

Comorbidity Polypharmacy Score (CPS) and Health Related Outcomes Associated with Cognitive and Functional Decline Among Older Adults

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Higher CPS at admission was strongly associated with Charlson Comorbidity Score (CCI), GerontoNet ADR , and functional impairment (P< 0.001). CPS is a simple bedside index that may strengthen medication reconciliation and deprescribing in hospitalized older adults.

INTRODUCTION	METHODS	RESULTS	RESULTS	CONCLUSION																																																																																																																																				
Aging populations carry more chronic conditions requiring long-term, multi-drug treatment, increasing the risk of inappropriate polypharmacy, which is linked to adverse outcomes associated with cognitive and functional decline. The Comorbidity-Polypharmacy Score (CPS), the simple sum of comorbid conditions and routine medications, provides an easy bedside measure of combined disease and drug burden, but it requires further validation across older-adult populations.	Design & Population: retrospective electronic medical chart review (EMR) in two tertiary hospitals in Beirut, Lebanon for inpatients aged 65 years or older, admitted from 2020 to 2025. Analytic sample: 624 patients with complete CPS data (data cleaning ongoing; target N= 1000). Exposure: CPS at admission analyzed continuously and stratified as Low / Moderate / High. Covariates: age, sex, Charlson Comorbidity Index, GerontoNet ADR Risk Score. Outcomes: hospital length of stay, hospital readmission, Emergency readmission, in-hospital death. Analysis: descriptive statistics by CPS stratum (ANOVA, Kruskal-Wallis, chi-square); Spearman correlations among indices; negative binomial regression for length of stay; logistic regression. Reporting follows STROBE.	Total 624 medical chart reports were reviewed and extracted; mean age 75 (SD 7.9) years; 44% female; CPS strata Low 34.0%, Moderate 46.4%, High 19.2%. Distribution of CPS strata at admission (n=624) Figure 1: Distribution of CPS strata at admission. Higher CPS tracked with higher CCI, GerontoNet score, chronic conditions, medications, anticholinergic burden (ACB), and functional impairment (all P<0.001; Figure 1). Length of stay increased across strata (median 4 / 5 / 6 days; P=0.0391) (See Figure 2). <table><caption>Table 1: Characteristics by CPS Stratum (N=624)</caption><tr><th>Characteristic</th><th>Total (625)</th><th>Low (215)</th><th>Moderate (290)</th><th>High (120)</th><th>P</th></tr><tr><td>CPS at admission, mean (SD)</td><td>10.11(5.21)</td><td>4.96(1.53)</td><td>10.50 (1.99)</td><td>18.4(3.33)</td><td><0.001</td></tr><tr><td>Age,years,mean (SD)</td><td>75 (7.93)</td><td>74.4 (8.20)</td><td>74.78 (7.80)</td><td>76.75 (7.54)</td><td>0.025</td></tr><tr><td>Sex, Female n (%)</td><td>280 (44)</td><td>99 (35.36)</td><td>124 (44.29)</td><td>57 (20.36)</td><td>0.613</td></tr><tr><td>Hospitals</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>AUBMC, n (%)</td><td>179 (24.48)</td><td>36 (16.74)</td><td>71 (24.48)</td><td>71(59.17)</td><td><0.001</td></tr><tr><td>RHUH, n (%)</td><td>447 (71.52)</td><td>179 (83.26)</td><td>219 (75.52)</td><td>49 (40.83)</td><td></td></tr><tr><td>Charlson, CI, mean (SD)</td><td>5.99 (2.35)</td><td>4.66 (2.0)</td><td>5.7 (2.09)</td><td>7.53(2.42)</td><td><0.001</td></tr><tr><td>GerontoNet ADR, mean (SD)</td><td>2.74 (2.32)</td><td>0.68 (0.83)</td><td>2.95 (1.65)</td><td>5.95 (1.47)</td><td><0.001</td></tr><tr><td>No. Chronic conditions, mean (SD)</td><td>4.43 (2.42)</td><td>2.41 (0.95)</td><td>4.59 (1.45)</td><td>7.68 (2.43)</td><td><0.001</td></tr><tr><td>Total meds at admission, mean (SD)</td><td>5.67(3.35)</td><td>2.54 (1.11)</td><td>5.91 (1.68)</td><td>10.71 (2.56)</td><td><0.001</td></tr><tr><td>ACB, median (IQR)</td><td>1 (0, 1)</td><td>0 (0, 1)</td><td>1 (0, 1)</td><td>1 (0, 2)</td><td><0.001</td></tr><tr><td>Functional: Impaired n (%)</td><td>474 (81.72)</td><td>145 (30.59)</td><td>235 (49.58)</td><td>94 (19.83)</td><td><0.001</td></tr><tr><td>Length of stay, days, median (IQR)</td><td>5 (1, 11)</td><td>4 (1, 9)</td><td>5 (1, 12)</td><td>6 (2, 11)</td><td>0.0391</td></tr><tr><td>In-Hospital death n (%)</td><td>27 (15.17)</td><td>4 (13.79)</td><td>12 (41.38)</td><td>13 (44.83)</td><td>0.398</td></tr><tr><td>Hospital Readmission, n (%)</td><td>178 (28.48)</td><td></td><td></td><td></td><td></td></tr><tr><td>No Readmission, n(%)</td><td>81(45.5)</td><td>19 (23.46)</td><td>40 (49.38)</td><td>22 (27.16)</td><td></td></tr><tr><td>1-2 Readmission, n(%)</td><td>46 (25.8)</td><td>12 (26.09)</td><td>12 (26.09)</td><td>22 (47.38)</td><td>0.007</td></tr><tr><td>≥ 3 Readmission, n (%)</td><td>51 (28.65)</td><td>5 (9.80)</td><td>19 (37.25)</td><td>27 (52.94)</td><td></td></tr><tr><td>ER Readmission, n (%)</td><td>178 (28.48)</td><td></td><td></td><td></td><td></td></tr><tr><td>No ER Readmission, n (%)</td><td>139 (78.0)</td><td>28 (20.14)</td><td>50 (35.97)</td><td>61 (43.88)</td><td></td></tr><tr><td>ER Readmission, n (%)</td><td>39 (21.9)</td><td>8 (20.51)</td><td>21 (53.85)</td><td>10 (2564)</td><td>0.083</td></tr></table> Table 1: Characteristics by CPS Stratum - Values: mean (SD), median (IQR), or n (%), P: ANOVA / Kruskal-Wallis/chi-square	Characteristic	Total (625)	Low (215)	Moderate (290)	High (120)	P	CPS at admission, mean (SD)	10.11(5.21)	4.96(1.53)	10.50 (1.99)	18.4(3.33)	<0.001	Age,years,mean (SD)	75 (7.93)	74.4 (8.20)	74.78 (7.80)	76.75 (7.54)	0.025	Sex, Female n (%)	280 (44)	99 (35.36)	124 (44.29)	57 (20.36)	0.613	Hospitals						AUBMC, n (%)	179 (24.48)	36 (16.74)	71 (24.48)	71(59.17)	<0.001	RHUH, n (%)	447 (71.52)	179 (83.26)	219 (75.52)	49 (40.83)		Charlson, CI, mean (SD)	5.99 (2.35)	4.66 (2.0)	5.7 (2.09)	7.53(2.42)	<0.001	GerontoNet ADR, mean (SD)	2.74 (2.32)	0.68 (0.83)	2.95 (1.65)	5.95 (1.47)	<0.001	No. Chronic conditions, mean (SD)	4.43 (2.42)	2.41 (0.95)	4.59 (1.45)	7.68 (2.43)	<0.001	Total meds at admission, mean (SD)	5.67(3.35)	2.54 (1.11)	5.91 (1.68)	10.71 (2.56)	<0.001	ACB, median (IQR)	1 (0, 1)	0 (0, 1)	1 (0, 1)	1 (0, 2)	<0.001	Functional: Impaired n (%)	474 (81.72)	145 (30.59)	235 (49.58)	94 (19.83)	<0.001	Length of stay, days, median (IQR)	5 (1, 11)	4 (1, 9)	5 (1, 12)	6 (2, 11)	0.0391	In-Hospital death n (%)	27 (15.17)	4 (13.79)	12 (41.38)	13 (44.83)	0.398	Hospital Readmission, n (%)	178 (28.48)					No Readmission, n(%)	81(45.5)	19 (23.46)	40 (49.38)	22 (27.16)		1-2 Readmission, n(%)	46 (25.8)	12 (26.09)	12 (26.09)	22 (47.38)	0.007	≥ 3 Readmission, n (%)	51 (28.65)	5 (9.80)	19 (37.25)	27 (52.94)		ER Readmission, n (%)	178 (28.48)					No ER Readmission, n (%)	139 (78.0)	28 (20.14)	50 (35.97)	61 (43.88)		ER Readmission, n (%)	39 (21.9)	8 (20.51)	21 (53.85)	10 (2564)	0.083	Length of hospital stay by CPS strata at admission (n=624) P=0.0391 Figure 2: Length of Stay by CPS Stratum. P: Kruskal-Wallis Higher admission CPS remained strongly associated with number of medications at admission (β=1.04, P <0.001, 95 % CI [0.81-1.26], and functional impairment (OR= 1.5, P=0.003, 95%CI [1.6, 2.10]) after adjusting for study covaries. CPS correlated with the Charlson Comorbidity Index (ρ=0.47) and strongly with the GerontoNet ADR Risk Score (ρ=0.87), supporting convergent validity (see figure 3). Figure 3: Pairwise relationships among burden indices Figure 3: Pairwise relationship Among Burden Indices. P: Spearman Correlation. Comorbidity Poly Pharmacy Score (CPS), Charlson Comorbidity Index (CCI), GerontoNet ADR Risk Score	As a simple bedside index, CPS could be embedded in medication reconciliation to flag high-burden patients for deprescribing review. Full-cohort (N=1000) and multivariable adjusted analyses are in progress. REFERENCES - Evans DC, et al. Comorbidity-polypharmacy score: a novel adjunct in post-emergency department triage. J Surg Res. 2012. - Onder G, et al. The GerontoNet ADR risk score. Arch Intern Med. 2010;170(13):1142-1148. - Charlson ME, et al. A new method of classifying prognostic comorbidity. J Chronic Dis. 1987;40(5):373-383 CONTACT Etwal Bou Raad Postdoctoral Fellow, Yale School of Public Health Email: Etwal.bouraad@yale.edu This research is funded by the Fogarty International Center at NIH through the Global Health Emerging Scholars Program under award number D43TW010540. Additional support was provided by NIA under award number 3D43TW010540-08S9. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.
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