

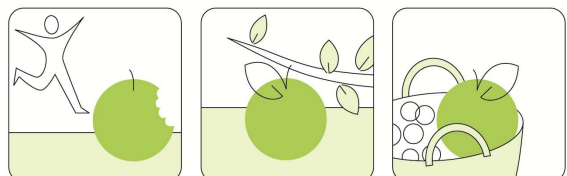


**EU Public Health Outcome Research and Indicators Collection
EUPHORIC Project
Grant Agreement n°2003134**

*A project funded by the European Commission,
Directorate General for "Health and Consumers"*

**Deliverable 12.5
Extended protocols**

January 2009 First release



This report was produced by a contractor for the “Health and Consumers” Directorate General and represents the views of the contractor or author.

These views have not been adopted or in any way approved by the Commission and do not necessarily represent the view of the Commission or the Directorate General for “Health and Consumers”. The European Commission does not guarantee the accuracy of the data included in this study, nor does it accept responsibility for any use made thereof.

Neither the European Commission nor any person acting on its behalf is responsible for the use that might be made of the following information.

Online information about the European Union in 23 languages is available at:

<http://europa.eu>

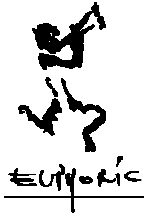
Further information on the “Health and Consumers” Directorate General is available at:

http://ec.europa.eu/dgs/health_consumer/index_en.htm

The EU Public Health Portal : <http://health.europa.eu>

This report is available at:

- <http://ec.europa.eu/eahc/projects/database.html?prjno=2003134>
- <http://www.euphoric-project.eu/>



EUPHORIC Project

MAIN BENEFICIARY



Istituto Superiore di Sanità, *Italy*

ASSOCIATED BENEFICIARIES



EFORT/EAR Verein zur Unterstützung der Tätigkeit von nationalen Endoprothesenregistern, *Austria*



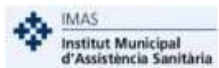
Sosiaali- ja terveysalan tutkimus- ja kehittämiskeskus, *Finland*



National and Kapodistrian University of Athens, *Greece*



ASL RM E Department of Epidemiology, *Italy*



Institut Municipal d'Assistència Sanitària, *Spain*



Karolinska Institutet, *Sweden*

COLLABORATING PARTNERS



National Center of Public Health Protection, *Bulgaria*



Catalan Agency for Health Technology Assessment and Research, *Spain*



Slovak Arthroplasty Register, *Slovak Republic*



Arthroplasty Register Tyrol, *Austria*



Ludwig Boltzmann Institut Health Technology Assessment, *Austria*



French Society of Orthopaedic and Trauma Surgery, *France*



BQS Bundesgeschäftsstelle Qualitätssicherung gGmbH, *Germany*



Israel Society for the Prevention of Heart Attacks at NCRI, *Israel*

This report was prepared by:

Danilo Fusco, Anna Patrizia Barone (partner DEASL¹)

¹ Department of Epidemiology ASL Roma E, Italy

Acknowledgment: The authors would like to thank Marina Torre (partner ISS), Jaume Marrugat (partner IMAS) for their comments.

INDICATORS

INDICATOR A10: DEATH WITHIN 30 DAYS OF ADMISSION TO HOSPITAL WITH AN ACUTE MYOCARDIAL INFARCTION (AMI)	1
EXTENDED PROTOCOL DEVELOPED BY USING ICD-9-CM.....	1
EXTENDED PROTOCOL DEVELOPED BY USING ICD-10	5
INDICATOR A10 MODIFIED: DEATH WITHIN 30 DAYS OF ARRIVAL AT HOSPITAL FOR AN ACUTE MYOCARDIAL INFARCTION (AMI)	10
EXTENDED PROTOCOL DEVELOPED BY USING ICD-9-CM.....	10
EXTENDED PROTOCOL DEVELOPED BY USING ICD-10	14
INDICATOR E2 MODIFIED: DEATH WITHIN 30 DAYS OF ARRIVAL AT HOSPITAL WITH A FRACTURED HIP	19
EXTENDED PROTOCOL DEVELOPED BY USING ICD-9-CM.....	19
EXTENDED PROTOCOL DEVELOPED BY USING ICD-10	22
INDICATOR E5 MODIFIED: INTERVENTION WITHIN 48 HOURS OF ARRIVAL AT HOSPITAL FOR HIP FRACTURE	26
EXTENDED PROTOCOL DEVELOPED BY USING ICD-9-CM.....	26
EXTENDED PROTOCOL DEVELOPED BY USING ICD-10	30

Indicator A10: Death within 30 days of admission to hospital with an Acute Myocardial Infarction (AMI)

Extended protocol developed by using ICD-9-CM

Definition

For a given provider, population and time period: the number of deaths within 30 days since the first hospital admission (AMI index admission) of an AMI episode per 100 AMI episodes. Multiple admissions occurring during the 8 weeks following the index admission are considered as a single episode of care.

Rationale

Timely and effective treatments for acute myocardial infarction (AMI) are essential for patient survival. Reductions in the mortality for AMI on both the patient level and the provider level have been related to better processes of care.

Treatments for AMI include appropriate use of thrombolytic therapy and revascularization. Early reperfusion results in a significant reduction in 30-day mortality (6-7%) and in an improvement of short/long-term prognosis.

Differences in case-mix, severity of the myocardial infarction, comorbidities and other factors outside the control of hospitals, such as the socio-economic mix of local populations and events prior to hospitalisation, may contribute to the variation of the indicator and to the differences between hospitals/providers. Therefore, the use of the adjusted indicator is recommended.

Potential uses

The indicator can be used:

- for comparative evaluation of hospital performances;
- for comparative evaluation between groups of facilities with similar organizational and/or process characteristics (for example, treatment volumes, technological equipments);
- for comparative evaluation between populations resident in different areas or of different socioeconomic status;
- for analysis of trend over time.

Inclusion criteria

Hospital discharges with a principal diagnosis of acute myocardial infarction (ICD-9-CM code 410.xx), or a secondary diagnosis of AMI with a principal diagnosis of a condition compatible with AMI diagnosis [ICD-9-CM codes 411, 413, 414, 423.0, 426, 427 (excluding 427.5), 428, 429.5, 429.6, 429.71, 429.79, 429.81, 518.4, 518.81, 780.01, 780.2, 785.51, 799.1, 997.02, 998.2].

Study period: 2 years (the most recent data available).

Exclusion criteria

- Age at admission < 18 or > 100 years;
- Admissions with total length of stay less than 48 hours (0-1 day) and with an ultimate disposition as the following: discharge to home or against medical advice;
- Admissions with one or more prior AMI admissions within the 8 weeks preceding the index admission;
- Transferred in from other acute care hospitals.

Definition of outcome

Outcome is defined as mortality within 30 days after AMI index admission.

Risk adjustment

Comparisons should be made in the context of case-mix information. Results should be directly standardised for age, gender, selected comorbidities and, if available, severity of patient populations. The comorbidities, or potential risk factors (see, for example, Table 1a), should be searched in AMI episode -within 30 days after AMI index admission- and in all previous hospital admissions within a specified time interval (i. e. four years). Clinical variables should be searched in AMI index admission (see, for example, Table 2).

Data sources

The data may be predominantly obtained from the Hospital Discharge Records; the numerator may be obtained from death certificates or from Mortality Records linked by a patient identifier to

previous hospital admissions for AMI, with an admission date within the specified period before death.

Other data sources (i.e. disease registries) could be used for a more accurate standardisation of the indicator.

Comments

Potential problems lie with the accuracy of HDR data with respect to diagnostic information (especially comorbidities).

References

- Antonucci D, Valenti R, Migliorini A et al. Relation of time to treatment and mortality in patients with acute myocardial infarction undergoing primary angioplasty. *Am J Cardiol* 2002; 89: 1248.
- Armstrong A, Duncan B, Oliver MF et al. Natural history of acute coronary heart attacks. A community study. *Br Heart J* 1972;34:67-80.
- Berger PB, Ellis SG, Holmes DR Jr et al. Relationship between delay in performing direct coronary angioplasty and early clinical outcome in patients with acute myocardial infarction: results from the global use of strategies to open occluded arteries in Acute Coronary Syndromes (GUSTO-IIb) trial. *Circulation* 1999; 100 (1): 14-20.
- California Hospital Outcomes Project. Heart Attack Outcomes 1996-1998. Volume 2: Technical Guide. OSHPD 2002.
- Canadian Cardiovascular Outcomes Research Team (CCORT). Quality Indicators for acute myocardial infarction (AMI) care. <http://www.ccort.ca/CCORTCCSAMIQI/tabid/92/Default.aspx>
- De Luca G, Suriyapranata H, Zijsta F et al. for Zolle Myocardial Infarction Study Group. Symptom onset to balloon time and mortality in patients with acute myocardial infarction treated by primary angioplasty. *J Am Coll Cardiol* 2003; 42: 991.
- Department of Health – National Health Service.
- www.performance.doh.gov.uk/nhsperformanceindicators/hlpi2000/downloads/spec2000_ci3.doc.

- De Vreede JJ, Gorgels AP, Verstraaten GM et al. Did prognosis after acute myocardial infarction change during the past 30 years? A meta-analysis. *J Am Coll Cardiol* 1991; 18:698–706.
- Idanpaan-Heikkila UM, Lambie L, Mattke S, et al. Selecting indicators for the quality of cardiac care at the health system level in Organization for Economic Cooperation and Development countries. *Int J Qual Health Care* 2006;18(Suppl 1):39-44.
- Malacrida R, Genoni M, Maggioni AP. A comparison of the early outcome of acute myocardial infarction in women and men. *N Engl J Med* 1998;338:8-14.
- Meehan TP, Hennen J, Radford MJ, et al. Process and outcome of care for acute myocardial infarction among Medicare beneficiaries in Connecticut: a quality improvement demonstration project. *Ann Intern Med* 1995;122(12):928-36.
- National Service Framework for Coronary Heart Disease: Modern Standards and Service Models. London: Department of Health, March 2000.
- Newby LK, Rutsch WR, Califf RM, et al. Time from symptom onset to treatment and outcomes after thrombolytic therapy: GUSTO-1 Investigator. *J Am Coll Cardiol*. 1996;27:1646-1655.
- Norris RM. Fatality outside hospital from acute coronary events in three British districts, 1994–5. United Kingdom Heart Attack Study Collaborative Group. *BMJ* 1998; 316:1065–70.
- Raitt MH, Maynard C, Wagner GS, et al. Relation between symptom duration before thrombolytic therapy and final myocardial infarct size. *Circulation* 1996; 93:48-53.
- Romano PS, Chan BK. Risk-adjusting acute myocardial infarction mortality: are APR-DRGs the right tool? *Health Serv Res*. 2000;34(7):1469-89.
- Second Report of the California Hospitals Outcomes Project, May 1996. Acute Myocardial Infarction. Sacramento, CA: Office of Statewide Health Planning and Development; 1996.
- Serruys PW, Simoons ML, Suryapranata H, et al. Preservation of global and regional left ventricular function after early thrombolysis in acute myocardial infarction *J. Am. Coll Cardiol*. 1986; 7:729-742.
- Specification Manual for National Hospital Quality Measures (2005). Joint Commission on Accreditation of Healthcare Organizations (JCAHO).
- http://www.jcaho.org/pms/core+measures/aligned_manual.htm

- Steg PG, Bonnefoy E, Chabaud S et al. Impact of Time to Treatment on Mortality After Prehospital Fibrinolysis or Primary Angioplasty. Data From the CAPTIM Randomized Clinical Trial. *Circulation* 2003;108:2851-2856.
- Tunstall-Pedoe H, Kuulasmaa K, Mahonen M et al. Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA project populations. Monitoring trends and determinants in cardiovascular disease. *Lancet* 1999;353:1547–57.
- Widimsky P, Budesinsky T, Vorac D, et al. Long distance transport for primary angioplasty vs immediate thrombolysis in acute myocardial infarction: final results of the randomized national multicentre trial: PRAGUE-2. *Eur Heart J.* 2003;24:94–104.

Extended protocol developed by using ICD-10

Definition

For a given provider, population and time period: the number of deaths within 30 days since the first hospital admission (AMI index admission) of an AMI episode per 100 AMI episodes. Multiple admissions occurring during the 4 weeks (28 days) following the index admission are considered as a single episode of care.

Rationale

Previously described.

Potential uses

Previously described.

Inclusion criteria

Hospital discharges with a principal diagnosis of acute myocardial infarction (ICD-10 code I21.x), or a secondary diagnosis of AMI with a principal diagnosis of a condition compatible with AMI diagnosis [ICD-10 codes I20, I23.0-I23.8, I24, I25, I44, I45, I47, I48, I49, I50, J81.0, J96.0, R40.2, R40.4, R57.0, R09.2].

Study period: 2 years (the most recent data available).

Exclusion criteria

- Age at admission < 18 or > 100 years;
- Admissions with total length of stay less than 48 hours (0-1 day) and with an ultimate disposition as the following: discharge to home or against medical advice;
- Admissions with one or more prior AMI admissions within the 4 weeks preceding the index admission;
- Transferred in from other acute care hospitals.

Definition of outcome

Previously defined.

Risk adjustment

Comparisons should be made in the context of case-mix information. Results should be directly standardised for age, gender, selected comorbidities and, if available, severity of patient populations. The comorbidities, or potential risk factors (see, for example, Table 1b), should be searched in AMI episode -within 28 days after AMI index admission- and in all previous hospital admissions within a specified time interval (i. e. four years). Clinical variables should be searched in AMI index admission (see, for example, Table 2).

Data sources

Previously described.

Comments

Previously described.

References

Previously described.

Tab 1a. List of potential risk factors – Discharge Records. ICD-9-CM codes

Risk factors	ICD-9-CM Code	
	AMI episode	Previous admissions
Malignant neoplasms	140.0–208.9	140.0–208.9
Diabetes	250.0-250.9	250.0-250.9
Lipid metabolism disturbances	272	272
Obesity	278.0	278.0
Blood disorders	280-285, 288, 289	280-285, 288, 289
Hypertension	401-405	401-405
Previous myocardial infarction	412	410, 412
Other forms of chronic ischemic heart disease		411, 413, 414
Heart failure		428
Ill-defined descriptions and complications of heart disease		429
Rheumatic heart disease	393-398	391, 393-398
Cardiomyopathy	425	425
Acute endocarditis and myocarditis		421, 422
Other heart conditions	745, V15.1, V42.1, V42.2, V43.2, V43.3, V45.0	745, V15.1, V42.1, V42.2, V43.2, V43.3, V45.0
Cardiac arrhythmias		426, 427
Cerebrovascular disease	433, 437, 438	430-432, 433, 434, 436, 437, 438
Vascular disease	440-448 (excluding 441.0, 441.1, 441.3, 441.5, 441.6, 444)	440-448, 557
Chronic obstructive pulmonary disease)	491, 492, 494, 496	491, 492, 494, 496
Chronic renal disease	582, 583, 585-588	582, 583, 585-588
Other chronic disease (liver, pancreas, intestine)	571 (excluding 571.1), 572, 577.1-577.9, 555, 556	571, 572, 577.1-577.9, 555, 556
Previous CABG	V45.81	V45.81, 36.1
Previous Percutaneous Transluminal Coronary Angioplasty (PTCA)	V45.82	V45.82, 36.0
Other operations on heart and pericardium		35, 37.0, 37.1, 37.3, 37.4, 37.5, 37.6, 37.9
Operations of intracranial and other vessels of head and neck, including endarterectomy		38.01, 38.02, 38.11, 38.12, 38.31, 38.32
Other operations on vessels		38-39.5, excluding: 38.01, 38.02, 38.5, 38.11, 38.12, 38.31, 38.32, 38.93

Tab 1b. List of potential risk factors – Discharge Records. ICD-10 codes

Risk factors	ICD-10 Code	
	AMI episode	Previous admissions
Malignant neoplasms	C00- C96	C00- C96
Diabetes mellitus	E10-E11	E10-E11
Lipid metabolism disturbances	E78	E78
Obesity	E66	E66
Blood disorders	D50-D53, D55-D64, D70-D77, D80-D89	D50-D53, D55-D64, D70-D77, D80-D89
Hypertension	I10-I15	I10-I15
Previous myocardial infarction	I25.2	I21, I22, I25.2
Other forms of chronic ischemic heart disease		I20, I24, I25.1, I25.3–I25.9
Heart failure		I50
Complications and ill-defined descriptions of heart disease		I51
Rheumatic heart disease	I05-I09	I00-I02, I05-I09
Cardiomyopathy	I42-I43	I42-I43
Acute endocarditis and myocarditis		I33, I40-I41
Other heart conditions	Q20, Q21, Q25, Z95.0, Z95.2- Z95.4, Z94.1, Z95.81	Q20, Q21, Q25, Z95.2-Z95.4, Z94.1, Z95.81
Cardiac arrhythmias		I44-I49
Cerebrovascular disease	I65, I66, I67, I69	I60-I67, I69
Vascular disease	I70-I74, I77-I78 (excluding I71.0, I71.1, I71.3, I71.5, I71.8, I74)	I70-I74, I77-I78, K55
Chronic obstructive pulmonary disease	J41-J44, J47	J41-J44, J47
Chronic renal disease	N03, N05, N11, N12, N18, N19, N25-N27	N03, N05, N11, N12, N18, N19, N25-N27
Other chronic disease (liver, pancreas, intestine)	K70, K71 K72.1, K72.9, K73-K76 (excluding K71.2, K76.1-K76.4), K86, K50, K51	K70, K71 K72.1, K72.9, K73- K76 (excluding K71.2, K76.1- K76.4), K86, K50, K51
Presence of aortocoronary bypass graft	Z95.1	Z95.1, Procedure code
Presence of coronary angioplasty implant and graft	Z95.5	Z95.5, Procedure code
Other operations on heart and pericardium		Procedure codes
Operations of intracranial and other vessels of head and neck, including endarterectomy		Procedure codes
Other operations on vessels		Procedure codes

Tab 2. List of potential risk factors – Clinical variables

Smoking
Hypertension
Dyslipaemia
Peripheral artery disease
Diabetes
Family History of CHD
Previous myocardial infarction
Previous angina
Congestive heart failure
Previous revascularization
Previous CABG
Previous renal failure
Previous stroke
Severe mitral valve dysfunction
Admission Killip class
Glycaemia mg/dl (first measurement within 24 h after h. admission)
Hemoglobin mg/dl
Pre-hospital Cardiopulmonary Resuscitation
Systolic blood pressure at entry
Diastolic blood pressure at entry
First Ejection Fraction determined during hospital admission
Creatinine (first measurement within 24 h after h. admission)

Indicator A10 modified: Death within 30 days of arrival at hospital for an Acute Myocardial Infarction (AMI)

In this protocol the Euphoric Indicator A10 was modified by including information from the Emergency Information System (HEIS). Death within 30 days was calculated from arrival at hospital, corresponding to the date of hospital admission or Emergency Room visit. The HEIS was also used as additional information system in order to increase the probability of finding patients' comorbidities to be included in risk adjustment models.

Extended protocol developed by using ICD-9-CM

Definition

For a given provider, population and time period: the number of deaths within 30 days since the arrival at hospital for an AMI episode per 100 AMI episodes.

AMI episode includes all hospital admissions and possible Emergency Room (ER) visits occurring during the 8 weeks following the arrival at hospital.

Date of arrival at hospital corresponds to the date of the first hospital admission for AMI (index admission) or to the date of the Emergency Room (ER) visit, occurring within one day since the index admission.

Rationale

Timely and effective treatments for acute myocardial infarction (AMI) are essential for patient survival. Reductions in the mortality for AMI on both the patient level and the provider level have been related to better processes of care.

Treatments for AMI include appropriate use of thrombolytic therapy and revascularization. Early reperfusion results in a significant reduction in 30-day mortality (6-7%) and in an improvement of short/long-term prognosis.

Differences in case-mix, severity of the myocardial infarction, comorbidities and other factors outside the control of hospitals, such as the socio-economic mix of local populations and events prior to hospitalisation, may contribute to the variation of the indicator and to the differences between hospitals/providers. Therefore, the use of the adjusted indicator is recommended.

Potential uses

The indicator can be used:

- for comparative evaluation of hospital performances;
- for comparative evaluation between groups of facilities with similar organizational and/or process characteristics (for example, treatment volumes, technological equipments);
- for comparative evaluation between populations resident in different areas or of different socioeconomic status;
- for analysis of trend over time.

Inclusion criteria

Hospital discharges with a principal diagnosis of acute myocardial infarction (ICD-9-CM code 410.xx), or a secondary diagnosis of AMI with a principal diagnosis of a condition compatible with AMI diagnosis [ICD-9-CM codes 411, 413, 414, 423.0, 426, 427 (excluding 427.5), 428, 429.5, 429.6, 429.71, 429.79, 429.81, 518.4, 518.81, 780.01, 780.2, 785.51, 799.1, 997.02, 998.2].

Study period: 2 years (the most recent data available).

Exclusion criteria

- Age at admission < 18 or > 100 years;
- Admissions with total length of stay less than 48 hours (0-1 day) and with an ultimate disposition as the following: discharge to home or against medical advice;
- Admissions with one or more prior AMI admissions within the 8 weeks preceding the index admission;
- Transferred in from other acute care hospitals or ERs.

Definition of outcome

Outcome is defined as mortality within 30 days since the date of arrival at hospital.

Risk adjustment

Comparisons should be made in the context of case-mix information. Results should be directly standardised for age, gender, selected comorbidities and, if available, severity of patient populations. The comorbidities, or potential risk factors (see, for example, Table 1a), should be

searched in AMI episode -within 30 days after AMI arrival at hospital - and in all previous hospital admissions and/or ER visits within a specified time interval (i. e. four years). Clinical variables should be searched in AMI index admission (see, for example, Table 2).

Data sources

The data may be predominantly obtained from the Hospital Discharge Records and Emergency Room visits; the numerator may be obtained from death certificates or from Mortality Records linked by a patient identifier to previous hospital admissions for AMI or ER visits, with a date of arrival at hospital within the specified period before death.

Other data sources (i.e. disease registries) could be used for a more accurate standardisation of the indicator.

Comments

Potential problems lie with the accuracy of HDR and ER data with respect to diagnostic information (especially comorbidities).

References

- Antonucci D, Valenti R, Migliorini A et al. Relation of time to treatment and mortality in patients with acute myocardial infarction undergoing primary angioplasty. *Am J Cardiol* 2002; 89: 1248.
- Armstrong A, Duncan B, Oliver MF et al. Natural history of acute coronary heart attacks. A community study. *Br Heart J* 1972;34:67-80.
- Berger PB, Ellis SG, Holmes DR Jr et al. Relationship between delay in performing direct coronary angioplasty and early clinical outcome in patients with acute myocardial infarction: results from the global use of strategies to open occluded arteries in Acute Coronary Syndromes (GUSTO-IIb) trial. *Circulation* 1999; 100 (1): 14-20.
- California Hospital Outcomes Project. Heart Attack Outcomes 1996-1998. Volume 2: Technical Guide. OSHPD 2002.
- Canadian Cardiovascular Outcomes Research Team (CCORT). Quality Indicators for acute myocardial infarction (AMI) care. <http://www.ccort.ca/CCORTCCSAMIQI/tabid/92/Default.aspx>

- De Luca G, Suriyapranata H, Zijsta F et al. for Zolle Miocardial Infarction Study Group. Symptom onset to balloon time and mortality in patients with acute myocardial infarction treated by primary angioplasty. *J Am Coll Cardiol* 2003; 42: 991.
- Department of Health – National Health Service. www.performance.doh.gov.uk/nhsperformanceindicators/hlpi2000/downloads/spec2000_ci3.doc.
- De Vreede JJ, Gorgels AP, Verstraaten GM et al. Did prognosis after acute myocardial infarction change during the past 30 years? A meta-analysis. *J Am Coll Cardiol* 1991; 18:698–706.
- Idanpaan-Heikkila UM, Lambie L, Mattke S, et al. Selecting indicators for the quality of cardiac care at the health system level in Organization for Economic Cooperation and Development countries. *Int J Qual Health Care* 2006;18(Suppl 1):39-44.
- Malacrida R, Genoni M, Maggioni AP. A comparison of the early outcome of acute myocardial infarction in women and men. *N Engl J Med* 1998;338:8-14.
- Meehan TP, Hennen J, Radford MJ, et al. Process and outcome of care for acute myocardial infarction among Medicare beneficiaries in Connecticut: a quality improvement demonstration project. *Ann Intern Med* 1995;122(12):928-36.
- National Service Framework for Coronary Heart Disease: Modern Standards and Service Models. London: Department of Health, March 2000.
- Newby LK, Rutsch WR, Califf RM, et al. Time from symptom onset to treatment and outcomes after thrombolytic therapy: GUSTO-1 Investigator. *J Am Coll Cardiol*. 1996;27:1646-1655.
- Norris RM. Fatality outside hospital from acute coronary events in three British districts, 1994–5. United Kingdom Heart Attack Study Collaborative Group. *BMJ* 1998; 316:1065–70.
- Raitt MH, Maynard C, Wagner GS, et al. Relation between symptom duration before thrombolytic therapy and final myocardial infarct size. *Circulation* 1996; 93:48-53.
- Romano PS, Chan BK. Risk-adjusting acute myocardial infarction mortality: are APR-DRGs the right tool? *Health Serv Res*. 2000;34(7):1469-89.
- Second Report of the California Hospitals Outcomes Project, May 1996. Acute Myocardial Infarction. Sacramento, CA: Office of Statewide Health Planning and Development; 1996.

- Serruys PW, Simoons ML, Suryapranata H, et al. Preservation of global and regional left ventricular function after early thrombolysis in acute myocardial infarction J. Am. Coll Cardiol. 1986; 7:729-742.
- Specification Manual for National Hospital Quality Measures (2005). Joint Commission on Accreditation of Healthcare Organizations (JCAHO).
- http://www.jcaho.org/pms/core+measures/aligned_manual.htm
- Steg PG, Bonnefoy E, Chabaud S et al. Impact of Time to Treatment on Mortality After Prehospital Fibrinolysis or Primary Angioplasty. Data From the CAPTIM Randomized Clinical Trial. Circulation 2003;108:2851-2856.
- Tunstall-Pedoe H, Kuulasmaa K, Mahonen M et al. Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA project populations. Monitoring trends and determinants in cardiovascular disease. Lancet 1999;353:1547–57.
- Widimsky P, Budesinsky T, Vorac D, et al. Long distance transport for primary angioplasty vs immediate thrombolysis in acute myocardial infarction: final results of the randomized national multicentre trial: PRAGUE-2. Eur Heart J. 2003;24:94–104.

Extended protocol developed by using ICD-10

Definition

For a given provider, population and time period: the number of deaths within 30 days since the arrival at hospital for an AMI episode per 100 AMI episodes.

AMI episode includes all hospital admissions and possible Emergency Room (ER) visits occurring during the 4 weeks (28 days) following the arrival at hospital.

Date of arrival at hospital corresponds to the date of the first hospital admission for AMI (index admission) or to the date of the Emergency Room (ER) visit, occurring within one day since the index admission.

Rationale

Previously described.

Potential uses

Previously described.

Inclusion criteria

Hospital discharges with a principal diagnosis of acute myocardial infarction (ICD-10 code I21.x), or a secondary diagnosis of AMI with a principal diagnosis of a condition compatible with AMI diagnosis [ICD-10 codes I20, I23.0-I23.8, I24, I25, I44, I45, I47, I48, I49, I50, J81.0, J96.0, R40.2, R40.4, R57.0, R09.2].

Study period: 2 years (the most recent data available).

Exclusion criteria

- Age at admission < 18 or > 100 years;
- Admissions with total length of stay less than 48 hours (0-1 day) and with an ultimate disposition as the following: discharge to home or against medical advice;
- Admissions with one or more prior AMI admissions within the 4 weeks preceding the index admission;
- Transferred in from other acute care hospitals or ERs.

Definition of outcome

Previously defined.

Risk adjustment

Comparisons should be made in the context of case-mix information. Results should be directly standardised for age, gender, selected comorbidities and, if available, severity of patient populations. The comorbidities, or potential risk factors (see, for example, Table 1b), should be searched in AMI episode -within 28 days after AMI arrival at hospital - and in all previous hospital admissions and/or ER visits within a specified time interval (i. e. four years). Clinical variables should be searched in AMI index admission (see, for example, Table 2).

Data sources

Previously described.

Comments

Previously described.

References

Previously described.

Tab 1a. List of potential risk factors. ICD-9-CM codes

Risk factors	ICD-9-CM Code	
	AMI episode	Previous hospital admissions or ER visits
Malignant neoplasms	140.0–208.9	140.0–208.9
Diabetes	250.0-250.9	250.0-250.9
Lipid metabolism disturbances	272	272
Obesity	278.0	278.0
Blood disorders	280-285, 288, 289	280-285, 288, 289
Hypertension	401-405	401-405
Previous myocardial infarction	412	410, 412
Other forms of chronic ischemic heart disease		411, 413, 414
Heart failure		428
Ill-defined descriptions and complications of heart disease		429
Rheumatic heart disease	393-398	391, 393-398
Cardiomyopathy	425	425
Acute endocarditis and myocarditis		421, 422
Other heart conditions	745, V15.1, V42.1, V42.2, V43.2, V43.3, V45.0	745, V15.1, V42.1, V42.2, V43.2, V43.3, V45.0
Cardiac arrhythmias		426, 427
Cerebrovascular disease	433, 437, 438	430-432, 433, 434, 436, 437, 438
Vascular disease	440-448 (excluding 441.0, 441.1, 441.3, 441.5, 441.6, 444)	440-448, 557
Chronic obstructive pulmonary disease	491, 492, 494, 496	491, 492, 494, 496
Chronic renal disease	582, 583, 585-588	582, 583, 585-588
Other chronic disease (liver, pancreas, intestine)	571 (excluding 571.1), 572, 577.1-577.9, 555, 556	571, 572, 577.1-577.9, 555, 556
Previous CABG	V45.81	V45.81, 36.1
Previous PTCA	V45.82	V45.82, 36.0
Other operations on heart and pericardium		35, 37.0, 37.1, 37.3, 37.4, 37.5, 37.6, 37.9
Operations of intracranial and other vessels of head and neck, including endarterectomy		38.01, 38.02, 38.11, 38.12, 38.31, 38.32
Other operations on vessels		38-39.5, excluding: 38.01, 38.02, 38.5, 38.11, 38.12, 38.31, 38.32, 38.93

Tab 1b. List of potential risk factors – Discharge Records. ICD-10 codes

Risk factors	ICD-10 Code	
	AMI episode	Previous admissions
Malignant neoplasms	C00- C96	C00- C96
Diabetes mellitus	E10-E11	E10-E11
Lipid metabolism disturbances	E78	E78
Obesity	E66	E66
Blood disorders	D50-D53, D55-D64, D70-D77, D80-D89	D50-D53, D55-D64, D70-D77, D80-D89
Hypertension	I10-I15	I10-I15
Previous myocardial infarction	I25.2	I21, I22, I25.2
Other forms of chronic ischemic heart disease		I20, I24, I25.1, I25.3–I25.9
Heart failure		I50
Complications and ill-defined descriptions of heart disease		I51
Rheumatic heart disease	I05-I09	I00-I02, I05-I09
Cardiomyopathy	I42-I43	I42-I43
Acute endocarditis and myocarditis		I33, I40-I41
Other heart conditions	Q20, Q21, Q25, Z95.0, Z95.2- Z95.4, Z94.1, Z95.81	Q20, Q21, Q25, Z95.2-Z95.4, Z94.1, Z95.81
Cardiac arrhythmias		I44-I49
Cerebrovascular disease	I65, I66, I67, I69	I60-I67, I69
Vascular disease	I70-I74, I77-I78 (excluding I71.0, I71.1, I71.3, I71.5, I71.8, I74)	I70-I74, I77-I78, K55
Chronic obstructive pulmonary disease	J41-J44, J47	J41-J44, J47
Chronic renal disease	N03, N05, N11, N12, N18, N19, N25-N27	N03, N05, N11, N12, N18, N19, N25-N27
Other chronic disease (liver, pancreas, intestine)	K70, K71 K72.1, K72.9, K73-K76 (excluding K71.2, K76.1-K76.4), K86, K50, K51	K70, K71 K72.1, K72.9, K73- K76 (excluding K71.2, K76.1- K76.4), K86, K50, K51
Presence of aortocoronary bypass graft	Z95.1	Z95.1, Procedure code
Presence of coronary angioplasty implant and graft	Z95.5	Z95.5, Procedure code
Other operations on heart and pericardium		Procedure codes
Operations of intracranial and other vessels of head and neck, including endarterectomy		Procedure codes
Other operations on vessels		Procedure codes

Tab 2. List of potential risk factors – Clinical variables

Smoking
Hypertension
Dyslipaemia
Peripheral artery disease
Diabetes
Family History of CHD
Previous myocardial infarction
Previous angina
Congestive heart failure
Previous revascularization
Previous CABG
Previous renal failure
Previous stroke
Severe mitral valve dysfunction
Admission Killip class
Glycaemia mg/dl (first measurement within 24 h after h. admission)
Hemoglobin mg/dl
Pre-hospital Cardiopulmonary Resuscitation
Systolic blood pressure at entry
Diastolic blood pressure at entry
First Ejection Fraction determined during hospital admission
Creatinine (first measurement within 24 h after h. admission)

Indicator E2 modified: Death within 30 days of arrival at hospital with a fractured hip

In this protocol the Euphoric Indicator E2 was modified by including information from the Emergency Information System (HEIS). Death within 30 days was calculated from arrival at hospital, corresponding to the date of hospital admission or Emergency Room visit. The HEIS was also used as additional information system in order to increase the probability of finding patients' comorbidities to be included in risk adjustment models.

Extended protocol developed by using ICD-9-CM

Definition

For a given provider, population and time period: the number of deaths within 30 days since the arrival at hospital for a hip fracture per 100 hip fractures.

Since increasing time between arrival at hospital and receipt of effective treatment for hip fracture may result in worse health outcomes, mortality is calculated from arrival at hospital, corresponding to the date of the hospital admission for hip fracture (index admission) or to the date of the Emergency Room (ER) visit, occurring within one day since the index admission.

Rationale

Timely and effective treatments for hip fracture are essential for patient survival. Lower mortality following admission for hip fracture has been related to better processes of care.

Differences in comorbidities and other factors outside the control of hospitals, such as the socio-economic mix of local populations, may contribute to the variation of the indicator and to the differences between hospitals/providers. Therefore, the use of the adjusted indicator is recommended.

Potential uses

The indicator can be used:

- for comparative evaluation of hospital performances;
- for comparative evaluation between groups of facilities with similar organizational and/or process characteristics (for example, treatment volumes, technological equipments);

- for comparative evaluation between populations resident in different areas or of different socioeconomic status;
- for analysis of trend over time.

Inclusion criteria

Hospital discharges of patients, aged at least 65 years, with a primary or secondary diagnosis of hip (neck of femur) fracture (ICD-9-CM diagnosis codes 820.0-820.9).

Study period: 2 years (the most recent data available).

Exclusion Criteria

Admissions of patients:

- hospitalized for hip fracture in the previous two years;
- transferred from other acute care hospitals or emergency departments (patients admitted to a given ER or hospital for hip fracture and coded as “transferred from” other not identified acute care facility or ER);
- with multiple significant trauma (DRGs 484-487);
- directly admitted in Intensive Care Units;
- died within 48 hours of admission without intervention (patients that could have not been operated because of worse baseline clinical conditions);
- with principal or secondary diagnosis of malignant neoplasms (codes 140.0-208.9) in the index admission (current admission for hip fracture) or in previous hospitalizations during the last two years.

Definition of outcome

Outcome is defined as mortality within 30 days since the date of arrival at hospital.

Risk adjustment

Comparisons should be made in the context of case-mix information. Results should be directly standardised for age, gender, selected comorbidities and, if available, severity of patient populations. The comorbidities, or potential risk factors (see, for example, Table 1a), should be searched in the index admission -within 30 days after arrival at hospital - and in all previous hospital admissions and/or ER visits within a specified time interval (i. e. two years). Clinical

variables should be searched in the index admission (for example, laboratory parameters as the International Normalised Ratio (INR) could be used) .

Data sources

The data may be predominantly obtained from the Hospital Discharge Records and Emergency Room visits; the numerator may be obtained from death certificates or from Mortality Records linked by a patient identifier to previous hospital admissions for hip fracture or ER visits, with a date of arrival at hospital within the specified period before death.

Other data sources (i.e. disease registries) could be used for a more accurate standardisation of the indicator.

Comments

Potential problems lie with the accuracy of HDR and ER data with respect to diagnostic information (especially comorbidities).

References

- Bottle A, Aylin P. Mortality associated with delay in operation after hip fracture: observational study. *Br Med J* 2006;332:947-51
- Casaletto JA, Gatt R. Post-operative mortality related to waiting time for hip fracture surgery. *Injury* 2004;35:114-20
- Gdalevich M, Cohen D, Yosef D, Tauber C. Morbidity and mortality after hip fracture: the impact of operative delay. *Arch Orthop Trauma Surg* 2004;124:334–40.
- New Zealand Guidelines Group. Acute management and immediate rehabilitation after hip fracture amongst people aged 65 years and over, 2003. <http://www.nzgg.org.nz/index.cfm?>
- Roberts SE, Goldacre MJ. Time trends and demography of mortality after fractured neck of femur in an English population, 1968-98: database study. *BMJ* 2003; 327(7418):771-5.
- Roche JJW, Wenn RT, Sahota O and Moran CG. Effect of comorbidities and postoperative complications on mortality after hip fracture in elderly people: prospective observational cohort study. *BMJ* 2005;331;1374-.
- Scottish Intercollegiate Guideline Network (SIGN): Prevention and management of hip fracture in older people, 2002. www.sign.ac.uk

- Stoddart J, Horne G, Devane P. Influence of preoperative medical status and delay to surgery on death following a hip fracture. ANZ J Surg 2002; 72:405-407.

Extended protocol developed by using ICD-10

Definition

Previously defined.

Rationale

Previously described.

Potential uses

Previously described.

Inclusion criteria

Hospital discharges of patients, aged at least 65 years, with a primary or secondary diagnosis of hip (upper femur) fracture (ICD-10 diagnosis codes S72.0-S72.2).

Study period: 2 years (the most recent data available).

Exclusion Criteria

Admissions of patients:

- hospitalized for hip fracture in the previous two years;
- transferred from other acute care hospitals or emergency departments (patients admitted to a given ER or hospital for hip fracture and coded as “transferred from” other not identified acute care facility or ER);
- with multiple significant trauma (DRGs 484-487);
- directly admitted in Intensive Care Units;
- died within 48 hours of admission without intervention (patients that could have not been operated because of worse baseline clinical conditions);

- with principal or secondary diagnosis of malignant neoplasms (codes C00-C96) in the index admission (current admission for hip fracture) or in previous hospitalizations during the last two years.

Definition of outcome

Previously defined.

Risk adjustment

Comparisons should be made in the context of case-mix information. Results should be directly standardised for age, gender, selected comorbidities and, if available, severity of patient populations. The comorbidities, or potential risk factors (see, for example, Table 1b), should be searched in the index admission -within 30 days after arrival at hospital - and in all previous hospital admissions and/or ER visits within a specified time interval (i. e. two years). Clinical variables should be searched in the index admission (for example, laboratory parameters as the International Normalised Ratio (INR) could be used) .

Data sources

Previously described.

Comments

Previously described.

References

Previously described.

Tab 1a. List of potential risk factors. ICD-9-CM codes

Risk factor	ICD-9-CM code	
	Index admission	Previous hospital admissions or ER visits
<i>Diseases of central nervous system</i>		
Dementias including Alzheimer's disease	290.0-290.4, 294.1, 331.0	290.0-290.4, 294.1, 331.0
Parkinson's disease	332	332
Hemiplegia and other paralytic syndromes	342, 344	342, 344
<i>Ischemic heart disease</i>		
Previous myocardial infarction	412	410, 412
Other forms of chronic ischemic heart disease		411, 413, 414
<i>Other cardiac disorders</i>		
Heart failure		428
Ill-defined descriptions and complications of heart disease		429
Rheumatic heart disease	393-398	391, 393-398
Cardiomyopathy	425	425
Acute endocarditis and myocarditis		421, 422
Other heart conditions	745, V15.1, V42.1, V42.2, V43.2, V43.3, V45.0	745, V15.1, V42.1, V42.2, V43.2, V43.3, V45.0
Cardiac arrhythmias		426, 427
Diabetes	250.1-250.9	250.1-250.9
Hypertension	401-405	401-405
<i>Circulatory disorders</i>		
Cerebrovascular disease	433, 437, 438	430-434, 436-437, 438
Vascular disease	440-448 (excluding 441.0, 441.1, 441.3, 441.5, 441.6, 444)	440-448, 557
Chronic obstructive pulmonary disease	491-492, 494, 496	491-492, 494, 496
Chronic renal disease	582-583, 585-588	582-583, 585-588
Other chronic disease (liver, pancreas, intestine)	571 (excluding 571.1), 572, 577.1-577.9, 555, 556	571-572, 577.1-577.9, 555, 556
<i>Bone and joint disorders</i>		
Rheumatoid arthritis and other inflammatory polyarthropathies	714	714
Osteoporosis and other disorders of bone and cartilage	733	733
Nutritional deficiencies	260-263, 783.2, 799.4	260-263, 783.2, 799.4
Obesity	278.0	278.0
Blood disorders	280-285, 288, 289	280-285, 288, 289

Tab 1b. List of potential risk factors – Discharge Records. ICD-10 codes

Risk factor	ICD-10 code	
	Index admission	Previous hospital admissions or ER visits
<i>Diseases of central nervous system</i>		
Dementias including Alzheimer's disease	F01-F03, G30	F01-F03, G30
Parkinson's disease	G20, G21	G20, G21
Hemiplegia and other paralytic syndromes	G81-G83	G81-G83
<i>Ischemic heart disease</i>		
Previous myocardial infarction	I25.2	I21, I22, I25.2
Other forms of chronic ischemic heart disease		I20, I24, I25.1, I25.3–I25.9
<i>Other cardiac disorders</i>		
Heart failure		I50
Ill-defined descriptions and complications of heart disease		I51
Rheumatic heart disease	I05-I09	I00-I02, I05-I09
Cardiomyopathy	I42-I43	I42-I43
Acute endocarditis and myocarditis		I33, I40-I41
Other heart conditions	Q20, Q21, Q25, Z95.0, Z95.2-Z95.4, Z94.1, Z95.81	Q20, Q21, Q25, Z95.0, Z95.2-Z95.4, Z94.1, Z95.81
Cardiac arrhythmias		I44-I49
Diabetes mellitus	E10-E11	E10-E11
Hypertension	I10-I15	I10-I15
<i>Circulatory disorders</i>		
Cerebrovascular disease	I65, I66, I67, I69	I60-I67, I69
Vascular disease	I70-I74, I77-I78 (excluding I71.0, I71.1, I71.3, I71.5, I71.8, I74)	I70-I74, I77-I78, K55
Chronic obstructive pulmonary disease	J41-J44, J47	J41-J44, J47
Chronic renal disease	N03, N05, N11, N12, N18, N19, N25-N27	N03, N05, N11, N12, N18, N19, N25-N27
Other chronic disease (liver, pancreas, intestine)	K70, K71, K72.1, K72.9, K73-K76 (excluding K71.2, K76.1-K76.4), K86, K50, K51	K70, K71, K72.1, K72.9, K73-K76 (excluding K71.2, K76.1-K76.4), K86, K50, K51
<i>Bone and joint disorders</i>		
Rheumatoid arthritis and other inflammatory polyarthropathies	M05, M06, M08	M05, M06, M08
Osteoporosis and other disorders of bone and cartilage	M80, M81, M83-M85	M80, M81, M83-M85
Nutritional deficiencies	E40-E46, R63.4, R64	E40-E46, R63.4, R64
Obesity	E66	E66
Blood disorders	D50-D53, D55-D64, D70-D77, D80-D89	D50-D53, D55-D64, D70-D77, D80-D89

Indicator E5 modified: Intervention within 48 hours of arrival at hospital for hip fracture

In this protocol the Euphoric Indicator E5 was modified by substituting “in-hospital waiting time for femur fracture surgery” for “intervention within 48 hours of arrival at hospital” and including information from the Emergency Information System (HEIS). Intervention within 48 hours was calculated from arrival at hospital, corresponding to the date of hospital admission or Emergency Room visit. The HEIS was also used as additional information system in order to increase the probability of finding patients’ comorbidities to be included in risk adjustment models.

Extended protocol developed by using ICD-9-CM

Definition

For a given provider, population and time period: the number of number of patients, aged at least 65 years, undergone intervention within 48 hours per 100 patients, aged at least 65 years, hospitalized for hip fracture.

Since increasing time between arrival at hospital and receipt of effective treatment for hip fracture may result in worse health outcomes, time to surgery is calculated since arrival at hospital, corresponding to the date of the hospital admission for hip fracture (index admission) or to the date of the Emergency Room (ER) visit, occurring within one day since the index admission.

Rationale

Effective and timely treatments for hip fracture, in particular an early surgical approach, has been related to better health outcomes. Recently, the Organization for Economic Co-operation and Development (OECD) has included a 48-hour waiting time to surgery in elderly patients with hip fracture in its national quality indicator list and a meta-analysis has shown that delaying surgery for 48 or more hours after admission may significantly increase the odds of 30-day and one-year mortality.

Differences in comorbidities and other factors outside the control of hospitals, such as the socio-economic mix of local populations, may contribute to the variation of the indicator and to

the differences between hospitals/providers. Therefore, the use of the adjusted indicator is recommended.

Potential uses

The indicator can be used:

- for comparative evaluation of hospital performances;
- for comparative evaluation between groups of facilities with similar organizational and/or process characteristics (for example, treatment volumes, technological equipments);
- for comparative evaluation between populations resident in different areas or of different socioeconomic status;
- for analysis of trend over time.

Inclusion criteria

Hospital discharges of patients, aged at least 65 years, with a primary or secondary diagnosis of hip (neck of femur) fracture (ICD-9-CM diagnosis codes 820.0-820.9),

Study period: 2 years (the most recent data available).

Exclusion Criteria

Admissions of patients:

- hospitalized for hip fracture in the previous two years;
- transferred from other acute care hospitals or emergency rooms (patients admitted to a given ER or hospital for hip fracture and coded as “transferred from” other not identified acute care facility or ER);
- with multiple significant trauma (DRGs 484-487);
- directly admitted in Intensive Care Units;
- died within 48 hours of admission without intervention (patients that could have not been operated because of worse baseline clinical conditions);
- with principal or secondary diagnosis of malignant neoplasms (codes 140.0-208.9) in the index admission (current admission for hip fracture) or in previous hospitalizations during the last two years.

Definition of outcome

Outcome is defined as intervention within 48 hours since the date of arrival at hospital.

The interventions are identified by the following ICD-9-CM codes: total or partial hip replacement (codes 81.51, 81.52) and reduction of fracture (codes 79.00, 79.05, 79.10, 79.15, 79.20, 79.25, 79.30, 79.35, 79.40, 79.45, 79.50, 79.55).

Risk adjustment

Comparisons should be made in the context of case-mix information. Results should be directly standardised for age, gender, selected comorbidities and, if available, severity of patient populations. The comorbidities, or potential risk factors (see, for example, Table 1a), should be searched in the index admission and in all previous hospital admissions and/or ER visits within a specified time interval (i. e. two years). Clinical variables should be searched in the index admission (for example, laboratory parameters as the International Normalised Ratio (INR) could be used) .

Data sources

The data may be predominantly obtained from the Hospital Discharge Records and Emergency Room visits; the numerator may be obtained from death certificates or from Mortality Records linked by a patient identifier to previous hospital admissions for hip fracture or ER visits, with a date of arrival at hospital within the specified period before death.

Other data sources (i.e. disease registries) could be used for a more accurate standardisation of the indicator.

Comments

Potential problems lie with the accuracy of HDR and ER data with respect to diagnostic information (especially comorbidities).

References

- Casaletto JA, Gatt R. Post-operative mortality related to waiting time for hip fracture surgery. *Injury* 2004;35:114-20

- Doruk H, Mas MR, Yildiz C, Sonmez A, Kyrdemir V. The effect of the timing of hip fracture surgery on the activity of daily living and mortality in elderly. Arch Gerontol Geriatr 2004;39:179–85.
- Gdalevich M, Cohen D, Yosef D, Tauber C. Morbidity and mortality after hip fracture: the impact of operative delay. Arch Orthop Trauma Surg 2004;124:334–40.
- Löfvendahl S, Eckerlund Ir, Hansagi H, Malmqvist B, Resch S, Hanning M. Waiting for orthopaedic surgery: factors associated with waiting times and patients' opinion. Int J Qual Health Care 2005; 17 (2):133-40.
- Mattke S, Kelley E, Scherer P, Hurst J, Lapetra MLG and the HCQI Expert Group Members Health care quality indicators project- initial indicators report. OECD Health Working Paper No. 22 (s), 2006.
- New Zealand Guidelines Group. Acute management and immediate rehabilitation after hip fracture amongst people aged 65 years and over, 2003. <http://www.nzgg.org.nz/index.cfm?>
- Novack V, Jotkowitz A, Etzion O, Porath A. Does delay in surgery after hip fracture lead to worse outcomes? A multicenter survey. Int J Qual Health Care 2007;19(3):170-6.
- Orosz GM, Magaziner J, Hannan EL et al. Association of timing of surgery for hip fracture and patient outcomes. JAMA 2004; 291:1738-1743.
- Scottish Intercollegiate Guideline Network (SIGN): Prevention and management of hip fracture in older people, 2002. www.sign.ac.uk
- Shiga T, Wajima Z, Ohe Y. Is operative delay associated with increased mortality of hip fracture patients? Systematic review, meta-analysis, and meta-regression [Le delai operatoire est-il associe a une mortalite accrue chez les patients atteints d'une fracture de la hanche ? Synthese systematique, meta-analyse et meta-regression]. Canadian J. Anesthesia 2008; 55: 146-154.
- Shortt SED, Shaw RA. Equity in Canadian health care: Does socioeconomic status affect waiting times for elective surgery? CMAJ 2003;168(4):413-6.
- Stoddart J, Horne G, Devane P. Influence of preoperative medical status and delay to surgery on death following a hip fracture. ANZ J Surg 2002; 72:405-407.

Extended protocol developed by using ICD-10

Definition

Previously defined.

Rationale

Previously described.

Potential uses

Previously described.

Inclusion criteria

Hospital discharges of patients, aged at least 65 years, with a primary or secondary diagnosis of hip (upper femur) fracture (ICD-10 diagnosis codes S72.0-S72.2),

Study period: 2 years (the most recent data available).

Exclusion Criteria

Admissions of patients:

- hospitalized for hip fracture in the previous two years;
- transferred from other acute care hospitals or emergency departments (patients admitted to a given ER or hospital for hip fracture and coded as “transferred from” other not identified acute care facility or ER);
- with multiple significant trauma (DRGs 484-487);
- directly admitted in Intensive Care Units;
- died within 48 hours of admission without intervention (patients that could have not been operated because of worse baseline clinical conditions);
- with principal or secondary diagnosis of malignant neoplasms (codes C00-C96) in the index admission (current admission for hip fracture) or in previous hospitalizations during the last two years.

Definition of outcome

Outcome is defined as intervention within 48 hours since the date of arrival at hospital.

The interventions under study are: partial or total hip replacement and reduction of fracture.

Risk adjustment

Comparisons should be made in the context of case-mix information. Results should be directly standardised for age, gender, selected comorbidities and, if available, severity of patient populations. The comorbidities, or potential risk factors (see, for example, Table 1b), should be searched in the index admission and in all previous hospital admissions and/or ER visits within a specified time interval (i. e. two years). Clinical variables should be searched in the index admission (for example, laboratory parameters as the International Normalised Ratio (INR) could be used) .

Data sources

Previously described.

Comments

Previously described.

References

Previously described.

Tab 1a. List of potential risk factors. ICD-9-CM codes

Risk factor	ICD-9-CM code	
	Index admission	Previous hospital admissions or ER visits
<i>Diseases of central nervous system</i>		
Dementias including Alzheimer's disease	290.0-290.4, 294.1, 331.0	290.0-290.4, 294.1, 331.0
Parkinson's disease	332	332
Hemiplegia and other paralytic syndromes	342, 344	342, 344
<i>Ischemic heart disease</i>		
Previous myocardial infarction	412	410, 412
Other forms of chronic ischemic heart disease		411, 413, 414
<i>Other cardiac disorders</i>		
Heart failure		428
Ill-defined descriptions and complications of heart disease		429
Rheumatic heart disease	393-398	391, 393-398
Cardiomyopathy	425	425
Acute endocarditis and myocarditis		421, 422
Other heart conditions	745, V15.1, V42.1, V42.2, V43.2, V43.3, V45.0	745, V15.1, V42.1, V42.2, V43.2, V43.3, V45.0
Cardiac arrhythmias		426, 427
Diabetes	250.1-250.9	250.1-250.9
Hypertension	401-405	401-405
<i>Circulatory disorders</i>		
Cerebrovascular disease	433, 437, 438	430-434, 436-437, 438
Vascular disease	440-448 (excluding 441.0, 441.1, 441.3, 441.5, 441.6, 444)	440-448, 557
Chronic obstructive pulmonary disease	491-492, 494, 496	491-492, 494, 496
Chronic renal disease	582-583, 585-588	582-583, 585-588
Other chronic disease (liver, pancreas, intestine)	571 (excluding 571.1), 572, 577.1-577.9, 555, 556	571-572, 577.1-577.9, 555, 556
<i>Bone and joint disorders</i>		
Rheumatoid arthritis and other inflammatory polyarthropathies	714	714
Osteoporosis and other disorders of bone and cartilage	733	733
Nutritional deficiencies	260-263, 783.2, 799.4	260-263, 783.2, 799.4
Obesity	278.0	278.0
Blood disorders	280-285, 288, 289	280-285, 288, 289

Tab 1b. List of potential risk factors – Discharge Records. ICD-10 codes

Risk factor	ICD-10 code	
	Index admission	Previous hospital admissions or ER visits
<i>Diseases of central nervous system</i>		
Dementias including Alzheimer's disease	F01-F03, G30	F01-F03, G30
Parkinson's disease	G20, G21	G20, G21
Hemiplegia and other paralytic syndromes	G81-G83	G81-G83
<i>Ischemic heart disease</i>		
Previous myocardial infarction	I25.2	I21, I22, I25.2
Other forms of chronic ischemic heart disease		I20, I24, I25.1, I25.3–I25.9
<i>Other cardiac disorders</i>		
Heart failure		I50
Ill-defined descriptions and complications of heart disease		I51
Rheumatic heart disease	I05-I09	I00-I02, I05-I09
Cardiomyopathy	I42-I43	I42-I43
Acute endocarditis and myocarditis		I33, I40-I41
Other heart conditions	Q20, Q21, Q25, Z95.0, Z95.2-Z95.4, Z94.1, Z95.81	Q20, Q21, Q25, Z95.0, Z95.2-Z95.4, Z94.1, Z95.81
Cardiac arrhythmias		I44-I49
Diabetes mellitus	E10-E11	E10-E11
Hypertension	I10-I15	I10-I15
<i>Circulatory disorders</i>		
Cerebrovascular disease	I65, I66, I67, I69	I60-I67, I69
Vascular disease	I70-I74, I77-I78 (excluding I71.0, I71.1, I71.3, I71.5, I71.8, I74)	I70-I74, I77-I78, K55
Chronic obstructive pulmonary disease	J41-J44, J47	J41-J44, J47
Chronic renal disease	N03, N05, N11, N12, N18, N19, N25-N27	N03, N05, N11, N12, N18, N19, N25-N27
Other chronic disease (liver, pancreas, intestine)	K70, K71, K72.1, K72.9, K73-K76 (excluding K71.2, K76.1-K76.4), K86, K50, K51	K70, K71, K72.1, K72.9, K73-K76 (excluding K71.2, K76.1-K76.4), K86, K50, K51
<i>Bone and joint disorders</i>		
Rheumatoid arthritis and other inflammatory polyarthropathies	M05, M06, M08	M05, M06, M08
Osteoporosis and other disorders of bone and cartilage	M80, M81, M83-M85	M80, M81, M83-M85
Nutritional deficiencies	E40-E46, R63.4, R64	E40-E46, R63.4, R64
Obesity	E66	E66
Blood disorders	D50-D53, D55-D64, D70-D77, D80-D89	D50-D53, D55-D64, D70-D77, D80-D89