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Working Group Report

Interventional cardiology in Europe 1995

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The working group Coronary Circulation of the European Society of Cardiology conducts, with the support of the national societies of cardiology, an annual survey on cardiac interventions in Europe. This report is the fourth consecutive summary on cardiac interventions in Europe and gives an overview of interventional cardiology activities during 1995 in 30 member countries of the European Society of Cardiology, representing a population of 550 million people.

Coronary angiography A total of 1 065 485 diagnostic coronary angiograms were reported, a 15% increase compared with 1994. The mean incidence of coronary angiograms increased to 1937 per 10^6 inhabitants, ranging from 4667 per 10^6 inhabitants in Germany to 67 per 10^6 inhabitants in Romania.

Coronary angioplasty A total of 278 982 coronary angioplasty (PTCA) procedures were reported, an increase of 24% compared with 1994. The mean incidence of coronary angioplasty per capita was 507 per 10^6 inhabitants, ranging from 1358 per 10^6 inhabitants in Germany to 12 per 10^6 inhabitants in Romania. The ratio of PTCAs per coronary angiogram was 0·26, ranging from 0·40 in the Netherlands to 0·08 in Cyprus. Ad hoc PTCA (combined diagnostic angiography and PTCA) accounted for 24% of all PTCA cases. The majority (85%) of PTCA procedures were restricted to a single vessel.

Coronary stenting Coronary stents were used in 80 383 coronary interventions, an increase of 272% compared with 1994, representing the fastest growth. The European mean ratio of coronary stenting per PTCA procedure was 0·29.

Other new devices Other new interventional therapeutic devices were employed in 9798 cases, accounting for 3·5% of all coronary interventions. Coronary ultrasound was used in 4787 (1·7%) and coronary angioscopy in 543 interventions (0·2%).

Non-coronary interventions Balloon valvuloplasty remained the most frequent non-coronary intervention during 1995 with a total of 2715 mitral, 615 pulmonary, and 719 aortic valvuloplasties.

Catheterization facilities There were a mean of 2·5 diagnostic cardiac catheterization institutions with a mean of 3·4 diagnostic laboratories per 10^6 inhabitants in Europe. The number of PTCA institutions and laboratories were a mean of 0·7 and 0·9 per 10^6 inhabitants, respectively. The mean numbers of trained operators were 11 for diagnostic cardiac catheterization and eight for PTCA per 10^6 inhabitants. On average, 704 yearly coronary angiograms per diagnostic catheterization laboratory and 203 yearly PTCAs per PTCA laboratory were reported in Europe. The average operator performed 210 coronary angiograms and 78 PTCAs per year.

Conclusions During 1995, coronary angiography increased at a mean annual rate of 10% and coronary angioplasty at a mean annual rate of nearly 20% in Europe. Coronary angioplasty was employed on a single vessel per procedure in the majority of cases. Coronary stenting remained the fastest growing procedure in interventional cardiology and the European mean ratio of coronary stenting per PTCA increased to 0·29. The ratio of PTCA to CABG further increased to 1·4:1. New devices were reserved for niche indications and balloon valvuloplasty was the most frequent non-coronary intervention.
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Key Words: Coronary angiography, PTCA, coronary stent.

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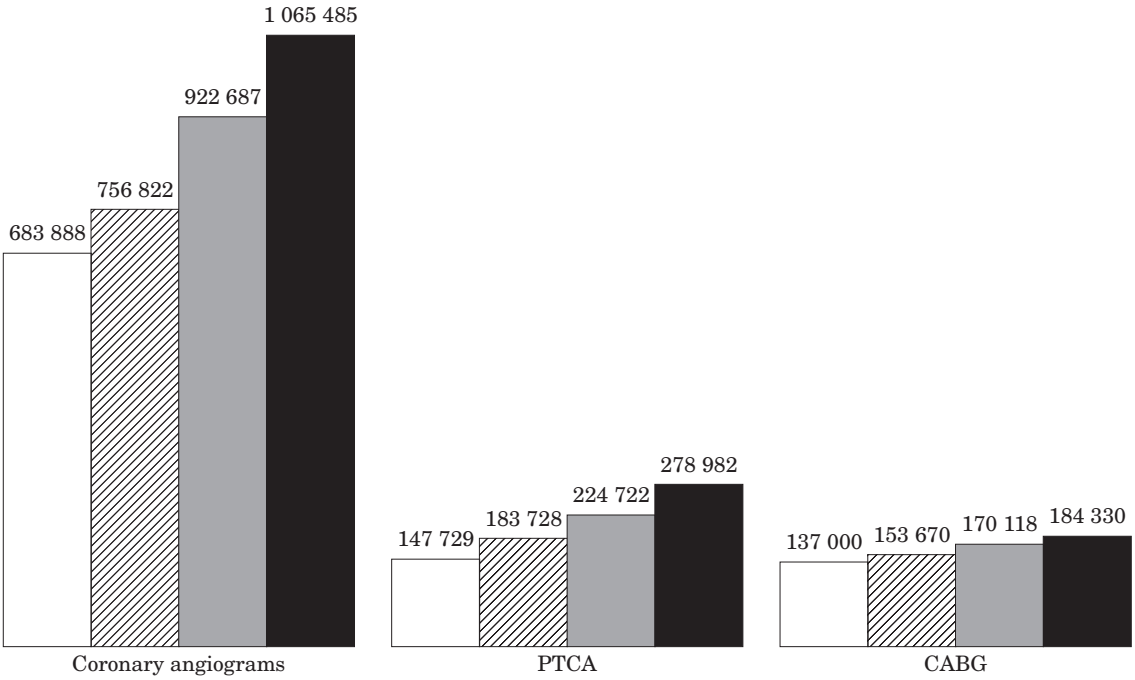

Figure 1 **Coronary angiograms, PTCA and CABG from 1992 to 1995 in Europe. □=1992; ▨=1993; ▩=1994; ■=1995.**

Introduction

Cardiovascular disease, in particular coronary artery disease, remains by far the major cause of death, disability, and hospitalization in the industrialized world[1,2]. The age-adjusted decline in cardiovascular death rates during the 1970s and 1980s diminished in recent years[2,3], but this was more than offset by the ageing of the population. Delivery of adequate cardiovascular care therefore constitutes one of the most important public health issues for the foreseeable future. In the care of patients with coronary artery disease, revascularization procedures such as coronary angioplasty (PTCA)[4,5] or coronary artery bypass grafting (CABG)[6,7] have assumed a pivotal role in alleviating symptoms and improving quality of life. PTCA has long surpassed CABG as the most frequent revascularization modality both in Europe[8,9] and the United States and has become one of the most frequently performed major therapeutic intervention in medicine. Recent technological innovations, such as coronary stenting[10–12] and adjunctive medical therapy[13–16], further heightened the efficacy and safety of percutaneous coronary interventions, encouraging their widespread utilization. However, any therapeutic intervention requires careful scrutiny with respect to immediate and long-term outcome as well as adverse effects to ensure adequate quality. Furthermore, analysis of the need for revascularization procedures in the context of different medical and socio-economic circumstances and cost-effectiveness considerations have become increasingly important. A prerequisite for any formulation of national and European guidelines on the desired utilization of cardiac interventional procedures is the availability of a database on current practice. The working group Coronary Circulation of the European Society of Cardiology therefore initiated an annual survey on coronary interventions in European countries in 1992[7,8,17]. The current report constitutes the fourth annual summary on cardiac interventions in Europe and analyses the data for the year 1995.

Methods

As in previous years, a detailed questionnaire was mailed to the presidents or designated delegates of the national societies of cardiology represented in the European Society of Cardiology. They then assumed the responsibility of distributing a copy of this questionnaire to all institutions performing diagnostic or interventional cardiac catheterization. Attached to the questionnaire were instructions and examples on how to complete the survey accurately. Upon completion the questionnaires were returned and summarized by the representatives of the national societies of cardiology to form the basis for the national summary data sheet of each country. The summary data sheets of each country were collected and entered into a central database and subsequently analysed. In cases of missing or incomplete data, the national societies were repeatedly reminded at increasingly shorter intervals. In December 1997 the registry was closed for the 1995 report. No data on cardiac interventions during 1995 were received from Luxembourg. Bulgaria and Turkey were newly added to this year's report. Sufficiently complete surveys were

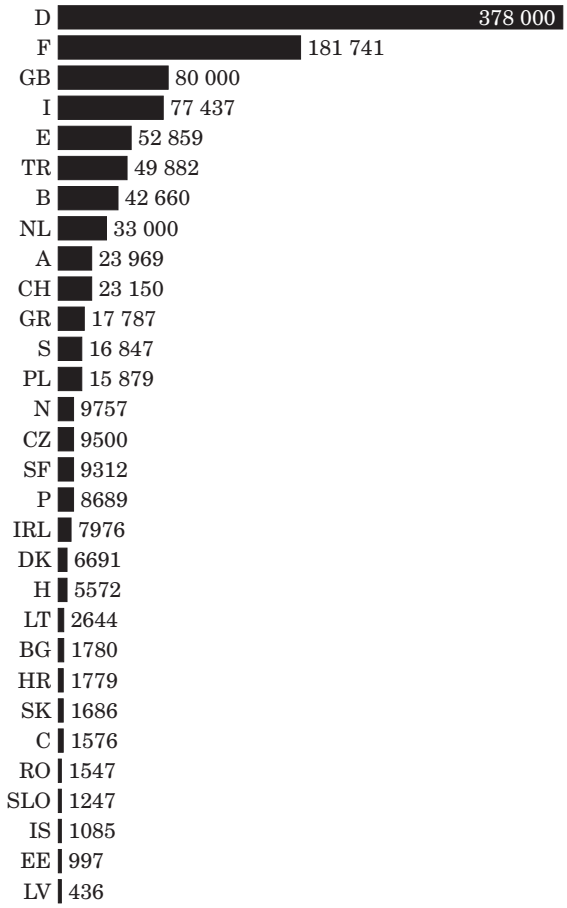

Figure 2 **Coronary angiograms per country in 1995. A=Austria, B=Belgium, BG=Bulgaria, C=Cyprus, CH=Switzerland, CZ=Czech Republic, D=Germany, DK=Denmark, E=Spain, EE=Estonia, F=France, GB=United Kingdom, GR=Greece, H=Hungary, HR=Croatia, I=Italy, IRL=Ireland, IS=Iceland, LT=Lithuania, LV=Latvia, N=Norway, NL=Netherlands, P=Portugal, PL=Poland, RO=Romania, S=Sweden, SF=Finland, SK=Slovak Republic, SLO=Slovenia, TR=Turkey.**

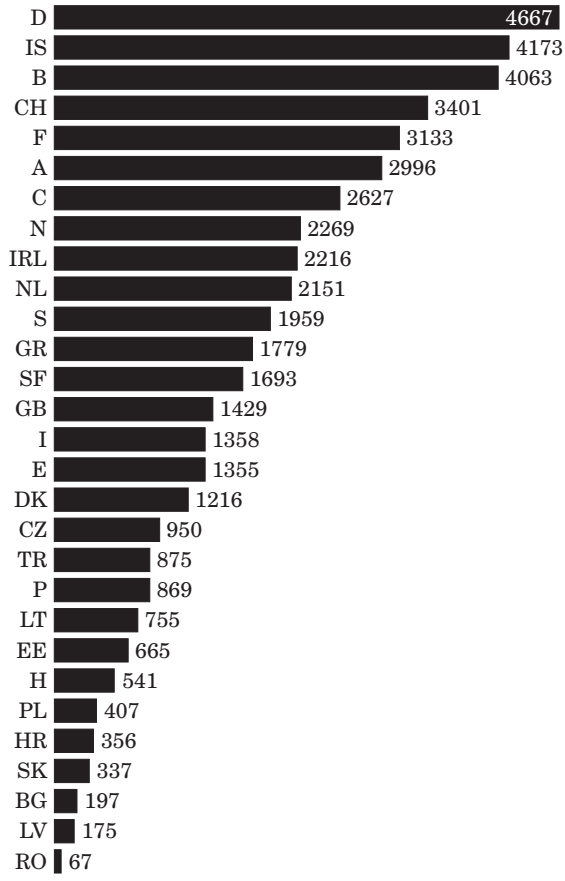

Figure 3 **Coronary angiograms per 10^6 inhabitants and country in 1995 (abbreviations as in Fig. 2).**

available from 30 countries, representing 550 million people in Europe during 1995.

The following definitions were used:

Coronary angiogram: Diagnostic catheterization with coronary angiography, irrespective of whether performed in conjunction with other diagnostic studies or PTCA.

PTCA: Coronary angioplasty procedure (case), irrespective of instrument used, the number of lesions or vessels dilated, whether a diagnostic study was carried out during the same session, or whether the patient had an additional procedure during the same year.

PTCA during diagnostic study (ad hoc): PTCA procedure performed in a single session immediately following a diagnostic study resulting in the indication for PTCA.

Single vessel PTCA: PTCA of one or more lesions in one vessel.

Multivessel PTCA: PTCA of more than one vessel in a single session.

PTCA for acute myocardial infarction: PTCA during ongoing infarction with or without fibrinolysis (primary PTCA).

Results

Coronary angiography

In Europe 1 065 485 coronary angiograms were performed during 1995, a 15% increase compared with 1994 (922 687) (Fig. 1). As in the previous year, the highest number was reported from Germany with 378 000 coronary angiograms and the lowest number from Latvia with 436 coronary angiograms (Fig. 2). Coronary angiograms continued to expand in almost all European countries compared with the previous year, with the highest increase observed in Romania (77%), followed by the Czech Republic and Sweden (46%, respectively). The population adjusted rate of coronary angiograms was a mean of 1937 per 10^6 inhabitants for all of Europe during 1995 (3% increase compared with 1881 per 10^6 inhabitants in 1994) ranging from as high as 4667 per 10^6 inhabitants in Germany to as low as 67 per 10^6

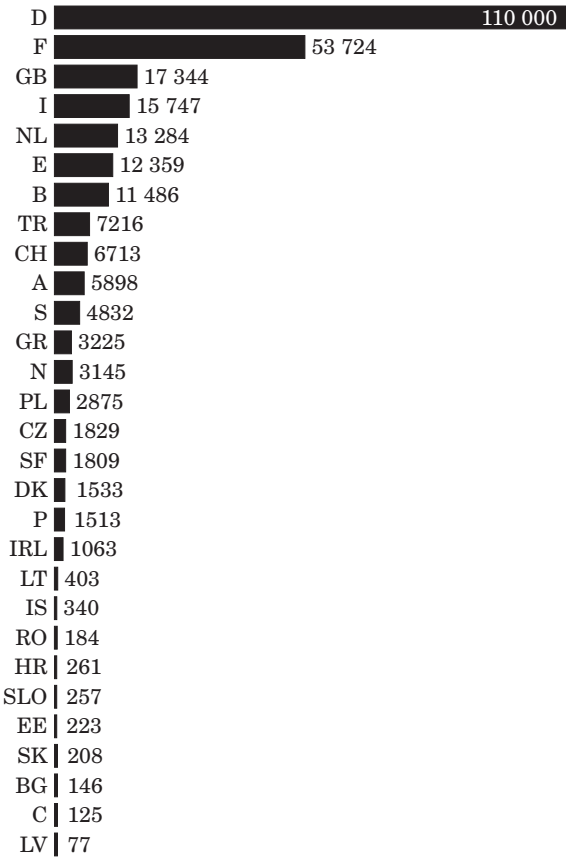

Figure 4 **PTCAs per country in 1995 (abbreviations as in Fig. 2).**

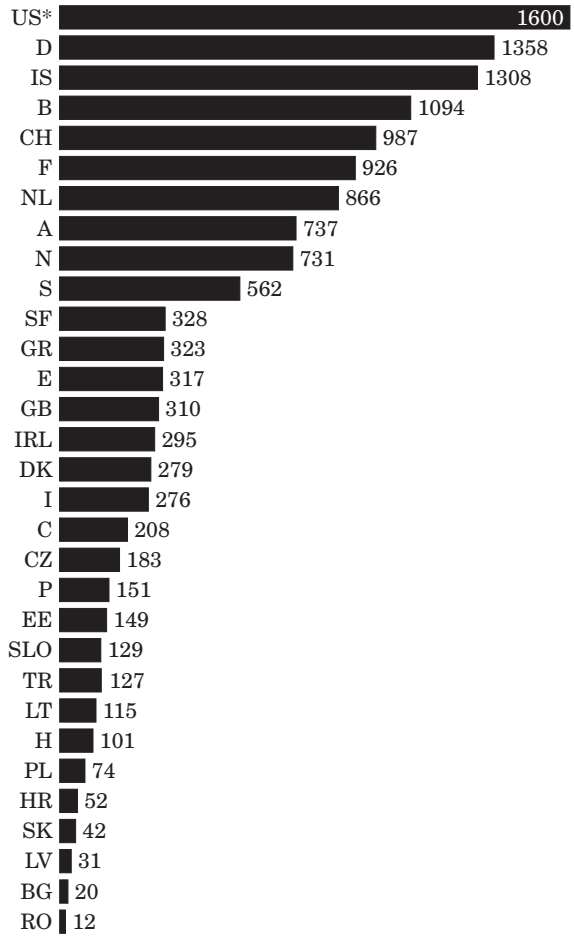

Figure 5 **PTCAs per 10^6 inhabitants and country in 1995 (abbreviations as in Fig. 2; US* : United States, data (1995) adapted from reference[18].**

inhabitants in Romania (Fig. 3). More than 3000 coronary angiograms per 10^6 inhabitants were reported from Germany, Iceland, Belgium, Switzerland, and France, whereas less than 500 coronary angiograms per 10^6 inhabitants were observed in Poland, Croatia, Slovakia, Bulgaria, Latvia, and Romania.

Coronary angioplasty

A total of 278 982 PTCA procedures was performed in Europe during 1995, a 24% increase compared with 1994 (Fig. 4). The population-adjusted number of PTCAs increased by 11% from a mean of 458 per 10^6 inhabitants in 1994 to a mean of 507 per 10^6 inhabitants in 1995. For reference, an estimated number of 400 000 PTCAs (1600 per 10^6 inhabitants) were performed in the United States during 1995[18]. The highest absolute and population adjusted number of PTCAs was reported from Germany with 110 000 procedures (1358 per 10^6 inhabitants) (Figs 4 and 5). In contrast, the lowest absolute number of PTCAs was observed in Latvia with 77 procedures and the lowest number of PTCAs per population in Romania with 12 PTCAs per 10^6 inhabitants in 1995. Fewer PTCAs as compared with 1994 were only reported from Croatia, while all other countries recorded an increase of PTCA interventions. Lithuania had the largest increase of 119%, followed by the Czech Republic (58%) and Cyprus (56%). Greece and Sweden, which recorded a small decrease of PTCA interventions during 1994, demonstrated a strong increase in the number of PTCAs of 43% and 27%, respectively, during 1995. More than 1000 PTCAs per 10^6 inhabitants were reported in decreasing order from Germany, Iceland, and Belgium, whereas fewer than 100 PTCAs per 10^6 inhabitants were observed in Poland, Croatia, Slovakia, Latvia, Bulgaria, and Romania.

Due to the faster growth of PTCA compared with coronary angiography during 1995, the mean ratio of PTCAs per coronary angiogram slightly increased from 0·24 in 1994 to 0·26 in 1995. The ratio of PTCAs to coronary angiograms ranged from as high as 0·40 in the Netherlands to as low as 0·08 in Cyprus (Fig. 6). Similarly, the percentage of PTCA procedures performed at the time of the diagnostic study (ad hoc PTCA) increased from 20% in 1994 to 24% in 1995 in Europe, compared with 16% in 1993 and 18% in 1992. The highest incidence of ad hoc PTCA occurred in Switzerland (58%), followed by Austria (50%) and the

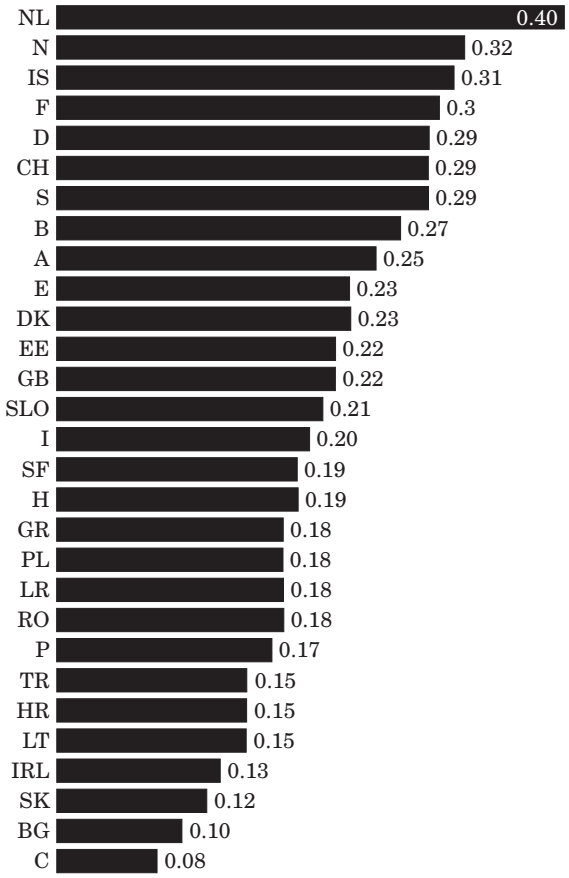

Figure 6 **PTCA per coronary angiogram in 1995 per country (abbreviations as in Fig. 2).**

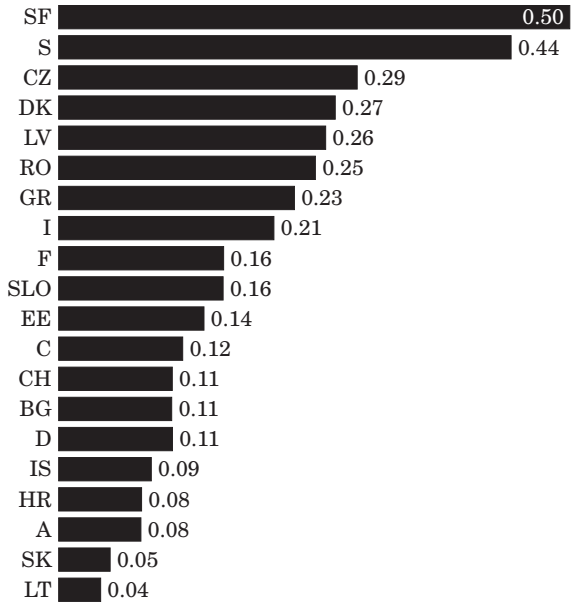

Figure 7 **Ratio of multivessel PTCAs per total PTCA per country in 1995 (abbreviations as in Fig. 2).**

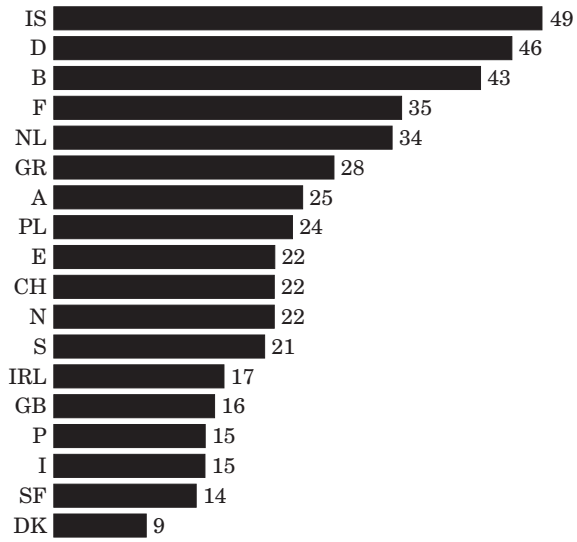

Figure 8 **Ratio of PTCAs per 10^9 US Dollars of gross domestic product (GDP) in 1995 per country (abbreviations as in Fig. 2).**

Czech Republic (50%). A single vessel was treated in 85% of all patients in 1995. The incidence of multivessel PTCA in a single session in individual European countries during 1995 is summarized in Fig. 7.

The ratio of PTCAs performed during 1995 relative to the national gross domestic product (GDP) as published by the OECD for 1995[19] was calculated in an attempt to relate the economic wealth of individual countries to their commitment to interventional cardiac care. The mean number of PTCAs per GDP increased from a mean of 28 PTCAs per 10^9 US Dollars of GDP during 1994 to a mean of 32 PTCAs per 10^9 US Dollars during 1995, ranging from as high as 49 PTCAs per 10^9 US Dollars in Iceland to as low as nine PTCAs per 10^9 US Dollars in Denmark (Fig. 8).

Coronary stenting

The number of coronary stent procedures increased by 272% from 21 599 stent cases in 1994 to 80 383 stent cases in 1995 in Europe (Fig. 9). While only 14 European nations had some experience with stent implantation during 1993, this number increased to 24 nations in 1994 and 26 nations during 1995. Germany surpassed with a total of 27 720 stent procedures (839% increase compared with 1994) France as the nation performing the highest absolute number of stent implantations (Fig. 10). However, relative to the number of PTCA interventions, France remained the nation with the highest ratio of coronary stenting per PTCA (0·51), followed by Italy (0·36), Spain (0·35) and Sweden (0·30) (Fig. 11). The European mean ratio of coronary stenting per PTCA increased from 0·10 in 1994 to 0·29 in 1995.

Other new devices

New therapeutic devices, such as laser angioplasty, directional coronary atherectomy, or rotablation were

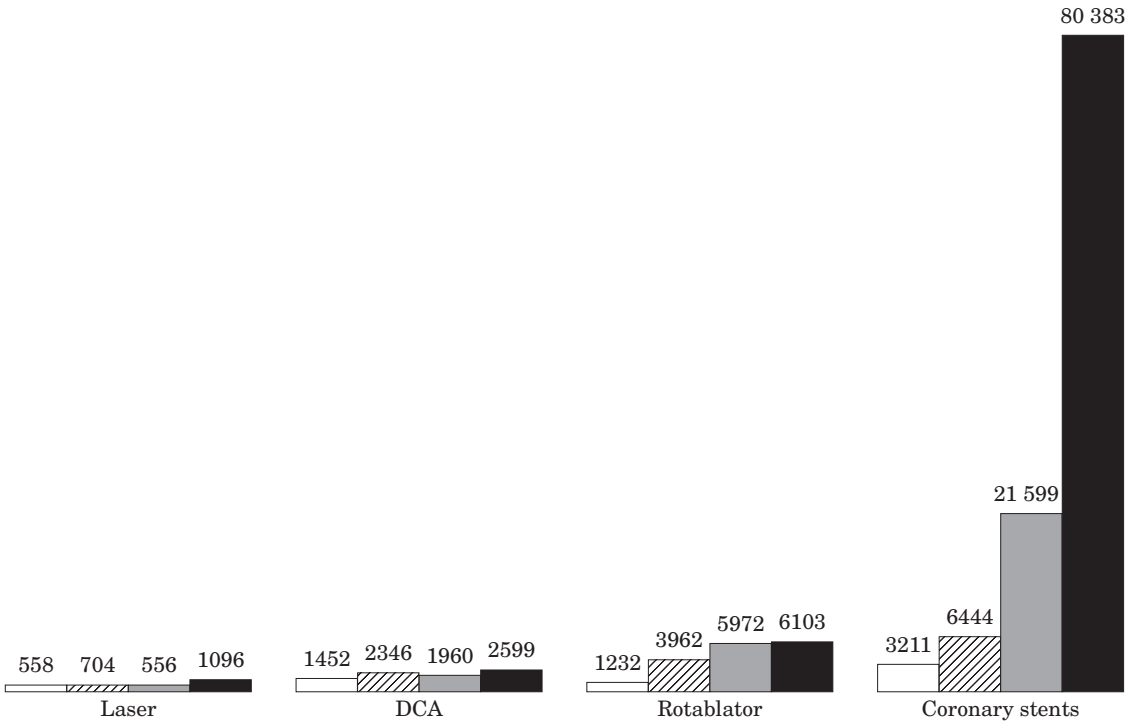

Figure 9 **New devices and coronary stents from 1992 to 1995. □=1992; ▨=1993; ▫=1994; ■=1995. DCA=directional coronary atherectomy.**

utilized in a total of 9798 interventions during 1995 in Europe. This accounts for 3·5% of all coronary interventions. The utilization of new devices has not significantly changed during the past 4 years (Fig. 9). Furthermore, the use of rotablation (91%) and directional atherectomy (75%) was largely limited to two European countries, Germany and France.

New diagnostic devices, including intracoronary ultrasound (4787), intracoronary Doppler (1241) and coronary angioscopy (543) were used in a total of 6571 interventions during 1995. Intracoronary ultrasound featured strong growth in Germany with an increase from 1383 cases in 1994 to 3267 cases in 1995, but remained infrequently used in the other European countries (Fig. 12).

Total coronary revascularization

Since the numbers of CABG procedures were collected by referring cardiologists, reporting back in some countries was deficient. The data on CABG were completed with numbers published elsewhere[20]. The distribution of revascularization procedures including the number of PTCA and CABG per population during 1995 in Europe is summarized in Fig. 13. The highest total revascularization rate for CABG and PTCA combined was achieved in Iceland (2147 per 10^6 inhabitants) and Germany (1996 per 10^6 inhabitants) and the lowest in Romania (14 per 10^6 inhabitants) with a European mean revascularization rate of 867 per 10^6 inhabitants (PTCA: 507 per 10^6 inhabitants; CABG: 360 per 10^6 inhabitants). PTCA remained the most common revascularization procedure in Europe, and the ratio of PTCA to CABG has risen to 1·4:1 in 1995. Within Europe, there continued to be a wide range of the relative contribution of each revascularization modality, ranging from a ratio PTCA to CABG as high as 6·0 in Romania to a ratio as low as 0·5 in Hungary and Slowakia.

Non-coronary interventions

Balloon valvuloplasty constituted the most frequent non-coronary intervention reported in 1995 with a total of 2715 mitral valvuloplasties (1994: 2622; 1993: 3438), 719 aortic valvuloplasties (1994: 506; 1993: 510), and 615 pulmonary valvuloplasties (1994: 609; 1993: 594) (Table 1). Seventy-eight percent of all aortic valvuloplasties were performed for congenital aortic stenosis. The distribution of these interventions per nation are summarized in Table 1. Other percutaneous interventions included closure of 324 patent ductus arteriosi (1994: 285; 1993: 189), 77 patent foraming ovali (1994: 22), 177 atrial septal defects (1994: 43; 1993: 27) and six ventricular septal defects (1994: 1; 1993: 8).

Catheterization facilities

In the 1995 survey, 17 European countries representing a population of 240 million inhabitants, provided

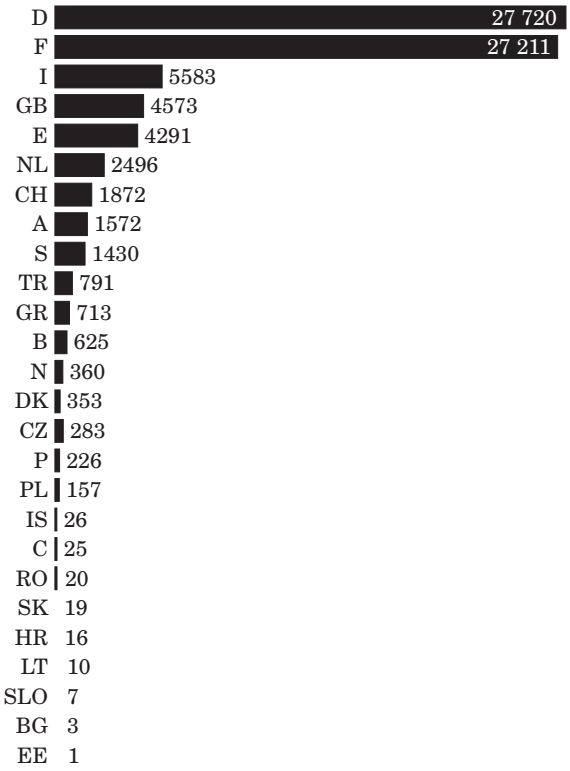

Figure 10 **Coronary stents per country in 1995 (abbreviations as in Fig. 2).**

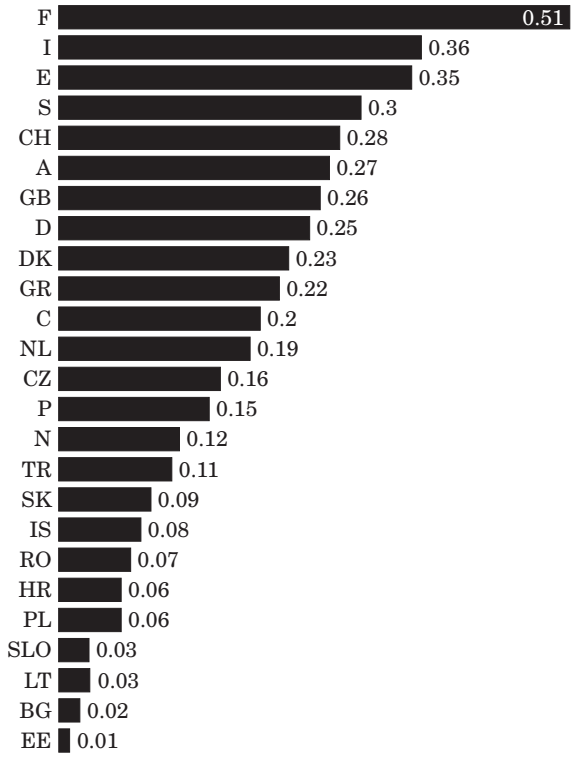

Figure 11 **Coronary stenting per PTCA per country in 1995 (abbreviations as in Fig. 2).**

information regarding the number of catheterization facilities and trained operators. There were a mean number of 2·5 diagnostic cardiac catheterization institutions with a mean of 3·4 diagnostic laboratories per 10^6 inhabitants and 0·7 PTCA institutions with a mean of 0·9 PTCA laboratories per 10^6 inhabitants in Europe during 1995. The number of diagnostic catheterization laboratories ranged from 7·7 per 10^6 inhabitants in Iceland to 0·2 per 10^6 inhabitants in Romania and the number of PTCA laboratories from 3·9 per 10^6 inhabitants in Iceland to 0·1 per 10^6 inhabitants in Romania (Table 2).

The highest population-adjusted figures of trained operators were also reported from Iceland with 39 operators for diagnostic cardiac catheterization per 10^6 inhabitants and 10 PTCA operators per 10^6 inhabitants and the lowest from Romania with 0·4 operators for diagnostic cardiac catheterization per 10^6 inhabitants and 0·3 PTCA operators per 10^6 inhabitants. The European mean numbers were 11 operators per 10^6 inhabitants for diagnostic catheterization and eight operators per 10^6 inhabitants for PTCA interventions (Table 2).

The ratios of coronary angiograms and PTCAs relative to the number of available catheterization laboratories in 1995 were calculated for each country. The highest number of coronary angiograms per diagnostic catheterization laboratory was reported from Cyprus, with 1576 diagnostic cardiac catheterizations per laboratory and the highest number of PTCAs per catheterization laboratory was documented in Iceland with 340 PTCAs per laboratory. In contrast, the smallest number was reported from Latvia with 218 coronary angiograms per laboratory and the lowest number of PTCA from Bulgaria with 45 PTCAs per laboratory. The European mean was 704 coronary angiograms and 203 PTCAs per catheterization laboratory (Table 2).

Similarly, the ratio of coronary angiograms and PTCAs performed in 1995 relative to the number of trained operators was calculated for each country (Table 2). The highest number of diagnostic cardiac catheterizations per operator was reported from Italy with 409 coronary angiograms per trained operator and the highest number of PTCAs from Sweden with 121 PTCAs per trained operator. In contrast, the smallest numbers were observed in Bulgaria with 77 coronary angiograms per trained operator and 26 PTCAs per trained operator. The European mean numbers were 210 coronary angiograms per trained operator and 78 PTCAs per trained operator.

Discussion

The working group Coronary Circulation of the European Society of Cardiology has conducted an annual survey of cardiac interventions since 1992[7,8,17], and this report summarizes the state and development of interventional cardiology in Europe during 1995. The information provided by the national societies of Cardiology

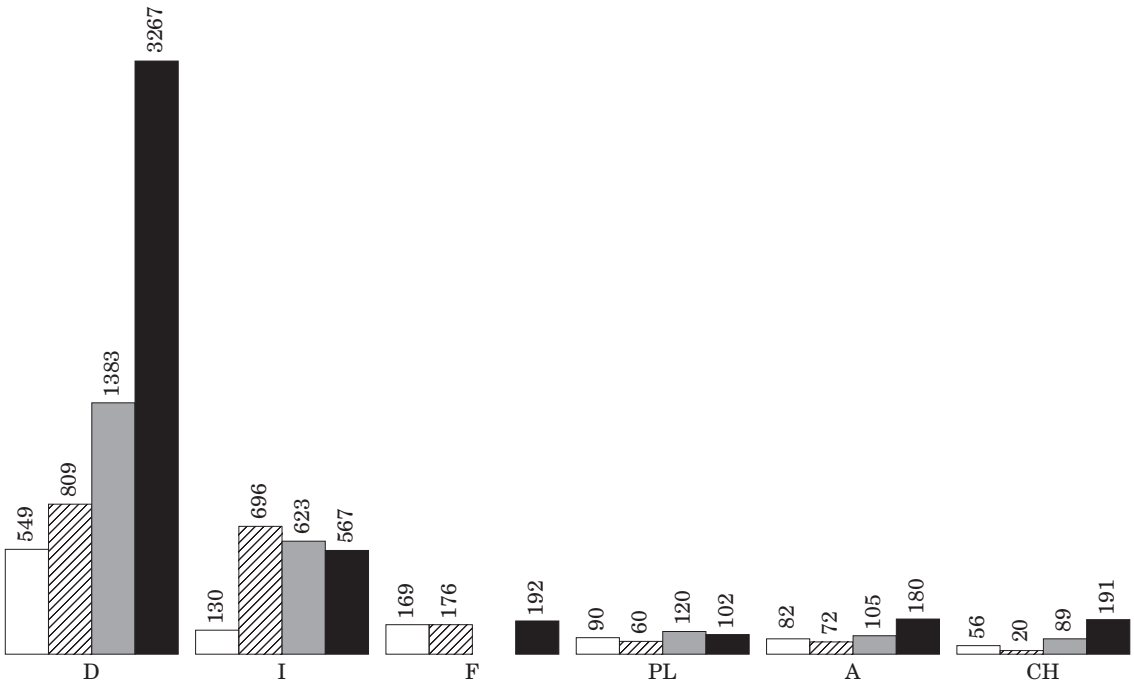

Figure 12 **Intracoronary ultrasound per country from 1992 to 1995 (abbreviations as in Fig. 2). □=1992; ▨=1993; □=1994; ■=1995.**

was voluntary and not subject to surveillance. The number of participating countries of the European Society of Cardiology increased from 23 countries in 1992 to 30 countries in 1995 representing a population of approximately 550 million people. Data provided by Bulgaria and Turkey were newly added since last year's report, whereas Luxembourg failed to provide any information and therefore was not included in this analysis.

For the first time, in 1995 more than 1 million coronary angiograms were registered in Europe with an increase of 15% compared with the previous year. In contrast, the population adjusted incidence of coronary angiograms increased by 3% to 1937 per 10^6 inhabitants compared with 1994 (1881 per 10^6 inhabitants). This surprisingly small rise is largely explained by the addition of Turkey to the survey with a relatively low number of coronary angiograms and a large population (875 coronary angiograms per 10^6 inhabitants; total population: 57 million). The fastest expansion in the utilization of coronary angiography took place in the eastern European countries, i.e. Romania (77% increase) and the Czech Republic (46% increase) due to the generally low incidence of coronary angiograms per population. However, even in the western European countries with high levels of coronary angiograms per population (>3000 per 10^6 inhabitants) coronary angiography continued to expand compared with the previous year as follows: Germany 5·7%, Iceland 27%, Belgium 18·2%, Switzerland 12·3%, France 8·8%. The ranking of nations relative to the number of coronary angiograms per population remained remarkably stable compared with the previous year.

PTCA was the most frequently employed method of coronary revascularization (278 982 PTCAs) in Europe during 1995, followed by coronary artery bypass grafting (184 330 CABGs). The number of PTCAs expanded by 24% in absolute numbers and by 11% adjusted per population to a mean of 507 PTCAs per 10^6 inhabitants compared with the previous year. Due to the faster growth of PTCA as compared with CABG, the ratio of PTCA to CABG (population adjusted mean incidence) increased to 1·4:1 in 1995. However, among European countries there was a wide range in the utilization of these two revascularization procedures. In general, northern European countries and countries with a relatively low revascularization rate favoured CABG as a primary revascularization method, whereas southern and western European countries as well as countries with high levels of revascularization preferred PTCA. One explanation for this phenomenon is the circumstance that in countries with high levels of revascularization symptomatic patients might undergo earlier cardiac catheterization and thereby have a higher incidence of one- or two-vessel disease amenable for percutaneous intervention. Other reasons might be the involvement of radiologists in the diagnostic catheterization procedure or the role of cardiac surgeons in the decision about the appropriate revascularization strategy.

Single-vessel PTCA remained the typical procedure in 1995 with only 15% of procedures classified as multivessel interventions. There was a wide range in the ratio of multivessel PTCA to the total number of PTCA procedures, from as high as 0·50 in Finland to as low as 0·04 in Lithuania. The low incidence of multivessel PTCA

comes somewhat as a surprise since several recent randomized trials reported equivalence between PTCA and CABG in terms of prognosis, but a higher requirement of subsequent revascularization procedures in patients undergoing multivessel PTCA[21–27]. The true incidence of multivessel PTCA might have been underestimated in our survey due to a restrictive definition. Thus, only patients undergoing PTCA of more than one vessel during the same intervention were considered in our survey, excluding patients undergoing a staged PTCA procedure. However, our observation of a relatively low incidence of multivessel PTCA in the overall indication for PTCA correlates well with a recent summary of PTCA procedures performed in the state of California during 1995[28], which reported PTCA of multiple vessels in only 12% of a total of 154 193 coronary interventions.

The ratio of PTCA per coronary angiogram varied considerably from 0·40 in the Netherlands to 0·08 in Cyprus. The mean ratio of PTCA per coronary angiograms of 0·26 seems low, if one considers that even after adding revascularization by CABG less than 50% of patients undergoing diagnostic cardiac catheterization will be referred for a revascularization procedure. However, a possible explanation for this low ratio may be the low incidence of ad hoc PTCA, that is PTCA at the same time as the diagnostic study[29], with the potential for double counting of diagnostic coronary angiography. Thus, reporting diagnostic coronary angiography not only at the time of the initial diagnosis but also at the time of a subsequent PTCA intervention inflates the number of coronary angiograms and artificially decreases the ratio of PTCA per coronary angiography. While ad hoc PTCA is frequently performed in Austria and Switzerland (>50% of all cases), the European mean incidence of ad hoc PTCA is only 24%. The number of coronary interventions correlates poorly with

Table 1 Mitral, aortic, and pulmonary balloon valvuloplasty in Europe in 1995 (abbreviations as in Fig. 2)

Country	Balloon valvuloplasties			
	Mitral valve	Aortic valve	Pulmonary valve	Total
A	25	21	20	66
B	18	7	17	42
BG	26	1	19	46
CH	37	10	12	59
CZ	84	21	15	120
D	1053	145	75	1273
E	582	34	38	654
F	216	449	154	819
GR	69	5	22	96
H	0	64	0	64
HR	26	0	17	43
I	337	437	121	895
PL	74	33	81	188
RO	50	9	22	81
S	11	0	6	17
SK	0	67	0	67
SLO	6	2	5	13

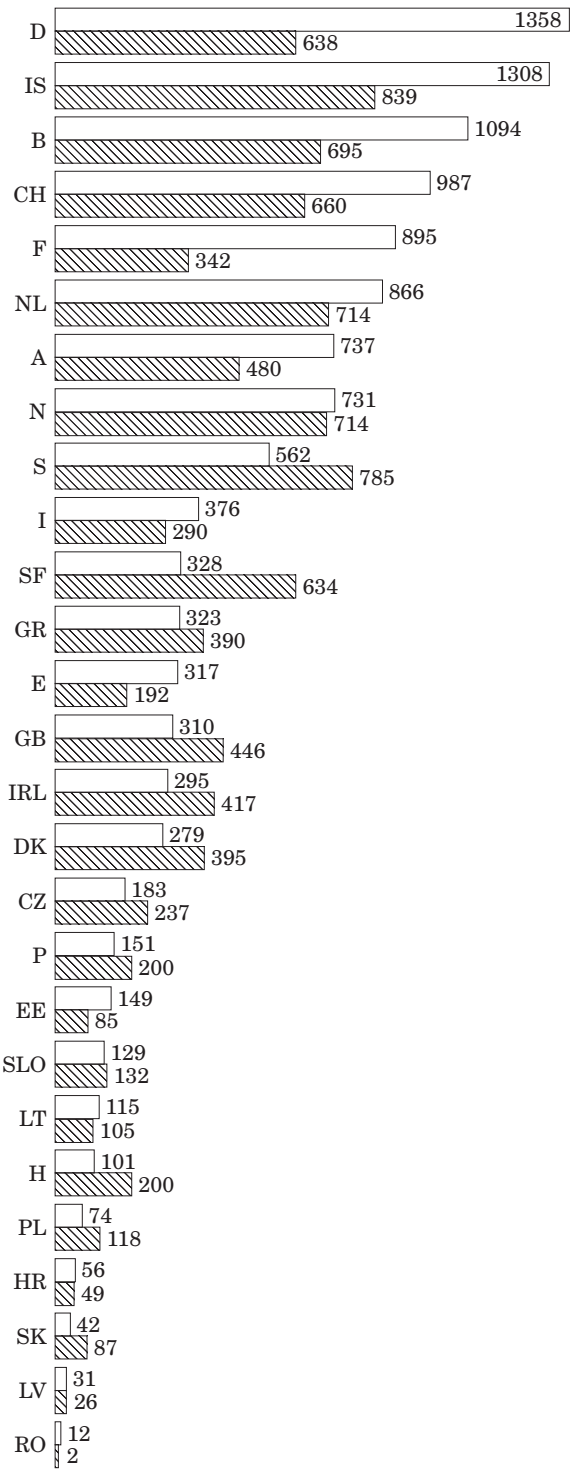

Figure 13 **Coronary revascularization by PTCA and CABG per 10^6 inhabitants per country in 1995. Mean of PTCA 507 per 10^6 inhabitants and of CABG 360 per 10^6 inhabitants (abbreviations as in Fig. 2; data arranged in order of number of PTCAs). □=PTCA; ▨=CABG procedures.**

Table 2 Summary of catheterization laboratories and trained operators in Europe in 1995 (abbreviations as in Fig. 2)

Country	Diagnostic coronary angiography					PTCA				
	Cath Operators/10^6	Cath Institutions/10^6	Cath Lab/10^6	Caths/ Operator	Caths/ Lab	PTCA Operators/10^6	PTCA Institutions/10^6	PTCAs Lab/10^6	PTCAs/ Operator	PTCAs/ Lab
A	15·8	3·2	3·5	190	856	6·9	2·3	2·8	107	268
BG	2·6	0·6	0·7	77	297	0·8	0·3	0·4	26	45
C	16·7	1·7	1·7	158	1576	6·7	1·7	1·7	31	125
CH	16·8	3·7	4·6	203	772	9·9	3·1	3·8	100	258
CZ	5·4	1·3	1·4	176	679	2·7	1·0	1·1	68	166
D	24·0	3·7	6·1	196	761	19·0	NA	NA	73	NA
EE	6·7	1·3	2·7	100	249	2·0	1·3	1·3	74	112
GR	8·2	1·6	1·8	217	988	3·9	1·3	1·4	83	230
HR	2·6	0·9	0·9	148	445	0·9	0·4	0·6	65	131
I	3·3	2·4	2·4	409	557	2·9	1·1	1·6	94	175
IS	39·0	7·7	7·7	90	543	10·0	3·9	3·9	113	340
LT	4·0	0·6	0·9	189	881	3·1	0·6	0·9	37	134
LV	1·2	0·4	0·8	145	218	0·4	0·4	0·4	77	77
RO	0·4	0·2	0·2	172	309	0·3	0·1	0·1	47	94
S	8·1	3·3	4·7	241	421	4·7	1·2	2·1	121	268
SK	2·0	0·4	0·4	169	843	0·4	0·2	0·2	104	208
SLO	4·5	1·0	1·0	139	624	2·5	0·5	0·5	51	257
Mean	11·0	2·5	3·4	210	704	8·0	0·7	0·9	78	203

Cath, denotes catheterization; Lab, denotes laboratory; NA=not available.

the national gross domestic product (GDP), which is partially explained by national differences in the health care delivery system as well as health care budget. Notwithstanding, the relative change in the utilization of PTCA compared with the previous year closely correlated with the corresponding change in GDP.

As in the previous year, coronary stenting remained the fastest growing procedure in interventional cardiology during 1995. Coronary stenting increased by 272% compared with the previous year to a European mean ratio of coronary stenting per PTCA procedure of 0·29. Nearly all countries performing PTCA reported some experience in stent implantation. The widespread acceptance of this technology is based on its efficiency in controlling acute complications of coronary interventions, such as dissection and abrupt or threatened closure[30–33], and reducing restenosis[11,12]. In contrast, other new devices including the rotablator, directional coronary atherectomy and laser angioplasty accounted for only 3·5% of all coronary interventions during 1995 and have not expanded during the past 4 years. The technical complexity, cost issues, and the potential for increased morbidity without translating into a clear-cut clinical benefit explain the reservation of these devices for niche applications[34–36].

Data on catheterization facilities and operators were provided by 17 countries representing a population of 240 million people. In contrast to last year's report, the 1995 survey allowed differentiation between facilities and operators with respect to their involvement in diagnostic cardiac catheterization or PTCA procedures. As expected, there were more institutions (2·5 per 10^6 inhabitants) and more operators (11 per 10^6 inhabitants) performing diagnostic cardiac catheterization than institutions (0·7 per 10^6 inhabitants) and operators (8 per 10^6 inhabitants) performing PTCA. Furthermore, eastern European countries and countries with relatively low health care spending feature fewer cardiac catheterization facilities and operators per population. One might intuitively infer that countries with a relatively low population-adjusted number of operators and catheterization facilities, i.e. Bulgaria, Estonia, Latvia and Romania, perform more interventions per operator and cardiac facilities to compensate for the intrinsic shortage of hardware and personnel. However, the low number of operators and facilities are paralleled by a low performance as reflected by the numbers of cardiac interventions performed per operator and cardiac catheterization facilities below the European mean. Possible explanations for this observation may be a lack of support personnel, a cap on disposable material or interventions imposed by government regulations and restricted working hours. The European mean numbers of coronary angiograms and PTCAs per operator are only slightly above the minimum recommendations for maintaining practice in interventional cardiology as formulated by the European Society of Cardiology[37]. This is of concern since it means that more than half of the operators fail to meet the requirements. Several recently published series emphasize the correlation between operator volume and procedural outcome[38–40].

Reporting back of data continued to improve during 1995, with most small countries providing complete data. However, a few large European countries were able to provide only partial information due to their population size and the inherently more difficult data collection process. Increased familiarity with the provided data sheet and improved electronic data collection will further facilitate reporting back in the future

and allow more instruments for quality control to be implemented.

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