

RESEARCH NOTE

TIME TRENDS IN THE UTILIZATION OF CARDIAC CATHETERIZATION PROCEDURES IN ITALY, 1983-93

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Abstract

The use of cardiac catheterization procedures and the number of hemodynamic laboratories in Italy increased steadily from 1983 through 1993, sometimes with no planning or modern technology assessment. It is recommended that in the future funds be assigned to improve underused laboratories rather than to build new facilities.

In the last few decades, cardiac catheterization laboratories have been established in different countries, sometimes without a rational planning process to evaluate costs, safety, concentration, adequate case load per lab, and the real needs of the population.

In 1978, for both economic reasons and patient safety a minimum case load of 300 studies per year per laboratory was recommended (1b). The same volume for adult laboratories was established by the Inter-Society Commission for Heart Disease Resources (ISC) in 1976 (15) and in 1983 (13), and by the American College of Cardiology/American Heart Association (ACC/AHA) Ad Hoc Task Force on Cardiac Catheterization (18). Only a weak relationship between case load and risk of complications has been observed (1;3;8;12;14), while there is evidence that it is increased by severe disease. According to the ISC (13), in laboratories with low case loads the duration of studies may be increased, and more repeated studies may be performed. The upper range of cases optimally managed by a single laboratory has not been well established, although it could be very high. The Conseil d'Evaluation des Technologies de la Santé du Québec has indicated a volume of 1,000 procedures per year per lab for the upper range (2).

This study examines trends in the use of cardiac catheterization procedures in Italy and makes international comparisons to advance the health policy decision-making process through objective assessment.

The authors thank the Italian Group for Hemodynamics and Interventional Cardiology (GISE) for making available the annual reports of cardiac catheterization procedures.

Table 1. Cardiac Catheterization Procedures in the North of Italy, 1983-93

Year	No.
1983	13.095
1984	16.959
1985	15.472
1986	17.852
1987	20.990
1988	23.072
1989	26.368
1990	29.473
1991	35.356
1992	48.329
1993	50.692

^a Number of cases per 100,000 population per year; thus, only the crude rate is shown.

METHODS

In 1982 the Italian Society of Interventional Cardiology, a scientific society, published a report on cardiac catheterization procedures. This report was part of the Italian public health system's annual reports from 1983 onwards and included data on cardiac catheterization, coronary angiography, interventional cardiology, and physiologic studies.

Data reflect the number of procedures performed of whom underwent the procedure in the operating room.

Utilization rates were calculated for the north, middle, southern, and industrialized areas.

RESULTS

Trends in Technological Utilization

In the period 1983-1993 the number of cardiac catheterization procedures increased steadily from 13,095 in the north (rate, 0.13) to 50,692 in 1993 (rate of 0.51). The utilization rate of cardiac catheterization increased from 34 per 100,000 in 1983 to 51 per 100,000 in 1993. In the period the rates of cardiac catheterization were higher in the north than in the south.

Trends in Levels of Utilization

In Italy the percentage of cardiac catheterization procedures was slowly and irregularly increasing. In the north such a trend was observed from 1983 to 1993.

Table 1. Cardiac Catheterization Procedures in Patients in Italy According to Geographic Area, 1983-93

Year	North		Middle		South and isles		Italy	
	No.	Rate ^a	No.	Rate ^a	No.	Rate ^a	No.	Rate ^a
1983	13.095	51	3.379	31	3.040	15	19.514	34
1984	16.959	66	5.340	49	4.221	21	26.520	47
1985	15.472	60	5.965	55	5.514	27	26.951	48
1986	17.852	69	6.423	59	5.606	28	29.881	53
1987	20.990	82	6.493	60	6.208	31	33.691	60
1988	23.072	90	7.041	65	7.233	36	37.346	66
1989	26.368	103	8.290	77	8.622	43	43.280	76
1990	29.473	115	8.886	82	10.159	51	48.518	86
1991	35.356	138	10.213	94	11.281	56	56.850	100
1992	48.329	188	11.537	107	13.647	68	73.513	130
1993	50.692	197	13.795	128	13.481	67	77.968	138

^a Number of cases per 100,000 population per year. Patients data about age and sex were not collected; thus, only the crude rates are presented.

METHODS

In 1982 the Italian Group for Hemodynamics and Interventional Cardiology (GISE), a scientific society, established an index file of patients undergoing cardiac catheterization procedures. The GISE includes, according to the best estimates, about 90% of the Italian public and private labs. Crude data are provided by the GISE annual reports from 1983 through 1993 (19;22;23;24;25;26;27) about the number of labs and cardiac catheterization procedures (cardiac catheterizations, coronary arteriography, interventional cardiac catheterization procedures not including percutaneous transluminal coronary angioplasty [PTCA], insertion of pacemakers, electrophysiologic studies, and provisory stimulations).

Data reflect the number of procedures rather than the number of patients, several of whom underwent more than one procedure during a single or multiple session in the operating room.

Utilization rates have also been calculated for the three main geographic areas: north, middle, south, and isles. The north and middle regions are richer and more industrialized when compared with the south and the isles.

RESULTS

Trends in Technology Diffusion and Utilization

In the period 1983 to 1993 the number of cardiac catheterization laboratories in Italy increased steadily from 44 to 97 (rate per million population, 0.8 to 1.7), mainly in the north (rate, 0.9 to 2.2). Overall figures for the study period indicate that the utilization rate of cardiac catheterization in Italy increased approximately fourfold from 34 per 100,000 population in 1983 to 138 per 100,000 in 1993. During the same period the rates of use continued to increase across the country and were significantly higher in the north (Table 1).

Trends in Levels of Use

In Italy the percentages of labs performing 300 or more procedures per year increased slowly and irregularly from 66% of all the labs in 1983 to 81% in 1993 (Table 2). In the north such percentages increased from 74% in 1983 to 81% in 1993. In the

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middle region the percentages of labs with case loads ≥ 300 increased in the decade from 70% to 93%, and in the south they rose from 45% to 77%.

The case load per catheterization lab almost doubled from 443 procedures in 1983 to 804 procedures per lab per year in 1993. In the middle region the case load increased threefold.

DISCUSSION

Unfortunately, the GISE database does not provide data about health outcomes and complication rates, so this study is mainly a description of time trends in the diffusion and geographic distribution of this technology in comparison with international standards. The figures provided by the GISE reports are the only information available nationally with respect to the use of cardiac catheterization.

Some of the variability in rates may be attributable to differences in the definition of terms or methods of data collection. Furthermore, the lack of information on patients' age and sex preclude adjusting the rates for these factors and a more definite estimate of future requirements.

Trends in Technology Diffusion

A finding of epidemiologic importance is that, nationwide, the number of cardiac catheterization laboratories and procedures has continued to increase, and it is unlikely that a plateau has been reached. The reasons for this growth are various and include technological advances in imaging devices and in the safety of contrast media, the increasing awareness by physicians and patients of the utility of this technology, and the identification by cardiologists of new clinical indications.

On the other hand, the real needs for this technology could be inflated by two factors. First, the appropriateness of its use is not well evaluated, despite the centrality of this issue (5;20;21). Our population-based study on residents in Padova, North Italy, who underwent coronary angiography in 1988 (4;9;10), showed an inappropriateness rate of 7%, according to ACC/AHA guidelines (20). Furthermore, the number of private labs is increasing (in 1991 they accounted for about 7% of all facilities); they generally have a direct financial incentive to use cardiac catheterization procedures, without an explicit control system of appropriateness made by the purchasers. Several sets of international utilization data are available for the year 1990 (6). The 1990 utilization rate in Italy (84,100,000 population) is lower than those of Belgium (296), Canada (236, in 1989), Germany (255), and the United States (373), and similar to those of the Netherlands (117), Sweden (113), and the United Kingdom (102). Such comparisons do not allow conclusions, for example on whether cardiac catheterization is overused in the United States or underused in Italy, as data about morbidity, appropriateness of use, and health outcomes are lacking.

Levels of Use

In the country as a whole, the annual average rates of cardiac catheterization procedures per laboratory are well above the suggested level of 300 exams per year. However, many facilities were operating at levels far below the minimum. The case load per catheterization lab in 1990 (571 procedures) seems to be low in comparison with Canada (1,247), Germany (755), and the United Kingdom (400-3,000), and high in comparison with the Netherlands (315).

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Table 2. Case Loads of Cardiac Catheterization Laboratories in Italy According to Geographic Area, 1983-93

Year	North		Middle		South and isles		Italy					
	Labs with case load < 300		Labs with case load < 300		Labs with case load < 300		Labs with case load < 300					
	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)				
1983	6	26	3	30	6	55	5	45	15	34	29	66
1984	4	15	5	38	6	46	7	54	15	29	37	71
1985	10	31	3	25	9	47	10	53	22	35	41	65
1986	9	28	3	25	8	42	11	58	20	32	43	68
1987	11	31	3	25	10	50	10	50	24	36	43	64
1988	12	31	3	25	8	38	13	62	23	32	49	68
1989	17	38	2	18	10	45	12	55	29	37	49	63
1990	16	33	2	17	10	42	14	58	28	33	57	67
1991	14	27	1	7	10	40	15	60	25	28	65	72
1992	13	23	1	8	12	26	20	74	21	22	75	78
1993	11	19	1	7	13	23	20	77	18	19	79	81

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Geographic Variations

The distribution of facilities and use of cardiac catheterization procedures correspond to a decreasing north-south gradient. This geographic distribution might be explained by mortality rates for coronary heart disease and cardiovascular disease (morbidity rates are not well known), which are higher in the north (17), where an older population lives. Furthermore, as patients in Italy have unlimited access to public hospitals, the supply of health services is higher in the north; traditionally, there is a migration of southern populations to undergo some major medical and surgical procedures in the north.

For analysis of these data, further information on the criteria for case selection and the therapies that have been adopted would also be of value.

CONCLUSIONS

Time trends in the diffusion of cardiac catheterization in Italy are dramatically increasing. On the other hand, many facilities show an inadequate level of use.

Funds in Interventional Cardiology in 1990 and 1991 (7;11) (about \$24 billion) have been assigned to the north, middle, south, and isles in the proportions of 40%, 20%, and 40%, respectively. It is hoped that the investments for hemodynamics will be used to strengthen the existing and underused laboratories rather than to create new ones, in part because of the risk of increasing inappropriate utilization by increasing the supply of facilities.

Epidemiologic analyses about the quality of clinical indications and performance are needed to improve data collection and information systems, which must be devoted not only to the structural and process aspects of performance, but also to patients' health outcomes.

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