DYNAMICS OF HOW ADAPTIVE PRACTICES BRING RESILIENCE TO EMERGENCY DEPARTMENTS

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EXTENDED ABSRACT:

Emergency departments (EDs) work under highly turbulent conditions that require ongoing adaptations to keep the system operating at a functional and desirable level. When done well, these adaptations are expressions of resilience that sustain the ED's ability to deliver vital services. This paper reports a first-hand observational study of an ED and explores the adaptive behaviors of the department's resident physicians to address simultaneous arrivals of multiple acute patients. Results highlight the improvised, in-the-moment adaptations that occur regularly during patient care.

We develop a system dynamics model of patient care tightly grounded in first-hand observation and interview data. We use the model of patient care within the ED to simulate the consequences of both unsuccessful and successful adaptations. We identify a key reinforcing loop that distinguishes patient care in the ED from many other service settings. We further show that adaptations that help control the potentially bad-news reinforcing loop are highly effective in achieving resilience for the ED. The simulations illuminate the resilience bestowed by improvised adaptations as a means of avoiding vicious cycles that can propel the system into crisis.

Emergency departments are chronically faced with the challenge of overload relative to the demands for which they were designed. Yet somehow the system continues to function. Although not without occasional adverse incidents, the dominant behavior mode is one of ongoing operations, albeit somewhat turbulent. The purpose of our ethnographic study of a busy inner-city emergency department (ED) was to understand the sources and dynamics of adaptive capacities in EDs - the capacities that enable the ED system to accomplish a resilient response to challenge or crisis. Regularly, the ED faces the challenge of multiple, simultaneous arrivals of critically ill patients, a situation that demands rapid and coordinated action from the resident physicians The study focuses on the front-line actions shortly before and during such incidents that enable to ED to meet the challenge. The findings begin to unearth some of the hidden reasons that front-line adaptations foster the successful maintenance of continuity of operations.

We conducted a close-in, ethnographic observation of the day-to-day operating practices in the emergency department and level 1 trauma centre of a busy, inner-city teaching hospital. Field notes from observations were transcribed and were then supplemented with a series of semi-structured interviews involving ED workers at all levels. The paper presents excerpts from our interview data with the resident physicians,

The formal, work-as-imagined cross-coverages offer a starting point, but they do not provide sufficient manpower to manage many common circumstances, such as critical cases in all three areas simultaneously. Thus, we have observed the emergence of informal, work-as-performed cross coverages. For example, when a trauma case arrives, the Resuscitation resident moves to Trauma, and the COD moves to Resuscitation. Another ED attending in a remote part of the ED (the observation unit) moves to trauma. Once the situation is stabilized, they all move back. These cross-coverages are negotiated on the fly, *in situ*, among the parties in informal ways. This informal system works remarkably well, is generally understood by all participants, but is not explicitly articulated in any protocols, guidelines, or training materials.

Our stylized model considers two resident physicians and explicitly represents two patients we shall call Patient A and Patient B. The fully documented model and its equations are available in supplementary material. Figure 1 shows the model structure, including a feedback look, reinforcing loop R2, that models patient deterioration.

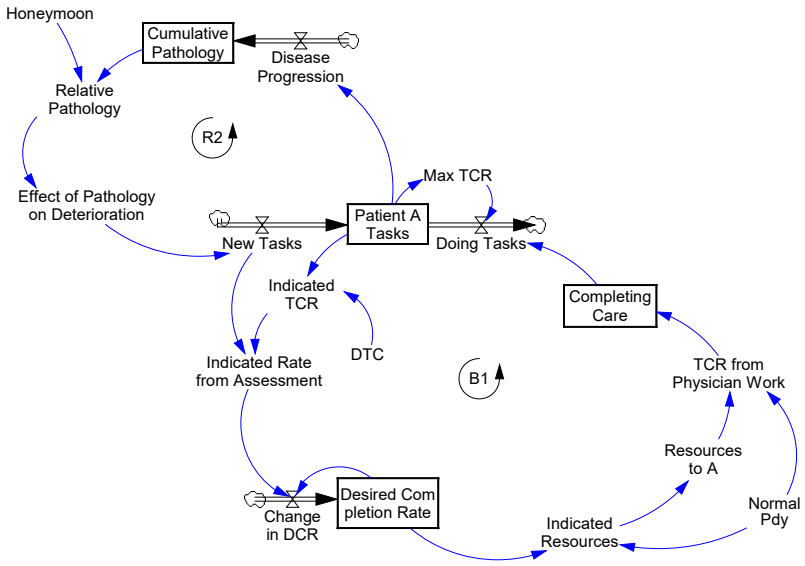
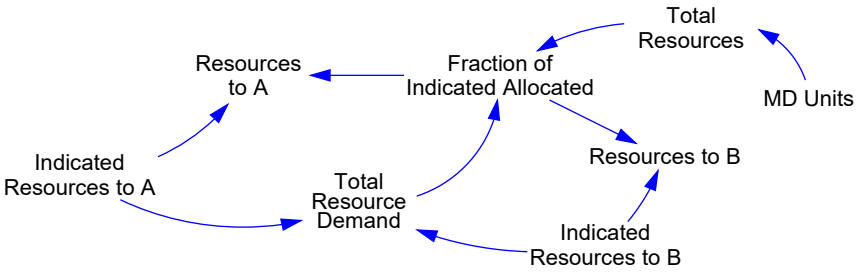


Figure 1: Patient care model with Loop R2 representing patient deterioration resulting from unresolved current pathology

The structure for the second doctor and Patient B is identical to that shown in Figure 2. Figure 2 shows the structure for allocating the two doctors' time across the two patients.



The model includes four possible adaptive responses that can be tested independently or

separately. First, the doctor can spend more time with a critical patient to manage their care (Loop B1). Second, the doctors can share resource, helping each other out, when conditions warrant. Third, a doctor can be endowed with great skill that boosts productivity allowing them to do more with the same resources. Fourth, the doctors can negotiate assignments to achieve a desirable match of doctors with patients for which their expertise and experience is well matched so they can immediately take the most-needed actions to stabilize an otherwise critical patient.

We highlight here three notable insights revealed by the simulation analysis. First, we note that relatively straightforward adjustment practices such as spending more time to take care of a critical patient, as in Loop B1, are helpful and even effective in averting crisis in the more forgiving scenario of a modestly stable patient. Second, the interview data point to the importance of quick conversations informed by an understanding of what patient needs are likely to be in the next short period of time. The simulation results confirm that such coordination and helping where needed do indeed bring resilience to the system – and may be enough to avert a crisis. Third, the simulation analysis sheds light on why the attention to who does what is an essential component of the most effective responses. The other three responses tested (adjusting time spent, sharing and helping, and increasing productivity) all have the effect of strengthening the balancing loops to manage the patient. But, deploying the well-matched expert to the patient who needs her most provides an opportunity, through a short-lived honeymoon as the expert prioritizes well, to weaken the reinforcing loop that is the fundamental cause of the situation getting out of control.