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Population Trends in Percutaneous Coronary Intervention

20-Year Results From the SCAAR (Swedish Coronary Angiography and Angioplasty Registry)

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Objectives The aim of this study was to describe the characteristics and outcome of all consecutive patients treated with percutaneous coronary intervention (PCI) in an unselected nationwide cohort over the past 2 decades.

Background Over the last 20 years, treatment with PCI has evolved dramatically, but the change in patient characteristics has not been well described.

Methods We included all patients undergoing a PCI procedure for the first time between January 1990 and December 2010 from the SCAAR (Swedish Coronary Angiography and Angioplasty Registry). Patients were divided into different cohorts on the basis of the year of the first PCI procedure.

Results A total of 144,039 patients was included. The mean age increased from 60.1 ± 9.9 years in 1990 to 1995 to 67.1 ± 11.2 years in 2009 to 2010. The proportion of patients presenting with unstable coronary artery disease and ST-segment elevation myocardial infarction increased from 27.4% and 6.2% to 47.7% and 32.5%, respectively. Diabetes mellitus and multivessel disease were more often present in the later-year cohorts. The 1-year mortality increased from 2.2% in 1990 to 1995 to 5.9% in 2009 to 2010, but after adjustment for age and indication, a modest decrease was shown, mainly in ST-segment elevation myocardial infarction patients.

Conclusions Characteristics of PCI patients have changed substantially over time, reflecting the establishment of new evidence. The increasing age and proportion of patients undergoing PCI for acute coronary syndromes greatly influence outcome. Understanding the changing patient characteristics is important for the translation of evidence to real-world clinical practice. (J Am Coll Cardiol 2013;61:1222–30) © 2013 by the American College of Cardiology Foundation

Percutaneous coronary intervention (PCI) is often part of standard therapy in patients presenting with significant coronary artery disease (1). Since the introduction of PCI, the procedure itself has evolved dramatically, with the introduction of bare-metal stents (BMS) and subsequently drug-eluting stents (DES) (2–4). In addition, primary PCI is now the recommended treatment in patients with ST-segment elevation myocardial infarction (STEMI), and it has resulted in a mortality reduction (5,6). Furthermore, PCI is increasingly used in

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patients with more complex lesions such as left main disease (7).

However, the risk profile of patients undergoing a PCI procedure has also changed substantially over time. Today, PCI is increasingly recommended for elderly patients with acute coronary syndromes, although they are often excluded from randomized trials (8). The changing patient characteristics may greatly influence outcome after PCI in randomized trials as well as in registry studies. It is, therefore, important to understand the changes in real-world clinical practice. After >20 years of PCI procedures, we found it opportune to present the clinical characteristics and outcome of all consecutive patients treated with PCI in an unselected nationwide cohort.

Abbreviations and Acronyms

BMS = bare-metal stent(s)
CABG = coronary artery bypass graft surgery
CI = confidence interval
CVA = cerebrovascular accident
DES = drug-eluting stent(s)
HR = hazard ratio
ICD = International Classification of Diseases
PCI = percutaneous coronary intervention
STEMI = ST-segment elevation myocardial infarction

Methods

Study population. In this descriptive study, we included all patients in Sweden undergoing their first PCI procedure between January 1990 and December 2010. All repeat procedures were excluded, to use the information from each patient only once. A PCI procedure was defined as any use of a guidewire for more than only diagnostic purposes. Patients without a Swedish personal identification number and patients with a missing procedure type were excluded.

SCAAR data. The SCAAR (Swedish Coronary Angiography and Angioplasty Registry), which is a part of the SWEDEHEART registry, documents all consecutive coronary angiographies and PCI procedures performed in Sweden (9,10). All 30 hospitals with a catheterization laboratory enroll all patients. During the first years, a few PCI procedures may have been performed outside of the SCAAR registry. The data are collected prospectively, according to data registration standards for clinical practice, and are audited and monitored as previously described (11,12). Data about medical history were obtained from the National Patient Register. In this register, the discharge diagnoses are collected of all hospitalizations in Sweden on the basis of the International Classification of Diseases (ICD), from 1987 and forward (13). The vital status and date of death were obtained from the Swedish National Population Registry until December 31, 2011; hence, all patients have at least 1-year of follow-up. Data from these national registers were merged with SCAAR on the basis of the personal identification number that all Swedish citizens have. The merging was performed by the Epidemiologic Center of the Swedish National Board of Health and Welfare, and was approved by the ethics committee of Uppsala University.

The indication for PCI was categorized as stable coronary artery disease, unstable coronary artery disease (non-STEMI with or without elevation of biomarkers of cardiac ischemia), STEMI, and other (e.g., cardiac arrest, heart failure, and arrhythmia). The definitions of the different indications have not changed over time. In SCAAR, smoking was defined as smoking in the 30 days before the PCI procedure. The risk factors diabetes mellitus, hyperlipidemia, and hypertension were defined by the medical treatment for the condition at the time of the PCI procedure. For diabetes, patient history and hospital records were also evaluated to include patients with diabetes on a dietary treatment.

Statistical analysis. The patients were divided into 8 different cohorts on the basis of the year of the first PCI procedure. New registry variables and therapies were introduced during the study period and, therefore, data are partly or completely missing in some year cohorts. Categorical variables are presented as frequency values and proportions. Continuous variables with a normal distribution are presented as mean ± SD. We have chosen not to present p values for the patient characteristics because this study does not include a sample, but rather the total population. The cumulative incidence of mortality was presented by Kaplan-Meier event curves for the different year cohorts. Cox regression analyses were performed to adjust for covariates. We adjusted only for age and indication, as not all baseline variables were available in all year cohorts. The adjusted hazard ratio (HR) is reported together with the corresponding 95% confidence interval (CI). The log minus log test and the scaled Schoenfeld residuals were performed to test the proportional hazard assumption of the covariates. In addition, sex-specific outcome was evaluated, and we also performed the analyses for all PCI procedures, included repeated PCI procedures. For the survival analyses, 2-sided p values <0.05 were defined as significant. Statistical analyses were performed using SPSS version 20.0 (SPSS, IBM Corporation, Armonk, New York).

Results

A total of 450,859 procedures were performed in 317,444 patients admitted to any catheterization laboratory in Sweden between January 1990 and December 2010 (Fig. 1). A total of 144,039 patients undergoing a PCI for the first time (72.5%) were analyzed. In SCAAR, the annual incidence of first-time PCI increased to 13,189 patients in 2006 and remained relatively stable thereafter. The number of hospitals performing PCI procedures increased from 9 between 1990 to 1995 to 29 in 2007 and onwards (Table 1).

Available data. Age and sex were available for all included patients, and the indication for PCI was available for 99.5% of the patients. Diabetes, hypertension, hyperlipidemia, and

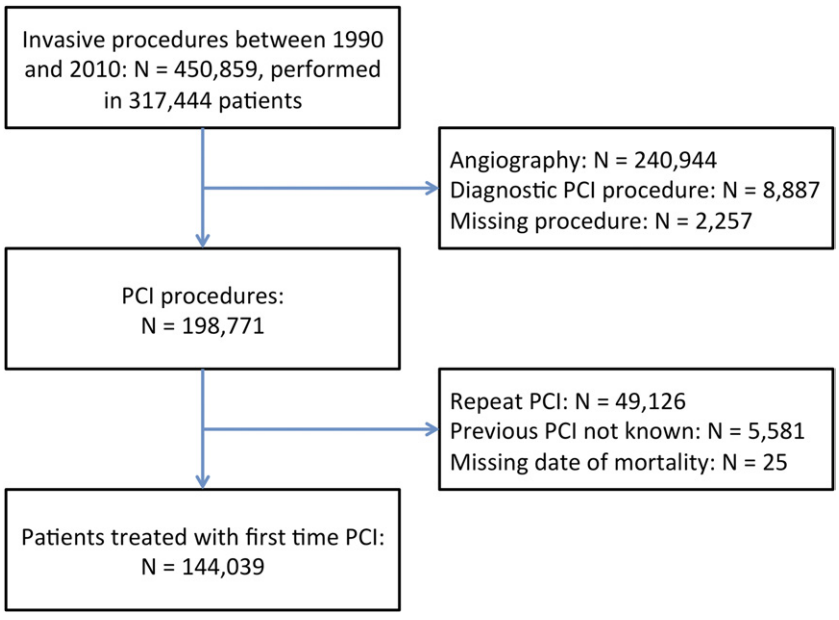

Figure 1 Flow Chart

Flow chart of the percutaneous coronary intervention (PCI) patients included in the analysis.

smoking were not registered before 1995. From 1995 to 1998, 80% of these data were missing. However, risk factor data increased over time, and there were no missing data after 2005. The angiographic findings were available in 52% of the patients between 1996 and 2002. From 2003, 99.5% of the angiographic data were available. Data regarding type of stent (BMS or DES) were available for 86% of stented patients during 2002, and for all patients afterwards. In addition, stent length and diameter were available for 60% until 2002, and for 100% afterward. For medication, data were complete in 99.8% of the patients after the introduction of each variable.

Table 1 Baseline Characteristics

Variable	1990–1995 (n = 10,200)	1996–1998 (n = 9,825)	1999–2000 (n = 11,121)	2001–2002 (n = 15,738)	2003–2004 (n = 20,801)	2005–2006 (n = 25,679)	2007–2008 (n = 25,532)	2009–2010 (n = 25,143)
Number of hospitals	9	11	14	22	26	27	29	29
Mean age, yrs	60.1 ± 9.9	61.9 ± 10.4	63.1 ± 10.8	64.1 ± 10.8	65.3 ± 10.9	66.6 ± 11.0	66.7 ± 11.2	67.1 ± 11.2
≥75 yrs	592 (5.8%)	1,172 (11.9%)	1,773 (15.9%)	3,019 (19.2%)	4,716 (22.7%)	6,887 (26.8%)	7,011 (27.5%)	7,131 (28.4%)
Male	7,489 (73.4%)	7,150 (72.8%)	7,942 (71.4%)	11,189 (71.1%)	14,882 (71.5%)	18,311 (71.3%)	18,054 (70.7%)	17,986 (71.5%)
Indication								
Stable CAD	6,583 (66.4%)	5,125 (53.2%)	4,179 (37.6%)	4,917 (31.3%)	4,944 (24.0%)	5,185 (20.2%)	4,425 (17.3%)	4,240 (16.9%)
Unstable CAD	2,715 (27.4%)	3,584 (37.2%)	5,223 (47.0%)	7,403 (47.1%)	10,656 (51.7%)	12,521 (48.8%)	12,174 (47.7%)	12,000 (47.7%)
STEMI	611 (6.2%)	883 (9.2%)	1,569 (14.1%)	2,675 (17.0%)	4,818 (23.4%)	7,569 (29.5%)	8,402 (32.9%)	8,180 (32.5%)
Other	10 (0.1%)	43 (0.4%)	150 (1.3%)	735 (4.7%)	202 (1.0%)	404 (1.6%)	531 (2.1%)	723 (2.9%)
Current smoker		459 (19.7%)	2,279 (20.5%)	3,292 (21.6%)	4,473 (21.5%)	5,433 (21.2%)	5,533 (21.7%)	5,474 (21.8%)
Diabetes mellitus		314 (13.4%)	1,744 (15.7%)	2,530 (16.6%)	3,396 (16.4%)	4,492 (17.5%)	4,310 (16.9%)	4,397 (17.5%)
Hyperlipidemia		1,088 (61.2%)	5,079 (49.0%)	6,644 (46.4%)	9,898 (48.5%)	11,491 (44.7%)	10,348 (40.5%)	9,997 (39.8%)
Hypertension		802 (34.4%)	3,994 (36.0%)	5,250 (34.4%)	9,078 (43.7%)	11,985 (46.7%)	12,414 (48.6%)	12,919 (51.4%)
History of								
Myocardial infarction	3,623 (35.5%)	3,337 (34.0%)	3,319 (29.8%)	3,972 (25.2%)	3,882 (18.7%)	3,576 (13.9%)	2,799 (11.0%)	2,483 (9.9%)
CABG	624 (6.1%)	770 (7.8%)	890 (8.0%)	1,215 (7.7%)	1,483 (7.1%)	1,682 (6.6%)	1,684 (6.6%)	1,572 (6.3%)
Heart failure	557 (5.5%)	705 (7.2%)	785 (7.1%)	1,091 (6.9%)	1,323 (6.4%)	1,615 (6.3%)	1,388 (5.4%)	1,380 (5.5%)
Stroke	368 (3.6%)	527 (5.4%)	609 (5.5%)	899 (5.7%)	1,214 (5.8%)	1,668 (6.5%)	1,577 (6.2%)	1,542 (6.1%)
Renal failure	44 (0.4%)	88 (0.9%)	114 (1.0%)	166 (1.1%)	226 (1.1%)	367 (1.4%)	380 (1.5%)	447 (1.8%)

Values are mean ± SD or n (%).
CABG = coronary artery bypass grafting; CAD = coronary artery disease; STEMI = ST-segment elevation myocardial infarction.

Baseline and procedural characteristics. The mean age of the PCI patients increased over the year cohorts, from a mean age of 60.1±9.9 years in the cohort 1990 to 1995, to 67.1±11.2 years in the cohort 2009 to 2010 (Table 1). The proportion of patients ages ≥75 years increased from 5.8% to 28.4%. The indication for PCI changed over time, with a majority of patients treated for stable coronary artery disease (66.4%) in 1990 to 1995, and a majority treated for unstable coronary artery disease (47.7%) or STEMI (32.5%) in 2009 to 2010 (Fig. 2). The proportion of smokers was between 19.7% and 21.8% in the different year cohorts. Diabetes and hypertension increased while hyperlipidemia decreased, and a lower proportion of patients had a history of myocardial infarction over time. Three-vessel disease increased from 3.8% in the cohort 1990 to 1995, to 17.3% to 19.0% in the cohorts from 2003 to 2010 (Table 2). In addition, stent use increased from nearly no stent usage (0.8%) to approximately 93% from the cohort 2003 to 2004 and later. Among the patients treated with a stent, the proportion receiving DES varied between 17.2% and 48.0% after its introduction in 2002.

Mortality. Figure 3A shows the mortality for the different year cohorts, with a median follow-up of 2,082 days (interquartile range: 1,105 to 3,335 days), and up to 21 years of total follow-up. The mortality rate was higher in the later year cohorts compared to the earlier year cohorts. Mortality at 1 year after PCI increased from 2.2% in 1990 to 1995, to 5.9% in 2009 to 2010 (Table 3). After adjustment for age and indication, a modest decrease in the mortality risk was seen over time (Fig. 3B). That was mainly due to a decrease in the risk of mortality in the subgroup of STEMI patients, with an age-adjusted HR up to approximately 2 in the earlier year cohorts, compared to the reference cohort 2009 to 2010 (Table 3, Fig. 4). Furthermore, the unadjusted mortality rate was lower in males compared to females in the long term after PCI (HR: 0.82 [95% CI: 0.80 to 0.84]). However, after adjustment for age, indication, and year cohort, no sex difference was seen at 1 year after PCI (HR: 1.00 [95% CI: 0.95 to 1.06]), whereas males had a slightly higher risk of mortality in the long term (HR: 1.12 [95% CI: 1.09 to 1.15]). When we performed the analyses in all PCI procedures, including repeated PCI procedures, the results were consistent.

Discussion

We evaluated the clinical characteristics of all consecutive patients undergoing a first PCI procedure in Sweden in the last 2 decades. The mean age of the PCI treated population increased, and patients were more often treated for unstable coronary artery disease or STEMI over time. As a consequence of the older population, the proportion of patients with comorbidities increased. Mortality after PCI was influenced by the increasing age and the changing indication for PCI.

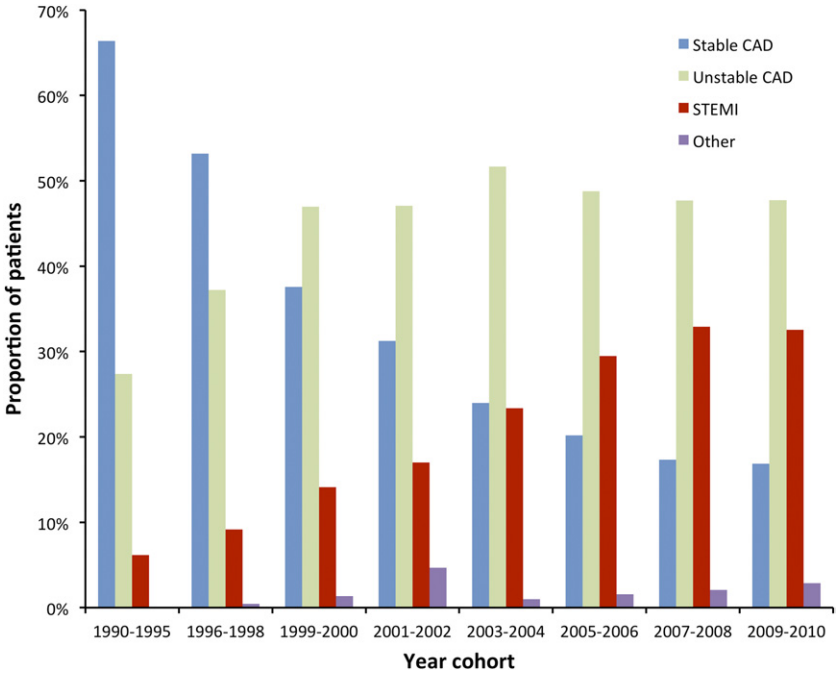

Figure 2 Indication for PCI Procedure

Proportion of patients undergoing percutaneous coronary intervention (PCI) for stable coronary artery disease (CAD) **(blue bars)**, unstable CAD **(green bars)**, ST-segment elevation myocardial infarction (STEMI) **(red bars)**, and other **(lavender bars)** in the different year cohorts.

Table 2 Angiographic and Procedural Characteristics

Variable	1990–1995 (n = 10,200)	1996–1998 (n = 9,825)	1999–2000 (n = 11,121)	2001–2002 (n = 15,738)	2003–2004 (n = 20,801)	2005–2006 (n = 25,679)	2007–2008 (n = 25,532)	2009–2010 (n = 25,143)
Angiographic findings								
1-vessel disease	7,266 (73.1%)	5,282 (71.0%)	1,772 (49.3%)	3,975 (48.7%)	9,544 (47.5%)	11,660 (45.9%)	12,222 (48.0%)	11,689 (46.5%)
2-vessel disease	2,082 (20.9%)	1,617 (21.7%)	1,138 (31.7%)	2,546 (31.2%)	6,095 (30.3%)	7,648 (30.1%)	7,390 (29.0%)	7,246 (28.8%)
3-vessel disease	376 (3.8%)	382 (5.1%)	547 (15.2%)	1,380 (16.9%)	3,570 (17.8%)	4,817 (19.0%)	4,462 (17.5%)	4,344 (17.3%)
Left main CAD	58 (0.6%)	114 (1.5%)	96 (2.7%)	207 (2.5%)	809 (4.0%)	1,156 (4.6%)	1,147 (4.5%)	1,232 (4.9%)
Stent use	80 (0.8%)	1,541 (15.7%)	9,552 (85.9%)	14,064 (89.4%)	19,339 (93.0%)	23,962 (93.3%)	23,681 (92.8%)	23,335 (92.8%)
Drug-eluting stent				111 (1.0%)	5,608 (29.1%)	11,500 (48.0%)	4,083 (17.2%)	7,476 (32.0%)
Number of stents								
1		943 (9.6%)	4,328 (38.9%)	7,708 (49.0%)	11,740 (56.4%)	12,773 (49.7%)	13,084 (51.2%)	12,747 (50.7%)
2		100 (1.0%)	1,179 (10.6%)	2,738 (17.4%)	5,311 (25.5%)	7,910 (30.8%)	7,904 (31.0%)	7,780 (30.9%)
≥3		3 (0.0%)	313 (2.8%)	1,117 (7.1%)	2,233 (10.7%)	3,278 (12.8%)	2,693 (10.5%)	2,825 (11.2%)
Stent size, mm								
Stent length		20.53 ± 8.47	18.98 ± 11.01	21.42 ± 13.23	25.80 ± 15.84	29.06 ± 17.83§	27.53 ± 16.27	29.09 ± 17.41
Stent diameter		3.00 ± 0.39	3.05 ± 0.43	3.09 ± 0.44	3.05 ± 0.46	3.01 ± 0.48	3.06 ± 0.49	3.05 ± 0.51
General success rate	8,207 (90.3%)	8,489 (93.1%)	10,413 (98.5%)	13,926 (97.2%)	19,417 (95.1%)	24,168 (94.1%)	24,036 (94.1%)	23,682 (94.2%)
Medication								
Aspirin before PCI					17,593 (84.6%)	23,407 (91.2%)	23,238 (91.0%)	23,131 (92.0%)
Aspirin during PCI					1,803 (8.7%)	1,731 (6.8%)	1,745 (6.8%)	1,451 (5.8%)
P2Y12 inhibitor before PCI					11,213 (54.0%)	18,520 (72.2%)	20,791 (81.4%)	21,157 (84.2%)
P2Y12 inhibitor during PCI					5,660 (27.3%)	5,598 (22.0%)	3,909 (15.3%)	3,459 (13.8%)
GPIIb/IIIa inhibitor before PCI					1,117 (5.4%)	1,635 (6.4%)	1,003 (3.9%)	436 (1.7%)
GPIIb/IIIa inhibitor during PCI					7,344 (35.4%)	8,806 (34.5%)	7,553 (29.6%)	4,616 (18.4%)
Bivalirudin before PCI						22 (0.1%)	63 (0.2%)	118 (0.5%)
Bivalirudin during PCI						2,163 (10.0%)	4,718 (18.5%)	7,005 (27.9%)
Acute CABG after PCI	121 (1.2%)	49 (0.5%)	32 (0.3%)	16 (0.1%)	22 (0.1%)	29 (0.1%)	16 (0.1%)	11 (0.0%)

Values are n (%) or mean± SD.

GP = glycoprotein; PCI = percutaneous coronary intervention; other abbreviations as in Table 1.

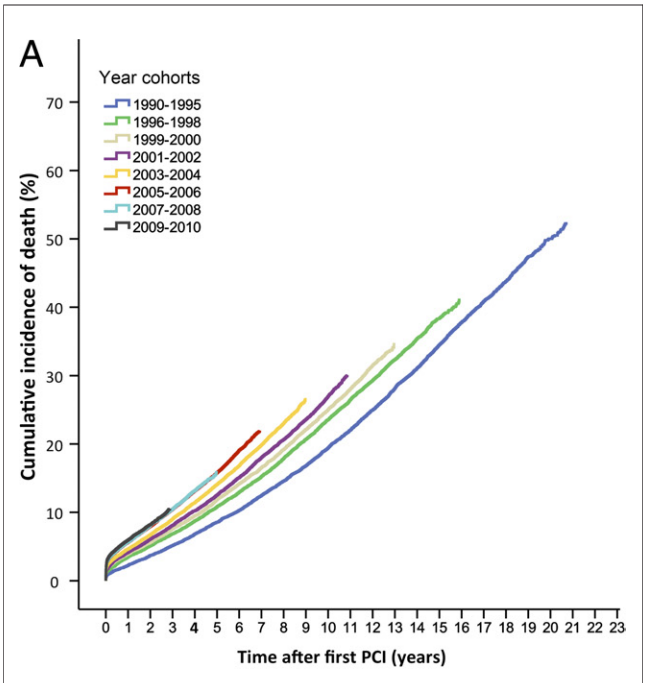

Figure 3 **Total Mortality in the Different Year Cohorts**

(A) Cumulative incidence of death in the different year cohorts. **(B)** Adjusted survival curve for the risk of death in the different year cohorts, adjusted for age and indication.

This study gives an overview of a nationwide population including virtually all patients undergoing a PCI procedure for the first time in all PCI centers in Sweden. To be able to interpret the results of clinical trials and registries, it is important to understand how the PCI population has changed over time. Changing characteristics of PCI patients have been previously described by Singh et al. (14) in a large

Table 3 **Mortality at 1-Year Follow-Up**

Variable	1990–1995 (n = 10,200)	1996–1998 (n = 9,825)	1999–2000 (n = 11,121)	2001–2002 (n = 15,738)	2003–2004 (n = 20,801)	2005–2006 (n = 25,679)	2007–2008 (n = 25,532)	2009–2010 (n = 25,143)	p Value for Trend
Overall population									
Number of deaths	223 (2.2%)	334 (3.4%)	437 (3.9%)	649 (4.1%)	961 (4.6%)	1,439 (5.6%)	1,446 (5.7%)	1,495 (5.9%)	
Adj. HR (95% CI)*	1.17 (1.01–1.35)	1.39 (1.23–1.57)	1.22 (1.10–1.36)	1.04 (0.94–1.14)	1.05 (0.97–1.14)	1.05 (0.97–1.13)	0.98 (0.91–1.05)	1.00 (ref.)	<0.001
Stable CAD									
Number of deaths	105 (1.6%)	99 (1.9%)	70 (1.7%)	86 (1.7%)	106 (2.1%)	95 (1.8%)	89 (2.0%)	92 (2.2%)	
Adj. HR (95% CI)	1.17 (0.88–1.55)	1.27 (0.96–1.70)	1.02 (0.75–1.39)	0.98 (0.73–1.31)	1.12 (0.84–1.48)	0.89 (0.67–1.19)	0.96 (0.72–1.29)	1.00 (ref.)	0.271
Unstable CAD									
Number of deaths	61 (2.2%)	112 (3.1%)	173 (3.3%)	258 (3.5%)	411 (3.9%)	540 (4.3%)	488 (4.0%)	505 (4.2%)	
Adj. HR (95% CI)	0.86 (0.66–1.12)	1.03 (0.84–1.27)	1.02 (0.86–1.22)	1.03 (0.89–1.20)	1.06 (0.93–1.20)	1.07 (0.95–1.21)	0.98 (0.87–1.11)	1.00 (ref.)	0.704
STEMI									
Number of deaths	56 (9.2%)	117 (13.3%)	182 (11.6%)	247 (9.2%)	428 (8.8%)	760 (10.0%)	804 (9.6%)	767 (9.4%)	
Adj. HR (95% CI)	1.66 (1.26–2.18)	2.21 (1.82–2.68)	1.74 (1.48–2.05)	1.26 (1.09–1.45)	1.10 (0.98–1.24)	1.11 (1.01–1.23)	1.03 (0.94–1.14)	1.00 (ref.)	<0.001

Value are n (%) or adjusted (Adj.) hazrad ratio (HR) (95% Confidence interval [CI]). *Adjusted for age (years) and indication (stable coronary artery disease, unstable coronary artery disease, ST-segment elevation myocardial infarction, other).
ref. = reference category; other abbreviations as in Tables 1 and 2.

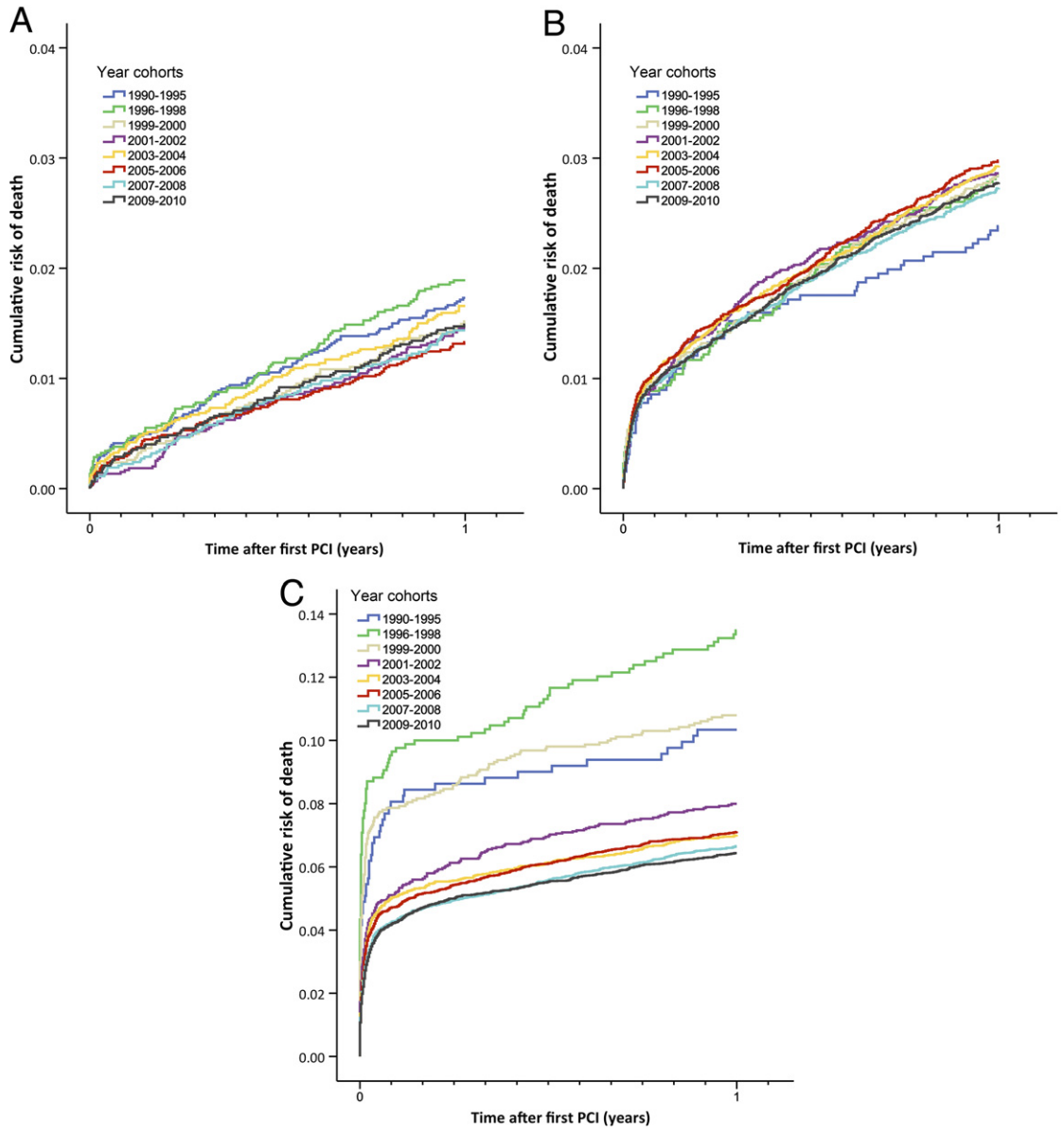

Figure 4 **Mortality During the First Year for Every Indication, Adjusted**

Age-adjusted survival curve for the risk of death in the different year cohorts during the first year: 1990 to 1995 **(blue line)**; 1996 to 1998 **(green line)**; 1999 to 2000 **(tan line)**; 2001 to 2002 **(purple line)**; 2003 to 2004 **(yellow line)**; 2005 to 2006 **(red line)**; 2007 to 2008 **(turquoise line)**; and 2009 to 2010 **(black line)**. **(A)** Stable coronary artery disease; **(B)** unstable coronary artery disease; **(C)** ST-segment elevation myocardial infarction. PCI = percutaneous coronary intervention.

cohort over 25 years, but did only include patients from a single institution.

The mean age of the PCI patients increased by 7 years over the 20-year study period. Patients ages ≥75 years currently represent 28% of the whole PCI population. As mortality rates have been reduced in elderly thanks to evidence-based treatment for acute coronary syndromes (15), guidelines nowadays recommend an invasive strategy for this high-risk subgroup (8). In addition, we observed a change in the indication of PCI over time, with an increase in the proportion of patients undergoing a PCI procedure for acute coronary syndromes. This change was mainly caused by an increase in the total number of patients with unstable coronary artery disease and STEMI undergoing PCI. In patients with STEMI, primary PCI is the recommended therapy, and it has been implemented over the years (5,6,16). In addition, it has also been shown that patients with non-STEMI acute coronary syndromes benefit from an early invasive strategy compared to a conservative therapy (17).

Stent use increased substantially to a proportion of approximately 93%, which was consistent with other contemporary studies (18). The proportion of patients receiving DES increased rapidly until 2006, followed by a sharp decline. The uncertainty about the risk of late stent thrombosis in patients receiving DES compared to BMS and a recommendation of a restricted use of DES by the Swedish health authorities greatly influenced this (19). The documented reduction in the incidence of restenosis, especially in specific subgroups such as small stent diameter, long stents, and patients with diabetes, contributed to a new increase in the use of DES from 2008 (4).

Many efforts have been made to improve clinical outcomes in patients with significant coronary artery disease. In our study, unadjusted data showed that the mortality increased over the year cohorts. After adjustment for the increasing age and the changing indication, the mortality risk decreased over time. This finding greatly illustrates the influence of the changing PCI population on outcome. In the subgroup of STEMI patients, we observed a lower mortality in the consecutive year cohorts. Nevertheless, it is important to emphasize the changing selection of STEMI patients undergoing a PCI procedure, as STEMI patients received fibrinolysis as the primary reperfusion therapy in the earlier years. In addition, pre-treatment with antithrombotic and antiplatelet therapies may have contributed to a decrease in mortality over time.

Study limitations. As in all observational studies of registry data, there are several limitations that need to be addressed. Data from observational registries typically have lower quality, and there are more missing data as compared to randomized clinical trials. Because of missing data in the first year cohorts, we did not adjust for all potential confounders in the Cox regression analysis for mortality. In addition, although the definitions of the different indications of PCI did not change over time, the interpretation of the definitions may have changed slightly.

Conclusions

As shown by our nationwide, all-comers study, the patient population undergoing PCI has substantially changed over the last 20 years, reflecting the establishment of new evidence into clinical practice. Despite a population with an increasing risk, the adjusted mortality modestly decreased in the overall PCI population over the different year cohorts. However, only in the subgroup of STEMI patients was a clinically relevant reduction in mortality seen over time, suggesting that the treatment for this indication continuously improves. The understanding of changing patient characteristics and baseline risk factors is important for the translation of evidence to real-world clinical practice. The changing patient population should be taken into account in the interpretation of previous studies and the design of future trials.

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