

Myocardial infarction in Norway in 2013

BACKGROUND The Norwegian Myocardial Infarction Registry was established in 2012 as a national quality registry. This first report from the registry presents the number of myocardial infarctions, the treatment provided and the 30-day mortality rate for myocardial infarctions admitted to Norwegian hospitals.

MATERIAL AND METHOD All patients with myocardial infarction admitted to Norwegian hospitals in 2013 and recorded in the Norwegian Myocardial Infarction Registry are included. The number of myocardial infarctions, patient characteristics and their treatment are indicated for myocardial infarctions with and without ST-segment elevation on ECG (STEMI and nSTEMI). The 30-day mortality is calculated for each health region.

RESULTS In 2013, a total of 13,043 myocardial infarctions in 12,336 patients were recorded in the Norwegian Myocardial Infarction Registry. Altogether 3,658 (28%) of the infarctions were classified as STEMI and 9,188 (70%) as nSTEMI. The average age at the time of the infarction was 68.1 years for men and 75.9 years for women. Percutaneous coronary intervention was performed for a total of 2,798 (77%) ST-segment elevation myocardial infarctions, whereas the corresponding number for nSTEMI was 3,179 (35%). The 30-day mortality in the entire infarction population was 10% (< 60 years: 2%, 60–69 years: 4%, 70–79 years: 9%, ≥ 80 years: 20%). We found no differences in mortality between health regions or between men and women.

INTERPRETATION This first report from the Norwegian Myocardial Infarction Registry shows that the treatment service is functioning well for most patients. Secondary prophylaxis using drug therapy and increased use of invasive examination of patients with nSTEMI appear to be areas for improvement.

Cardiovascular diseases constitute the most common cause of hospitalisation in Norway (1). Although the mortality rate for these diseases has fallen in Norway in recent years, ischaemic heart disease is still one of the most common causes of death (2). Up until 2012 there was no national quality registry of patients admitted to hospital with acute myocardial infarction in Norway.

Since 1 January 2012 all Norwegian hospitals have had a duty to report health data for patients admitted with a diagnosis of acute myocardial infarction to the Myocardial Infarction Registry (3). The Myocardial Infarction Registry is one of several quality registries associated with the Cardiovascular Diseases Register, which is a national registry of personally identifiable information which is not subject to the consent of the registered patients (4).

The main objective for the Myocardial Infarction Registry is to raise the quality of the treatment offered to myocardial infarction patients in Norway. An important part-objective is to provide better and comparable information about the number of myocardial infarctions and their treatment at Norwegian hospitals, thus helping to ensure a high quality of service and good patient outcomes. The registry will also be a tool for individual hospitals as they evaluate their own treatment results.

For various reasons only a small number

of hospitals reported to the Norwegian Myocardial Infarction Registry in 2012, but in 2013, as many as 48 of 54 Norwegian hospitals submitted patient data throughout the year. This article presents, for the first time, an overview of the number of myocardial infarctions treated at Norwegian hospitals over a one-year period, based on data obtained from the Norwegian Myocardial Infarction Registry. We have also looked at the treatment provided and calculated the 30-day mortality. Based on the results, we will point to some of the challenges involved in collecting and interpreting data from a medical quality registry.

Material and method

All patients who were diagnosed with acute myocardial infarction on admission to a Norwegian hospital in the period 1 Jan–31 Dec 2013 and whose data were reported to the Myocardial Infarction Registry were included in this analysis, provided they had previously been allocated a national identification number. Primary admissions and transfers were recorded separately at each hospital, but at the national level these were linked to a single stay in hospital.

If any of the variables were recorded differently at the first and second hospital in the treatment chain, we opted to use the highest risk or most serious alternative for the purpose of our analysis. This means that any

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E-box 1 and e-fig 2 are found in the online edition of the journal

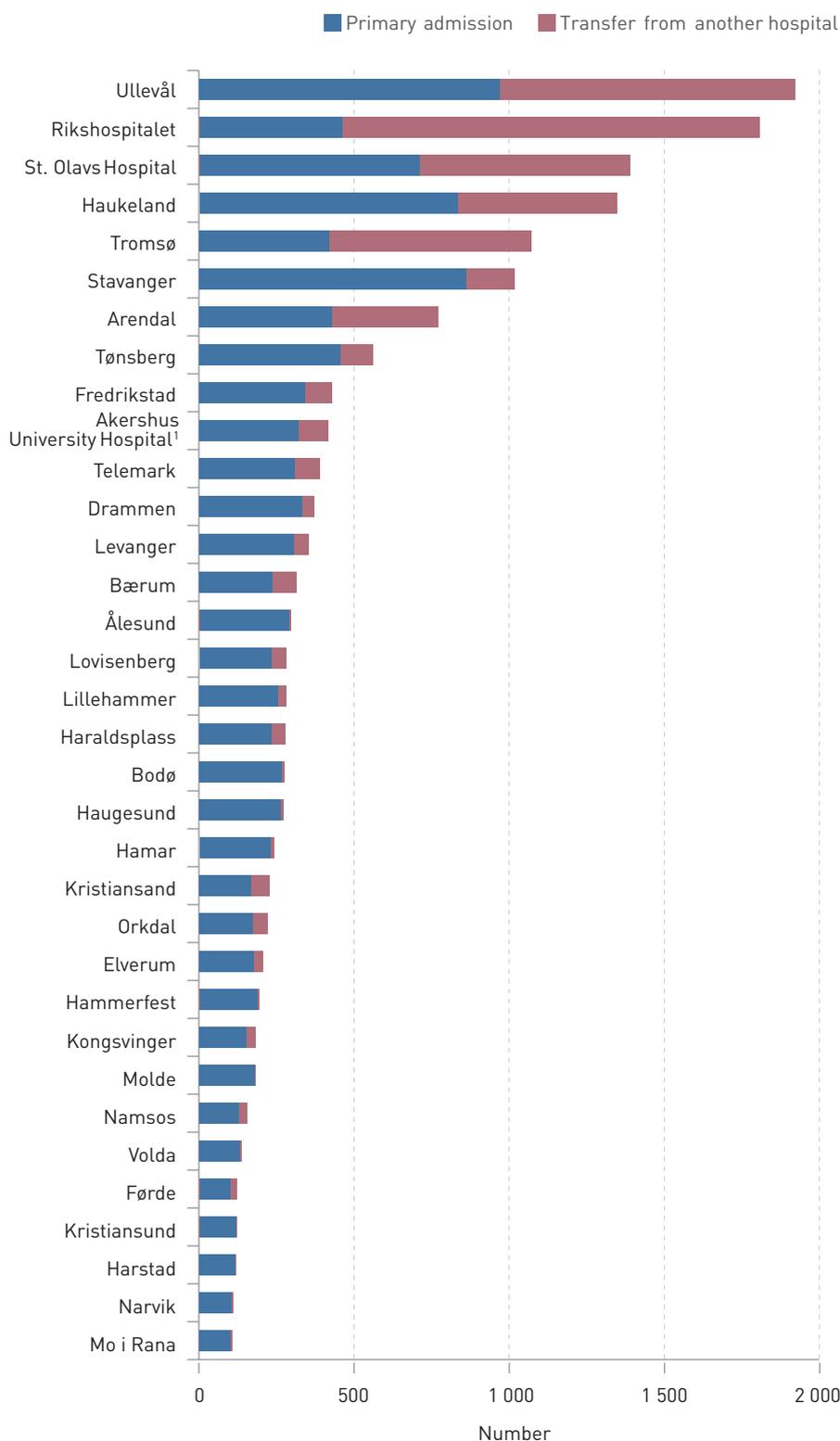
MAIN MESSAGE

In 2013, a total of 13,043 cases were registered in the Norwegian Myocardial Infarction Registry, of which 70% were myocardial infarctions without ST-segment elevation.

44% of the affected patients were ≥ 75 years old.

Reperfusion therapy with percutaneous coronary intervention was provided for 77% of myocardial infarctions with ST-segment elevation (STEMI) and in 35% of cases without ST-segment elevation (nSTEMI).

The 30-day mortality rate for myocardial infarctions was 10%, and when adjusted for age, the analysis showed no difference between health regions.



¹Submitted data to the Norwegian Myocardial Infarction Registry for only parts of 2013

Figure 1 Number of primary admissions and transfers registered in the Myocardial Infarction Registry in 2013 per hospital with >100 primary admissions

patient who was registered as a smoker at one hospital and as a non-smoker at a different hospital during the same treatment period, would be analysed as a smoker. Similarly, ST elevation infarction (STEMI) was recorded rather than non-ST elevation infarction (nSTEMI) if two hospitals involved with the treatment of the same infarction gave different accounts. When comparing the various hospitals that offer invasive coronary examination and treatment (invasive hospitals), we limited our work to records submitted by these hospitals.

The Myocardial Infarction Registry holds a record of patients' gender, age, known risk factors, previous diseases and medication, symptoms and clinical findings on admission as well as details of examinations, treatments and complications during their stay in hospital. In addition, times were recorded for the onset of symptoms, for admission to the first hospital and for starting invasive treatment. It was recommended that the time recorded for invasive examination/treatment be the time of inflating the first balloon or inserting the stent into the coronary artery (5).

The Myocardial Infarction Registry uses the international criteria for diagnosing acute myocardial infarction (e-box 1) (6). Myocardial infarctions with symptom onset ≤ 28 days prior to hospitalisation were recorded as acute myocardial infarction. Troponin is the preferred biochemical myocardial infarction marker. The reference limits (the 99th percentile) for troponin I depend on the manufacturer. For troponin T, the traditional Norwegian diagnostic limit ≥ 30 ng/l was in use until the end of May 2013. On 1 June 2013 the internationally recommended diagnostic limit for myocardial infarction – troponin T > 14 ng/l – was introduced into Norwegian practice (7).

Myocardial infarctions were classified as either ST elevation (STEMI) or non-ST elevation (nSTEMI) infarctions based on changes to ECG – STEMI in cases of new ST-segment elevation or recent left bundle branch block, n-STEMI in cases of normal ECG, ST depression or other ST-T changes. Primary percutaneous coronary intervention (PCI) was defined as the procedure performed in case of STEMI < 12 hours from symptom onset if no prior thrombolytic treatment had been administered.

The Myocardial Infarction Registry is run by the Regional Health Authority of Central Norway whereas data are being processed at St. Olavs hospital and the Norwegian Institute of Public Health is responsible for all data processing. A medical advisory group has been established involving representatives of all regional health authorities, the Norwegian Institute of Public Health, the

Norwegian Nurses Organisation, the Norwegian Medical Association and the patient organisations. Records are compiled by means of online web-based registration of patient data.

Each hospital reporting to the Myocardial Infarction Registry had appointed a chief medical officer and a nurse/secretary who was given responsibility for ensuring the quality and completeness of recorded data. The method of data collection varied among hospitals. Some used a hardcopy form that stayed with the patients throughout their stay; the data was then recorded electronically after they had been discharged. At other hospitals the data would be entered straight into a computerised reporting system in an ongoing process throughout the patients' stay in hospital or after they were discharged.

The hospitals were each asked to check that their submitted records were complete by conducting diagnosis searches of their patient administration system and adding any data that had been omitted, provided the infarction diagnosis was considered to be correct. A user manual, help texts and validation rules were established to help ensure uniform interpretation of different variables and to make sure that the data would be correct and complete (5). The registry's secretariat checked all recorded data for logical errors, but had no opportunity to check the data against the patient records held at the individual hospitals.

Data were analysed using SPSS statistics software, version 21. Continuous variables are presented as average \pm standard deviation (SD) or median (lower, upper quartile), and differences between groups have been

Table 1 Characteristics in patients (n = 12,155) recorded in the Myocardial Infarction Registry in 2013 split between types of infarction¹

	STEMI (n = 3,583)		NSTEMI (n = 8,572)	
Men	2,530	71 %	5,297	62 %
Average age (years) \pm SD	66.1 \pm 13.6		72.7 \pm 13.6	
\geq 75 years	1,048	29 %	4,235	49 %
Previous myocardial infarction	615	17 %	2,791	33 %
Diabetes mellitus	492	14 %	1,860	22 %
Hypertension	1,437	40 %	4,553	53 %
Smoking ²	2,307	64 %	4,976	58 %
Treatment with statin prior to admission	1,153	32 %	3,769	44 %

¹ 181 patients are excluded from the table because the type of infarction had not been recorded. Smoking status had not been recorded for 1,530 patients (13%). For the other variables, the response rate was > 98%

² Former smokers or current smokers

analysed by performing T-tests or non-parametric tests. Categorical data are presented as numbers and percentages (%), and differences between groups have been analysed by using a chi-square test. The 30-day mortality (all causes) was obtained from the national population registry and was calculated per health region. Logistic regression was used to calculate the age-adjusted odds ratio (OR) of death. The health region with the lowest absolute mortality rate was used for reference in the regression analysis. For all analyses, a p-value < 0.05 was considered statistically significant.

It is a legal obligation for Norwegian hospitals to record all patients admitted with

acute myocardial infarction in the Myocardial Infarction Registry, cf. s. 2–1(3) of the Cardiovascular Disease Register Regulations. Registration is not subject to the patient's consent and the information is personally identifiable (cf. s. 8 of the Norwegian Health Registry Act) (4). Section 1–4 of the Cardiovascular Disease Registry Regulation also allows for direct links between the Myocardial Infarction Registry and the national population registry. The right to collate and publish information from the registry is founded on section 3–1 of the Cardiovascular Disease Registry Regulation and is not subject to the approval of the regional committees for research ethics.

Table 2 Reperfusion treatment in cases of STEMI at Norwegian invasive acute hospitals in 2013

	Primary admissions		Thrombolytic treatment at primary admission		Primary percutaneous coronary intervention at primary admission		Median time lapse from admission to primary percutaneous coronary intervention (min) (lower, upper quartile) ¹
	Total number	Number (%)	Number (%)	Number (%)	Number (%)		
Ullevål	792	537 (68)	36 (7)		393 (73)		32 (24, 44)
Rikshospitalet	585	377 (64)	4 (1)		331 (88)		20 (15, 29)
Arendal	270	222 (82)	3 (1)		205 (92)		20 (11, 42)
Stavanger	360	293 (81)	5 (2)		183 (62)		54 (32, 124)
Haukeland	335	259 (77)	4 (2)		201 (78)		47 (30, 75)
St. Olavs Hospital	471	300 (64)	37 (12)		206 (69)		— ²
Tromsø	304	136 (45)	48 (35)		69 (51)		38 (20, 97)

¹ Time lapse between admission and primary percutaneous coronary intervention was not recorded in precisely the same way at the various hospitals, so the data are not directly comparable

² Excluded from the table because the quality control process found systematic recording errors

Table 3 Medication on discharge after myocardial infarction from all Norwegian hospitals in 2013

	STEMI (n = 3,429)		nSTEMI (n = 8 557)	
	Number	(%)	Number	(%)
Acetylsalicylic acid	3,250	[97]	7,745	[91]
ADP-receptor inhibitor	3,083	[92]	6,349	[74]
Beta blockers	2,754	[82]	6,788	[79]
Statin	3,073	[92]	6,942	[81]
ACE/All receptor inhibitor	2,047	[61]	4,441	[52]

Results

In 2013, a total of 13,043 myocardial infarctions in 12,336 patients were recorded in the Norwegian Myocardial Infarction Registry. Most Norwegian hospitals confirmed that all their patients with myocardial infarction had been reported to the registry (48 of 54 possible hospitals – 89%). Six local hospitals registered their patients for only parts of 2013.

Figure 1 shows the number of primary admissions and transfers of patients with myocardial infarction registered at the largest hospitals. E-box 2 includes all hospitals. For 1,585 patients with myocardial infarction who were transferred to one of the invasive hospitals from a local hospital, their primary admission to the local hospital had not been registered. Oslo University Hospital Ullevål treated the highest number of patients with myocardial infarction in 2013, followed by the other six invasive hospitals with an acute treatment facility.

A total of 3,658 cases (28%) were classified as STEMI and 9,188 (70%) as nSTEMI. A small number had not been classified (n = 197–2%). More men than women were registered with STEMI (age-adjusted OR 1.16 (1.06–1.26), p = 0.001). Most cases of

STEMI were treated at one of the invasive hospitals during the course of the patient's illness (3,267 – (89%); the corresponding number for nSTEMI was 6,056 (66%).

Clinical characteristics are shown in Table 1. For patients who suffered more than one myocardial infarction in 2013, the data from the first instance were used. The proportion of men was 64%. The average age was 68.1 years (\pm 13.5 years) for men and 75.9 years (\pm 13.2 years) for women. The average age of STEMI patients was 6.6 years lower than the average age of nSTEMI patients. Previous myocardial infarction was registered in 28% of cases, diabetes in 19% and hypertension in 49%.

The majority of patients (60%) were registered as smokers or former smokers, but there was some uncertainty associated with this variable due to the fact that smoking status had not been recorded for 13% of patients. With respect to other variables, the registration of previous diseases and risk factors was virtually complete.

A total of 418 STEMI patients (11%) were given primary thrombolytic treatment, 223 of them (53%) prior to hospitalisation. The proportion of STEMI patients who received thrombolytic treatment varied

between health regions – in North Norway 41% (n = 174), Central Norway 21% (n = 114), South-East Norway 6% (n = 114) and West Norway 2% (n = 16). Primary percutaneous coronary intervention was performed in 1,590 STEMI patients (75%) who were first admitted to one of the invasive hospitals (n = 2 128). Examination with coronary angiography was performed in a total of 3,116 STEMI cases (85%) and percutaneous coronary intervention was performed in 2,798 cases (in 77% of all STEMI patients, in 90% of angiographed patients). Coronary angiography was performed in a total of 4,941 cases (54%) of nSTEMI and percutaneous coronary intervention in 3,179 (35%) cases.

Unfortunately, the time lapse between symptom onset and admission to the first hospital cannot be given with any degree of certainty due to deficient registration of the time of symptom onset. Registration was virtually complete (99.7%) with respect to the time lapse between hospitalisation and primary percutaneous coronary intervention for STEMI patients who had not received thrombolytic treatment and were first admitted to one of the invasive hospitals with an acute facility, and this is shown in Table 2. For nSTEMI patients the time of angiography was unfortunately registered in only 1,611 cases (35%). It has therefore been impossible to give the time lapse before treatment with any degree of certainty.

Table 3 shows the use of secondary prophylactic drugs such as blood platelet inhibitors (acetylsalicylic acid and adenosine diphosphate receptor inhibitors (ADP receptor inhibitors)), beta blockers, statins and renin-angiotensin-system-inhibitors (angiotensin convertase inhibitors (ACE inhibitors) and angiotensin II receptor inhibitors (AII receptor inhibitors) in patients discharged alive. A high proportion of STEMI patients were discharged with acetylsalicylic acid (97%) and statin (92%). The propor-

Table 4 The 30-day mortality rate after myocardial infarction in 2013 per health region

	Number of myocardial infarctions		30-day mortality rate				
	Number ¹	Average age (years) \pm SD	Number	(%)	Age-adjusted OR	95% CI	P-value
North Norway	1,631	72.0 \pm 13.5	177	[11]	1.1	0.9–1.3	0.27
Central Norway	2,111	73.0 \pm 13.5	250	[12]	1.1	1.0–1.3	0.11
West Norway	2,699	71.7 \pm 14.2	279	[10]	1.0	0.9–1.2	0.69
South-East Norway	6,485	70.2 \pm 13.9	593	[9]	Reference		

¹ Private hospitals (the Feiring Clinic) are not included. The 30-day mortality rate is missing from the records of 37 patients

tion was somewhat lower for nSTEMI patients. There was a particularly large difference between STEMI patients and nSTEMI patients with respect to the proportion discharged with ADP-receptor inhibitors (92% versus 74%).

The 30-day mortality rate in the entire infarction population was 10% (n = 1,299). Of these, 959 individuals (74%) died before discharge from hospital. The 30-day mortality rate varied with age and was 2% (n = 68) for patients < 60 years, 4% (n = 125) for patients aged 60–69 years, 9% (n = 253) for the 70–79 age group and 20% (n = 853) for patients ≥ 80 years. Adjusted for age, the 30-day mortality was higher in STEMI patients than in nSTEMI patients (OR 1.87 (1.63–2.14), p = 0.001). We found no difference between male and female mortality rates when adjusted for age. The 30-day mortality rates for each health region are set out in Table 4. When adjusted for age, the analysis show no difference between health regions.

In the autumn of 2014 the Norwegian Myocardial Infarction Registry will publish a complete report for 2013 on www.hjerteinfarktregisteret.no.

Discussion

This is the first report from the Norwegian Myocardial Infarction Registry, providing details of the number of patients with myocardial infarction admitted to Norwegian hospitals, their treatment and the mortality rate. A total of 13,043 cases were recorded in 2013. The majority were classified as nSTEMI (70%). Most STEMI patients received reperfusion therapy with percutaneous coronary intervention (77%, n = 2,798), while the corresponding number for nSTEMI patients was 35% (n = 3,179). Secondary prophylaxis with drug therapy was prescribed to a lesser degree for nSTEMI patients than for STEMI patients. The 30-day mortality rate was 10% for the entire population, and there was no difference between health regions or between men and women.

A high proportion of patients had suffered a myocardial infarction on a previous occasion. Entries submitted to the Myocardial Infarction Registry were completed on the patient's discharge from hospital. Consequently, we have no information relating to further patient follow-up or the outcomes of secondary prophylactic measures, but our findings may indicate that there is a need for further investment in prevention.

The European Society of Cardiology recommends early revascularisation for most patients with myocardial infarction, irrespective of the type of infarction (8, 9). The time of the first pre-hospital contact with a medical officer (GP, ambulance ser-

vice, pre-hospital ECG etc.) was not recorded in the Myocardial Infarction Registry in 2013. Regrettably, the times of symptom onset, hospital admission and angiography/percutaneous coronary intervention were incompletely registered at many hospitals, particularly in cases of nSTEMI. It is therefore impossible to say what proportion of STEMI patients received reperfusion therapy with primary percutaneous coronary intervention within the recommended 90-minute time lapse from first contact with a medical officer.

The time lapse between arrival at the invasive hospital and treatment with percutaneous coronary intervention was short. The variation found between invasive hospitals may have been caused by differences in the recording procedures at the different locations. However, all hospitals stayed within the international guidelines (9). The proportion of nSTEMI patients who were offered invasive coronary examination was lower than the corresponding proportion of STEMI patients, and lower at primary admission to local hospitals than to invasive hospitals.

The guidelines recommend coronary angiography for all nSTEMI patients without counter-indications (8). These patients were older than the STEMI patients and suffered from a higher number of additional diseases. This can explain the difference to some extent, but we nevertheless feel that there is potential for improvement in offering more nSTEMI patients invasive coronary examination and treatment. It is necessary to exercise caution when interpreting variations between hospitals due to demographic differences and dissimilar distribution of functions.

Most patients suffering from myocardial infarction received secondary prophylaxis with drugs such as acetylsalicylic acid, ADP receptor inhibitors, beta-blockers, statins and ACE/AII receptor inhibitors in compliance with the European guidelines (8, 9). The proportions within each group of medication was somewhat lower in Norway than in Sweden (10), but the two countries' myocardial infarction registries do not lend themselves to direct comparison because some of the hospitals in Sweden had registered only patients in cardiac intensive care units.

Some patients with myocardial infarction, particularly the elderly, suffer from complicated additional diseases and an increased risk of bleeding which may make the use of various types of medication difficult, especially blood platelet inhibitors. Nevertheless, there is reason to take note of the difference between STEMI patients and nSTEMI patients with respect to the proportion discharged with ADP-receptor inhibitors. This may

also be associated with the lower percentage of percutaneous coronary intervention in nSTEMI cases, but the guidelines recommend ADP receptor inhibitors irrespective of whether or not percutaneous coronary intervention is performed.

In general, the 30-day mortality was low (10%) and found to be similar across the various health regions. The results from the Myocardial Infarction Registry are comparable to the analysis of mortality following myocardial infarction that was conducted by the Norwegian Knowledge Centre for the Health Services in 2010 and 2011 (30-day mortality rate of 12.6 per cent) (11). Recently published data from the EU funded research project entitled European Health Care Outcomes, Performance and Efficiency (EuroHOPE) also demonstrate that the survival rate after myocardial infarction in Norway is higher than the European average (12).

We have refrained from giving the 30-day mortality rate per hospital because the age distribution and risk profiles of patients vary between hospitals and because the hospitals' dissimilar patient flow procedures affected the results. Moreover, the death rate at many hospitals was very low, so that random variations would impact considerably on the reported figures.

The Myocardial Infarction Registry and the 2013 data analysis suffer from a number of limitations. Only myocardial infarctions that led to hospitalisation were recorded. We had no access to records of myocardial infarctions that did not result in hospitalisation, nor of patients who died of infarction outside of hospital.

Six hospitals failed to submit complete data. Each hospital was asked to ensure that all their cases were registered by checking their internal patient administration systems, but the Registry's secretariat had no opportunity to check this at national or local level. It is therefore impossible to give the exact incidence of myocardial infarction in Norway. For the time being, Norwegian patient registries do not have access to comparable data for the number of admissions diagnosed with myocardial infarction in 2013.

The procedures used for recording the time of admission and invasive examination and treatment varied between hospitals. The Myocardial Infarction Registry has not had the opportunity to undertake quality control at local level of data submitted by individual hospitals. Data submitted by several hospitals in the course of the same patient's treatment, were linked up at the Registry. This led to a certain degree of uncertainty, particularly if the same variable had been recorded differently.

When figures were collated for the different types of infarction, STEMI was given a

higher priority even if recorded by only one hospital in the course of the same treatment. This may have meant that a myocardial infarction registered as STEMI at the first hospital but assessed as nSTEMI at a subsequent hospital, has been registered as STEMI. An amendment to the legislation would be desirable to enable registration of only a single record per myocardial infarction by allowing local hospitals and invasive hospitals to enter their data into the same electronic form.

Despite the above-mentioned limitations the results indicate that the majority of patients receive satisfactory treatment. The 30-day mortality rate was at a level found in comparable countries, and a high proportion of our patients received the recommended secondary prophylaxis with drug therapy. However, we identified a number of areas for improvement. In particular, the routines for invasive examination and treatment of myocardial infarctions without ST-segment elevation should be reassessed.

It is the Myocardial Infarction Registry's objective to represent a constant source of improvement for the treatment of myocardial infarction in Norway. Complete high-quality records are essential – which is why it is important that everyone involved with the treatment of patients with myocardial infarction contribute towards this end. The Norwegian Myocardial Infarction Registry will continue its work to ensure that all hospitals introduce similar recording procedures, tighten the requirement to submit complete records and enhance its contributions to local and central quality assurance. Also, better systems must be introduced for the reporting of results and relevant quality indicators back to all hospitals.

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References

1. Patients på somatiske sykehus, 2012. Oslo: Statistisk sentralbyrå, 2013. www.ssb.no/patient/ [20.3.2014].
2. Dødsårsaker, 2012. Statistisk sentralbyrå. www.ssb.no/helse/statistikker/dodsarsak/aar [20.3.2014].
3. FOR 2011-12-16 nr 1250. Forskrift om innsamling and treatment av helseopplysninger i Nasjonalt register over hjerte- and karlidelser (Hjerte- and karregisterforskriften). www.lovdata.no/cgi-wift/ldeles?doc=/sf/sf-20111216-1250.html#3-3 [20.3.2014].
4. LOV 2001-05-18 nr 24. Lov om helseregistre and treatment av helseopplysninger (helseregisterloven). www.lovdata.no/alt/tl-20010518-024-002.html#8 [20.3.2014].
5. Brukermanual Norsk hjerteinfarktregister. <http://www.helse-midt.no/NO/HF/HEMIT/MRS/hjerteinfarktregister/Horizontal-meny-1/Manualer/67571/> [20.3.2014].
6. Thygesen K, Alpert JS, Jaffe AS et al. Third universal definition of myocardial infarction. *Eur Heart J* 2012; 33: 2551–67.
7. Aakre KM, Rotevatn S, Hagve TA et al. Nye anbefalinger for tolking av troponinverdier. *Tidsskr Nor Legeforen* 2013; 133: 2241–2.
8. Hamm CW, Bassand JP, Agewall S et al. ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: The Task Force for the management of acute coronary syndromes (ACS) in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2011; 32: 2999–3054.
9. Steg PG, James SK, Atar D et al. ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur Heart J* 2012; 33: 2569–619.
10. SwedeHeart. Årsrapport 2012. www.ucr.uu.se/swedeheart/index.php/arsrapporter [20.3.2014].
11. Helgeland JK, Kristoffersen DT, Hassani S et al. 30 dagers overlevelse etter innleggelse i Norwegian sykehus i 2010 and 2011. www.kunnskapssenteret.no/publikasjoner/30-dagers-overlevelse-etter-innleggelse-i-Norwegian-sykehus-i-2010-og-2011 [20.3.2014].
12. The EuroHOPE study group. Summary of the findings of the EuroHOPE project. 2014. www.eurohope.info/doc/summary.pdf [20.3.2014].

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