited using a  
329 convenience sampling method. Also, the sample was recruited in the geriatric clinics of a  
330 single center in Tainan City. Therefore, the representativeness of the present sample is  
331 restricted and cannot be generalized to the entire Taiwan geriatric population. Future studies  
332 are therefore needed to examine if the FIND-NEEDS possesses good clinimetric properties in  
333 a more heterogeneous sample. Second, the sample size was not big enough to provide  
334 sufficient power for advanced clinimetric testing (e.g., confirmatory factor analysis). Future  
335 studies are needed to use other advanced clinimetric testing method to corroborate the present  
336 study's conclusions. Third, the present study did not examine a number of clinimetric  
337 properties of the FIND-NEEDS including inter-rater reliability, test-retest reliability and

338 responsiveness. Therefore, it is unclear if the reproducibility and the ability to detect  
339 intervention effects of the FIND-NEEDS are satisfactory.

340

### 341 **Conclusion**

342 The present study showed that the newly developed instrument (i.e., FIND-NEEDS) is an  
343 ease-for-use instrument with acceptable clinimetric properties. Apart from its brevity which  
344 saves time for healthcare practitioners in busy clinical practice, the FIND-NEEDS has the  
345 strength of corresponding to the intrinsic capacity framework, DEEP-IN, and 4Ms model. By  
346 considering intrinsic capacity, DEEP-IN, and 4Ms model in its development, the FIND-  
347 NEEDS captures precise geriatric needs using a holistic method. Healthcare providers can  
348 use the FIND-NEEDS to quickly screen overall conditions among older adults. Further in-  
349 depth assessment in specific domains and appropriate geriatric care plan can then be  
350 conducted afterwards.

351

### 352 **ACKNOWLEDGMENTS**

#### 353 **Conflict of Interest**

354 The authors declare no conflicts of interest.

#### 355 **Author Contributions**

356 Conception and design of study: CMC, FWH, YWW, CCH, YTL, CYW, YFC, LFL, CCW;  
357 Acquisition of data: CMC, FWH, CCH, YTL, YCY; Analysis of data: CMC, YJC, MDG, DCL, CYL;  
358 Drafting of article and/or critical revision: CMC, CYW, YFC, YJC, MDG, DCL, CYL; Final approval  
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Table 1. Characteristics of participants receiving screening and assessment

	Mean (SD) or n (%)
Age (years)	78.3 (7.6)
Sex (male)	35 (30.7)
Educational level	
<i>Illiterate</i>	25 (22.3)
<i>Primary school</i>	42 (37.5)
<i>Junior high</i>	16 (14.3)
<i>Senior high</i>	9 (8.0)
<i>College or above</i>	20 (17.9)
Marital status	
<i>Married or cohabiting</i>	73 (65.2)
<i>Widowed</i>	35 (31.3)
<i>Other</i>	4 (3.6)
Living alone	8 (7.1)
Current cigarette smoker	3 (2.7)
Current alcohol drinker	13 (11.7)
Underlying diseases	
<i>Hypertension</i>	69 (62.2)
<i>Diabetes mellitus</i>	39 (35.1)
<i>Hyperlipidemia</i>	24 (21.6)
<i>Cardiovascular accident</i>	8 (7.2)
<i>Cardiovascular disease</i>	37 (33.3)
<i>Neurological disease</i>	13 (11.7)
<i>Respiratory disease</i>	10 (9.0)

Table 1. Characteristics of participants receiving screening and assessment

<i>Liver disease</i>	9 (8.1)
<i>Gastrointestinal disease</i>	26 (23.4)
<i>Renal disease</i>	18 (16.2)
<i>Musculoskeletal disease</i>	31 (27.9)
<i>Eye disease</i>	41 (36.9)
<i>Psychiatric disease</i>	30 (27.0)
<i>Urological disease</i>	25 (22.5)
<i>Cancer</i>	16 (14.4)

Table 2. Domain properties for FIND-NEEDS (N=114)

Domain	n (%) of having problem	Factor loading	Item-total correlation
F: Function, Falls, Frailty	94 (82.5)	0.42	0.36
I: Incontinence	38 (33.3)	0.47	0.36
N: Nutrition	36 (31.6)	0.24	0.17
D: Dementia	82 (71.9)	0.61	0.50
N: Number of medications	72 (63.2)	0.46	0.32
E: Eyes	39 (34.2)	0.26	0.18
E: Ears	35 (30.7)	0.15	0.12
D: Depression	59 (51.8)	0.60	0.46
S: Social interaction	53 (46.5)	0.37	0.25

Note.

1. For exploratory factor analysis: Kaiser–Meyer–Olkin value=0.67; Bartlett’s test chi-square=110.56, df=36 (p<0.001),  $\chi^2/df=3.07$ ; root mean square residual error of approximation=0.044 (90% CI=0.00, 0.09).
2. Area Under the ROC Curve (using FIND-NEEDS binary score and CGA binary score): AUC=0.95. Accuracy=0.99; Precision=0.99; Sensitivity=1.00; Specificity=0.90.
3. FINDNEEDS domain score: Internal consistency using greatest lower bound (GLB) method=0.76 (95% CI, 0.70, 0.84); using McDonald’s omega=0.64 (95% CI, 0.54, 0.73); using Cronbach’s alpha=0.62 (95% CI, 0.50, 0.71).
4. FINDNEEDS item score: Internal consistency using GLB method=0.98 (95% CI, 0.99, 1.00); using McDonald’s omega=0.92 (95% CI, 0.90, 0.94); using Cronbach’s alpha=0.92 (95% CI=0.89, 0.94).



Table 3. Intercorrelations of binary scores between domains of FINDNEEDS and Comprehensive Geriatric Assessment (CGA)

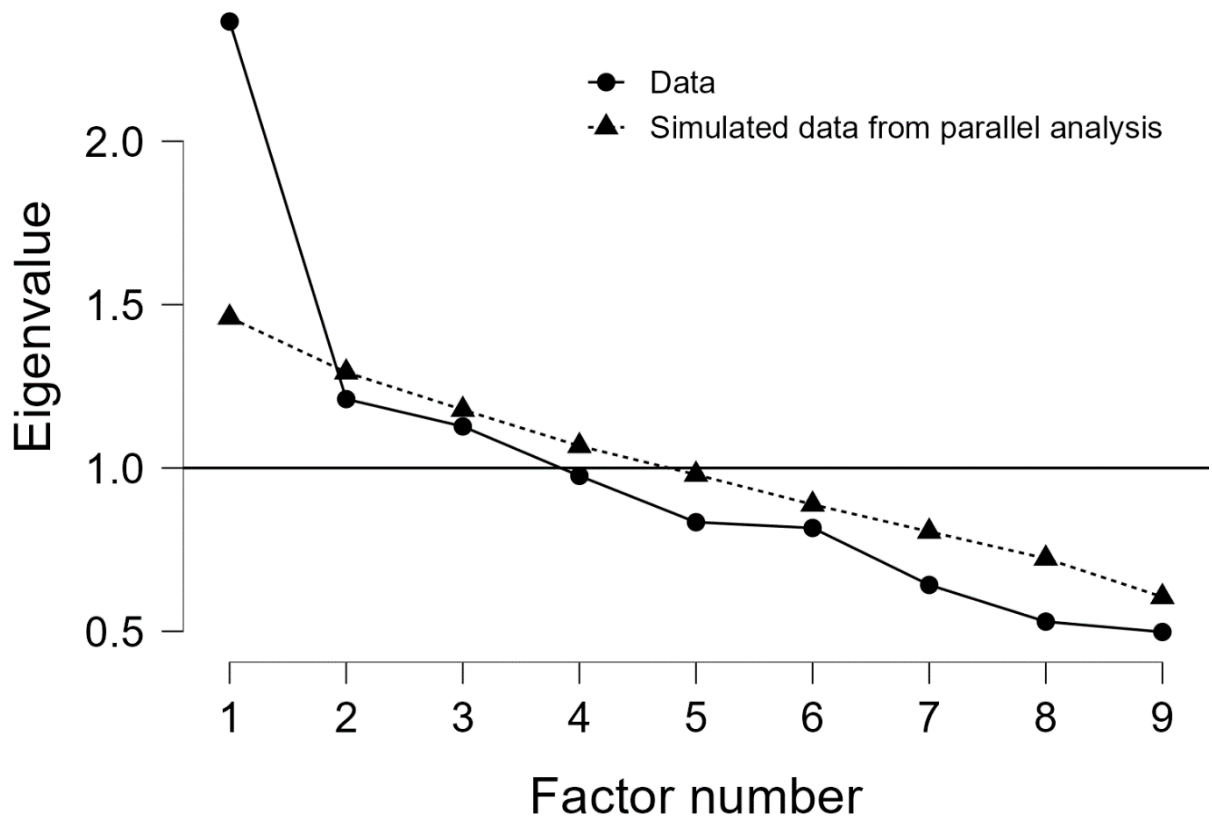
	CGA									Sum score (0-1) <sup>a</sup>	Sum score
	1.	2.	3.	4.	5.	6.	7.	8.	9.		
FIND-NEEDS	(0-1) <sup>a</sup>	(0-1) <sup>a</sup>	(0-1) <sup>a</sup>	(0-1) <sup>a</sup>	(0-1) <sup>a</sup>	(0-1) <sup>a</sup>	(0-1) <sup>a</sup>	(0-1) <sup>a</sup>	(0-1) <sup>a</sup>	(0-1) <sup>a</sup>	
1. F: Function, Falls, Frailty	0.68 ***										
2. I: Incontinence		0.63 ***									
3. N: Nutrition			0.44 ***								
4. D: Dementia				0.39 ***							
5. N: Number of medications					0.53 ***						
6. E: Eyes						0.47 ***					
7. E: Ears							0.64 ***				
8. D: Depression								0.40***			
9. S: Social interaction									0.02		
sum score (0-1)										0.94 ***	
sum score											0.69 ***

\*\*\* $p < 0.001$ . <sup>a</sup> Phi coefficient; <sup>b</sup> Spearman's rank correlation coefficient.

Table 4. Intercorrelations between FIND-NEEDS domains (N=114)

	<i>r</i> ( <i>p</i> )								
	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. F: Function, Falls, Frailty	--								
2. I: Incontinence	0.23 *	--							
3. N: Nutrition	0.17	-0.04	--						
4. D: Dementia	0.17	0.28 **	0.17	--					
5. N: Number of medications	0.17	0.31 **	0.13	0.25 **	--				
6. E: Eyes	0.14	0.08	-0.01	0.33 ***	0.05	--			
7. E: Ears	0.11	0.13	0.04	0.16	-0.08	0.12	--		
8. D: Depression	0.25 **	0.19 *	0.26 **	0.34 ***	0.33 ***	0.14	0.07	--	
9. S: Social interaction	0.20 *	0.27**	0.01	0.23 *	0.13	-0.04	-0.01	0.24 **	--

\* $p < 0.05$ , \*\* $p < 0.001$ , \*\*\* $p < 0.001$ .



502

503

Figure 1. Parallel analysis of the FIND-NEEDS