Shaping Tomorrow's Nephrology: Insight-Driven Kidney Care
KSN 2026 SEOUL, KOREA
The 46th Annual Meeting of the Korean Society of Nephrology
THE KOREAN SOCIETY OF NEPHROLOGY
Jun 11 (Thu) – 14 (Sun), 2026
COEX, Seoul, Korea

Abstract Type : Oral presentation
Abstract Submission No.: A-0500
Abstract Topic : Dialysis

Reimagining Drug-Related Problems in Hemodialysis Population Using Bayesian Networks

Shan Lii Ching[1], Ernieda Hatah[2], Zaidi Isa[3], Zamira Hasanah Zamzuri[3], Farida Islahudin[2], Nurul Ain Mohd Tahir[2]
[1]Department of Pharmacy, University Kebangsaan Malaysia, Malaysia & Ministry of Health Malaysia, Malaysia
[2]Department of Pharmacy, Universiti Kebangsaan Malaysia, Malaysia
[3]Department of Mathematical Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, Malaysia

Objectives : Drug related problems (DRP) cause significant clinical and economic burden on healthcare systems globally. Conventional regression-based models are fundamentally limited in identifying linear associations, leaving them unable to capture the multi-dimensional, non-linear dependencies that drive DRP occurrence. Bayesian Network's (BN) transparent probabilistic framework explicitly represents causal assumptions that overcomes this, by capturing both associations and causal structures within a single model. The study describes development of a preliminary BN-based predictive framework of DRP risk and characteristics within the hemodialysis population.
Methods : BN development involved structural and parameter learning. Variables were determined through combination of literature, expert-elicited domain knowledge and longitudinal dataset from a previous retrospective study that analysed records of adult hemodialysis patients recruited into a pharmacist-led medication management program. DRP were classified using Pharmaceutical Care Network Europe Association DRP classification, v9.0. A three-membered panel of statisticians and DRP expert finalized the model, that was subsequently computed using Netica© software. Model performance was assessed through error rate, quadratic loss and spherical payoff measurements.
Results : Model development involved hybrid method, with BN structure informed by manual "by-hand" elicited domain knowledge. Automated learning from dataset consisting 842 cases was used for BN parameters, where Conditional Probability Table was produced and optimized through Maximum Likelihood Estimation and Expectation-Maximisation algorithm. Nine variables were included that influenced the second layer (DRP event causes) and third layer (outcome of DRP characteristics). The model achieved moderate predictive accuracy level with error rate (32.9%), quadratic loss (0.5079) and spherical payoff (0.6717). The practical application and predictive capacity of the BN model are visualized in Figures 1 and 2, highlighting its utility as a clinical decision-support tool.
Conclusions : BN demonstrates strong predictive performance with interpretability, enabling transparent DRP risk reasoning and formalizing DRP identification into a systematic, efficient and data-driven framework that supports informed decision-making and targeted interventions.

Figure 1.jpg

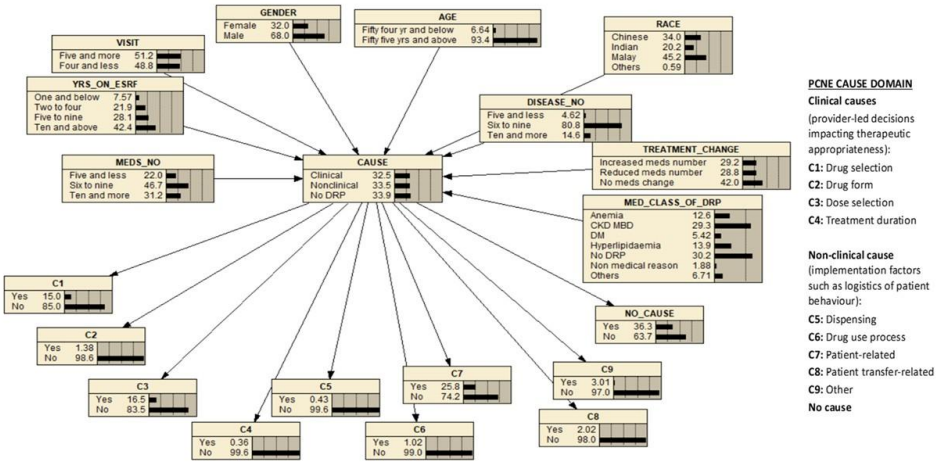

Figure 1: Final preliminary BN model of predicting DRP characteristics. The direct cause and effect relationship is visualized using BN software Netica® to demonstrate the probabilistic dependencies between variables to support inference and clinical decision making. Yellow nodes represent variables with posterior probabilities derived from prior distribution and evidence propagation within BN.

Figure 1.jpg

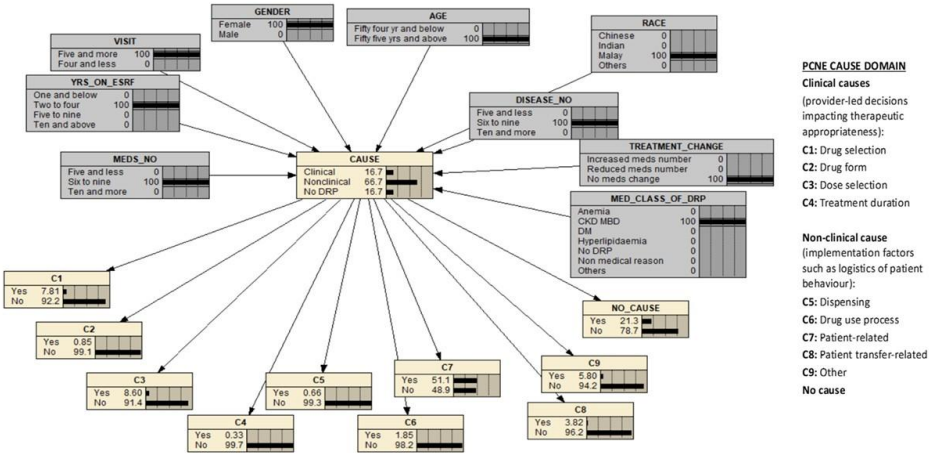

Figure 2: The clinical application of the BN model for real-time decision support is illustrated in this figure. Grey nodes represent observed evidence (instantiated values) used to facilitate conditional inference. In this scenario, clinical parameters for a female Malay patient (aged > 55 years, 6-9 co-morbidities, 6-9 medications and ≥ 5 pharmacist-led medication management visits with no recent medication changes) were inputted into the BN model. The model predicted a significant 17.4% rise in the probability of DRP occurrence (from 66.0% to 83.4%). Furthermore, the etiology was predicted to shift toward a non-clinical nature (increasing by 33.2% to a 66.7% probability), specifically identifying C7: Patient-related factors as the most likely cause (increasing by 25.3% to a 51.1% probability).