Efficiency optimization through in-hospital reorganization: The chest pain unit challenge?

Amélioration de l’efficience par une réorganisation des structures hospitalières, le défi des unités de la douleur thoracique

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Chest pain is one of the main common causes of ED [1] presentation and admission. In the USA database AHRQ News and Numbers, based on data in Emergency Department Visits for Adults in Community Hospitals from Selected States, 2005 [2], chest pain was the reason for more than 1.6 million visits to EDs in 23 states in the USA in 2005. Ultimately, only 345 000 patients were hospitalized for observation or treatment. An ACS is a high-risk situation and must be eliminated as a possible diagnosis before the patient leaves the ED. While in some situations there is no real doubt (clear ST-segment elevation myocardial infarction, clear non-cardiac cause, etc.), in a number of cases it is impossible to confirm or exclude the diagnosis, especially in the first hours after admission to the ED, without additional tests. However, it is crucial to begin effective treatment as early as possible, due to the high risk of complications in patients with undetected unstable angina. On the other hand, beginning an aggressive anticoagulant therapy in all patients in the ED at risk of an ACS is not a good alternative, due to the relatively high risk of complications in a large cohort and the fact that only a small number of patients would gain a possible benefit from such therapy, as reported in this article [2] and in other registries.

Abbreviations: ACS, acute coronary syndrome; CAD, coronary artery disease; CPU, chest pain unit; ECG, electrocardiogram; ED, emergency department; MICU, mobile intensive care unit; TIMI, Thrombolysis in myocardial infarction.


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The main problems associated with the early management in the ED of a chest pain patient with a suspected ACS are the multiple limitations of the initial diagnostic tests. The patient’s history can help but is not sufficient to confirm the diagnosis by itself, as demonstrated by the TIMI risk score [3]. The patient’s symptoms also have limited diagnostic accuracy. An ECG can diagnose acute myocardial infarction in only 40–65% of patients and is even less useful in patients with unstable angina. The emergence of specific markers such as troponin I and troponin T (and more recently, ultrasensitive troponins) has changed ED management, as they have a high sensitivity for detecting patients with a very high-risk profile, who derive the greatest benefit from early revascularization and aggressive anticoagulant therapies. However, these markers are prognostic only and are unable to confirm or exclude the existence of underlying coronary disease; they permit only stratification of risk as short-term, middle-term or long-term. Furthermore, their accuracy depends on the time between initial symptoms and blood sampling, and serum markers at admission are positive in only 66% of patients with a discharge diagnosis of acute myocardial infarction. American Heart Association/American College of Cardiology guidelines recommend taking at least two serial samples to measure kinetics and to detect late positivity of troponins. Accordingly, ED physicians need at least eight to nine hours to analyse the cardiac risk profile of chest pain patients.

Owing to these difficulties in diagnosing or eliminating CAD, and due to the consequences of making a wrong diagnosis when faced with a patient complaining of an acute chest pain, ED physicians often choose to admit most patients in whom the diagnosis is not immediately clear. In this cohort, and as reported by Durand et al. in this issue of the journal, the majority of patients have a final diagnosis of non-cardiac chest pain. This type of approach is time-consuming, expensive and causes in-hospital congestion. The increasing complexity of additional diagnostic tests for CAD (magnetic resonance imaging, computed tomography, stress magnetic resonance imaging, stress echocardiography, stress exercise test and nuclear imaging), all of which are associated with confounding factors, limitations and local availability issues, complicates the role of the ED physician when trying to confirm or exclude a diagnosis of CAD. CPUs emerged to improve this situation and to optimize the management of patients in whom the probability of an ACS is low, but not sufficiently low to allow the ED physician or the MICU emergency physician to discharge them to their home.

Interestingly, the first applications of this “around the symptoms” concept were based in EDs, particularly in the USA, where more than 15% of EDs proposed a CPU in 1997 [4], and where more than 1500 CPUs have opened. Durand et al. describe, for the first time in France, a cardiology-specific CPU. In most of the CPUs described in the literature, the ascertainment of risk is at the discretion of the physician in charge of the patient, and sometimes the TIMI score [3] or the Goldman algorithm is used. The initial risk assessment is crucial. Indeed, a patient with a confirmed or highly likely ACS is sent directly to the coronary care unit or intensive care unit rather than to the CPU associated with the ED. In the same way, the presence of a complication (heart failure, rhythm disorder, shock, etc.) is considered to be a contraindication for sending a patient to a CPU in the USA [4].

The problem is slightly different in the European Georges Pompidou Hospital, where the CPU is close to the intensive care unit and is more closely associated with the cardiology department than the ED. Here, the algorithm used is well described and is based on patient examination, ECG, chest X-ray, echocardiography and troponin, as recommended by the international guidelines. However, this algorithm does not use an integrated approach such as that proposed for determining the TIMI risk score. The European Georges Pompidou Hospital CPU receives patients from the ED (43%) but also directly from home via the MICU and cardiologist, and it acts mostly as a “first-line” structure, which does not differ from the initial concept in the USA. In this situation, the problem of dispatching patients with other pathologies, such as pulmonary embolism, gastrointestinal ulcer, pneumothorax, etc., is clear, and could lead to rapid congestion of the CPU. In the authors’ experience, the prevalence of a final diagnosis of ACS or non-ischaemic cardiac aetiology is high (41.5%) compared with the literature (2–15% of patients with a final diagnosis of ACS), and could limit the congestion of the department [ok?].

In the paper by Durand et al., 63% of patients were discharged directly from the CPU, which is a low percentage compared with other studies based mainly on ED CPUs (72–92%). It is interesting to note that only 17% and 19.9% of patients were admitted finally to a coronary care unit or “cardiology” ward, respectively, compared with everyday practice where the majority of these patients would be hospitalized in a cardiology department for additional tests. The unique feature of the CPU described by the authors is the specific management by a dedicated nurse and cardiologist and the close relationship with the stress-test department. As underlined by the authors, if the stress test is close to the physicians in charge of the chest-pain patient, the duration of stay is shorter, the final diagnosis is made more quickly and the management of the patient is optimized. In many CPUs in the USA, treadmill ramps are available on site, which could be especially helpful at weekends or when the stress-test department is closed.

Another surprising point was the low ability of the stress test to identify patients with abnormal coronary angiograms with the existence of a significant coronary stenosis (more than 50%): only 48.8% of such patients had an initial abnormal stress test and 53.8% had an abnormal 64-slice computed tomography scan. The low-risk profile of the study population (lesser than 50% of patients with dyslipidaemia, low percentage of diabetic patients, etc.) may have artificially reduced the accuracy of the stress test.

CPU management, as described in this article, is associated with high efficacy, with a very low rate (6.5%) of hospital readmission at 30 days, only one patient (0.18%) with a missed diagnosis of initial ACS and 12.6% of patients discharged without an additional stress test. These results compare favourably with the first data from CPUs in the USA (missed diagnosis of ACS in 1.2% of patients and only 19% with a stress test before discharge). The report is in line with previous reports that emphasize the safety of a CPU approach [5].

CPUs could also help French cardiologists to improve the management of patients presenting with chest pain. However, opening a CPU involves not only reorganizing part of the ED or cardiology department, but also requires
behaviour modification: specific analysis of patients’ cardiovascular risk (TIMI score [3], Global Registry of Acute Coronary Events risk score [6], etc.) in order to base the process on a validated model rather than on physician experience alone; use of the CPU as a stress-test department with the local possibility of doing this "on site" with the same team or with specific slots for echocardiography and stress testing (treadmill test, stress echocardiography, stress magnetic resonance imaging, etc.), even at weekends or in the evening; determination of the management of patients discharged without any cardiac causes (gastrointestinal fibroscopy, pulmonary scintigraphy, etc.); and evaluation of 30-day outcome of discharged patients.

The increasing complexity of diagnostic tools, the ageing of the population and the improvements in quality of care are combining to lead us to change our management of patients, thereby reducing the duration of in-hospital stay and also improving the quality of our care and effectiveness. As with heart failure units, CPUs are rare in France and in Latin countries in general, but, as Durand et al. describe, this type of in-hospital organization could help us to increase our efficiency. Physicians in CPUs do not act differently from clinicians in cardiology departments, but through the use of treatment algorithms, the immediate implementation of the stress test and the strong evaluation of its efficacy (quality control by analysis of patient outcome, early risk after discharge, percentage of "normal" angiograms) they will reduce time from admission to final diagnosis and optimize resource utilization. CPUs, like heart failure units, facilitate specific, "aggressive" and fast management of patients with a specific, dedicated, medical team, and have proved their effectiveness, mainly in the USA. These two types of "disease management units" are based on the concept of quick access to additional tests (stress test, echocardiography, markers) and have to involve an experienced medical team and be based in large medical centres to be useful to the population and economical for the healthcare system.

References