

New way to identify patients likely to return to hospital could reduce future readmissions

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Recurrent, unplanned readmissions to the hospital—which happen when patients return shortly after discharge and are readmitted for the same or a related condition—are a challenge worldwide. Many researchers have examined how to predict them and how to understand the factors that contribute to them. A new study looked at how the risk of readmission

progressed over multiple visits to emergency departments (EDs) in Israel by patients with chronic diseases. The study explored a way to identify distinct groups of patients who are more likely to be readmitted so medical professionals can intervene to prevent or reduce the possibility of future readmissions.

The study, by researchers at Carnegie Mellon University in Pittsburgh and Ono Academic College in Kiryat Ono, appears in *MIS Quarterly*.

"Understanding the differences in disease progression in people who have frequent hospital admissions and predicting the likelihood of their [readmission](#) as they move from ED visit to hospitalization are critical steps in developing policies and interventions to minimize adverse outcomes to patients and society," explains Rema Padman, professor of management science and healthcare informatics at Carnegie Mellon University's Heinz College, who coauthored the study.

"Our goal was to see if we could predict each readmission to prevent future readmissions. We hope that if doctors had additional information early in the process, they could intervene earlier to avoid having patients return."

Patients who have unplanned readmissions not just once or twice, but multiple times, are costly and challenging for the health care system. Many prior studies have looked at this issue by focusing on one condition, such as congestive heart failure. This study looked at the risk of readmission among patients with more than one chronic condition. Studies show that patients with multiple underlying chronic conditions are more likely to be readmitted to hospitals within 30 days of discharge than those without chronic conditions.

Most prior studies have also used information based on patients' most recent visit to the hospital or first readmission to predict the likelihood

of a subsequent readmission. This study followed patients over multiple visits: To predict patients' risk of future readmission, researchers applied statistical and machine learning methods to information from the electronic health records of patients with multiple chronic conditions and frequent readmissions that began with a visit to the ED and continued from 2005 to 2008.

Specifically, using information from 16,117 patients enrolled in a large Israeli Health Management Organization, the study sought to understand how the risk of readmission progressed over 5 to 12 separate visits to the ED by chronic patients who were readmitted 1 to 11 times. Researchers clustered patients into high-, medium-, and low-risk groups, and then generated predictions about their likelihood of subsequent readmissions based on a range of characteristics of each patient, such as age, gender, and number of chronic conditions and prior stays in the hospitals.

The researchers found that tracking multiple readmissions over time can help to identify specific groups of patients early based on their patterns of seeking emergency care and being readmitted. The data led researchers to discover three distinct trajectories related to the progression of readmissions, with a small group of patients displaying increasing likelihood of readmission over time, a large group having low likelihood of readmission, and a third group showing varying likelihoods of readmission over time, which captured the heterogeneity of the patient population.

The study also found that 30-day readmission rates differed significantly by age, gender, levels of creatinine (a waste product from wear and tear of muscles), chronic conditions, and length of stay, measured at each visit to the ED. This finding may allow earlier identification of patients who are more likely to be readmitted and this, in turn, could lead to targeted interventions and individualized post-discharge plans for these patients.

"Based on the results of our study, high-risk patients can be identified earlier, which will result in better care in the ED, appropriate and timely interventions for coordinated and personalized care in inpatient and ambulatory settings, and better allocation of resources," suggests Ofir Ben-Assuli, senior lecturer at Ono Academic College, who coauthored the study.

The authors acknowledge that their study was limited to patients with multiple chronic conditions, so additional research is needed to investigate multiple readmissions in [patients](#) without [chronic conditions](#). In addition, lack of availability of data on patient mortality prevented investigation of this important outcome.

More information: Trajectories of Repeated Readmissions of Chronic Disease Patients: Risk Stratification, Profiling, and Prediction, by Ben-Assuli et al. *MIS Quarterly*, 2020.

Provided by Carnegie Mellon University

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