HOSPITAL COMPETITION WITH AGE-STRUCTURED PATIENTS AND CONGESTION EFFECTS: A DIFFERENTIAL GAME APPROACH

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ABSTRACT

We explore a noncooperative game framework involving two hospitals, where treatment quality suffers under congestion. Recognizing that healthcare demand is significantly influenced by patient age, we incorporate a continuous age distribution into our model. Each hospital aims to determine the optimal treatment (age-structured) intensity that maximizes its objective: for a public hospital, this involves enhancing the cross life-expectancy as measure for the number and quality of treated patients (public hospital); for a private hospital, the goal is to maximize profits based on public payments for treatment. The resulting problem leads to the introduction of differential games with the closed-loop information structure. The paper formulates conditions for verifying whether a given strategy profile constitutes an ε-Nash equilibrium with the dual closed-loop information structure. The verification theorem is then used to develop a numerical algorithm for determining ε-Nash equilibria in a finite number of steps. The numerical simulations demonstrate how the Nash equilibrium can shift in response to varying socio-economic factors.