Mortality of patients with implanted pacemaker: Long-term follow-up Data from Czech National Pacemaker Registry (REPACE).

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Aim of the study

- The aim is the long-term continuous monitoring of patients with an implanted pacemaker (PM) regarding real mortality and morbidity in relation to the standard population without PM, to predict the development of procedures and costs of care in the next ten years.

Methodology:

- The analysis is based on data managed by the Institute of Health Information and Statistics of the Czech Republic (ÚZIS ČR), which are collected within the framework of the National Health Information System (NZIS) and national health registers. The National Register of Reimbursed Health Services – contains data from health insurance companies in both inpatient and outpatient areas, including complete data on reported diagnoses, procedures, treatment and rehospitalizations.

Used data sources - NZIS

The analysis is based on data managed by the Institute of Health Information and Statistics of the Czech Republic (ÚZIS ČR), which are collected within the framework of the National Health Information System (NZIS) and national health registers.

1. National Register of Reimbursed Health Services (NRHZS) – contains data from health insurance companies in the hospital and outpatient areas, including complete data on reported diagnoses, procedures and treatment; data is currently available for the period 01/2010–12/2021.

2. Certificate of inspection of the dead individual (LPZ) – is the basic source of information about each death. Immediately after examining the deceased, it is filled out by the examining physician, who, in addition to basic socio-demographic characteristics, also records the sequence of causes leading to death (coded using ICD-10); data is available until the end of 2021.

Results:

- The analysis is performed on a population sample of 82.791 patients who underwent PM implantation for symptomatic bradycardia with standard indications according to the ESC guidelines.
- The annual number of PM implantations is steadily increasing slightly (in the years 2010-2019 by an average of 120 cases per year). In 2020, there was a year-on-year decrease of 6%, in connection with the COVID-19 pandemic, increased mortality and the limitation of care provided.
- The annual share of reimplantations in the total number of performed procedures varies between 24% and 30%. In the years 2010-2021, almost 114 thousand pacemakers were implanted, of which 27.9% were single-chamber, 67.4% were double-chamber , and 4.6% were biventricular.
- A higher proportion of pacemakers are implanted in men (56.9% vs. 43.1% in women). This share is increasing over time: in 2010, the share of men was 55.3%, in 2021 it will be 57.8%. The average age of a patient at the time of initial pacemaker implantation is 76 years (75 years for men, 77 years for women). From 2010 to 2021, the average age of patients at primary implantation increased by 1 year from 75.3 years to 76.3 years. Patients with primary PM implantation in the years 2010–2021 (N = 82,791) according to the age of the patient at the time of the procedure - the length of survival is evaluated using the Kaplan-Meier method. The

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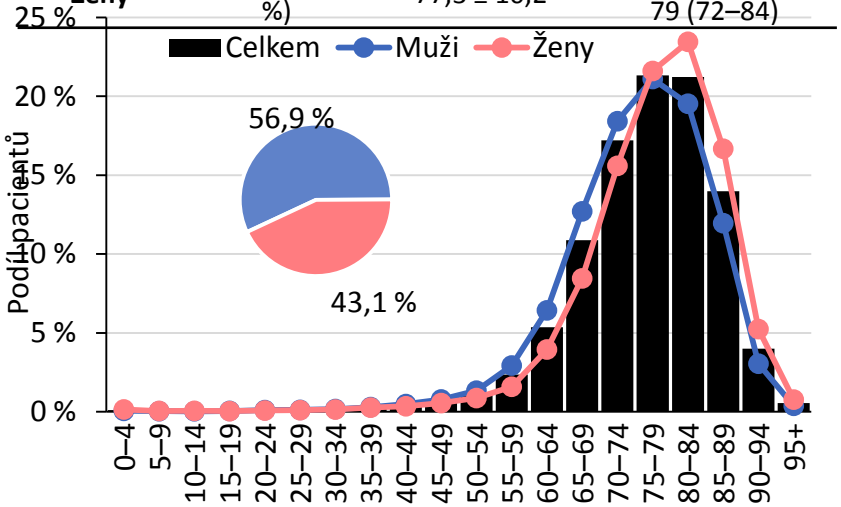
- From 2010 to 2021, the average age of patients at primary implantation increased by 1 year from 75.3 years to 76.3 years. Patients with primary PM implantation in the years 2010–2021 (N = 82,791) according to the age of the patient at the time of the procedure - the length of survival is evaluated using the Kaplan-Meier method. The patient is monitored from the date of PM primoimplantation until the date of death.

Demographic characteristics of patients at the time of PM implantation

Source: NRHZS 2010–2021

Pohlaví a věková struktura pacientů při primoimplantaci PM (2010–2021):

	Počet	Věk	
		průměr (SD)	medián (IQR)
Celkem	82 791	75,9 ± 10,4	77 (71–83)
Muži	47 070 (56,9 %)	74,8 ± 10,3	76 (69–82)
Ženy	35 721 (43,1 %)	77,3 ± 10,2	79 (72–84)



A higher proportion of pacemakers are implanted in men (56.9% vs. 43.1% in women). This share is increasing over time: in 2010 the share of men was 55.3%, in 2021 it will already be 57.8%.
The average age of the patient at the time of the first implantation of a pacemaker is 76 years (75 years for men, 77 years for women). From 2010 to 2021, the average age of patients at primary implantation increased by 1 year from 75.3 years to 76.3 years.

Comorbidities of patients at the time of PM implantation

Source: NRHZS 2010–2021

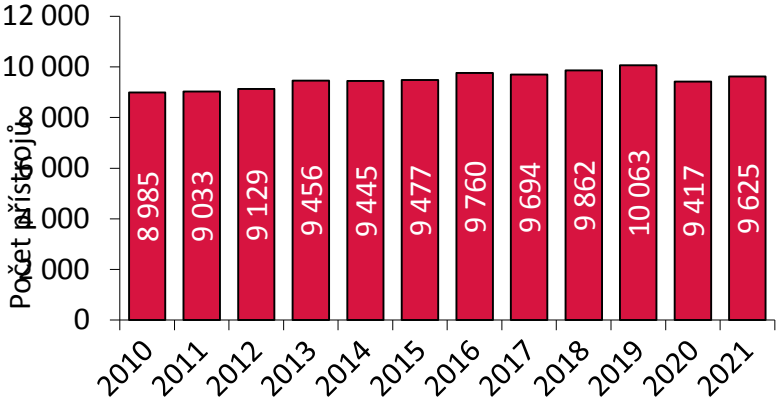
Selected comorbidities of patients during primary PM implantation (2010–2021; N = 82,791):

Comorbidities:	% from N
Diabetes mellitus	29,1 %
Hypertension	84,4 %
Ischemic heart disease (hospitalization history/PCI/CABG)	18,7 %
Heart failure (hospitalization history)	13,8 %
Stroke (hospitalization history)	6,4 %
Oncological disease (dg. in the last 5 years, malignant neoplasms except C44)	5,3 %

Number of implanted devices: primo-/reimplantation

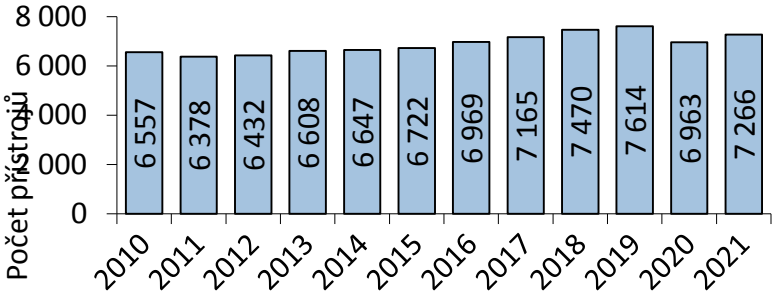
Source: NRHZS 2010–2021

Number of PM in the Czech Republic in 2010–2021:

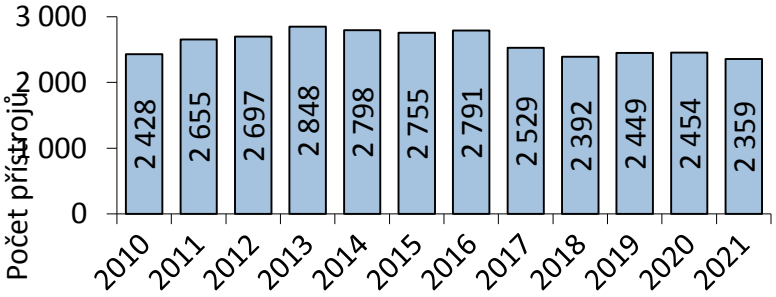


The annual number of PM implantations is steadily increasing slightly (between 2010 and 2019, an average of 120 cases per year). In 2020, there was a year-on-year decline of 6%, likely related to COVID-19, increased mortality and reduced care. The annual share of reimplantations in the total number of performed procedures varies between 24% and 30%.

Number of primary PM implantations in 2010–2021:



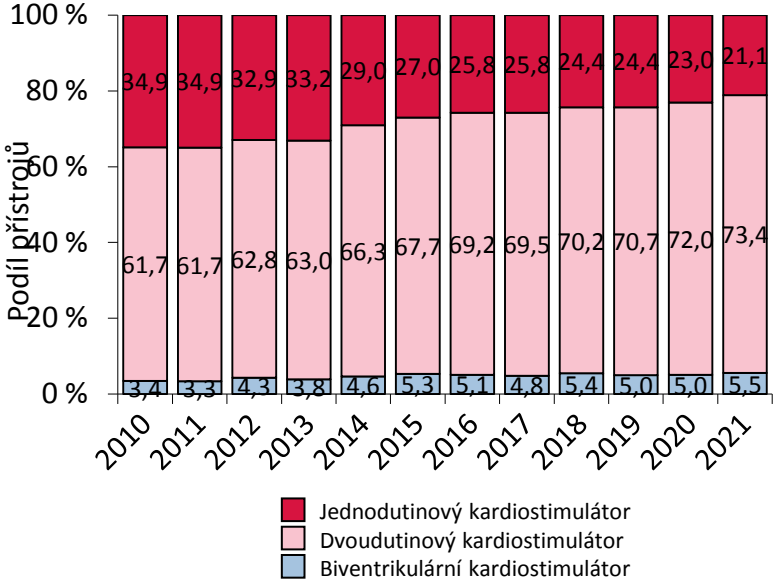
Number of PM reimplantations in 2010-2021:



Type of implanted devices: primo-/reimplantation

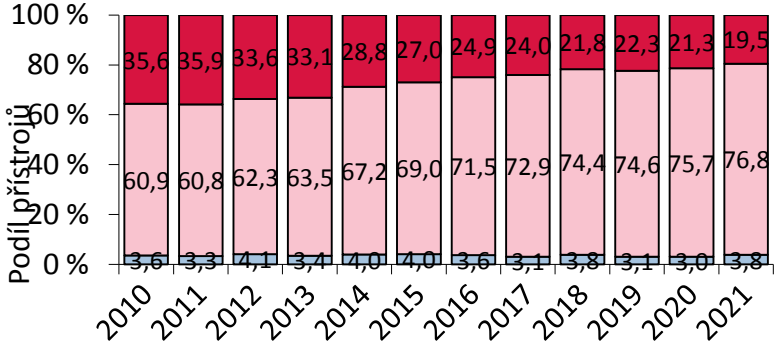
Source: NRHZS 2010–2021

Typ implantovaných PM v ČR v letech 2010–2021:

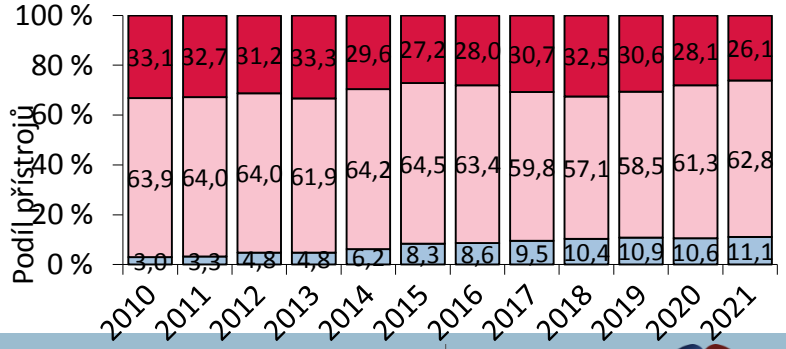


In the years 2010-2021, almost 114 thousand pacemakers were implanted, of which 27.9% were single-cavity, 67.4% were double-cavity, and 4.6% were biventricular.

Typ PM při primoimplantaci v letech 2010–2021:



Typ PM při reimplantaci v letech 2010–2021:



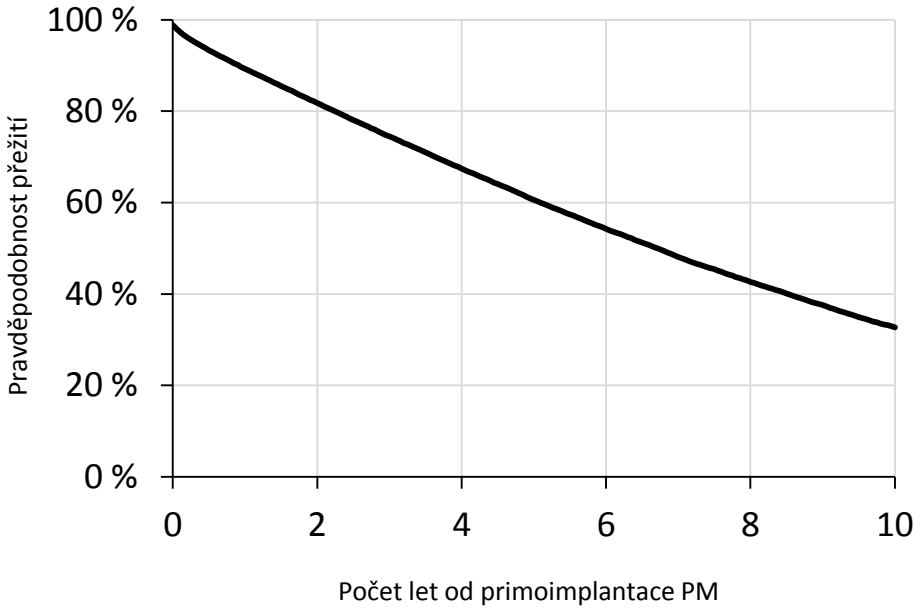
Pacemakers in the Czech Republic in 2010–2021

Survival analysis - patients with PM primoimplantation

5-year and 10-year overall survival of patients after primary PM implantation

Source: NRHZS 2010–2021

Patients with primary PM implantation in 2010–2021 (N = 82,791):
The length of survival is evaluated using the Kaplan-Meier method. The patient is followed up from the date of PM primoimplantation until the date of death. If no death was recorded, the patient is censored as of 12/31/2021.



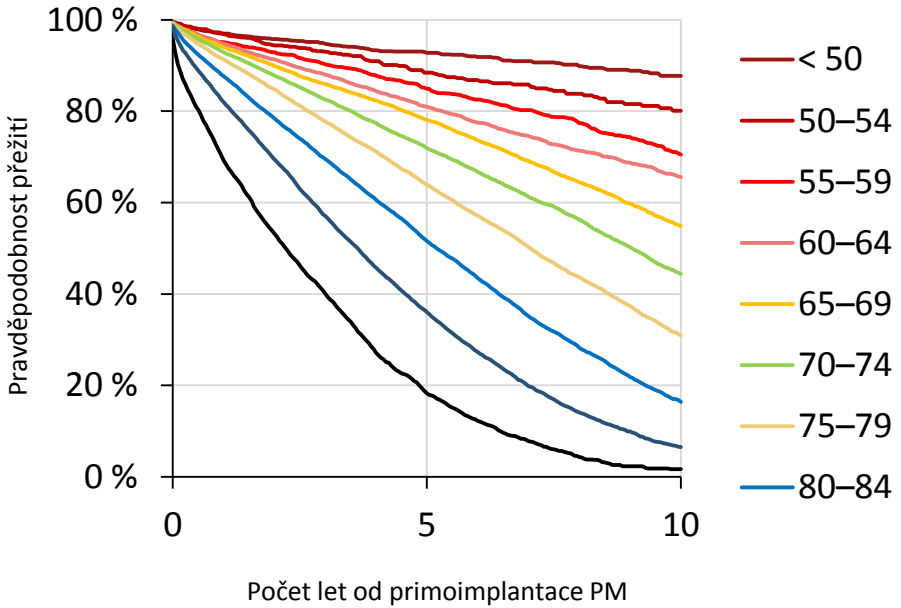
Počet let ve sledování	Pravděpodobnost přežití (95% interval spolehlivosti)
1	89,3 % (89,0 %; 89,5 %)
2	81,8 % (81,5 %; 82,1 %)
3	74,5 % (74,1 %; 74,8 %)
4	67,4 % (67,1 %; 67,8 %)
5	60,6 % (60,2 %; 61,0 %)
6	54,2 % (53,8 %; 54,7 %)
7	48,1 % (47,7 %; 48,5 %)
8	42,7 % (42,2 %; 43,1 %)
9	37,6 % (37,1 %; 38,1 %)
10	32,7 % (32,2 %; 33,2 %)

60.6% of patients survive five years after primary implantation, 32.7% survive ten years.

Overall survival of patients after PM primary implantation by age

Source: NRHZS 2010–2021

Patients with primary PM implantation in 2010–2021 (N = 82,791) according to the age of the patient at the time of the procedure: Survival is assessed using the Kaplan-Meier method. The patient is followed up from the date of PM primoimplantation until the date of death. If no death was recorded, the patient is censored as of 12/31/2021.



PRAVDĚPODOBNOST PŘEŽITÍ

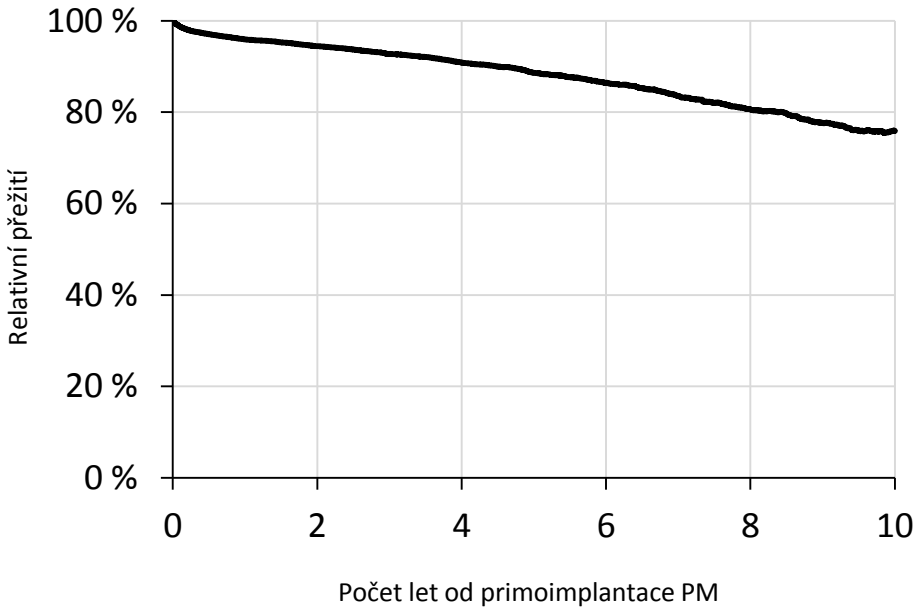
Věk	Počet let od primoimplantace PM									
	1	2	3	4	5	6	7	8	9	10
< 50	97 %	96 %	95 %	93 %	93 %	92 %	91 %	90 %	89 %	88 %
50–54	97 %	94 %	93 %	91 %	88 %	87 %	86 %	84 %	82 %	80 %
55–59	95 %	93 %	90 %	88 %	85 %	83 %	80 %	77 %	74 %	71 %
60–64	95 %	91 %	88 %	84 %	81 %	78 %	75 %	71 %	69 %	66 %
65–69	94 %	90 %	86 %	82 %	78 %	74 %	69 %	64 %	60 %	55 %
70–74	93 %	88 %	83 %	77 %	72 %	67 %	61 %	56 %	50 %	44 %
75–79	91 %	85 %	78 %	71 %	64 %	57 %	50 %	44 %	37 %	31 %
80–84	88 %	78 %	70 %	61 %	52 %	43 %	35 %	28 %	22 %	16 %
85–89	82 %	69 %	57 %	46 %	36 %	27 %	20 %	14 %	10 %	6 %
90+	69 %	53 %	40 %	27 %	18 %	12 %	8 %	4 %	2 %	2 %

100 %	90 %	80 %	70 %	60 %	50 %	40 %	30 %	20 %	10 %	0 %

5-year and 10-year relative survival of patients after primary PM implantation

Source: NRHZS 2010–2021

Patients with primary PM implantation in 2010–2021 (N = 82,791):
The relative survival estimate is determined by the Pohar-Perme method; observed survival was determined by the Kaplan-Meier method, expected survival based on mortality tables for the Czech population.



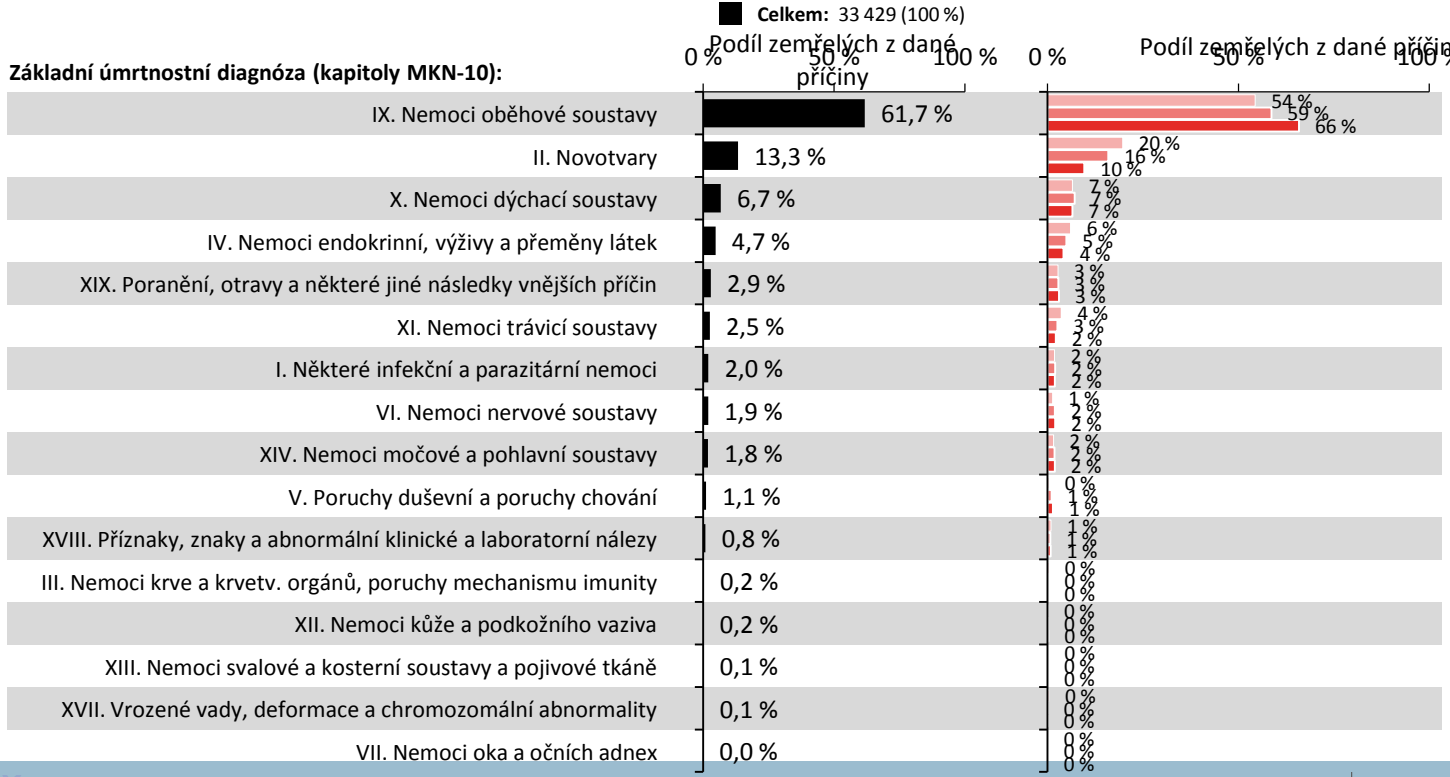
Počet let ve sledování	Relativní přežití (95% interval spolehlivosti)
1	95,9 % (95,7 %; 96,2 %)
2	94,5 % (94,1 %; 94,8 %)
3	92,7 % (92,3 %; 93,2 %)
4	90,9 % (90,3 %; 91,4 %)
5	88,6 % (87,9 %; 89,3 %)
6	86,4 % (85,6 %; 87,3 %)
7	83,6 % (82,5 %; 84,7 %)
8	80,6 % (79,0 %; 82,2 %)
9	77,6 % (75,7 %; 79,6 %)
10	75,9 % (73,5 %; 78,4 %)

Relative survival expresses the survival rate of patients with an implanted pacemaker compared to the general population. 5-year relative survival is 88.6% (overall survival: 60.6%), 10-year relative survival is 75.9% (overall survival: 32.7%).

Causes of death 2010–2019 in patients with implanted PM

Source: NRHZS 2010–2019; persons with primary implantation or reimplantation of PM in the years 2010–2019

Cause of death for persons with implanted PM who died before 31/12/2019 (33,429 cases of death):



The most common cause of death in people with implanted PM is diseases of the circulatory system (62% of deaths; of which 31% dg. I25 chronic CAD, 6% dg. I50 heart failure, 4% dg. I21 acute MI). This is followed by oncological diseases (13%) and diseases of the respiratory system (7%). The average age of the deceased is 83 ± 8 years.

Causes of death vary according to the patient's age at death; with age, the proportion of deaths from diseases of the circulatory system increases, while the proportion of deaths from oncological diseases decreases.

Conclusions:

- Relative survival expresses the rate of survival of patients with an implanted pacemaker compared to the general population.
- 5-year relative survival is 88.6% (overall survival: 60.6%)
- 10-year relative survival is 75.9% (overall survival: 32.7%). (Fig.2)
- The most common cause of death in people with implanted PM are the circulatory system diseases (62% of death cases; of which 31% dg. I25 chronic CAD, 6% dg. I50 heart failure, 4% dg. I21 acute MI).
- This is followed by oncological diseases (13%) and diseases of the respiratory system (7%).
- The average age of the deceased is 83 ± 8 years. Causes of death vary according to the patient's age at death; with age, the proportion of deaths from diseases of the circulatory system increases, while the proportion of deaths from oncological diseases decreases.

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Děkuji za pozornost

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