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Heterogeneity of patients' engagement in patient safety during systemic antineoplastic therapy: application of latent profile analysis and network analysis

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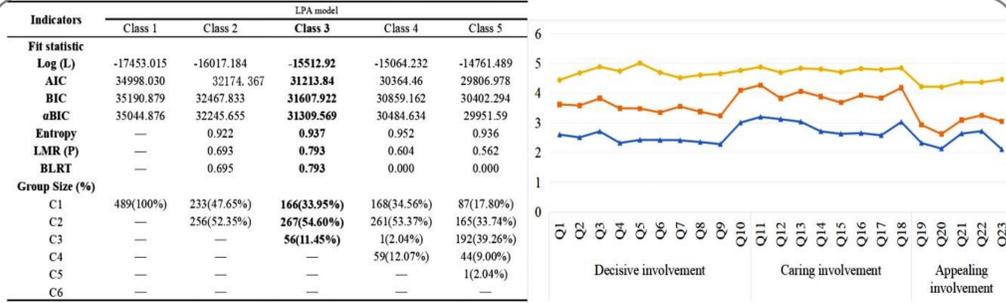
INTRODUCTION & AIM

Global cancer burden remains heavy, with systemic antineoplastic therapy advancing but bringing new safety challenges. Patient and family engagement (PFE) in safety is an international priority, and patient participation in medication safety helps reduce errors, influenced by factors like health literacy. Existing studies lack subgroup analyses, ignoring individual and disease-related differences.

This study uses Latent Profile Analysis (LPA) to identify cancer patient subgroups based on safety participation behaviors and assess demographic differences, and network analysis to find core symptoms in each subgroup, exploring the relationship between participation behaviors and symptoms.

METHOD

Researchers conducted a cross-sectional survey of 489 adults undergoing non-initial chemotherapy cycles from October 2024 to May 2025. We collected demographics data along with scores from the Inpatients' Involvement in Medication Safety Scale (α=0.923) and EORTC QLQ-C30 for nine symptoms. Latent profile analysis employed Mplus software while network analysis used the qgraph package in R with EBICglasso estimation and bootstrapping for stability.

RESULTS & DISCUSSION

Indicators	LPA model				
	Class 1	Class 2	Class 3	Class 4	Class 5
Fit statistic					
Log (L)	-17453.015	-16017.184	-15512.92	-15064.232	-14761.489
AIC	34998.030	32174.367	31213.84	30364.46	29806.978
BIC	35190.879	32467.833	31607.922	30859.162	30402.294
aBIC	35044.876	32245.655	31309.569	30484.634	29951.59
Entropy	—	0.922	0.937	0.952	0.936
LMR (P)	—	0.693	0.793	0.604	0.562
BLRT	—	0.695	0.793	0.000	0.000
Group Size (%)					
C1	489(100%)	233(47.65%)	166(33.95%)	168(34.56%)	87(17.80%)
C2	—	256(52.35%)	267(54.60%)	261(53.37%)	165(33.74%)
C3	—	—	56(11.45%)	1(2.04%)	192(39.26%)
C4	—	—	—	59(12.07%)	44(9.00%)
C5	—	—	—	—	1(2.04%)
C6	—	—	—	—	

Note: K Number of free parameters, AIC Akaike information criterion, BIC Bayesian information criterion, aBIC same-size adjusted Bayesian information criterion, LMR Lo-Mendell-Rubin likelihood ratio test, VLMR Vuong-Lo-Mendell-Rubin likelihood ratio test, BLRT Bootstrapped likelihood ratio test

Decisive involvement — Caring involvement — Appealing involvement
class1(34.0%) — class2 (54.5%) — class3 (11.5%)

FIGURE 1 Model fit indices and profile characteristics of the latent profile analysis for patient medication safety participation behaviors.
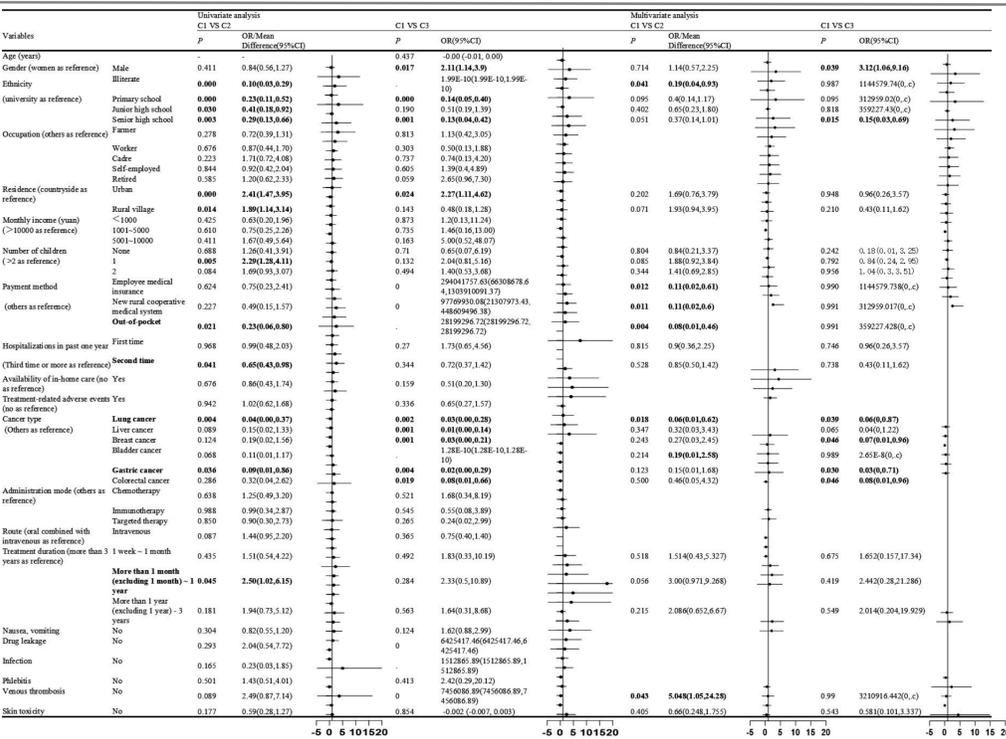

FIGURE 2 Univariate and multivariate logistic regression analyses of the latent classes of medication safety participation. Note: OR, odds ratio; CI, confidence interval. Boldface type indicates P < 0.05 compared with the reference group.
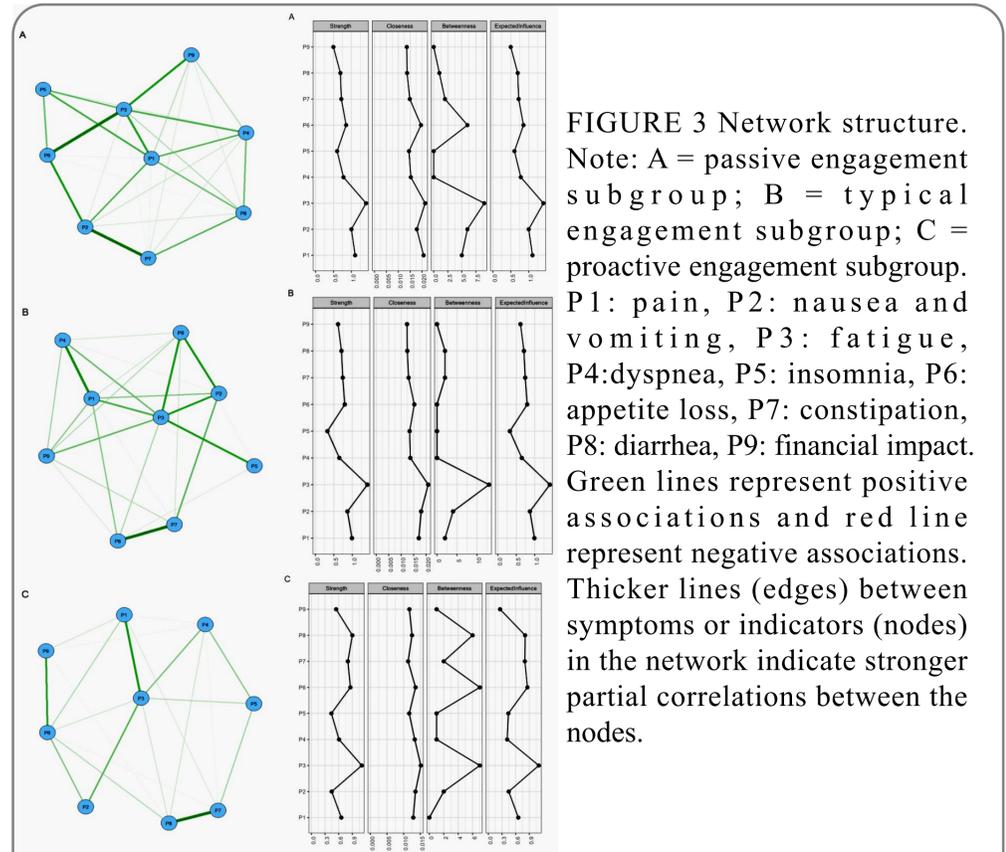

FIGURE 3 Network structure. Note: A = passive engagement subgroup; B = typical engagement subgroup; C = proactive engagement subgroup. P1: pain, P2: nausea and vomiting, P3: fatigue, P4:dyspnea, P5: insomnia, P6: appetite loss, P7: constipation, P8: diarrhea, P9: financial impact. Green lines represent positive associations and red line represent negative associations. Thicker lines (edges) between symptoms or indicators (nodes) in the network indicate stronger partial correlations between the nodes.
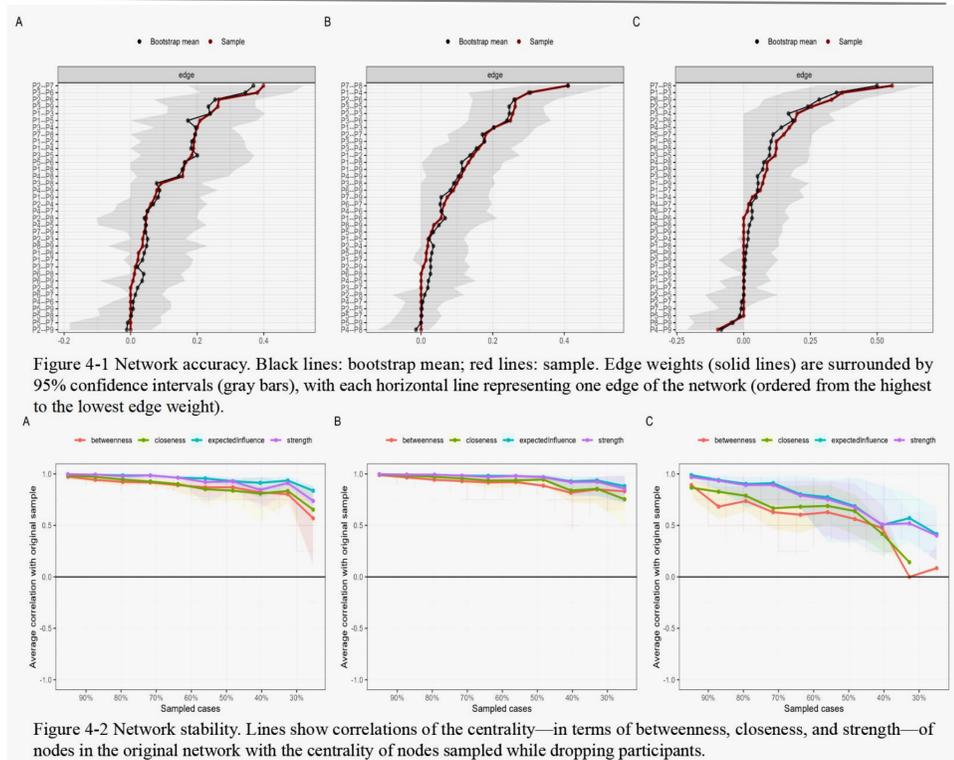

Figure 4-1 Network accuracy. Black lines: bootstrap mean; red lines: sample. Edge weights (solid lines) are surrounded by 95% confidence intervals (gray bars), with each horizontal line representing one edge of the network (ordered from the highest to the lowest edge weight).

Figure 4-2 Network stability. Lines show correlations of the centrality—in terms of betweenness, closeness, and strength—of nodes in the original network with the centrality of nodes sampled while dropping participants.

FIGURE 4 Network accuracy and stability. Note: A = passive engagement subgroup; B = typical engagement subgroup; C = proactive engagement subgroup. P1: pain, P2: nausea and vomiting, P3: fatigue, P4:dyspnea, P5: insomnia, P6: appetite loss, P7: constipation, P8: diarrhea, P9: financial impact.

CONCLUSION

Patients exhibit heterogeneous safety engagement patterns and symptom networks during antineoplastic therapy. Interventions should target fatigue and pain management in passive and typical profiles alongside engagement strategies for active ones. Combining latent profile and network analysis supports precision approaches to oncology patient safety.