One of the key relevant consequences of queuing theory is that when demand on the system increases, the response is nonlinear. This property has profound implications, one of which is illustrated below.

This MICU utilization and patient rejection graph shows that at 0 percent use of capacity, the MICU is empty, and the odds of a rejection of a request for an ICU bed are zero. If the MICU is full, the odds of being rejected are close to 100 percent. As the curve reaches and surpasses 60 percent utilization, it starts to take off. This is not a linear curve; it is a geometric one, a logarithmic curve, meaning that the observed data (in this case, the need for an ICU bed) reflects a sharp increase in rejections as patient utilization increases. For the patient and the provider, this means that the rejection rates rise dramatically as utilization rises above 60 percent. A utilization rate of 80 percent to 85 percent is often the optimal point for a queuing system to operate. Above that rate, it is highly likely that there will be no room for patients in need of services.

If an emergency department typically sees 150 patients per day and admits 25 percent of them, 10 of whom will need MICU beds, MICU utilization rates over 80 percent at the beginning of the day bode poorly for obtaining MICU beds in a timely fashion, barring a concerted effort to obtain a substantial number of MICU transfers to other units or to obtain discharges. Under these circumstances, we can forecast not only our projected MICU needs for the emergency department but also the need to use flow tools to address this demand-capacity mismatch.