Simulating a Mass-Casualty Event

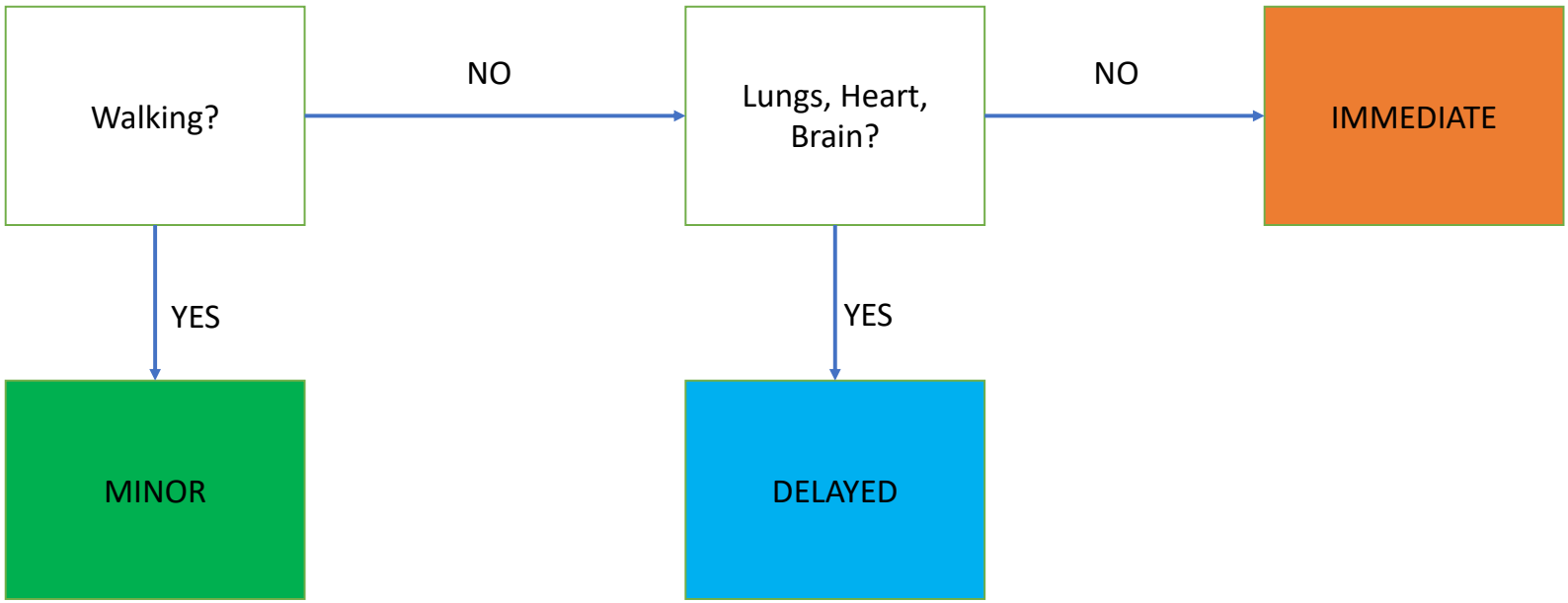
May 21st, 2019

Mass-Casualty Event

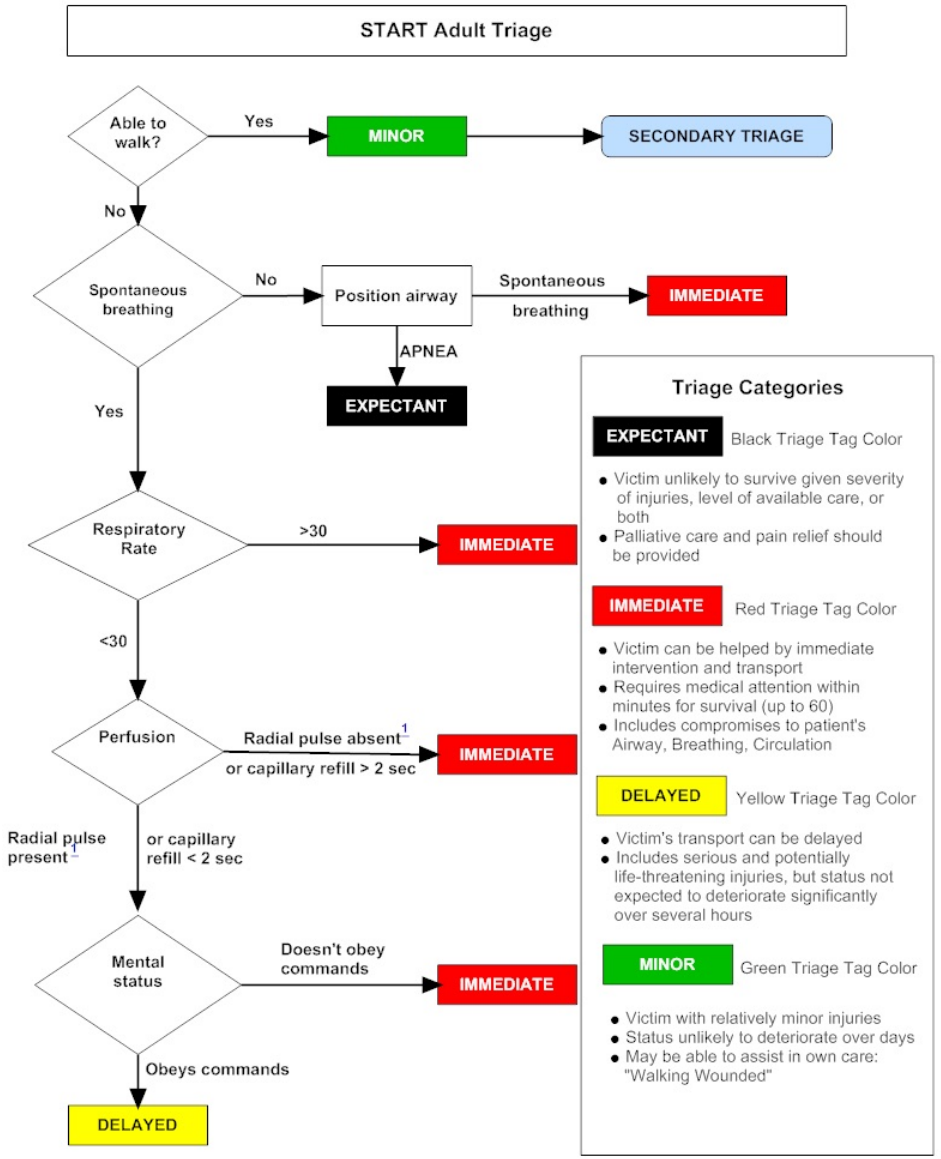
Triage

- **First-responders:** Triage patients based on injury severity
- RED: Patients in worst shape
- YELLOW: Patients whose care can be delayed
- GREEN: Patients with minor injuries

Simple Triage and Rapid Treatment (START)



Simple Triage and Rapid Treatment (START)



Oh no! The red line has derailed!

Meanwhile, you must prepare the UChicago Trauma Unit

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- **Problem:** Not enough resources for all injured
- Expect around 30 patients but we only have the capacity to help 10!
- Any patients who cannot be seen here will need to be transported to the next closest unit which will take an additional 50 minutes!
- **Who should be admitted and who should we turn away?**

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- First-Come-First-Serve
- Reserve beds for IMMEDIATE patients
- Reserve beds for DELAYED patients
- Reserve some for IMMEDIATE and some for DELAYED
- Other?

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- Let's use computers to help us!

Based On Actual Research!

Flexible Services and Manufacturing Journal
June 2018, Volume 30, Issue 1–2, pp 98–122 | Cite as

Markov decision process model for patient admission decision at an emergency department under a surge demand

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Article
First Online: 08 February 2017

308 Downloads
1 Citations

Abstract

We study an admission control problem for patients arriving at an emergency department in the aftermath of a mass casualty incident. A finite horizon Markov decision process (MDP) model is formulated to determine patient admission decisions. In particular, our model considers the time-dependent arrival of patients and time-dependent reward function. We also consider a policy restriction that immediate-patients should be admitted as long as there is available beds. The MDP model has a continuous state space, and we solve the model by using a state discretization technique and obtain numerical solutions. Structural properties of an optimal policy are reviewed, and the structures observed in the numerical solutions are explained accordingly. Experimental results with virtual patient arrival scenarios demonstrates the performance and advantage of optimal policies obtained from the MDP model.