# Quality improvement in the treatment of acute coronary syndrome patients

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Timely revascularisation of the infarcted vessel by percutaneous coronary intervention (PCI) is the mainstay of treatment of acute coronary syndrome (ACS). Previously, standards of care within hospitals and within hospital networks were developed to ensure that every patient with an ACS can benefit from this treatment modality. In many countries, as in Switzerland, primary PCI has entirely replaced fibrinolytic therapy in the treatment of patients with ST-elevation myocardial infarction (STEMI) [1]. After acute treatment, secondary prevention measures minimise the risk of recurrent events. These secondary prevention measures are all well established and based on evidence derived from many large randomised clinical trials. "When medical professionals apply the most up-to-date evidence-based treatment guidelines, patient outcomes improve". This is the slogan of the American Heart Association (AHA) initiative "Get with the Guidelines". The AHA and many other health organisations, as well as insurers and governmental offices, track guideline adherence in voluntary or mandatory registries as a way to enhance quality of care. The "Acute Coronary Treatment and Intervention Outcomes Network Registry–Get with the Guidelines" of the AHA is one of the most sophisticated of its kind.

Now in *Swiss Medical Weekly*, Welker et al. report the rate of guideline-recommended secondary prevention interventions after an ACS in the "Special Program University Medicine – Acute coronary syndrome and inflammation" (SPUM-ACS) cohort of Switzerland. This SPUM programme focuses on the role of inflammation in ACS and its role in the pathogenesis, diagnosis, therapy and prevention of ACS. Three university hospitals and their referring hospitals participate in the programme, and the results of one of the centres and its referring network of regional nonacademic centres are reported [2]. The authors found not only a very good rate of guideline-recommended secondary prevention interventions, but also found little difference in their use between the university hospital and the regional nonacademic centres, indicating a high degree of awareness of guideline-recommended treatment and its implementation in regional hospitals. This latter finding is somewhat surprising, since several studies in the USA and France have reported inferior rates of guideline-recommended treatment and outcome in referring hospitals compared

with PCI centres of ACS networks. This difference may be partially explained by patient selection. In the analysis of Welker et al. only patients treated with PCI, not all ACS patients within the network, were included [2]. The results of Welker et al. are, however, in line with findings of the Swiss AMIS Plus Registry, which found similar high rates of prescription of secondary prevention measures throughout Switzerland and no difference in mortality of ACS patients in PCI centres versus nonacademic referring centres [1, 3]. Welker et al. report two deficits in implementing secondary prevention interventions. Formal in-hospital smoking cessation programmes were not available in regional hospitals and enrolment in cardiac rehabilitation programmes was not optimal in the university hospital. A very similar finding was recently reported from a larger network in Ontario, Canada, where smoking cessation counselling was not consistently performed across hospitals [4]. Welker et al. describe reasons for this finding and suggest ways for improvement of quality of care.

Can we conclude from the above that such registries help to test the system and to improve quality of care? Let us first examine the quality indicators chosen in this study. In quality assurance programmes a variety of quality indicators should be used that address the three main domains of quality, i.e. system, process and outcome [5]. System refers to those aspects existing independently of the patient, such as expertise of the healthcare providers and availability of specialty teams, e.g. PCI capability. Process refers to measures performed in delivering the care, such as timing of treatment. Outcomes are the results of the care provided, such as in-hospital mortality. Welker and colleagues analysed quality parameters that are process indicators [6]. This approach served the purpose of finding flaws in the system, i.e. lack of smoking cessation programmes and insufficient prescription of rehabilitation programmes in this particular cohort. Would a better performance in these two areas have improved outcome? In previous studies, variability in a single process-of-care indicator had almost no influence on outcome, i.e. mortality [7]. It was the composite adherence to process-of-care indicators that was correlated with mortality in patients with non-ST-elevation myocardial infarction [7]. Even this association was found to be minor, accounting for only 6% of hospital-variation in risk-

standardised 30-day mortality [8] in one study and was not correlated at all in another study [4]. Therefore, even though we put great emphasis on pharmacological and non-pharmacological secondary prevention interventions for quality improvement, these particular quality indicators are weak predictors of short-term outcome. None the less, in some healthcare systems tracking cards have been installed for these process-of-care measures, and reimbursement is dependent on adherence to these performance standards (pay for performance).

Are there other nonpharmacological process-of-care indicators better suited to predict quality of care and improve outcome? One parameter that has proven to be an excellent quality indicator, not only as a process-of-care indicator, but also as a system indicator, is door-to-balloon time. Since many patients are transferred from other hospitals and systems have been put in place where emergency medical services perform prehospital electrocardiographic diagnosis and bypass hospitals without PCI capability, the indicator has had to be redefined as time-from-first medical contact to reperfusion. Practice guidelines recommend that time from first medical contact to reperfusion be less than 120 minutes [9]. There is no doubt that shorter time to reperfusion is associated with decreased mortality [10]; however, there is controversy with respect to the optimal time to reperfusion, since newer studies did not show a decreased mortality with further reduction of time to reperfusion [11]. In-hospital mortality has remained a steady 4.6-4.8% in the USA and was independent of improvement in door-to-balloon time, but dependent on age, location of myocardial necrosis and the occurrence of cardiogenic shock [11]. In Switzerland, similar and constant over time in-hospital mortality rates of around 5% were found by the AMIS plus investigators [12]. Mortality rates were dependent on age, Killip class, diabetes, gender and comorbidities. There are several explanations why further reduction in door-to-balloon time has not resulted in further reduction in mortality [13]. It may be that small reductions in the range of minutes of door-to-balloon time reduce total ischaemic time too little to have an impact on clinical outcomes. It may also be that the reduction of average time decreased because a great number low risk patients are treated very quickly and a relatively small number of polymorbid patients with the highest mortality risk, who take longer to treat, do not influence the average door-to-balloon time. Furthermore, it might be that the time-to-treatment interventions and all the other process-of-care measures have reduced in-hospital mortality as much as possible [13].

It is generally accepted, that quality of treatment is best assessed with outcome measures. Outcome measures for myocardial infarction can be grouped into three categories [10]: (1) disease progression: survival, development of heart failure, reinfarction; (2) health status of the patient: functional status, symptoms, quality of life and patient satisfaction; and (3) costs: direct costs and indirect costs, such as loss of employment. In-hospital mortality is widely used by health authorities. To everybody, including the health authorities themselves, it is clear that crude mortality rates are an inaccurate parameter for assessing quality of care. Myocardial infarction mortality is, as outlined above, very much dependent on patient characteristics and initial health status. Therefore, tertiary centres, which treat out-of-hospital arrest patients and patients with cardiogenic shock will appear inferior compared with their referring hospitals, who send patients with such conditions to them. Crude mortality rates from myocardial infarction for a hospital will, however, tell something about the system and process-of-care measures for the entire hospital, not only for the cardiology department. It may serve as an incentive to a comprehensive approach for improving quality within a system. Furthermore, it might stimulate the continuous reassessment of all system and process-of-care measures. That such an iterative approach is necessary is nicely exemplified in the efforts to improve the time to reperfusion. The success of these efforts has resulted in some unexpected consequences [13]. External patient triage and a reduced emphasis on diagnosis and treatment of coexisting conditions have increased the number of false alarms and potentially inappropriate invasive procedures. This exemplifies the dynamic nature of optimising quality of care performance measures. The current challenge for network systems is no longer the improvement of process-of-care measures for quick transfer of patients to the PCI centre, but to establish process-of-care measures for correct diagnosis and appropriate treatment of every patient with chest pain and positive troponin.

In conclusion, the established process-of-care measures of pharmacological and secondary prevention interventions, as well as first-medical-contact to balloon time interventions can serve as basis, but the task ahead is to reassess critically the current status and to develop the system further for a comprehensive care that suffices the great variability of patients.

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## References

1 Radovanovic D, Nallamothu BK, Seifert B, Bertel O, Eberli F, Urban P, et al. Temporal trends in treatment of ST-elevation myocardial infarction among men and women in Switzerland between 1997 and 2011. 2012;1:183–91.

2 Welker J, Auer R, Gencer B, Muller O, Cornuz J, Matter CM, et al. Hospital revascularization capability and quality of care after an acute coronary syndrome in Switzerland. Swiss Med Wkly. 2016;146:w14275.

3 Radovanovic D, Urban P, Simon R, Schmidli M, Maggiorini M, Rickli H, et al. Outcome of patients with acute coronary syndrome in hospitals of different sizes. A report from the AMIS Plus Registry. Swiss Med Wkly. 2010;140:314–22.

4 Czarnecki A, Prasad TJ, Wang J, Wijeysundera HC, Cheema AN, Dzavik V, et al. Adherence to process of care quality indicatoris after percutaneous coronary intervention in Ontario, Canada: a retrospective observational cohort study. Open Heart. 2015;2:e000200.

5 Donabedian A. The quality of care. How can it be assessed? JAMA. 1988;260:1743–8.

6 Tu JV, Khalid L, Donovan LR, Ko DT; Canadian Cardiovascular Outcomes Research Team / Canadian Cardiovascular Society Acute Myocardial Infarction Quality Indicator Panel. Indicators of quality

of care for patients with acute myocardial infarction. CMAJ. 2008;179:909–15.

7 Peterson ED, Roe MT, Mulgund J, DeLong ER, Lytle BL, Brindis RG, et al. Association between hospital process performance and outcomes among patients with acute coronary syndromes. JAMA. 2006;295:1912–20.

8 Bradley EH, Herrin J, Elbel B, McNamara RL, Magid DJ, Nallamothu BK, et al. Hospital quality for acute myocardial infarction: correlation among process measures and relationship with short-term mortality. JAMA. 2006;296:72–8.

9 American College of Emergency P, Society for Cardiovascular A, Interventions, O'Gara PT, Kushner FG, Ascheim DD, et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2013;61(4):485–510.

10 Spertus JA, Radford MJ, Every NR, Ellerbeck EF, Peterson ED, Krumholz HM, et al. Challenges and opportunities in quantifying the quality of care for acute myocardial infarction: summary from the Acute Myocardial Infarction Working Group of the American Heart Association/American College of Cardiology First Scientific Forum on Quality of Care and Outcomes Research in Cardiovascular Disease and Stroke. Circulation. 2003;107:1681–91.

11 Menees DS, Peterson ED, Wang Y, Curtis JP, Messenger JC, Rumsfeld JS, et al. Door-to-balloon time and mortality among patients undergoing primary PCI. N Engl J Med. 2013;369(10):901–9.

12 Roffi M, Radovanovic D, Erne P, Urban P, Windecker S, Eberli FR. Gender-related mortality trends among diabetic patients with ST-segment elevation myocardial infarction: insights from a nationwide registry 1997–2010. Eur Heart J Acute Cardiovasc Care. 2013;2(4):342–9.

13 Bates ER, Jacobs AK. Time to treatment in patients with STEMI. N Engl J Med. 2013;369:889–92.