RevelSI Artificial Intelligence Discovers Novel Dementia-Vascular Network and Dual Vitamin-Cardiovascular Axis

Revel Business Group LLC (RevelSI) announces the publication of a new study detailing the discovery of cross-system syndromic clusters, revealing a Dementia-Lipids-Vascular Network and a Dual Vitamin-Cardiovascular Axis.

New York City, New York May 7, 2026 (Issuewire.com) - The research, titled "AI-Powered Phenotypic Clustering Reveals a Dementia-Lipids-Vascular Network and a Dual Vitamin-Cardiovascular

Axis", applied Association Rule Mining to MEAT-verified diagnoses to discover cross-system syndromic clusters across a large geriatric population of 104,724 patients. By identifying only actively managed conditions at the ICD-10 category level, the explainable artificial intelligence (XAI) uncovered syndromic clusters that remain invisible to traditional epidemiology.

The system's strongest cross-system discovery was a Dementia-Lipids-Vascular Network. The analysis demonstrated that the presence of metabolic conditions amplifies the association between Alzheimer's disease and dementia, rather than diluting it. The triplet combination of unspecified dementia, Alzheimer's disease, and hypertension yielded an association strength (Lift) of 18.7, strongly implicating vascular burden as a key driver. These findings suggest that patients diagnosed with both dementia and Alzheimer's should receive aggressive cardiovascular risk management as a potential disease-modifying intervention targeting the vascular component of neurodegeneration.

Furthermore, the study identified a novel Dual Vitamin-Cardiovascular Axis linking two distinct nutritional deficiency pathways jointly to cardiovascular disease. The artificial intelligence found that patients with simultaneous B-vitamin and Vitamin D deficiencies are 12.6 times more likely to have coronary artery disease (CAD) than expected by chance. This co-occurrence suggests a "double-hit" model where homocysteine-mediated endothelial damage is compounded by Vitamin D-mediated vascular calcification. The network also extends to chronic kidney disease and hypertension, creating a positive feedback loop that argues for routine dual vitamin screening in patients with established coronary disease.

A defining characteristic of RevelSI's methodology is full statistical transparency. The Apriori engine generates frequent itemsets of the cohort and scores each association rule by Lift and Confidence, with significance confirmed via Yates-corrected chi-square on a 2×2 contingency table — or Fisher's exact test where expected cell counts fall below five. Every Lift value in the study is backed by a patient count, a chi-square exceeding 900, and $p < .001$, reconstructable from the published contingency tables without access to model weights, because there are none. This is architecturally distinct from transformer-based or deep neural network approaches, where the equivalent signal surfaces as an attention weight or latent embedding vector with no direct statistical interpretation.

The upstream layer enabling these outputs is RevelSI's deterministic MEAT-criteria phenotyping engine. Rather than probabilistic NLP embeddings or neural classifiers, it applies a rule-based extraction pass that assigns an ICD-10 code if and only if the clinical record contains explicit evidence of Monitoring, Evaluation, Assessment, or Treatment for that condition - with administrative chapters excluded entirely. ICD-10 subcategory codes are collapsed to the 3-character category level, producing a sparse binary transaction matrix (patients × ICD-10 categories) as direct input to Apriori. This architecture has been validated against age-adjusted CDC national benchmarks at $r = 0.94$, confirming that the phenotypic signal entering the mining step reflects genuine disease burden rather than documentation noise.

"What we built here is an end-to-end explainable AI pipeline designed specifically for the constraints of clinical medicine," said Bogdan Tulai, CEO at RevelSI. "The MEAT filter handles the hardest part of the problem - distinguishing active disease burden from background documentation noise — before a single association rule is computed. What the Apriori engine then produces are Lift ratios and chi-square statistics: numbers a clinician can audit, challenge, and act on without needing to trust a hidden model. The findings in this study, including a Dementia-Alzheimer-Hypertension triplet at Lift 18.7 and a dual-vitamin axis at Lift 12.6, are not outputs of a black box - they are statistically grounded co-occurrence signals, reproducible from the contingency tables we publish. Going forward, this architecture gives us the foundation to run the same analysis across any sufficiently large EHR dataset and systematically map disease topologies that have never been visible to traditional epidemiology."

About Revel Business Group (RevelSI):

RevelSI is an AI and cybersecurity technology company that develops deterministic artificial intelligence and data analytics solutions tailored for the healthcare sector in a secure environment. The company focuses on clinical documentation accuracy and population health metrics to support evidence-based medical administration.

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