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Improving Patient Flow with Data-Driven Patient Prioritization Method in the Emergency Department

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IMPROVING PATIENT-FLOW WITH DATA-DRIVEN PATIENT PRIOTIZATION METHOD IN EMERGENCY DEPARTMENT

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Managing wait times at Emergency Department (ED) is generally challenging because ED deals with patients without appointment and with a large variety of illnesses and large variance in the time required diagnosing and treating them. In our study, the patients are classified into four acuity categories in the ED, namely P1, P2, P3 and P4 in the decreasing order of acuity. P1 patients are always served immediately due to the acute and time sensitive conditions that require immediate attention or resuscitation. The national guidelines provide targets for P2 (critical patients) and P3 patients (less severe patients). P4 patients are non-emergency patients. Due to high volume of P3 patients, some patients may encounter high length-of-stay (LOS) and wait-time that exceed the national guidelines. Although it is not life-threatening, patients suffer in terms of service efficiency.

There is rich literature related to improvements in ED processes, managing patient flow with use of fast-track systems [2] and advanced triage[3] for early initiation of care protocol. Fast-track systems require change of process and advanced triage may involve the deployment of a senior doctor at triage, a scarce resource for attending to critical patients. In our work, we contribute by considering post-triage patients and offer decision-support to manage patient flow, with minimum process change and without changing the resource requirements.

We proposed the use of real-time ED patient flows coupled with investigative tests and treatment data (from the Computerized Physician Order Entry system) to dynamically prioritize and manage patient flow for P3 patients in the ambulatory care area of the ED. In a typical ED process, the large variance in LOS of patients is attributed to the need to re-visit the doctor multiple times, due to orders of investigative tests or treatment by the doctor during consultation (see Figure 1). We term this as patient re-entrance (within the same visit at the ED). It is a challenge to dynamically prioritize the patients in the same acuity (triage) classification when they re-enter the queue again after taking a test/treatment. In practice, it is usually left to doctors to make judgemental calls or first-in-first-out mechanisms to know which patient to see first. The process of handling re-entrants can be improved by applying dynamic prioritization strategies such as “Shortest-Consultation-Time-First” (SCON) on the patient queue [1]. Using SCON strategy, the aim is to identify re-entrants with small consultation time and complete their ED treatment process, freeing up resources in the ED and lowering overall LOS. Based on our field study, patients with little or no issue with their investigative tests are examples of such candidates.

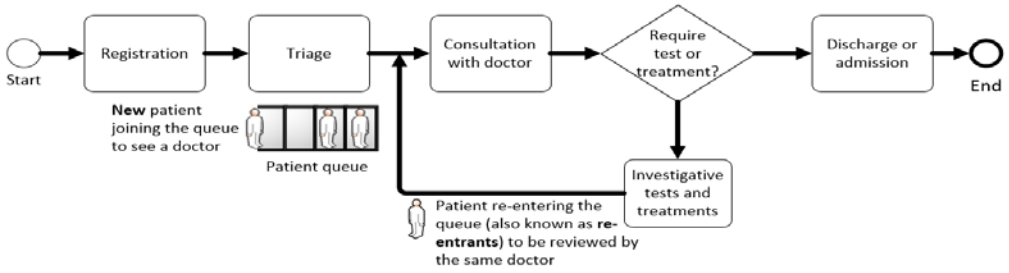

Figure 1: Typical process at ED in the ambulatory care area for non-emergency patients

We evaluate the use of real-time CPOE data and test-results to support the prioritization decisions. The CPOE data contains set of electronic entries of the investigative tests and treatment of patients. Our initial analysis of the data showed that we can draw interesting decision-support rules from the top 3 tests/treatment ordered, i.e., radiology, laboratory and non-parenteral. There was significant increase in LOS for patients with radiology and laboratory tests while a decrease in LOS for patients with non-parenteral treatment ordered (see Figure 2). The laboratory test results provide predictive potential to estimate consultation time with the doctor. E.g., a clear blood test result generally requires short re-entrant consultation time. Our further work shall find explanatory factors for long and short stays in the ED and to apply estimation techniques to better estimate consultation times.

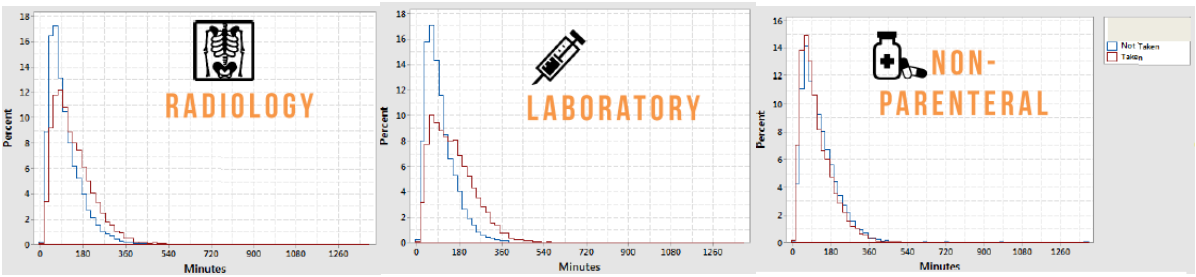

Figure 2: CPOE results showing how LOS (x-axis) is affected when the test is ordered[1].

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