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***Nurse-to-Patient Ratios and Bed Capacity in Hospitals:
A Queueing Perspective***

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The health care industry is plagued by rising costs, inefficient and strained resources, inequity in care provision, and shortages in expert staff. Policymakers continue to struggle with effective measures to address these issues. Unsurprisingly, their attempts at resource allocation are contentious at best. For instance, Trenton, NJ currently has roughly three times as many hospital beds per capita than the New Jersey average. Further, the number of residents in the city is steadily declining. Plans to close one of the city's less used hospitals and replace it with one in a fast-growing (and ostensibly more profitable) suburb are under consideration -- to the chagrin of many residents.

California, as well, passed a law in 1999, Bill AB394, mandating nurse-to-patient staffing ratios as a means to guarantee uniform quality of service among hospitals across the state. The actual ratios were set and went into effect in 2004 after extensive debates among nurse unions and hospital administrators. Even now, compliance to the ratios remains a political sticking point.

In this talk we consider the hospital bed and nurse staffing questions jointly. Bed availability is altered on a monthly or yearly timescale, while workforce schedules are made on daily or weekly basis. Both of these, together, are capacity management decisions and can be evaluated in terms of quality of service as experienced by patients. A reasonable quality measure tracks the timely provision of service, whether in assigning a bed to a new patient or in dispatching a nurse to a patient in need. We evaluate capacity management decisions using a queueing theoretic approach to modeling and analyzing hospital operations. We conclude that nurse-to-patient ratios is no staffing panacea, high bed utilization leads to extensive delays, and staffing decisions can adversely affect bed availability.