

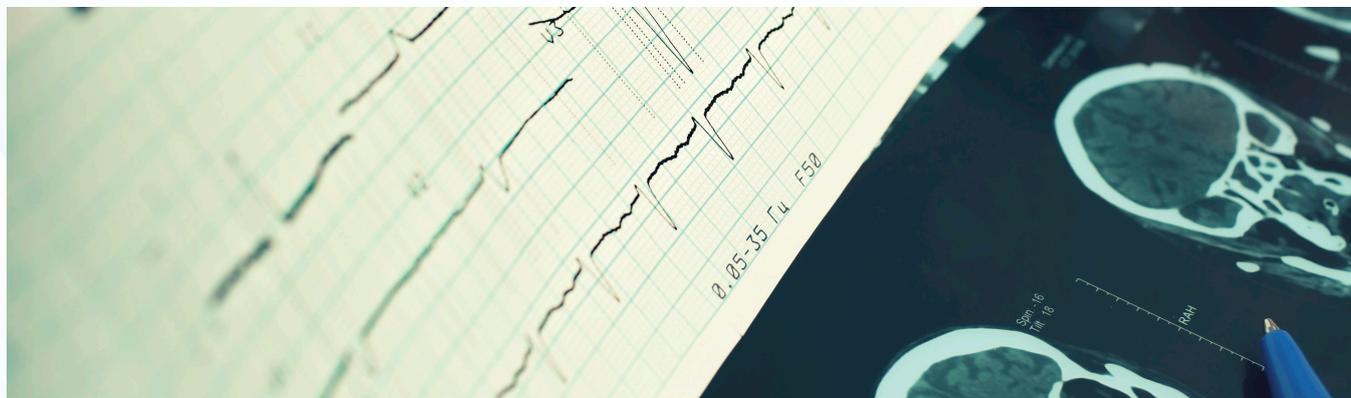
# Evidence-Based Medicine

Dr Andrew Munro



# Evidence-Based Medicine

**Dr Andrew Munro works to make clinical practice more efficient and effective. He recently developed new protocols to determine when emergency room patients experiencing chest pain can be safely discharged. Using data from this population, he then conducted a research study demonstrating the usefulness of these protocols.**



## **How did your background lead you into medicine and why did you decide to focus your efforts on evidence-based clinical practice?**

I was led to medicine by my family doctor, a true old-style rural GP, who often visited my family home for a cup of tea or end-of-day scotch. He often regaled the cases of the day—all de-identified, I am sure! This captured the imagination of the youngster that I was at the time. I subsequently developed a fascination for scientific enquiry, leading me to study towards a BSc. During this period, [my] father's ill health and premature cardiovascular death compelled me to further understand this field.

Whilst at medical school, I spent some time as a junior researcher in the vascular lab. This rekindled an interest in research and publication.

During my house officer years, I realized that acute and critical care medicine was for me. Shortly after embarking on Emergency Medicine specialist training, it became clear to me that evidence-based medicine for emergency medicine was, at best, vestigial. I feel it's important to contribute to the evidence as best I can without losing focus on clinical practice. My research focus recently has been about pragmatic medicine and POEM (Patient Oriented Evidence that Matters).

**You suggested that since research published by Goldman became standard in the field 1982, efficiency as reflected by the discharge rate has not increased. Can you go into more detail about Goldman's work and explain why it does not address discharge rates?**

ACS is a frightening and life-threatening event that can be missed. Admission rates are largely driven by the fear of inappropriate discharge.

Ultimately, Goldman's work signalled the birth of rapid assessment pathways. However it has been a circuitous route.

Goldman's study established that a hierarchical clinical decision tool could work to produce safe discharge in almost 40% of patients with chest pain. Disappointingly, the intervening period has seen higher admission rates and the development of pathways that require additional beds such as chest pain units. The cause is multifactorial and largely associated with the availability of advanced diagnostics and treatments as well due to published consensus guidelines.

## **Were there any significant roadblocks that you encountered while conducting this research?**

No funding, and we are all full-time clinicians. The work was done in non-clinical and 'free time'.

We were fortunate to work in a hospital where the cardiology department and its staff were fully supportive of the project

## **Why do the existing acceleration decision protocols result in over-estimates of risk and too few patients with chest pain being discharged?**

This is primarily due to risk-scoring tools. It should be noted that in our study (and others), ED physician gestalt [was] used to over-rule

discharge [as suggested] by the protocol. [Gestalt is a decision-making process that uses pattern recognition to come to a sound conclusion]. We found that applying the serum cut-offs retrospectively improved risk estimation with addition of SMO gestalt. The only instances that yielded different results is in two potential misses for the price of a number of unnecessary admissions. The study was not designed to tease this out. However the general feeling is that clinical experience remains a key element in a functional risk assessment pathway.

## **Are you planning to build on this research or are you headed in a new direction?**

Currently, we are completing a twelve-month follow-up for all non-high risk patients. Some additional materials from the original data have been used to analyse the specificity of a negative initial troponin or a troponin measures at <5ngm/l.

We await external validation of this protocol.

We are also involved in a multi-centred study looking at improving finding clinically-important pulmonary emboli [arteries in the lungs blocked by blood clots].

Recently, it was announced that the NZ Emergency Medicine Network, a patient-centred emergency care research collaborative has been launched. As an inaugural member, I hope to continue to provide research used in daily clinical practice.

# New Research Improves Hospital Staff Decision-Making

**Hospital staff who work in emergency departments must quickly decide whether a patient needs to be discharged or admitted to the hospital for further treatment. Dr Andrew Munro of the Nelson Hospital created new decision-making tools to aid hospital staff in making these crucial decisions.**

## **AN EMERGENCY IN THE EMERGENCY DEPARTMENT**

It is a problem when emergency department (ED) staff do not have good tools to help them make decisions quickly. Working in such a chaotic, high-intensity environment requires clear guidelines for how to manage patients. One decision made constantly by ED staff is the discharge or admission of a patient. Hospital resources are crucial, which means that every treatment and test should be designated to patients who are in dire need or with serious illnesses. The wrong decision would result to either wasted resources on a relatively healthy patient or the harm or death of a patient who was misdiagnosed and discharged. Because of the risk, many patients who visit EDs with chest pain are given more care than is necessary.



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**Shortly after embarking on Emergency Medicine specialist training, it became clear to me that the evidence-based medicine for emergency medicine was, at best, vestigial. By contributing to patient-oriented evidence that matters, it helps us maintain the focus on clinical practice and gives us confidence in some of the necessarily pragmatic decision-making required in busy and often overcrowded Emergency Departments.**

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This is because of the difficulty of quickly determining whether that patient may be at risk of having a heart attack. Specifically, patients

who visit the ED with chest pain of a possible cardiac nature make up more than five percent of the total number of patients who present to the emergency department. However, only a small portion of this five percent actually have Acute Coronary Syndrome (ACS). Consequently, the number of patients admitted from the ED without getting a high-risk discharge diagnosis is still too high.

In recognition of the important role that decision support in the ED plays, the New Zealand Ministry of Health requires all EDs to utilise a chest pain pathway or accelerated decision protocol (ADP). These tools are flow charts that guide hospital staff through the process of deciding whether or not to admit a patient. Most chest pain pathways divide

patients into three or more categories of risk: low, intermediate and high. Still, Munro believes that these terms are not clear enough to give hospital staff the confidence to discharge patients who are not at high-risk to develop ACS over the next 30 days.

#### NEW INSIGHTS FROM OTHER RESEARCHERS

Despite L. Goldman's research in 1982, which suggested that implementation of rapid assessment pathways would increase discharge rates, Munro noted that many emergency departments still struggle with waste as a result of non-ACS patients being admitted by EDs. Munro hoped to use new medical tools that would make rapid assessment of ACS risk possible. Work done by Tobias Reichlin offered one such tool. Reichlin had previously studied high sensitivity cardiac troponin-T (hs-TnT) and its usefulness in predicting myocardial infarction, also known as heart attacks. Troponins are regulatory proteins that assist in the contraction of cardiac and skeletal muscle. Hs-TnT is specifically associated with cardiac muscle, and a measurement of the levels of hs-TnT present in cardiac muscle can help reveal whether chest pain may be caused by ACS.



Raised levels of hs-TnT are due to cardiac necrosis (cell death). However, cardiac necrosis alone is not always symptomatic of ACS. Relatively high levels of hs-TnT are also caused by many other diseases such as pericarditis, an inflammation of the sac housing the heart,

pulmonary embolism or arterial clotting in the lungs, a tachyarrhythmia or abnormal increase in heart rate, and Takotsubo cardiomyopathy, a temporary weakening of the heart muscle.

Chronic elevations can also occur in conditions such as renal impairment, which is a kidney disease. Congestive cardiac failure, a disease that prevents the heart from circulating blood efficiently, also raise hs-TnT levels over a long period of time. Previous work suggested that the best way to use measurements of this protein in a clinical setting is to monitor the change in hs-TnT over an hour. The change over time will be able to target whether chest pain is specifically caused by ACS.

#### FINDING A NEW PATH

Munro and his team developed a new set of chest pain pathways that classify patients as "high risk" or "non-high risk" based on the change in their hs-TnT levels over time. To test the effectiveness of the new protocols, the team designed study capable of being executed by hospital staff alongside their various job-related duties. If there was a possibility that a patient's chest pain was caused by cardiac problems, he or she was asked to be included in the study. Any patient with chest pain clearly unrelated to heart conditions were excluded. Ultimately, 452 chest pain patients agreed to participate. This gave the study the power to detect if a previously calculated miss rate of <1% was due to chance or not. (The miss rate is the chance that a patient whose chest pain is of a cardiac nature will be discharged.)

The specific criteria for assigning risk status to patients involved three different considerations. First, ECG wave patterns are examined to look for a specific pattern. Second, an initial troponin level is recorded. If indicated by the protocol, a second level is taken at two hours. A change in troponin-T over time is then used to assign the risk type. Finally, a senior emergency department doctor is required to sign off on disposition (admission vs. discharge). The emergency department doctor could override the ADP at any point in the pathway. If the senior ED physician on staff felt that the patient was at a high risk of experiencing a heart attack over the next 30 days, they were free to admit them even if the protocol indicated they should be discharged.

The research team followed up with patients via phone interviews a month after the trials. This

was conducted to determine whether the discharged patients had experienced any cardiac episodes over the past 30 days. They discovered that the new pathways demonstrated 100% sensitivity, meaning that not a single patient discharged had experienced a heart attack or died in the intervening time. The Nelson Hospital ED also saw an unprecedented discharge rate of 70%. The protocols also identified all patients who were at high risk of having heart attacks. Additionally, the average length of time spent in the ED was four hours and five minutes. Several other EDs have already expressed an interest in using the new chest pain pathways developed by Munro and his team, since they will dramatically improve the care that patients receive. Not only that, the protocols will help hospital staff do their jobs quickly in less stressful conditions.

## Researcher Profile



**Dr Andrew Munro**  
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Dr Andrew Munro received his BSc from the University of Canterbury and his MBChB from the University of Otago. Apart from being a full-time clinician, he is also a part-time researcher working in the Emergency Department of Nelson Hospital, New Zealand, as well as a fellow of the Australasian College for Emergency Medicine. A known regular contributor to Best-BETS in the Emergency Medicine Journal, Munro maintains his focuses on the research to improve clinical practices for better patient care.

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