

# This Week's Citation Classic

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**Killip T & Kimball J T.** Treatment of myocardial infarction in a coronary care unit: a two year experience with 250 patients. *Amer. J. Cardiol.* 20:457-64, 1967.  
[Dept. Medicine, Cornell Univ. Medical Coll., New York, NY]

This paper describes the results of treatment of 250 consecutive patients with acute myocardial infarction in a coronary care unit (CCU). Criteria for diagnosis are carefully defined. A classification of functional severity based on clinical evidence of heart failure presented. Morbidity and mortality are related to severity of illness according to the classification. Mortality in the CCU improved compared to regular care only after nurses were trained and given authority to recognize and treat arrhythmia and initiate resuscitation including defibrillation. [The SC® indicates that this paper has been cited in over 315 publications since 1967.]

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"In the 1960s, academic medicine 'discovered' that patients with ischemic heart disease faced a high mortality and were sitting in large numbers in every hospital. Few clinical or experimental papers were being published on coronary artery disease, the leading cause of death in the Western world. In 1960, H.W. Day, working in a nonteaching community hospital, found that the care of patients with myocardial infarction was facilitated if they were clustered in a special unit during the first few days of their illness.<sup>1</sup> Closed chest cardiac resuscitation, defibrillation, and oscillographic monitoring of the electrocardiogram had been recently developed thus making the coronary care unit (CCU) feasible.<sup>2</sup>

"In 1961, I returned from a special fellowship at the Karolinska Institute to become chief of the division of cardiology at Cornell University Medical College. Our group quickly developed an interest in the problems of coronary artery disease. We developed a four-bed experimental CCU at the New York Hospital-Cornell Medical Center. John Kimball joined our group as a clinical fellow, and subsequently became a member

of the faculty as we collaborated for several years.

"Does the CCU save lives? Our initial experience with 100 consecutive cases did not show improved survival. We then trained nurses to recognize arrhythmias, initiate therapy, and defibrillate if cardiac arrest occurred. The gratifying results of our experience were published in the article cited.

"I have long had an interest in the quantification of clinical events so that the physician can measure severity of illness or effect of treatment. Myocardial infarction alters function of the heart as a pump. An important index of the severity is the degree of heart failure. Prognostic indices had been devised by others<sup>3</sup> but Kimball and I focused on the degree of clinical heart failure as reflecting left ventricular function and, hence, damage. We devised a classification of severity based on presence or absence of signs of heart failure or shock for patients in the CCU with myocardial infarction.

"It is the clinical classification which we proposed which has led to the frequent citing of this article. We showed that mortality is directly related to the bedside estimation of the severity or class of heart failure. Later, several clinical centers, including Cornell, were awarded NIH grants to support myocardial infarction research units (MIRU). Our classification was adopted by the MIRUs and used in a number of papers emanating from that program.

"Determination of a patient's clinical class depends upon serial bedside examination by the physician or nurse. The classification provides a good guide to prognosis, permits comparison of clinical results between institutions, is an index of ventricular damage, and offers a degree of objectivity to the bedside evaluation of a common disease. This is why it has been widely used.

"I have been surprised by the popularity of this paper. Requests for reprints still arrive from all over the world. It is certainly not my most profound publication. What Kimball and I showed was that a classification of clinical severity based upon simple bedside observations could be related to outcome and is a useful guide to the effectiveness of therapy in patients with myocardial infarction."

1. Day H W. An intensive coronary care area. *Dis. Chest* 44:423-7, 1963.
2. Jude J R, Kouwenhoven W B & Kulckerbocker G G. Cardiac arrest: report of application of external cardiac massage on 118 patients. *J. Amer. Med. Assn.* 178:1063-70, 1961.
3. Peel A A F, Semple T, Wang I, Lancaster W M & Dall J L G. A coronary prognostic index for grading the severity of infarction. *Brit. Heart J.* 24:745-60, 1962.