

# Access to selected diagnostic procedures in the management of heart failure patients in Poland – POLKARD 2005

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## Abstract

**Background:** Polish heart failure surveys from 1999 and 2005 indicated that non-invasive and invasive diagnostic procedures in heart failure patients are underused, mostly due to limited availability.

**Aim:** To assess the access to procedures used for the diagnosis and treatment of heart failure in randomly selected outpatient clinics and hospital wards in Poland.

**Methods:** The study was undertaken in 2005, as a part of the National Project of Prevention and Treatment of Cardiovascular Diseases – POLKARD. The data on non-interventional and interventional procedures were collected from 400 primary care units, 396 secondary outpatient clinics and 259 hospitals, and included cardiology or internal medicine departments. Additionally, the last five patients with diagnosed heart failures were identified, who visited outpatient clinics or were discharged from the hospitals, and their medical records of diagnostic procedures were analysed.

**Results:** Echocardiography was not available in approximately 10% of hospital wards and 13-37% of outpatient clinics, both primary and secondary. Generally, the waiting time for echocardiography in Poland varied from region to region. A one-month waiting time was declared by more than 50% of secondary outpatient clinics and only 11-18% of primary care units, regardless of the community size. On the first day of hospital admission, echocardiography was performed in approximately 10% of patients of internal medicine wards and up to 36% of patients in cardiology departments. The assessment of B-type natriuretic peptide (BNP) or N-terminal pro-B-type natriuretic peptide (NT-proBNP) was generally performed only in a few hospitals, usually in cardiology departments. In primary care units, it was practically not available. Percutaneous coronary interventions, pacemaker or cardioverter-defibrillator implantations were available in approximately 20% of city hospitals, 30-40% of province hospitals, and 60-70% of clinical wards of medical universities.

**Conclusions:** These data show limited availability of echocardiography in primary care units. It is necessary to continue actions for better accessibility and frequency of performing interventional procedures in patients with heart failure in Poland.

**Key words:** heart failure, diagnosis, interventional procedure in cardiology

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## Introduction

Heart failure (HF) is a chronic disease with a prognosis comparable to that of oncologic conditions. It has been estimated that there are 1 million HF patients in Poland; the morbidity is significantly higher in elderly patients, especially after the 65<sup>th</sup> year of age. Heart failure is the main cause of 5% of all hospital admissions. Diagnosis of HF is most commonly made in hospital; however treatment of HF is generally delivered in primary care settings (POZ) and in specialist clinics. The IMPROVEMENT trial (1999-2000) carried out by general practitioners also in Poland has showed that the management of patients with HF significantly differs with regards to the diagnostic procedures and treatment from the established recommendations [1]. The POLKARD program carried out in 2005 was aimed at the assessment of the current state of diagnosis and treatment of HF in Poland among general practitioners, specialists (cardiologists and general medicine specialists) and within inpatient services treating patients with HF [2]. Despite some improvement in the management of patients with HF after five years of the POLKARD programme, the results showed some major discrepancies, for example in the frequency of the referrals for echocardiography, between patients treated by general practitioners and those treated by specialists [3]. Similar discrepancies were noted in other European countries [4]. The most common cause for this situation was limited access to echocardiography facilities.

Presumably, this problem refers less to specialised hospital departments and outpatient services within the tertiary centres, but more to care providers in small cities and rural areas. The aim of this paper was to assess the availability of basic and specialist diagnostic procedures as well as invasive treatment methods in HF in random outpatient and inpatient services in Poland taking care of patients with HF.

## Methods

The study was carried out between March and December 2005 in random outpatient and inpatient centres in Poland.

By means of stratified multistage sampling, 400 primary care units, and 259 cardiac and internal wards

were recruited into the study. Sampling of specialist doctors was not random. Specialists were recruited on the basis of general practitioner's indication of a specialist doctor to whom they usually refer their patients or a specialist doctor who usually sees their patients. A detailed description of the sampling process and the methods is given elsewhere [2].

Independently of the type and the reference level of the centre, the sampled centres were studied with regards to the medical records of the last five patients with the diagnosis of HF who were discharged home from the sampled ward or seen in the outpatient clinic. The diagnosis was based on the entry in the medical records (patient's file, discharge summary). In the case of outpatient services, the diagnosis was based on the entry in outpatient notes or doctor's presumption of the presence of HF based on clinical symptoms, test results or the treatment delivered.

Heart failure did not have to be a direct cause of hospital admission or outpatient appointment. A diagnosed or currently treated oncologic condition was an exclusion criterion.

The study questionnaires were designed to be used in both outpatient and inpatient settings taking into consideration different functional profiles. They referred to the diagnostic and treatment facilities of the studied centre and to the diagnostic process and management of the patient included into the study. Data from medical records were obtained for the last 365 days for outpatients and for the period of the last hospital stay for inpatients.

## Results

### Inpatient services

Internal wards were mainly represented by municipal and district hospitals (Table I), whereas cardiac wards were usually based in the specialist centres of a higher level of care (regional and university hospitals). Internal wards with cardiac beds constituted less than 20% of the sample and were usually a part of district hospitals (around 30%) (Table I).

On average, the number of cardiac beds in these wards was about 14-17. There was at least one cardiology specialist employed in about 60% of medical wards with cardiac beds in municipal and district hospitals, in about

**Table I.** Characteristics of inpatient services included into the programme

Type of the health service centre	Total	Ward profile		
		Internal	Internal with cardiac beds	Cardiac
District hospital [%]	43.4	56.4	30.4	13.2
Municipal hospital [%]	23.7	59.0	9.8	31.1
Regional hospital [%]	22.9	35.6	11.9	52.5
University hospital [%]	10.1	15.4	11.5	73.1
Total [%]		48.1	19.4	32.5

70% of wards in regional hospitals and in all wards in university hospitals.

A 24-hour ECG Holter monitoring, exercise test and spirometry were available in 80-90% of studied centres. Access to transoesophageal echocardiography and to stress-echocardiography was limited – the possibility of carrying out the procedure in the studied unit without the need to discharge the patient from the ward beforehand was declared by 10-20% of district hospitals, 30% of municipal hospitals, 60% of regional hospitals and by 80% of university hospitals, usually by cardiac wards. Highly specialised imaging such as cardiovascular magnetic resonance (CMR), single photon emission computed tomography (SPECT) as well as coronary angiography were available only in large specialised centres in the urban areas (Table II).

Based on the data from the medical records concerning the last hospital stay of patients included into the study, the usage of diagnostic procedures was higher in specialised centres. In district hospitals echocardiography was performed in half of the patients admitted with HF, in municipal and regional centres in about 65% of patients, and in 80% of patients admitted to university hospital wards (Table III).

Echocardiography was more commonly carried out in cardiac wards (in about 80% of HF patients) than in internal wards (in half of HF patients). Patients staying in cardiac wards had more often (by 20%) 24-hour ECG Holter and coronary angiography performed whereas exercise test and spirometry were done just as often in medical and cardiac wards.

In the centres where echocardiography was available on site in most of the cases (80-90%) the study was carried out within the first 3 days of hospital stay. In cardiac wards, large cities and university hospitals about 30-40% of patients had echo done on the day of admission. Based on the data regarding the accessibility of echocardiography, about 10% of studied wards (mostly internal wards and municipal and district hospital wards in towns of less than 30 thousand citizens) had no echocardiography facilities (Table IV).

The B-type natriuretic peptide (BNP) or N-terminal pro-B-type natriuretic peptide (NT-proBNP) levels were taken in a few centres – usually in cardiac wards and in the centres of a higher level of care, i.e. regional and university hospitals (Table IV).

**Table II.** Availability of the diagnostic procedures within the studied units of inpatient health services

Inpatient services	Holter ECG [%]	Spirometry [%]	Exercise test [%]	Coronary angiography [%]	Transesophageal echocardiography [%]	Stress-echo [%]	Ventriculography /radioisotope scintigraphy [%]	CMR [%]	SPECT [%]
<b>Hospital</b>									
district	91.9	79.4	94.6	4.5	9.7	20.6	2.7	1.8	0.9
municipal	95.1	83.6	96.7	19.7	27.9	32.8	8.2	4.9	3.3
regional	96.6	81.4	98.3	47.5	57.6	66.1	15.3	11.9	5.1
university	96.2	84.6	96.2	73.1	84.6	84.6	61.5	46.2	19.2
<b>Ward</b>									
internal	91.1	80.6	92.7	9.7	19.4	21.8	2.4	3.2	0.8
internal with cardiac beds	96.0	78.0	98.0	10.0	24.0	32.0	8.0	8.0	2.0
cardiac	97.6	84.5	100.0	56.1	57.0	72.8	31.0	19.1	10.7
<b>City size</b>									
< 30 000	88.1	76.1	91.6	1.2	3.3	9.5	1.2	2.4	.0
30-80 000	96.5	89.5	98.2	14.0	28.1	38.6	5.3	1.8	1.8
80-400 000	96.7	81.9	98.3	46.8	55.2	64.9	21.7	21.7	8.4
> 400 000	98.1	78.9	98.1	50.8	60.2	66.2	30.1	15.0	9.4
<b>Total</b>	<b>94.2</b>	<b>81.4</b>	<b>96.1</b>	<b>24.8</b>	<b>32.5</b>	<b>40.3</b>	<b>12.8</b>	<b>9.3</b>	<b>4.3</b>

Abbreviations: CMR – cardiovascular magnetic resonance, SPECT – single photon emission computed tomography  
Percentage in columns do not sum up to 100%

**Table III.** Percentage of diagnostic and imaging procedures performed during the studied hospital stay with regards to the type of health care settings

	Echocardiography [%]	Coronary angiography [%]	Spirometry [%]	Holter ECG [%]	Exercise test [%]
<b>Hospital</b>					
district	48.8	0.5	7.2	12.5	6.6
municipal	62.0	2.0	4.6	17.5	4.0
regional	64.9	15.2	3.7	19.3	6.8
university	80.8	23.1	10.8	26.2	4.6

**Table IV.** Usual waiting time for echocardiography and BNP or NT-proBNP level measurement in the inpatient services

	Echocardiography [%]				BNP (NT-proBNP) [%]			
	On the day of admission	1-3 days	> 3 days	No access	On the day of admission	1-3 days	> 3 days	No access
<b>Hospital</b>								
district	13.4	62.4	13.4	10.7	1.9	-	0.9	97.2
municipal	14.8	63.9	13.1	8.2	6.9	1.7	-	91.4
regional	27.0	59.5	13.5	-	21.4	7.1	-	71.5
university	38.5	53.8	3.8	3.8	23.8	4.8	4.8	66.7
<b>Ward profile</b>								
internal	8.9	60.5	19.4	11.3	3.4	1.7	0.8	94.1
internal with cardiac beds	18.0	64.0	12.0	6.0	8.7	-	-	91.3
cardiac	35.7	60.7	2.4	1.2	19.2	5.1	1.3	74.4
<b>City size</b>								
< 30 000	9.5	57.0	16.7	16.7	1.2	0	.0	98.8
30-80 000	22.8	66.7	8.8	1.8	7.5	0	1.9	90.6
80-400 000*	21.7	68.2	6.7	3.3	21.5	5.4	1.8	71.3
> 400 000 #	30.1	53.0	16.9	0	12.4	6.2	0	81.3
<b>Total</b>	<b>19.4</b>	<b>61.2</b>	<b>12.4</b>	<b>7.0</b>	<b>9.5</b>	<b>2.5</b>	<b>0.8</b>	<b>87.2</b>

Abbreviations: BNP – type-B natriuretic peptide, NT-pro-BNP – N-terminal type-B natriuretic peptide

\* including: Białystok, Bydgoszcz, Katowice, Lublin, Zabrze, # Gdańsk, Kraków, Łódź, Poznań, Szczecin, Warszawa, Wrocław

**Table V.** Accessibility to the invasive therapeutic procedures in the studied inpatient centres

Inpatient services	Catecholamine infusions [%]	Coronary angioplasty [%]	Percutaneous heart disease treatment [%]	Pacemaker [%]	ICD [%]	Cardiosurgery [%]
<b>Hospital</b>						
district	98.2	3.6	0	7.2	10.7	0.9
municipal	93.4	14.8	3.3	18.0	16.4	3.3
regional	96.6	39.0	1.7	45.8	33.9	5.1
university	100.0	73.1	38.5	65.4	61.5	30.8
<b>Ward profile</b>						
internal	96.0	4.8	0	11.3	14.5	0.8
internal with cardiac beds	98.0	8.0	2.0	12.0	14.0	2.0
cardiac	97.6	53.7	14.3	51.3	39.4	14.3
<b>City size</b>						
< 30 000	98.8	2.4	0	6.0	10.7	1.2
30-80 000	96.5	8.8	1.8	10.5	10.5	0
80-400 000*	95.0	40.1	6.7	45.2	31.8	8.4
> 400 000 #	96.2	45.1	15.0	47.0	45.1	15.0
<b>Total</b>	<b>96.9</b>	<b>21.3</b>	<b>5.0</b>	<b>24.4</b>	<b>22.5</b>	<b>5.4</b>

Abbreviations: ICD – implantable cardioverter-defibrillator

\* including: Białystok, Bydgoszcz, Katowice, Lublin, Zabrze, # Gdańsk, Kraków, Łódź, Poznań, Szczecin, Warszawa, Wrocław

Invasive therapeutic procedures were limited to the centres of a higher level of care (Table V).

Coronary angioplasty as well as pacemaker and cardioverter-defibrillator (ICD) implantations were available in 15-18% of municipal hospitals, 30-40% of regional hospitals and in about 60-70% of university hospitals. Cardiosurgical procedures were performed exclusively in university hospitals.

### Outpatient settings

Primary care services (POZ) and specialised clinics delivering care on the basis of contracts with the

National Health Service were included into the study. Distribution of POZ and specialised clinics in the sample was 1 : 1. However, taking into account the size of cities there was a higher share of specialised clinics (about 62%) and therefore better access to specialised care in large cities.

The POZ physicians most commonly referred their HF patients to cardiology clinics (63.6%), cardiology specialist practices within the public health services (28.6%), hospital-based cardiology clinics (17.6%) and private cardiology specialist practices (15.4%). The 8% of POZs

declared no cooperation with any cardiology centre or practice.

Among specialist clinics, 68% were based in hospital (hospital outpatient department), 8% were attached to cardiac wards and 24% were based in POZs.

Patients under specialist care had more often echocardiography performed within a year before the analysed appointment as compared to patients treated in POZs (Figure 1). The average waiting time for echocardiography varied across regions (Figure 2).

The waiting time for echocardiography in patients treated in POZs was significantly longer than in specialist care settings – possibility to perform echocardiography within one month from the referral was declared by more than a half of specialist clinics (50-60%) and by only 11-18% of POZs independently of city size. Specialist clinics based in hospitals or within the cardiac wards had better access to echocardiography.

The BNP level measurement was practically impossible in POZ settings (92.6%) as well as in most specialist clinics (79.4%). Access to the test was usually declared by the centres in large cities and by the clinics within the cardiac wards.

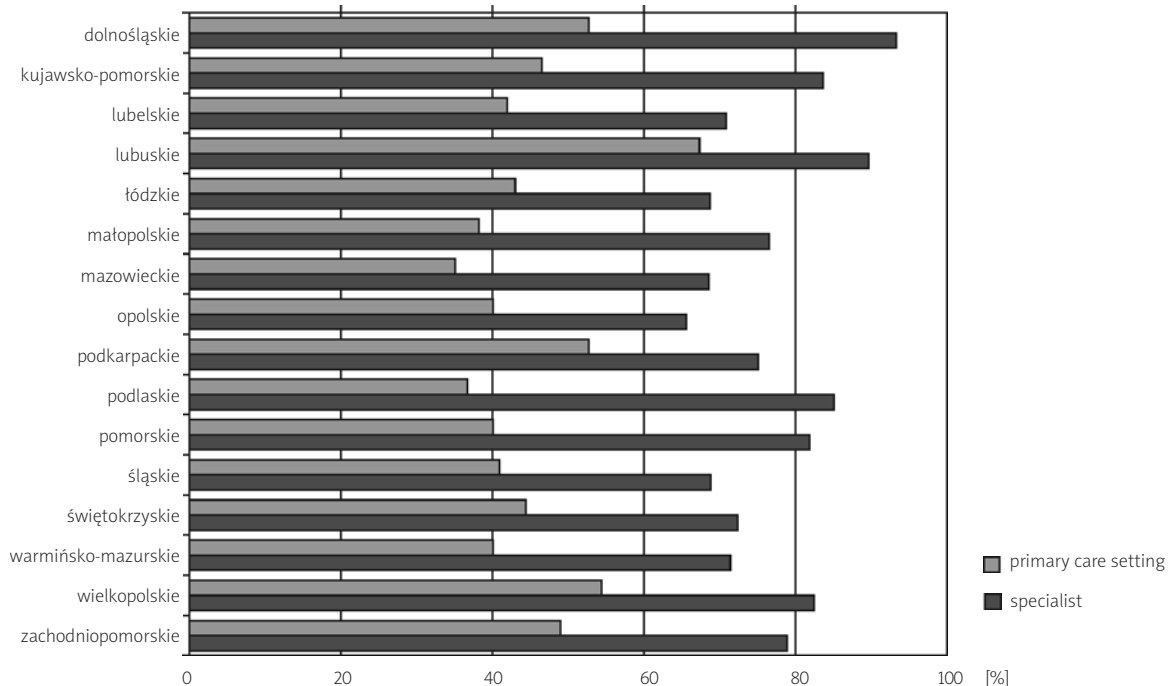
About 20-25% of patients remaining under outpatient care had been previously treated invasively for coronary artery disease (percutaneous coronary intervention – PCI with possible stent implantation or coronary artery bypass graft operation) – they were mostly patients under the care of a cardiology specialist (around 25 vs. 15%). Less

than 10% of patients had a history of pacemaker or ICD insertion – about 2-3% of POZ and specialist clinic patients.

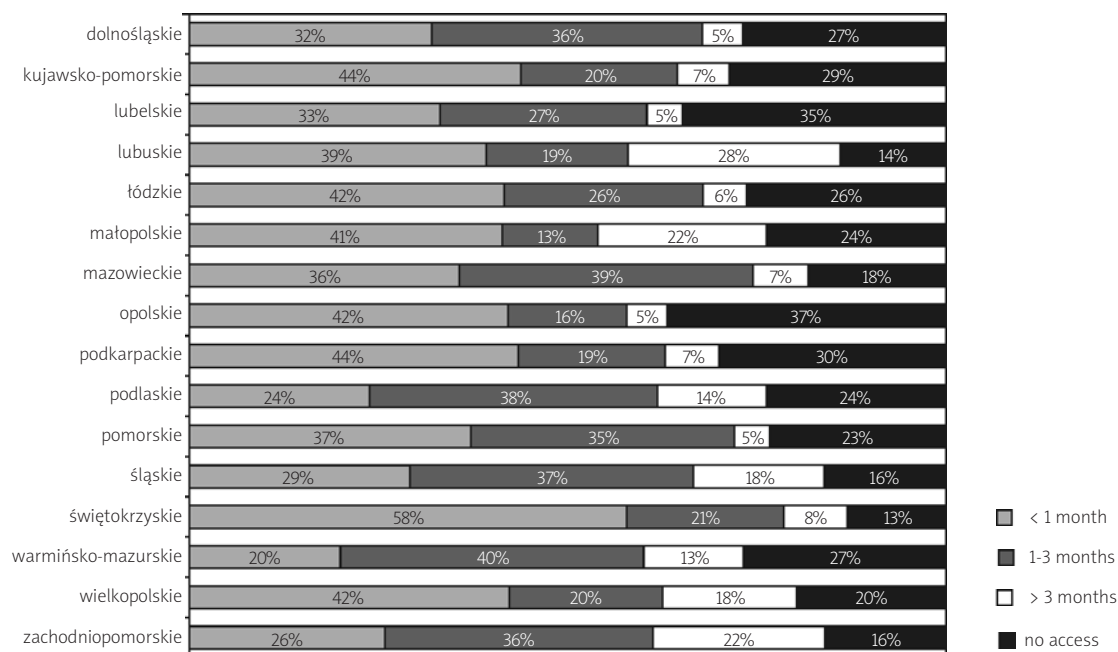
## Discussion

Our study has showed that the weakest link in the HF diagnostic procedures in Poland is echocardiography, which is least commonly performed in primary care settings, in about 45% of patients treated by a POZ physician and in 75% of patients under the care of a specialist. Therefore, HF is probably under-diagnosed in primary care settings. It can be partially explained by poor access to echocardiography facilities and long waiting lists. An improvement in the accessibility of echocardiography by means of providing POZs with echocardiographic machines does not seem to be a reasonable solution because of poor usage of the devices, lack of physician's experience in performing and interpreting studies and the high costs of machines. It seems to be more reasonable to provide already existing echocardiography services in smaller cities (cardiology practices, clinics, medical wards, district hospitals) with additional mid-range ultrasound systems. On the basis of European practice and first Polish experiences over the last few years, it seems to be justified to create centres providing comprehensive care for patients with HF, so-called HF clinics [5, 6].

The IMPROVEMENT study showed that echocardiography was performed on average in 66% of HF patients in hospital settings and a bit more often in university hospitals (about 68%). At the same time in 2003 in Spain in internal and



**Figure 1.** Percentage of patients undergoing echocardiography within the last 365 days analysed – data from the outpatient services with regards to the level of care



**Figure 2.** Declared usual waiting time for echocardiography in outpatient services in Poland with regards to individual regions

geriatric wards, echocardiography was performed in 52% of patients admitted to hospital for the first time and in over 82% of patients in cardiac wards [7]. Although since the IMPROVEMENT trial the frequency of performing echocardiography in hospital settings in Poland has raised, in the presented data from 2005 there was a large discrepancy between the number of studies performed in large university centres and studies performed in municipal and district hospital wards.

The BNP and NT-proBNP serum level measurements were performed only in a small percentage of patients usually in clinics within cardiac wards. In inpatient settings natriuretic peptide levels were taken mostly in regional and university hospitals, usually in cardiac wards. At that time the guidelines for the management of chronic HF defined BNP level measurement as helpful for the diagnosis of HF [8]. Current guidelines of the European Society of Cardiology (ESC) define the normal ranges and recommend BNP level measurement as a standard procedure to emphasise its significance in the diagnosis and treatment of HF. In Poland, testing BNP levels is still poorly accessible, relatively expensive and, therefore, of minor importance in every-day clinical practice.

About 20-25% of patients remaining under outpatient care had previously invasive therapeutic procedures for coronary artery disease performed and more commonly they were patients under the care of a cardiology specialist. Less than 10% of patients had a pacemaker inserted and 2-3% had ICD. A higher percentage of

patients with a history of invasive procedures remaining under the care of a specialist seemed to be a result of better availability of such treatment especially in the centres in large cities. Current rules in health services allow only specialist centres to refer patients for invasive procedures. However, poor access to such procedures limited by funding restrictions lengthens the waiting times.

A report of the National Specialist Supervision Authority in the field of cardiology in 2004 summarised the state of cardiological care in Poland and the performance of diagnostic and therapeutic procedures [9, 10]. The report shows that the number of coronary angiographies raised each year since 2001 but the increase was far smaller than expected. In 2003, the number of these procedures per 1000 citizens reached 2.76 on average (105 479 procedures). In 2004, a further rise in the number of procedures was observed (119 246 procedures), mostly in the Silesian, Wielkopolska and Lubuski regions (more than 4 000 angiographies per 1 million citizens) [9].

An increase in the pacemaker device insertions has also been noted: in 2004, 18 077 pacemakers were inserted (on average 471/1 million citizens) and it was 1 500 more (109%) as compared to 2003 [9]. In 2004, ICD were implanted by 28 centres across the country (5 centres more than in 2003) and altogether 1,213 devices were inserted (about 100 devices more than in 2003), which gives about 30 devices per 1 million

inhabitants: from just a few implantations/million in the Warmińsko-Mazurski and Podlaski regions to 290 implantations per million in the Mazowiecki region [9]. As the authors of the report showed despite the increasing trend, the percentage of ICD implantations is very low compared to data from other countries – 67/million ICD devices implanted in Germany and Italy and 185/million devices in the USA in 1999.

In 2009, we gained the knowledge from the last few years. While in 2005 there were 129 716 coronary angiographies performed in Poland, in 2008 there were 160 360 procedures performed. Each year new invasive cardiology centres are founded. In 2008, there were 98 such centres in Poland, which means that over the last 3 years at least 21 new centres were established. What is more important, with the dynamic development of interventional cardiology, the university centres and regional hospitals are no longer the only facilities that perform invasive procedures. An even higher increase in the number of pacemaker implantations (including cardiac resynchronisation systems) and more importantly of ICD implantations is observed, 19 430 in 2005 to 26 994 in 2008 and 1 503 to 3 324, respectively. This currently gives an index of 87 ICD implantations per 1 million inhabitants [11].

A methodological limitation of the performed analysis is the retrospective approach in the data collection from the medical records of the studied centres, which could affect the accuracy of the numbers presented. However, a wide range of information from the randomly sampled centres of a varied level of care across the whole country provided a significant source of information about recent development and difficulties in the care of HF patients. Therefore, the results of our analysis should indicate the direction of the decisions regarding systemic changes in the cardiological care.

Results from the analysis performed refer mostly to the need for better access to the diagnostic procedures, especially in outpatient settings. With regard to the current situation in Poland, changes in the funding and structure of health services are required. This refers especially to echocardiography that is a basic test to diagnose and monitor the advance of heart failure. Wider access to this relatively cheap procedure should improve and optimise treatment of HF by reducing the percentage of false positive and false negative diagnoses. According to the current ESC guidelines, the access to BNP or NT-proBNP level tests should be improved, which will allow verification of the diagnosis in uncertain cases, especially if echocardiography is non-diagnostic.

To maintain the standards of diagnostic and therapeutic management of HF and to increase the number of basic tests it is justified to intensify physicians education, especially with regards to the primary care internal ward doctors.

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# Dostępność wybranych procedur diagnostycznych w zakresie opieki nad pacjentem z niewydolnością serca w Polsce – POLKARD 2005

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## Streszczenie

**Wstęp:** Badania prowadzone w Polsce w latach 1999 i 2005 wskazały na niedostateczną częstość wykonywania podstawowych procedur diagnostycznych, nieinwazyjnych i inwazyjnych, w opiece nad pacjentem z niewydolnością serca. Jedną z najczęstszych przyczyn takiego stanu była ich ograniczona dostępność.

**Cel:** Ocena możliwości diagnostycznych w zakresie niewydolności serca wśród losowo dobranych ośrodków opieki ambulatoryjnej i lecznictwa zamkniętego w Polsce.

**Metody:** W ramach realizacji zadania POLKARD 2005 przeprowadzono badanie ankietowe w losowo dobranych ośrodkach lecznictwa otwartego i zamkniętego z terenu całej Polski. Dane na temat możliwości diagnostycznych ankietowanych placówek uzyskano z 400 ośrodków podstawowej opieki zdrowotnej (POZ), 396 poradni specjalistycznych oraz 259 oddziałów szpitalnych: internistycznych i kardiologicznych. Analiza postępowania diagnostycznego, przeprowadzona na podstawie dokumentacji medycznej, obejmowała ostatnich pięciu pacjentów z niewydolnością serca przyjętych w gabinecie lub wypisanych ze szpitala.

**Wyniki:** Około 10% jednostek lecznictwa zamkniętego oraz 13–37% ośrodków lecznictwa otwartego nie miało dostępu do ultrasonografii serca (USG serca). Możliwość wykonania badania u pacjenta w ciągu miesiąca podała ponad połowa poradni specjalistycznych (50–60%) i zaledwie 11–18% ośrodków POZ, niezależnie od wielkości miejscowości. Czas oczekiwania na USG serca w lecznictwie otwartym był w dużym stopniu zróżnicowany regionalnie. W lecznictwie zamkniętym ok. 10% pacjentów oddziałów internistycznych i do 36% pacjentów oddziałów kardiologicznych miało wykonane USG serca w dniu przyjęcia. Stężenie peptydu natriuretycznego typu B (BNP) lub NT-proBNP oznaczane było w nielicznych ośrodkach, głównie na oddziałach kardiologicznych i w placówkach o wyższym poziomie referencyjności. Badanie to było praktycznie niedostępne dla ośrodków POZ. Plastyka naczyń wieńcowych oraz wszczepianie układów stymulujących, kardiowerterów dostępne były w ok. 20% szpitali miejskich, 30–40% szpitali wojewódzkich i ok. 60–70% badanych szpitali klinicznych.

**Wnioski:** Przeprowadzona analiza wskazuje na wyraźny problem z dostępnością do USG serca w ośrodkach POZ. Konieczne jest również podjęcie działań zmierzających do poprawy sytuacji w zakresie dostępności i częstości wykonywania procedur inwazyjnych, m.in. koronarografii i wszczepiania kardiowerterów-defibrylatorów.

**Słowa kluczowe:** niewydolność serca, diagnostyka, interwencje zabiegowe w kardiologii

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