The management of acute myocardial infarction in the cardiological intensive care units in Italy: the 'BLITZ 4 Qualità' campaign for performance measurement and quality improvement

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Abstract

Aim: To assess and promote compliance of Italian cardiological intensive care units (CCUs) with evidence-based guidelines for the management of acute myocardial infarction (MI).

Methods and results: The process of diagnosis and treatment of MI was prospectively evaluated in 163 CCUs by use of 30 indicators during two enrolment phases, each followed by a feedback of both local and general performance. Overall, 5854 patients with ST-segment elevation MI (STEMI) and 5852 with non-ST-segment elevation MI (NSTEMI) were consecutively enrolled. The target for each indicator was defined as compliance with the relevant recommendations in $\geq 90\%$ of suitable patients and it was met for nine (30%) and 10 (33.3%) indicators in the first and second phases, respectively. Regardless of target, a significant improvement in compliance was observed in the second phase in 10 out of 30 indicators (33.3%). Use of pre-hospital ECG, expedite delivery of reperfusion therapy, dosage of antithrombotic drugs, and non-pharmacological implementation of secondary prevention were often off target. Similar in-hospital mortality was observed in phases I and II, both in patients with STEMI (4.0 vs. 4.2%, $p=0.79$) and NSTEMI (1.8 vs. 2.4%, $p=0.11$). Overall, 30-day mortality were 5.7% for patients with STEMI and 3.4% with NSTEMI.

Conclusions: Performance indicators can accurately weigh the whole process of diagnosis and treatment of patients with MI and monitor the improvements in the quality of care. In our large population of consecutive patients, satisfactory 30-day outcomes were observed despite suboptimal adherence to guidelines for some indicators of recognised prognostic relevance.

Keywords

Acute myocardial infarction, performance measures

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Introduction

Clinical practice guidelines (GL) summarize updated available evidence and help to standardize and improve the quality of care.^{1–4} Despite some limitations inherent in the guidelines,⁵ their implementation is associated with better clinical outcomes.^{6–9} However, suboptimal application of guidelines is frequent and may reflect uneven levels of quality of care among centres.^{10–14}

In 2009 the Italian Association of Hospital Cardiologists (ANMCO, Associazione Nazionale Medici Cardiologi Ospedalieri), launched the 'BLITZ-4 Qualità', a project involving Italian cardiological intensive care units (CCUs), spread across the entire national territory. The goal of the BLITZ-4 was to collect demographic, process of care, and outcome measures among patients with both ST-segment elevation (STEMI) and non-ST-segment elevation (NSTEMI) myocardial infarction (MI), to provide feedback to participating centres as well as specific interventions aimed at increasing compliance with guidelines, and, ultimately, to improve the quality and the standardization of MI care across Italian CCUs. The campaign included two phases of patient enrolment (from 15 September to 30 November 2009 and from 15 February to 30 April 2010) each followed by feedback regarding the local performance, based on the measure of guideline-derived quality indicators (QI).^{15–18}

This paper describes the main findings of the BLITZ-4 campaign on overall performance of these centres and short-term changes following quantitative feed-back report to participating sites.

Methods

Site and patient selection

Based on the results of a previous national survey,¹⁹ only the CCUs with an expected case load of at least 20 patients with STEMI and 20 with NSTEMI during each period of the campaign, in agreement with the study protocol, were invited to participate. No fee for enrolment was paid. Each centre had to enrol consecutive consenting patients meeting the following inclusion criteria: chest pain lasting >10 min, or sudden shortness of breath, or syncope, or cardiac arrest, and (a) release of troponin I or T above local upper limit of normal or (b) ST-segment elevation in ≥ 2 contiguous leads (≥ 0.2 mV in V1–V3, ≥ 0.1 mV in other leads), or ST-segment depression (≥ 0.05 mV) in ≥ 2 contiguous leads, or inverted T-waves, or new-onset left bundle branch block. Patients without ischaemic ECG changes, or with pre-existing left bundle branch block, or with pacemaker rhythm could be included on the basis of the only clinical + cardiac enzyme criteria as above. Patients with ST-segment elevation and those with new-onset left bundle branch block were defined as STEMI, all others as NSTEMI.

Data collection

Data collection included pharmacological and non-pharmacological indicators of performance (Table 1) as well as measures of excess dose of antithrombotic drugs (Table 2), in eligible populations. The selection of indicators were based on the European Society of Cardiology and the American College of Cardiology/American Heart Association (ACC/AHA) guidelines,^{1–4} and to the ACC/AHA and Canadian Cardiovascular Outcome Research Team/Canadian Cardiovascular Society recommendations.^{15–18} With regard to the pharmacological QIs, the definition of non-eligibility because of contraindications to specific treatments were left to the judgement of physicians, based on clinical considerations and on the commonly accepted contraindications for each drug. A significant modification was made in regards to the measurement of time to reperfusion therapy (RT). The starting point for the time interval to RT was calculated from the qualifying ECG, because its exact timing is documented in virtually all cases and less liable to errors than the time of first medical contact, especially for transferred patients. The starting point of reperfusion therapy was identified as the moment of arterial access for primary percutaneous coronary intervention (PCI) or infusion initiation for fibrinolysis. For each performance indicator, compliance with the applicable recommendations in $\geq 90\%$ of suitable patients was considered as the target.

Study procedures

The BLITZ 4 Qualità project included two phases: phase-I enrolment (from 15 September to 30 November 2009) followed by phase-I feedback; phase-II enrolment (from 15 February to 30 April 2010) followed by phase-II feedback.

During phase-I enrolment, ≥ 20 consecutive and consenting patients with both STEMI and NSTEMI per site were to be included. Data on patient demographics, concomitant therapies, process and quality indicators, and outcomes were collected during index hospitalization in web-based electronic case report forms. Six-month clinical follow-up data were requested for all patients. In phase-I feedback, each site received a performance report including a report of national performance as comparison. During this phase, the interventions aimed at improving the adherence to QIs were also carried out and each centre was provided with educational tools to enforce most recent guidelines recommendations regarding the management of patients with STEMI and NSTEMI,^{1–4} performance measures and a comprehensive template for discharge documents, printed both in complete and pocket forms, as well as in electronic files with slides for local presentations and in posters to be exposed in the CCU. During the ensuing 2 months, all CCUs were encouraged to organize staff rounds including nurse and medical personnel of both the cardiology and emergency department units to evaluate their own performance report,

Table 1. Pharmacological and non-pharmacological performance indicators and eligible populations

Indicators	Eligible population
(1) Aspirin within 3 h after admission	Patients surviving >24 h after admission without aspirin medication in the preceding 24 h, or patients transferred after CA/pPCI
(2) Aspirin at discharge	All patients except those: (a) transferred to interventional centre (b) discharged on OA (c) with contraindications to specific treatment
(3) Clopidogrel or ticlopidine at discharge	All patients except those: (a) transferred to interventional centre (b) discharged on OA (c) with contraindications to specific treatment
(4) Betablockers at discharge	All patients except those: (a) transferred to interventional centre (b) with contraindications to specific treatment
(5) ACE-I or ARB at discharge	All patients except those: (a) transferred to interventional centre (b) with contraindications to specific treatment
(6) Statin at discharge	All patients except those: (a) transferred to interventional centre (b) with contraindications to specific treatment
(7) ACE-I or ARB at discharge	As above + LVEF $\leq 40\%$
(8) Pre-hospital ECG	All patients first assisted by the '118' mobile emergency system
(9) ECG within 10 min after hospital admission	All patients without pre-hospital ECG not transferred from other hospitals
(10) RT with TL or pPCI (STEMI)	All patients with known time of symptoms onset, ECG compatible with STEMI, symptoms duration <12 h, or Killip class IV
(11) ECG-pPCI time <90 min (STEMI)	(a) known time of symptoms onset and symptoms duration ≤ 120 min (b) ECG compatible with STEMI
(12) ECG-pPCI time <120 min (STEMI)	(a) known time of symptoms onset and symptoms duration >120 min (b) ECG compatible with STEMI
(13) ECG-TL time <30 min (STEMI)	All patients with TL chosen as initial RT
(14) LVEF	All surviving patients
(15) LDL-C assessment during hospital stay	All surviving patients
(16) Ischaemic risk stratification by CA and/or stress tests	All surviving patients except those with severe comorbidity and/or ongoing stroke, and/or severely impaired general conditions, and/or very advanced age, and/or patient refusal
(17) Smoking cessation counselling	All active smokers discharged home
(18) Referral for cardiac rehabilitation programme	All patients, except those transferred to other hospital or division of same hospital

All indicators apply to both patients with STEMI and NSTEMI, except when otherwise indicated. ACE-I, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; CA, coronary angiography; LDL-C, low-density lipoprotein cholesterol; LVEF, left ventricular ejection fraction; NSTEMI, non-ST-segment elevation myocardial infarction; OA, oral anticoagulation; pPCI, primary percutaneous coronary intervention; RT, reperfusion therapy; STEMI, ST-elevation myocardial infarction; TL, thrombolysis.

to share educational materials, and to discuss and plan possible improvements.

The phase-II enrolment and feedback were similar to phase I and were necessary for the understanding of the impact of the project on the overall quality of care patterns as well to allow the auto-evaluation for single centres.

Data analysis

Data were analysed by the ANMCO Research Center (Florence, Italy). Web-based data collection allowed checks

for mandatory variables, data range, and logical consistency for variables of interest. Phase-I patients were compared to phase-II patients, both in the STEMI and NSTEMI population. Categorical variables were reported as frequencies and percentages, and compared using the chi-squared test, whereas continuous variables were reported as mean $\pm$ standard deviation and compared by the T-test, if normally distributed, or as median and interquartile range (IQR) and compared by the Mann-Whitney U-test, if not normally distributed. QIs in phases I vs. II were compared with the chi-squared test. A p -value <0.05 was considered

Table 2. Excessive dosing of antithrombotic drugs

Drug and eligible population	Excessive dosing
UFH during pPCI (STEMI)	iv bolus injection >100 U/kg, or >60 U/kg if associated with GP IIb/IIIa inhibitors
UFH during TL or no RT (STEMI)	iv bolus injection >60 U/kg, or >4000 U, or peak aPTT >75 s, or peak aPTT/baseline aPTT >2.5 s
UFH (NSTEMI)	iv bolus injection >60 U/kg, or >5000 U, or peak aPTT >75 s, or peak aPTT/baseline aPTT >2.5 s
Enoxaparin in patients ≤75 years, plasma creatinine ≤2,5 mg/dl (males) or ≤2,0 mg/dl (females)	Daily dosage >200 U/kg or treatment >8 days
Enoxaparin in patients >75 years and eGFR ≥30	Daily dosage >150 U/kg or treatment > 8 days
Enoxaparin in patients with eGFR <30	Daily dosage >100 U/kg or treatment >8 days
Tirofiban in patients with eGFR ≥30	iv bolus injection >12 µg/kg or infusion >0.10 µg/kg/min or treatment >96 h
Tirofiban in patients with eGFR <30	iv bolus injection >6 µg/kg or infusion >0.05 µg/kg/min or treatment >96 h
Eptifibatide in patients with eGFR ≥50	iv bolus >180 µg/kg or infusion >2 µg/kg/min or treatment >96 h
Eptifibatide in patients with eGFR ≥30–49	iv bolus >180 µg/kg or infusion >1 µg/kg/min or treatment > 96 h
Eptifibatide in patients with eGFR <30	Any regimen
Abciximab	iv bolus injection >0.25 mg/kg or infusion >0.125 µg/kg/min or treatment >12 h

aPTT, activated partial thromboplastin time; eGFR, estimated glomerular filtration rate (ml/min); GP, glycoprotein; NSTEMI, non-ST-segment elevation myocardial infarction; pPCI, primary percutaneous coronary intervention; RT, reperfusion therapy; STEMI, ST-elevation myocardial infarction; TL, thrombolysis; UFH, unfractionated heparin.

statistically significant; all *p*-values are two-sided. Analyses were performed with SAS system software (SAS Institute, Cary, USA).

Results

Participating centers

A total of 163 CCUs (out of about 400 active in Italy) participated in phase-I enrolment: 135 (83%) had an interventional cardiology facility and 112 had 24/7 cath lab access. Two centres withdrew participation to enrolment phase II. During phase-I feedback, data evaluation and discussion was actually performed in 93% of centres. The attendance to data evaluation and discussion meetings was 100, 84, 75, and 11% among CCU physicians, cardiology ward physicians, nurses, and emergency department/emergency mobile service physicians, respectively.

In phases I and II, 126 vs. 124 centres recruited ≥20 patients of at least one type of MI, whereas the target enrolment of ≥20 cases for each type of MI was reached in 82 vs. 77 centres.

Patient population

Overall, 5854 patients with STEMI and 5852 with NSTEMI as admission diagnosis were enrolled. The diagnosis was confirmed at discharge in 97.2% of the STEMI (change to NSTEMI in 2.1%) and in 95.5% of the NSTEMI (change to STEMI in 3.1%). The characteristics of patients enrolled are detailed in Table 3.

In the whole population, 1657 (28.3%) patients with STEMI and 1174 (20.1%) with NSTEMI were recruited after early emergency transfer from other centres, before undergoing coronary angiography, whereas 198 patients (3.4%) with STEMI and 66 (1.1%) with NSTEMI were recruited after transfer from other non-participating centres, where coronary angiography/PCI had already been performed. This latter group was excluded from the analyses on reperfusion time.

Pharmacological indicators

The results on pharmacological indicators are shown in Figure 1. Although in both recruitment phases the ≥90% target was reached only for aspirin and statin prescription at discharge, a significant increase in compliance was observed for four out of seven (57.1%) indicators in phase II, including the prescription of thienopyridins, angiotensin-converting enzyme inhibitors, and angiotensin receptor blockers.

Non-pharmacological indicators

Among the non-pharmacological process-of-care indicators (Figure 2), in both recruitment phases the ≥90% target was reached for the use of RT in eligible STEMI patients, the assessment of left ventricular function and risk stratification; for the assessment of low-density lipoprotein cholesterol (LDL-C) plasma levels, the ≥90% target was achieved only in phase II. A significant increase in compliance was also observed for five out of 11 (45.5%) indicators in this class, including the smoking cessation counselling

Table 3. Baseline characteristics of patients with STEMI and NSTEMI

Characteristic	STEMI (n=5854)	NSTEMI (n=5852)	p-value
Females	1600 (27.3)	1957 (33.4)	<0.0001
Age (females)	73±13	74±11	0.0001
Age (males)	63±13	68±12	<0.0001
Active smokers	2273 (38.8)	1443 (24.7)	<0.0001
Arterial hypertension in treatment	3121 (53.3)	3930 (67.2)	<0.0001
Hyperlipidaemia in treatment	1905 (32.5)	2329 (39.8)	<0.0001
Diabetes mellitus in treatment	1187 (20.3)	1790 (30.6)	<0.0001
Known renal failure	276 (4.7)	694 (11.9)	<0.0001
Previous MI	481 (8.2)	1012 (17.3)	<0.0001
Previous PCI	519 (8.9)	1093 (18.7)	<0.0001
Previous CABG	128 (2.2)	534 (9.1)	<0.0001
Killip class II	862 (14.7)	882 (15.1)	0.60
Killip class III–IV	344 (5.9)	440 (7.5)	0.0004

Values are mean±SD or n (%). CABG, coronary artery bypass graft; MI, myocardial infarction; NSTEMI, non-ST-segment elevation myocardial infarction; PCI, percutaneous coronary intervention; STEMI, ST-elevation myocardial infarction.

Figure 1. Pharmacological indicators in eligible patients in phases I and II

ASA, aspirin; ACE-I, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; EF= left ventricular ejection fraction.

(considered as the formal programme and not simple advice to the patients) and referral for rehabilitation.

Reperfusion therapy in STEMI patients

Among the 5656 STEMI patients, RT was provided to 3924 (90.7%) of 4324 eligible patients, ranging from 75.9% in centres with no interventional capability to 93.4% in centres with 24/7 interventional capability (Figure 3). Fibrinolysis and primary PCI were used in 615 (16%) and 3308 (84%) of the cases, respectively. Fibrinolysis was followed by rescue PCI in 153 (24.9%) patients. RT (with primary PCI in 91.1% of cases) was also provided to 54.9% of the 1332 non-eligible patients, due to late or uncertain diagnosis. Time intervals from diagnostic ECG to primary PCI

were calculated in eligible patients with available data: median times were 78 min (IQR 57–106) in phase 1 and 75 min (IQR 55–100) in phase 2 for 2304 patients directly admitted to a primary PCI-capable centre, and 125 min (IQR 90–179) vs. 130 min (IQR 93–176) for 753 patients transferred from other hospitals.

Antithrombotic drug dosing

Among the specific indicators for the non-excessive dosage of antithrombotic drugs, the ≥90% target compliance was reached only in patients with unimpaired renal function treated with enoxaparin or eptifibatide (Figure 4). Unfractionated heparin was frequently overdosed, whereas tirofiban and eptifibatide were overdosed mainly in presence or renal failure. In

Figure 2. Non-pharmacological indicators in eligible patients in phases I and II

Pre-hospital ECG and time to ECG in ER indicators are calculated separately for ST-elevation myocardial infarction (STEMI) and non-STEMI (NSTEMI) patients. Time from ECG to pPCI indicator is calculated separately for transferred and non-transferred patients. ER, emergency room; pPCI, primary percutaneous coronary intervention; LDL-C, low-density lipoprotein cholesterol; LV, left ventricle.

Figure 3. Reperfusion treatments in eligible STEMI patients during phases I and II

Hospital type 1, no interventional capabilities; hospital type 2, interventional capabilities during office hours; hospital type 3, interventional capabilities 24/24 hours.

recruitment phase II, a significant increase in compliance was observed only for 1/12 (8.3%) indicators in this class.

In-hospital and 30-day outcomes

Overall, 5333/5656 patients with STEMI (94.3%) and 4923/5786 with NSTEMI (85.1%) underwent coronary angiography. Among patients undergoing coronary angiography performed at participating sites (thus with known

decision regarding the choice of revascularization), PCI was performed in 4465/4886 (91.4%) of STEMI and 2898/4336 (66.8%) of NSTEMI, and coronary artery bypass surgery (CABG) was performed or recommended in 252 (5.2%) vs. 583 (13.4%), respectively.

The mean duration of hospital stay (CCU + cardiology ward) was 7.89 ± 5.00 and 7.92 ± 5.07 days for patients with STEMI and NSTEMI, respectively. Transfer to another hospital or division of the same hospital occurred in 21.3

Figure 4. Indicators regarding non-excessive dosage of antithrombotic drugs in eligible patients

eGFR, estimated glomerular filtration rate in ml/min; pPCI, primary percutaneous coronary intervention; RT, reperfusion therapy; UFH, unfractionated heparin.

Table 4. Clinical outcomes in CCU or cardiology ward and at 30 days

Outcome	STEMI (n=5854)		NSTEMI (n=5852)	
	In CCU/ward	At 30 days	In CCU/ward	At 30 days
Death	237 (4.1)	315 (5.7)	122 (2.1)	189 (3.4)
Reinfarction	62 (1.1)	72 (1.4)	57 (1)	66 (1.3)
Stroke	43 (0.7)	52 (1.0)	34 (0.6)	42 (0.8)
Haemorrhagic complications	224 (3.8)	230 (4.4)	225 (3.8)	227 (4.4)
Blood transfusions	75 (1.3)	NA	111 (1.9)	NA
Congestive heart failure	629 (10.7)	646 (12.2)	671 (11.5)	683 (13.1)
Recurrence of angina	147 (2.5)	161 (3.1)	299 (5.1)	310 (6.0)

Values are n (%). Event rates at 30 days refers to the population with available data: mortality in 11,163 patients, reinfarction in 10,321, stroke in 10,314, haemorrhagic complications in 10,377, congestive heart failure in 10,498, and recurrence of angina in 10,350. NA, not assessed. CCU, cardiological intensive care unit.

and 23.7% of surviving patients with STEMI and NSTEMI, respectively. The clinical outcomes, both in the acute phase and at 30 days, are summarized in Table 4. In-hospital mortality was similar in phases I and II for STEMI (4.0 vs. 4.2%, $p=0.79$) and NSTEMI (1.8 vs. 2.4%, $p=0.11$) patients. Thirty-day mortality could be assessed in 95.2% of discharged or transferred patients. In 89 centres with 100% complete follow up, overall 30-day mortality was 5.6% (178/3203) and 3.4% (108/3143) for STEMI and NSTEMI patients, respectively.

Among 4324 STEMI patients eligible for reperfusion, in-hospital mortality was 14/615 (2.3%), 77/3308 (2.3%), and 37/400 (9.3%) after fibrinolysis, primary PCI, and no RT respectively ($p<0.0001$). Delivery of RT within the recommended time limits from presentation compared to

patients out of window was associated with 2.2% (43/1923) vs. 2.5% (29/1158) mortality after primary PCI ($p=0.63$), and 2.4% (9/378) vs. 2.2% (5/228) after fibrinolysis ($p=0.88$). In 1332 STEMI patients non-eligible to RT, in-hospital mortality was 8.2%.

In-hospital mortality of reperfusion-eligible patients in centres with 24/7 capability, non-24/7, and no interventional capability, was 2.6, 4.7, and 4.3%, respectively ($p=0.02$).

Haemorrhagic complications occurred in 449 patients, with the same (3.8%) incidence in STEMI vs. NSTEMI, and vascular access site was involved in 42.8 vs. 32.4% of cases, respectively. Overall, intracranial and retroperitoneal bleeding occurred in 11 and 18 patients, respectively, and 1.6% were transfused.

Discussion

The development of regional and/or national programmes to measure performance indicators systematically and to provide feedback to individual participating centres has been strongly recommended by the European Society of Cardiology.² In compliance with this recommendation, on the background of previous short-term nationwide BLITZ surveys,^{12,13,19} ANMCO has launched the scout project 'BLITZ 4 qualità'.

Our findings demonstrate that pharmacological indicators scored close or superior to the target of compliance with the relevant recommendations in $\geq 90\%$ of suitable patients whereas this was not the case for non-pharmacological process-of-care indicators. In fact, pre-hospital ECG recording, timely delivery of reperfusion by either primary PCI or fibrinolysis, counselling for smoking cessation on discharge, and referral to cardiac rehabilitation programmes were all markedly below target. With regard to antithrombotic therapies, an excessive dose was often administered, especially with unfractionated heparin, and among patients with renal insufficiency, but intracranial and retroperitoneal bleeding were very rare as well the need for transfusion.

Quantitative improvements were observed during phase II for 10 of the 30 indicators analysed, and were most marked for pharmacological indicators. Smoke cessation counselling was the single indicator showing the most favourable change in phase II, probably because this can be rapidly achieved by cooperation of the medical and nursing staff. Pre-hospital ECG recording, speeding up delivery of reperfusion and institutional referral to cardiac rehabilitation programmes require specific allocation of resources and more complex and time-consuming adjustments in the process of care outside cardiology units and may not be rapidly achievable.

Despite a high-risk profile, the in-hospital outcomes of our population with STEMI compare favourably with recently reported registries data²⁰ and may appear to challenge the validity of our indicator scores. Specifically, the delay to primary PCI has to be considered as underestimated, because we measured the 'ECG to primary PCI' delay, expected to be shorter than 'door to balloon' time. The main reason for this discrepancy may be due to the fact that mostly high-volume interventional centres were selected for participation and the high rate of reperfusion – especially with primary PCI – is likely to have had a strong impact on the favourable outcomes. Comparison with the most recent data (period 4) from Euro Heart Survey ACS III²⁰ lends support to this hypothesis, since a higher use of reperfusion (91.9 vs. 81.3%) in eligible patients, particularly with primary PCI (78.1 vs. 64%) – albeit with longer delays [ECG–primary PCI time 92 min (IQR 65–151) vs. door–artery time 45 min (IQR 26–84)] – was associated with a lower acute mortality in our population

(4.1 vs. 6.6%). Improvements in the door-to-balloon time in itself were also shown to be poorly correlated with acute outcomes in a report from the Get With The Guidelines programme.²¹ This observation is consistent with the impressive absolute 6.5 and 5.7% reduction in acute mortality observed in the Wien and Bologna STEMI registries,^{22,23} respectively, after a 21 and 18% increase in the rate of reperfusion had been achieved, mostly by primary PCI, much larger than expected on the sole basis of superiority of primary PCI over fibrinolysis, verified in meta-analysis of randomized controlled trials that demonstrated only a 2% absolute reduction in mortality.²⁴ Simply striving to achieve a higher use of reperfusion in population with STEMI may impact total mortality more than other initiatives (e.g. shortening treatment delays, or shifting from fibrinolysis to primary PCI) and should therefore be given a stronger priority.

Similarly, the in-hospital mortality in our population with NSTEMI was favourable (2.1 vs. 2.9%) if compared to the GRACE registry,²⁵ as well as death + reinfarction (2.9 vs. 5.7%), despite a similar or worse baseline risk profile, such as troponin elevation in 100 vs. 42.1%, age 72 years (IQR 62–80) vs. 68 years (IQR 57–77), Killip class III–IV in 7.5 vs. 5.2%, and ST-segment deviation in 48.3 vs. 31.8%, in BLITZ 4 and in GRACE respectively. The possible reasons for this finding are not clear although, once again, a larger use of coronary revascularization may be among the reasons: 60.2 vs. 30.5% of patients received PCI/CABG in BLITZ 4 vs. GRACE, respectively. Because a systematic early invasive approach has not been shown to impact on short-term outcomes in NSTEMI, myocardial revascularization is not considered a quality indicator in this setting. However, analyses of randomized controlled trials are based on the intention to treat principle (with frequent crossover to revascularization), whereas early revascularization, when actually performed, has been shown to be associated with better outcomes.²⁸

The use of reperfusion in eligible STEMI patients was increased in phase II in centres with interventional facilities, but not in those devoid of such facilities. In the latter setting, patients reaching the emergency department and being directly transferred for reperfusion may have been missed for screening and enrolment. Due to this possible bias, the observed performance of those centres should be evaluated with caution and future assessments should include recruitment of patients directly in the emergency room.

Study limitations

The limitations of our work must be acknowledged and should be addressed in our upcoming initiatives, as follows. (1) No ad-hoc validation was performed of consecutive enrolment and this limitation should be overcome in the future by check of administrative data based on hospital

discharge records. (2) Patients were recruited during two narrow time windows and a short feed-back time was allowed for performance improvement. The BLITZ 4 quality was intended as a pilot project, to investigate the applicability of both the instant survey/feedback method, and the use of a set of performance indicators. Results from this pilot project will help in tailoring and targeting future nationwide initiatives with permanent data collection. (3) High-volume centres with interventional facilities were preferentially selected for participation in this survey. Inclusion of a larger proportion of non-tertiary centres is advisable in future projects.

Conclusions

The measurement of quality of care indicators in a large population of STEMI and NSTEMI patients admitted to CCUs in Italy is feasible and allows detection of the most important shortcomings in the diagnosis and treatment of these conditions. Feedback of results to participating centres was followed by a significant improvement for a third of quality indicators, whereas the goals for pre-hospital ECG recording, shortening delays in delivering reperfusion, adherence to correct dosage of antithrombotic drugs, and referral to cardiac rehabilitation programmes remained unmet. Very favourable short-term clinical outcomes were observed in this pilot project despite unsatisfactory scores in a number of performance indicators, suggesting that both the latter and their targets should be better tailored in our future work.

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Conflict of interest

None declared.

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