Abstract

Nurses work around the clock in response to hourly medical demands. Their work characteristics include rotational shifts, strenuous workloads, and irregular work hours. Such conditions contribute to fatigue, burn-out, job dissatisfaction, and turnover intention. These are common causes of the intensified nursing shortage faced by hospitals worldwide. To improve nurse retention, hospital management must devise measures to enhance nurses' well-being, job satisfaction, and intention to stay.

Systematic scheduling strategies with proper workload assignment, meeting nurses' preferences and ensuring fairness are among the keys to achieving high job satisfaction. This dissertation develops two satisfaction-enhanced nurse scheduling models using mathematical optimization approaches. The first nurse scheduling model aims to maximize the fulfillment of nurses' individual preferences in shifts and days off. At the same time, deviations in workload and preferred assignments among nurses are minimized for scheduling fairness. Since cost-effectiveness is crucial for implementability, the second model encompasses cost minimization and job satisfaction maximization objectives. This model aims to ensure economic, satisfactory, and fair work schedules. Both models are validated using data collected from actual hospital cases in Thailand. The findings highlight the models capability to promptly generate schedules that fulfill preferences and fairly allocate workload and desirable assignments among nurses. The proposed scheduling models can serve as practical decision-support tools for hospital management.

Hospital operations are dynamic in nature. Unexpected absences or variations in nursing demand emerge daily. Operational variations sometimes lead to mismatches between nursing demand and supply and schedule disruptions. For such cases, rescheduling is needed to maintain operational flow and service quality. This dissertation proposes a practical nurse rescheduling model to minimize the rescheduling penalty under uncertain demand and absenteeism. Under disruptions, the model repairs the original schedule while maintaining service quality and job satisfaction. In order to do so, the operational-related penalty is imposed to maintain an appropriate skill mix. At the same time, the satisfaction-related

penalty minimizes undesirable rescheduling impacts via a human judgment shift change penalization. Differences among nurses' rescheduling impacts are also penalized to ensure rescheduling fairness throughout the planning period. The model is tested with multiple uncertain scenarios to verify its ability to handle uncertainties. The results indicate the model's effectiveness in promptly generating modified schedules with minimal rescheduling impacts, adequate service quality, and relatively fair.

Keywords: Nurse scheduling problem, Nurse rescheduling problem, Job satisfaction, Fairness, Mathematical optimization, Uncertainty