

# Emergency department algorithm may predict risk of death for heart failure patients

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Physicians can reduce the number of heart failure deaths and unnecessary hospital admissions by using a new computer-based algorithm developed at the Institute for Clinical Evaluative Sciences (ICES) that calculates each patient's individual risk of death. Published in the *Annals of Internal Medicine*, the algorithm improves upon clinical decision-making and determines whether or not a patient with heart failure should be admitted to hospital. To bring this tool into the emergency departments, Peter Munk Cardiac Centre cardiologists are developing smartphone and web-based applications to assist physicians in the emergency department to determine patients' numerical risk score in real time.

Heart failure is the most common cause of hospitalization in North American adults – over one million [emergency department](#) visits for [heart failure](#) occur annually. When a patient arrives at an Emergency Department (ED) with difficulty breathing, shortness of breath, fatigue, or chest tightness, the ED physician, consulting cardiologist or general internist must decide if the patient is at high short-term risk of death. For high and intermediate-risk patients, hospital admission is often required, but for low-risk patients, it may be safe for them to return home after receiving medical treatment, which typically involves diuretics or fluid-reducing medications.

"Doctors estimate the risk of heart failure patients in the emergency

department based on best clinical judgment which may include different factors depending on their prior experience," says Dr. Douglas Lee, cardiologist in the Peter Munk Cardiac Centre, scientist at ICES and Associate Professor of Medicine at the University of Toronto.

"However, doctors may overestimate or underestimate the risk of death because the prognosis of heart failure patients may not be clearly apparent by a clinical assessment at the bedside."

"For those in very poor health or reasonably good health, [physicians](#) do a good job, but it's the middle group where the most improvement can be made. Some of these patients are dying at home or spending days in a hospital bed that they don't need to be in."

The lack of models that accurately predict a heart failure patient's risk of death and frequent misclassification of patients as high- or low-risk prompted Dr. Lee and his team to develop the "Emergency Heart Failure Mortality Risk Grade" (EHMRG), a risk model or [algorithm](#) using 10 simple predictors, including blood pressure, heart rate, and troponin levels, all of which are indicators of potential heart trouble. Each indicator is allocated a different weight in the algorithm based on the level of risk to the patient and the relative impact on the risk of death in the week following presentation to the ED, calculated as a percentage risk.

Prior studies have found that it may be safe for about 40 per cent of heart failure patients with cardiac symptoms to be discharged home from the ED; however one in every 11 discharged patients die within one week of coming to the ED. In the latter group, quality of care can be improved if appropriately discharged heart failure patients are assessed by their physician early after ED discharge to ensure that appropriate care is provided. Innovative programs of this type are being considered for implementation by the Peter Munk Cardiac Centre.

Heart failure is among the most expensive chronic diseases to treat. The cost to admit one patient to a hospital for eight days – the average length of stay for a Canadian heart failure patient – is estimated to be \$8,000 to \$12,000. Some hospitals have high rates of admission of heart failure patients, while others are more likely to discharge many of the patients who come to the ED for care. The EHMRG tool will help hospitals use precious ED and hospital resources more efficiently.

The next step is to develop web and smartphone applications so physicians can integrate the algorithm seamlessly into practice. With funding from the Peter Munk Cardiac Centre's Innovation Fund, Dr. Lee is developing smartphone and web-based applications that will assist with risk assessment, with a goal to collect data from individual physicians and hospitals, enabling comparisons between physicians and other centres, improving quality of care and influencing practice changes.

This study has global implications as well, since the EHMRG can also be used in developing countries, which are projected to increase in heart disease and heart failure burden in the future.

**More information:** To view the Emergency Heart Failure Mortality Risk Grade (EHMRG) calculator, click here:

[www.ccort.ca/EHMRGTerms.aspx](http://www.ccort.ca/EHMRGTerms.aspx)

Provided by University Health Network

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