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Optimizing emergency home healthcare scheduling with improved Quantum-behaved Particle Swarm Optimization

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A B S T R A C T

With the intensification of China's aging society, improving the health management and emergency response capabilities of the elderly at home has become an urgent issue that needs to be addressed. To meet this challenge, an Emergency Home Monitoring System (EHMS) that utilizes real-time data and wearable device monitoring is developed to optimize the Emergency Medical Transport Vehicle and Hospital Scheduling Problem (EMTVHSP) for elderly people at home. The patient's condition classification and waiting time are effectively combined to establish an Emergency Medical Transport Vehicle and Hospital Scheduling Model (EMTVHSM). Specifically, the optimization objective of the model is to minimize the maximum rescue time, thereby improving the allocation efficiency of medical resources and the efficiency of patient transfer. To solve this model, an Improved Quantum-behaved Particle Swarm Optimization (IQPSO) is proposed. The algorithm significantly improves the ability to solve complex scheduling problems by introducing neighborhood structure, improving constraint processing, introducing mutation operations and designing innovative resource reallocation strategies. Simulation results show that the dynamic resource scheduling method based on the IQPSO has significant advantages over traditional algorithms in reducing the maximum patient transfer time and improving scheduling efficiency and the optimization effect is improved by an average of 6.1 %. The emergency home monitoring system, scheduling model, and optimization algorithm designed effectively provide a more efficient emergency medical resource scheduling solution for elderly people at home and offer strong technical support and a practical basis for addressing health management challenges in an aging society.

A R T I C L E I N F O

Keywords:
Emergency home monitoring system;
Emergency medical resource scheduling;
Treatment priority;
Quantum-behaved Particle Swarm Optimization;
Cellular neighbor network;
Roulette wheel selection;
Machine learning

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