COVID-19: PATIENT INTAKE BOTTLENECK ANALYSIS

Michael Pearson Berger, MBA

April 1, 2020

GLOBAL SITUATION

The Coronavirus disease (COVID-19) is a viral infection that causes severe acute respiratory syndrome. The World Health Organization (WHO) declared the COVID-19 outbreak a "pandemic" on March 11, 2020, at which point in time the rate of deaths per number of diagnosed cases had a global mean of 4.4 percent (as of March 23, 2020).

CLINICAL PROBLEM

COVID-19 is posing an unprecedented challenge to clinical processes. The impact on hospital intake and triage is directly correlated to an exponential growth rate of COVID-19 patients, compounded by routine medical and trauma cases.

Within clinical processes, variability is the common enemy. The COVID-19 pandemic is exposing extreme vulnerabilities in hospital and emergency department patient flows due to high patient volume surges and shifts in demand that significant alter average patient arrival and flow rates. This strain creates an immediate bottleneck in the front end of the patient intake and triage process, as well as affecting the entire hospitalization care process. Given a finite number of resources to administer a hospital's intake department, there are a number of manual steps required to process each patient, including collecting patient information, medical histories, pre-existing conditions, insurance information, and multiple HIPAA forms. The processing times are extended as many hospital systems continue to use paper forms and records.

PROBLEM DRIVERS

- COVID-19 exponential growth rate
- Hospital intake over-capacity and over-utilization
- Paper forms and/or decentralized EMR/EHR system

HOSPITAL OBJECTIVES

- Improve efficiencies by identifying bottlenecks
- Reduce patient intake processing time
- Maximize clinical staff and facility utilization
- Minimize patient waiting time and exposure

PROPOSED SOLUTION

To alleviate bottlenecks and inefficiencies in patient intake processing, hospital systems can look towards the new frontier of integrated digital healthcare. R&D on wearable and implanted Electronic Medical Records (EMR) is emerging as methods to reduce patient processing times while increasing the immediacy and accuracy of patient information. A wearable and implantable EMR would work by accessing data directly from the patient via a wearable or hermetically sealed tag that is safely implanted in subcutaneous tissue. This method is intended to securely exchange, in-real time, information and data that is stored on, or inside, a patient via a scanner/touch probe and wireless communication technology. Implementing wearable and implantable EMR eliminates paper forms and records by securely and safely scanning the patient. The interrogated patient information is securely uploaded to a digital interface and populates a hospital's central EMR system to follow the patient through the hospital's continuation of care.

DISCUSSION

Little's Law is a foundational equation that explains the impacts of patient processing time, on average. Little's Law is comprised of three components: average number of patients being processed, number of patients arriving to a hospital in a given time period, and the patient processing time. Little's Law informs us that when patient processing time decreases with a given arrival rate, average number of patients in the process decreases proportionally. For example, if EMRs are able to reduce the patient processing time by 75%, then that means there are 75% less patients co-located within the patient processing room queue. As a result, not only does the hospital achieve higher service levels, but also sees a reduction of risk due to less co-located individuals.

Based on the hypothetical diagram below, normal resource utilization for a patient intake station that uses paper is around 62.5%, well within the normal hospital operating range. Given a high volume of COVID-19 patients during this crisis, resources become extremely over-utilized and upwards of 250%. In this example, the utilization of resources through scanning EMR patients dropped to under 100%, which substantially reduces patient processing time, wait time, and exposure.

COMMUNITY HOSPITAL
(HYPOTHETICAL EXAMPLE)

	AVERAGE ARRIVAL RATE		RESOURCES		PROCESSING TIME	CAPACITY	UTILIZATION
Pre-COVID-19	X	5 (per 60 minutes)	X	2	15 minutes (per patient)	8	62.5%
COVID-19	X	20 (per 60 minutes)	X	2	15 minutes (per patient)	8	250% (theoretical)
EMR Patient (Wearable/Implant)	X	20 (per 60 minutes)	X	2	5 minutes (per patient)	24	83.3%