The workload of the interventional cardiology centers in Romania: a 2022 overview and 2014 - 2022 trends

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Abstract
This article provides data on the workload of the interventional cardiology centers of Romania during 2022. Members from all interventional cardiology centers of Romania were requested to fill out a standard form about the total number of various procedures performed during 2022. The report highlights the total number of coronary interventions, peripheral interventions, and interventions for structural heart diseases that were performed in 2022 in Romania. A comparison of the workload of the interventional cardiology centers of Romania between 2014 to 2022 was done.

Keywords
interventional cardiology, percutaneous coronary interventions, stents

Rezumat
Acest articol oferă date despre volumul de lucru al centrelor de cardiologie intervenţională din România în cursul anului 2022. Membrii din toate centrele de cardiologie intervenţională din România au fost rugaţi să completeze un formular standard despre numărul total de proceduri intervenţioale efectuate în cursul anului 2022. Raportul evidenţiază numărul total de intervenţii coronariene, intervenţii periferice şi intervenţii pentru boli structurale cardiace, care au fost efectuate în 2022 în România. S-a făcut o comparaţie între volumul de lucru al centrelor de cardiologie intervenţională din România între anii 2014 şi 2022.

Cuvinte cheie
cardiologie intervenţională, intervenţii coronariene percutane, stenturi

Introduction

This article provides data on the workload of the interventional cardiology centers in Romania during 2022 and highlights the trends in coronary and peripheral interventions between 2014 and 2022.[1-9] Members from all interventional cardiology centers in Romania were requested to fill out a standardized form about the total number of various procedures performed during 2022. Data was collected at the initiative of the Interventional Cardiology Working Group of the Romanian Society of Cardiology.

Table 1 summarizes the data from 2022 provided by 40 public and private interventional cardiology centers of Romania. In 2022, there were 66 interventional cardiologists in training, 143 full interventional cardiologists, and 56 functional angiographs in Romania. The exact number of full interventional cardiologists is difficult to know because some interventional cardiologists also work in public and private hospitals.

The annual number of PCIs in every interventional cardiology center in Romania is represented in Figure 1. A direct comparison of data from 2014 to 2022 was done, which highlights the continuous increase of the workload of the interventional cardiology centers of Romania until 2021 when we have a clear decrease (Figure 2). In 2021, the number of PCIs increased close to the pre-pandemic era. In 2022, 21,767 PCIs were performed in Romania compared to 19,862 in 2021, which represents an increase of 9.5%. The total number of primary PCIs increased in 2022 by 22% compared to 2021 (figure 3).

Although the total number of peripheral angioplasties doubled from 2014 to 2018, there was a decrease by 13% in 2019. It further decreased in 2020 by 38% (Figure 4), but in 2022, 1,796 peripheral angioplasties were performed.

The number of TAVI procedures doubled every year between 2015 and 2019, and the trend continued in 2022 with an increase of 31% compared to 2021 (figure 5). The number of procedures performed in structural heart diseases decreased by 47% between 2021 and 2022 (figure 5).

The data analysis in this study is limited to those centers that actively responded to the request from the Interventional Cardiology Working Group. Some centers did not participate or provided poor quality data not feasible for the analysis. We emphasized the importance of participation and providing useful and accurate data from all interventional cardiology centers in Romania to have a better picture of the phenomenon.

There is a continuous need to implement a Mandatory Interventional Cardiology National Registry capable of monitoring

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objectively these key health care services in a standard manner. This national registry can guide further development of interventional cardiology in Romania[1-6].

Table 1 - Reported data from all Interventional Cardiology Centers in Romania in 2022

CITY	Bucuresti							
Hospital	**CC Iliescu**	**SUUB**	**Floreasca**	**Agrippa Ionescu**	**Militar**	**Bagdasar**	**Elias**	**Sf Ioan**
Nr. Of Cathlabs	3	2	1	2	3	2	1	1
Nr. Independent operators	7	6	6	2	7	4	6	2
Nr. of in-training operators	5	7	2	0	3	0	5	0
Coronary Interventions								
Coronarography	3166	1041	1619	734	2631	784	499	271
Total nr. of PCI	1233	1092	950	131	995	276	636	75
PCI without stents	98	59	20	17	21	14	41	7
PCI with stents	1135	1033	910	114	974	262	595	68
STEMI with primary PCI	479	811	700	14	268	97	450	17
PCI left main	80	54	45	3	32	24	58	3
CTO	45	38	35	12	49	16	42	0
Stents per patient[2]	1.8	1.46	1.9	1.42	1.9	1.58	1.3	1.3
Total nr. of stents	2043	1602	1805	187	1851	416	831	103
Nr. of DES	2043	1602	1805	187	1845	416	831	103
DES/stents ratio (%)	100%	100%	100%	100%	99%	100%	100%	100%
Cutting, Scoring	45	11	4	5	6	6	0	0
Rotabalation	5	0	9	3	10	0	0	0
Shockwave	3	0	6	0	2	0	0	0
FFR/IFR	12	8	67	14	5	0	0	0
IVUS	18	2	15	8	1	0	0	0
OCT	12	4	48	2	0	0	0	0
Peripheral interventions								
Peripheral PTA [3]	150	0	0	17	271	2	24	22
Renal PTA	10	0	0	0	7	1	0	7
Carotid PTA	4	0	0	17	51	0	2	0
Total nr. of stents in peripheral PTA	85	0	0	15	220	2	7	34
Peripheral angiography	623	57	0	175	1017	116	158	106
Other interventions								
TAVI	216	36	44	4	38	0	0	0
MitraClip	0	0	0	0	0	0	0	0
Aortic endoprosthesis	UR	0	17	0	14	0	0	0
Interventions in structural heart disease[4]	30	23	0	0	2	0	0	0

Continued Table 1 - Reported data from all Interventional Cardiology Centers in Romania in 2022

CITY	Bucuresti				Cluj Napoca			
Hospital	**Sanador**	**Ares - Monza**	**Colentina**	**Medlife**	**Institutul Inimii Cluj**	**SCJU Cluj**	**Monza-Ares Cluj**	**Sp. Recuperare Cluj**
Nr. Of Cathlabs	1	3	1	1	3	1	2	1
Nr. Independent operators	2	7	1	10	10	6	3	2
Nr. of in-training operators	0	0	1	0	1	8	0	0
Coronary Interventions								
Coronarography	1241	1043	220	518	2069	1345	565	423
Total nr. of PCI	154	420	81	125	1923	743	228	190
PCI without stents	1	2	1	12	60	47	8	10
PCI with stents	153	418	80	113	1779	696	220	180
STEMI with primary PCI	UR	0	1	4	571	216	0	2
PCI left main	UR	73	UR	4	75	33	20	10
CTO	10	23	UR	10	64	43	11	9
Stents per patient[2]	UR	1.74	1.56	1.25	1.35	2.03	1.32	2
Total nr. of stents	UR	729	125	156	2403	1508	291	360
Nr. of DES	UR	729	125	156	2403	1508	291	349
DES/stents ratio (%)	UR	100%	100%	100%	100%	100%	100%	97%
Cutting, Scoring	UR	UR	0	1	58	3	UR	0
Rotabalation	UR	31	0	0	20	10	5	0
Shockwave	UR	21	0	1	9	0	0	0
FFR/IFR	UR	0	0	0	80	0	0	0
IVUS	UR	0	0	0	69	0	0	0
OCT		0	0	0	25	23	0	0
Peripheral interventions								
Peripheral PTA [3]	123	30	19	40	155	288	37	73
Renal PTA	4	0	0	2	14	12	0	2
Carotid PTA	UR	34	0	6	31	8	22	0
Total nr. of stents in peripheral PTA	UR	62	14	1.6	152	196	58	0
Peripheral angiography	594	93	44	125	175	425	60	116
Other interventions								
TAVI	80	62	0	0	141	0	0	0
MitraClip	0	2	0	0	0	0	0	0
Aortic endoprosthesis	24	8	0	0	12	0	UR	0
Interventions in structural heart disease[4]	4	22	0	0	19	0	5	0

Continued Table 1 - Reported data from all Interventional Cardiology Centers in Romania in 2022

CITY	Iași			Târgu Mureș			
Hospital	**IBCV Iași**	**Arcadia Iasi**	**Sp. Sf. Spiridon**	**IBCV Tg Mureș**	**CardioMed Tg. Mures**	**SCJU Tg Mureș**	**Topmed**
Nr. Of Cathlabs	2	1	2	1	1	2	1
Nr. Independent operators	6	3	4	6	1	6	4
Nr. of in-training operators	9	0	2	0	11	2	0
Coronary Interventions							
Coronarography	3783	847	1221	1761	987	1316	1435
Total nr. of PCI	2077	92	892	1104	770	1026	208
PCI without stents	215	3	3	111	32	43	3
PCI with stents	1862	90	895	993	737	983	205
STEMI with primary PCI	863	0	259	406	385	513	0
PCI left main	UR	UR	83	UR	12	16	21
CTO	UR	UR	25	20	31	41	13
Stents per patient[2]	1.47	1..43	1.47	1.41	1	1.17	1.24
Total nr. of stents	3048	129	1318	1567	829	1105	258
Nr. of DES	3048	129	1318	1567	765	1020	258
DES/stents ratio (%)	100%	100%	100%	100%	100%	92%	100%
Cutting, Scoring	0	UR	30	0	0	0	7
Rotabalation	0	UR	0	6	0	0	11
Shockwave	0	UR	0	5	0	0	0
FFR/IFR	21	UR	19	28	19	25	0
IVUS	16	UR	12	0	0	0	0
OCT	0	UR	0	12	31	41	4
Peripheral interventions							
Peripheral PTA [3]	67	6	9	89	22	29	17
Renal PTA	8	0	12	0	2	3	0
Carotid PTA	31	12	8	28	0	0	7
Total nr. of stents in peripheral PTA	106	UR	21	60	7	9	18
Peripheral angiography	708	118	32	120	61	81	129
Other interventions							
TAVI	53	0	0	132	0	0	0
MitraClip	0	0	0	0	0	0	0
Aortic endoprosthesis	8	0	0	13	0	0	0
Interventions in structural heart disease[4]	0	2	0	12	0	0	0

Continued Table 1 - Reported data from all Interventional Cardiology Centers in Romania in 2022

CITY	Timișoara	Brașov		Oradea	Suceava	Baia Mare
Hospital	**IBCV Timișoara**	**Clinicco Brasov**	**Sp. Jud. Brasov**	**Sp. Jud. Oradea**	**Sp. Jud. Suceava**	**Sp. Jud. Baia Mare**
Nr. Of Cathlabs	2	1	UR	2	UR	3
Nr. Independent operators	6	2	UR	4	UR	3
Nr. of in-training operators	4	0	UR	2	UR	0
Coronary Interventions						
Coronarography	3250	1009	UR	671	UR	286
Total nr. of PCI	1876	294	UR	811	UR	592
PCI without stents	40	7	UR	31	UR	24
PCI with stents	1722	287	UR	780	UR	568
STEMI with primary PCI	985	3	UR	326	UR	257
PCI left main	196	42	UR	45	UR	35
CTO	56	5	UR	71	UR	8
Stents per patient[2]	1.95	1.66	UR	1.87	UR	1.51
Total nr. of stents	3590	477	UR	1456	UR	859
Nr. of DES	3532	477	UR	1456	UR	859
DES/stents ratio (%)	98.30%	100%	UR	100%	UR	100%
Cutting, Scoring	11	0	UR	14	UR	14
Rotabalation	0	0	UR	17	UR	1
Shockwave	0	11	UR	1	UR	0
FFR/IFR	4	0	UR	10	UR	9
IVUS	0	0	UR	12	UR	0
OCT	3	0	UR	0	UR	4
Peripheral interventions						
Peripheral PTA [3]	66	10	UR	59	UR	32
Renal PTA	9	1	UR	2	UR	3
Carotid PTA	66	1	UR	19	UR	0
Total nr. of stents in peripheral PTA	121	15	UR	21	UR	23
Peripheral angiography	486	6	UR	105	UR	119
Other interventions						
TAVI	52	1	UR	0	UR	0
MitraClip	0	4	UR	0	UR	0
Aortic endoprosthesis	9	0	UR	13	UR	10
Interventions in structural heart disease[4]	12	1	UR	0	UR	0

Continued Table 1 - Reported data from all Interventional Cardiology Centers in Romania in 2022

CITY	Sibiu		Constanta	Ploiesti	Pitesti
Hospital	Polisano Sibiu	Sp. Jud. Sibiu	Monza - Ares Constanta	Sp. Jud. Ploiesti	Sp. Jud. Pitesti
Nr. Of Cathlabs	1	UR	1	1	1
Nr. Independent operators	1	UR	2	2	3
Nr. of in-training operators	0	UR	1	0	0
Coronary Interventions					
Coronarography	610	UR	1005	588	635
Total nr. of PCI	251	UR	548	396	516
PCI without stents	2	UR	16	26	22
PCI with stents	249	UR	532	370	494
STEMI with primary PCI	0	UR	196	217	361
PCI left main	12	UR	17	5	27
CTO	25	UR	3	0	23
Stents per patient[2]	1.7	UR	1.3	1.56	1.67
Total nr. of stents	415	UR	721	578	866
Nr. of DES	415	UR	721	578	866
DES/stents ratio (%)	100%	UR	100%	100%	100%
Cutting, Scoring	0	UR	0	3	31
Rotabalation	12	UR	4	0	6
Shockwave	5	UR	4	0	4
FFR/IFR	0	UR	0	0	10
IVUS	0	UR	0	0	12
OCT	0	UR	0	0	0
Peripheral interventions					
Peripheral PTA [3]	17	UR	32	3	72
Renal PTA	0	UR	0	0	0
Carotid PTA	0	UR	1	0	18
Total nr. of stents in peripheral PTA	15	UR	15	3	UR
Peripheral angiography	30	UR	40	102	145
Other interventions					
TAVI	70	UR	0	0	0
MitraClip	0	UR	0	0	0
Aortic endoprosthesis	2	UR	0	0	0
Interventions in structural heart disease[4]	2	UR	0	0	0

Continued Table 1 - Reported data from all Interventional Cardiology Centers in Romania in 2022

CITY	Pitesti		Craiova	Tulcea	Buzau
Hospital	Memorial Hospital	Sp. Muntenia	Sp. Jud. Craiova	Monza - Ares Tulcea	Sp. Jud. Buzau
Nr. Of Cathlabs	1	1	2	1	1
Nr. Independent operators	1	2	4	1	1
Nr. of in-training operators	1	0	1	0	1
Coronary Interventions					
Coronarography	14	85	2285	239	115
Total nr. of PCI	5	13	884	119	42
PCI without stents	0	1	28	10	1
PCI with stents	5	12	856	109	41
STEMI with primary PCI	0	0	491	0	4
PCI left main	0	0	63	10	0
CTO	0	0	11	0	2
Stents per patient[2]	2	1.92	1.2	1.4	1.4
Total nr. of stents	10	25	1046	167	59
Nr. of DES	10	25	1046	167	59
DES/stents ratio (%)	100%	100%	100%	100%	100%
Cutting, Scoring	0	0	10	0	0
Rotabalation	0	0	0	0	0
Shockwave	0	0	5	0	0
FFR/IFR	0	0	3	0	0
IVUS	0	0	0	0	0
OCT	0	0	0	0	0
Peripheral interventions					
Peripheral PTA [3]	4	0	0	11	0
Renal PTA	0	0	2	0	0
Carotid PTA	1	0	0	0	0
Total nr. of stents in peripheral PTA	4	0	2	16	0
Peripheral angiography	32	11	83	8	4
Other interventions					
TAVI	0	0	0	0	0
MitraClip	0	0	0	0	0
Aortic endoprosthesis	0	0	0	0	0
Interventions in structural heart disease[4]	0	0	0	0	0

1 Total number of elective and urgent PCIs
2 It will represent the ratio between the total number of implanted stents and the total number of patients undergoing PCI
3 Number of peripheral angioplasty (lower and upper limbs artery, not including carotid arteries)
4 Interventions in cardiac structural diseases: percutaneous closures of DSA, DSV, PFO, arterial duct, balloon valvulotomies, left atrial appendage closure (PCI - percutaneous coronary intervention, STEMI - ST segment elevation myocardial infarction, DES – drug eluting stent, BVS - bioresorbable vascular scaffold, FFR - fractional flow reserve, IFR - instantaneous wave-free ratio, IVUS – intravascular ultrasound, OCT - optical coherence tomography, PTA - percutaneous transluminal angioplasty, TAVI - transcatheter aortic valve implantation, UR – unreported or data not available)

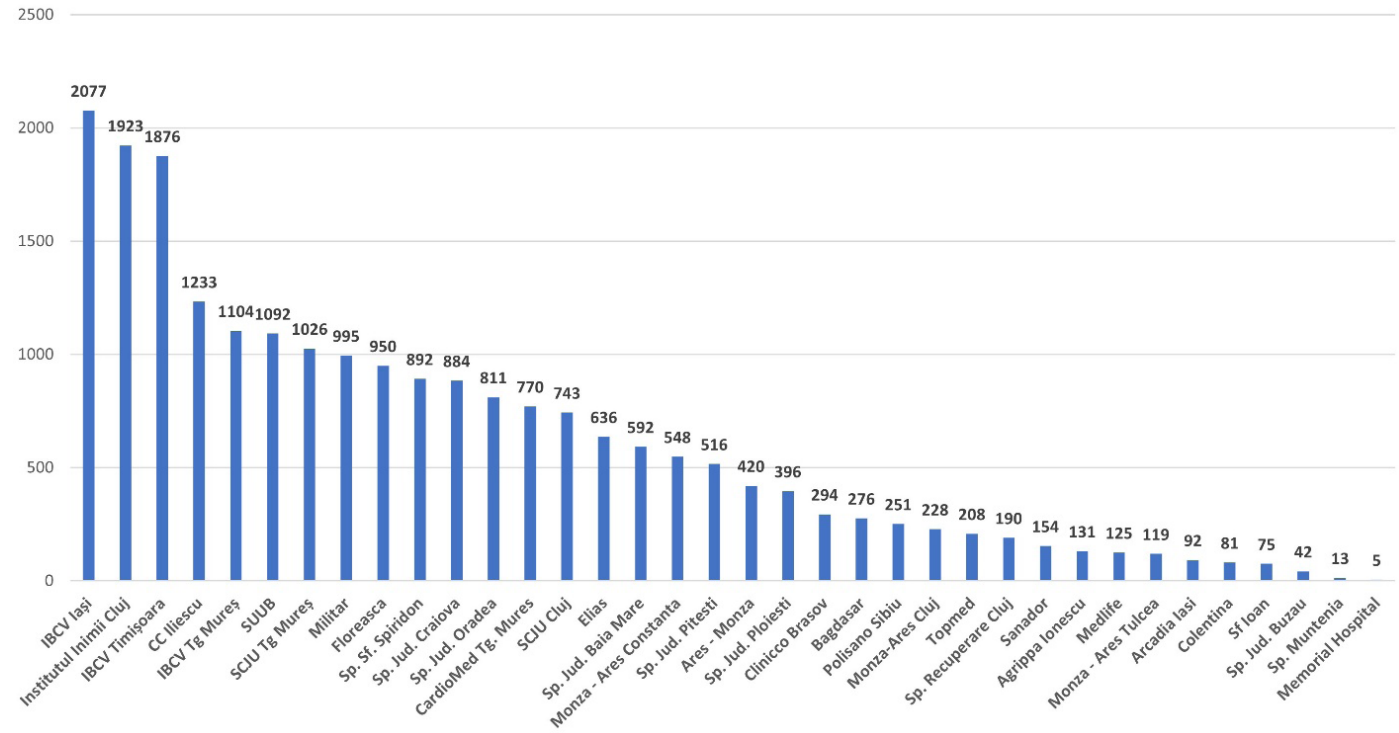


Figure 1 - Total number of PCIs in 2022 in all interventional centers of Romania (PCI - percutaneous coronary intervention).

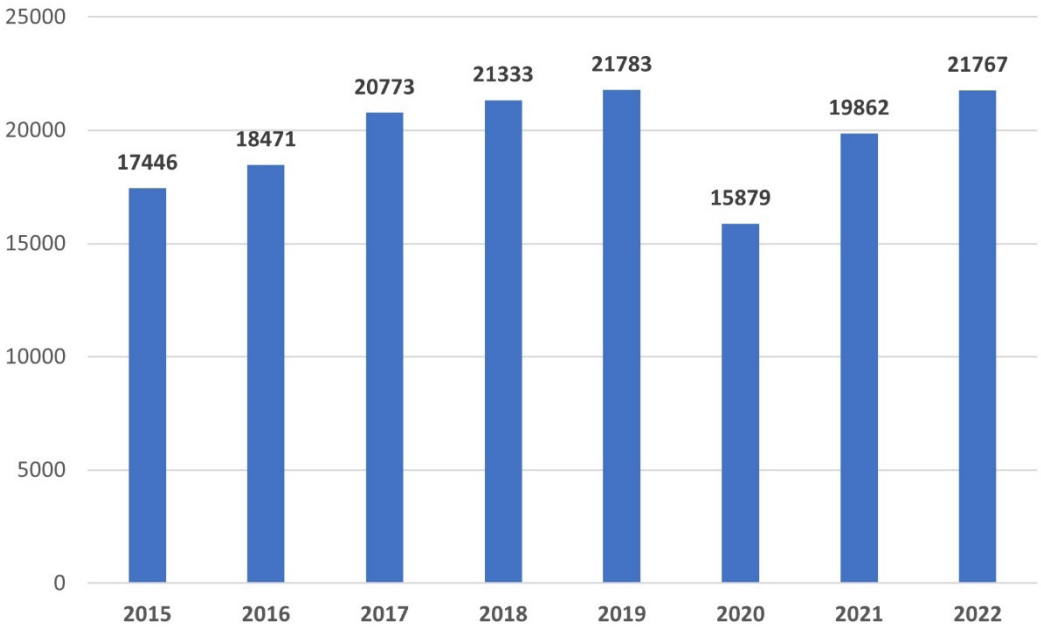


Figure 2 - Total number of percutaneous coronary interventions from 2014 to 2022 in Romania.

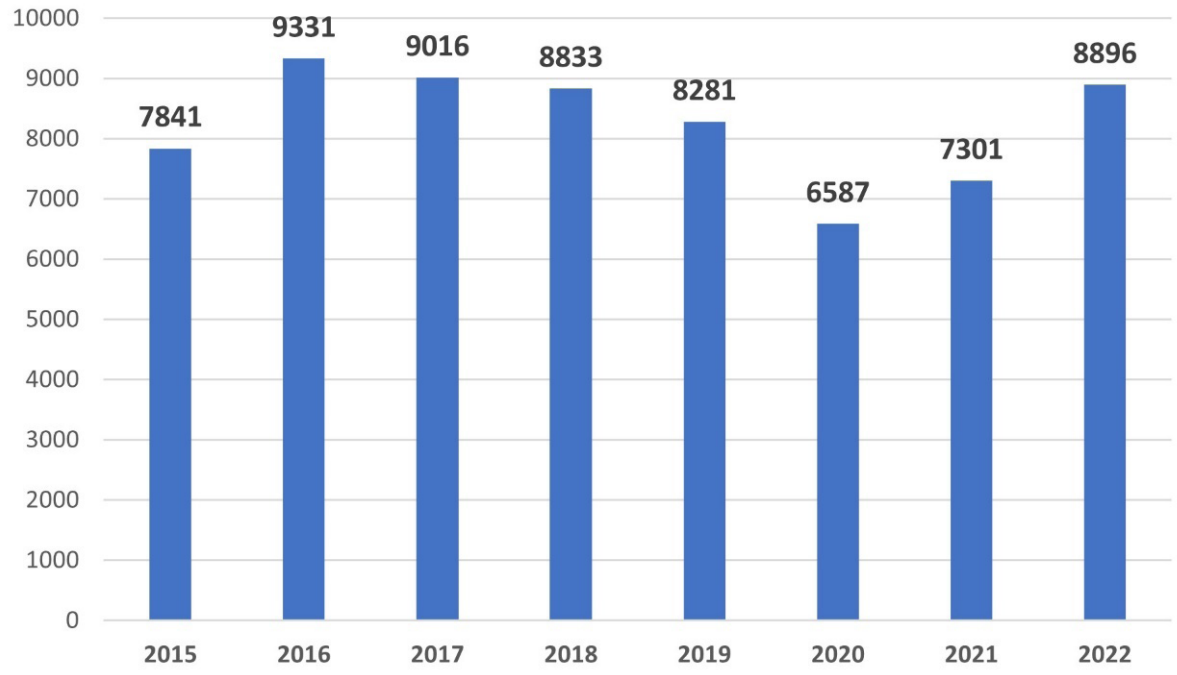


Figure 3 - Total number of primary PCIs in STEMI patients from 2015 to 2022 in interventional centers of Romania (PCI - percutaneous coronary intervention, STEMI - ST segment elevation myocardial infarction).

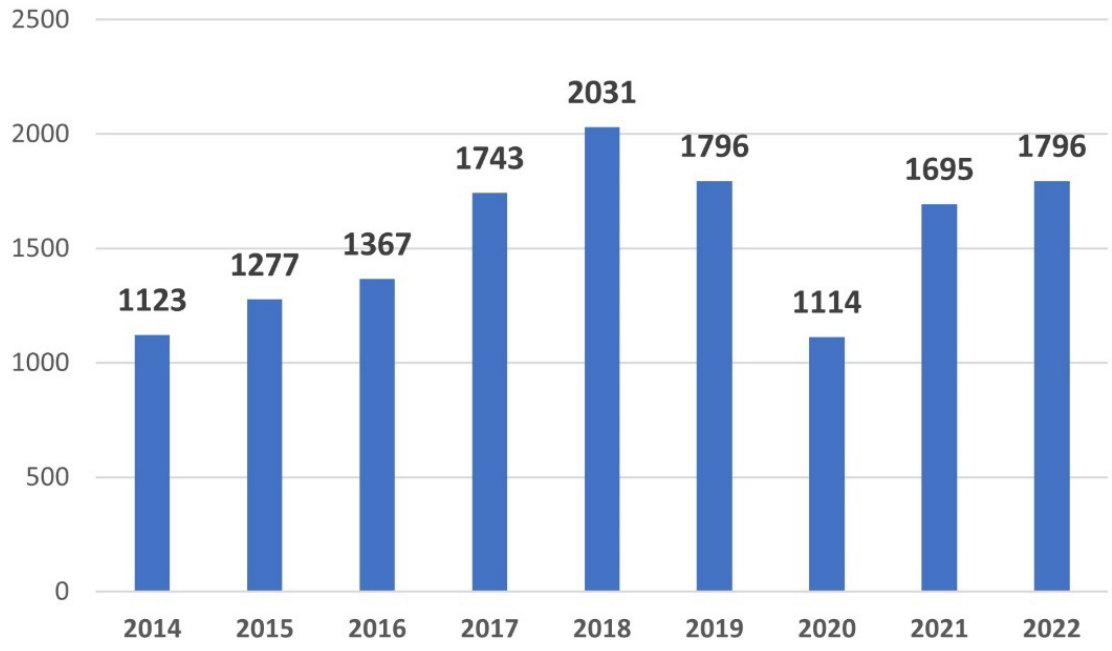


Figure 4 - Total number of peripheral angioplasties from 2014 to 2022 in Romania (only in interventional cardiology centers).

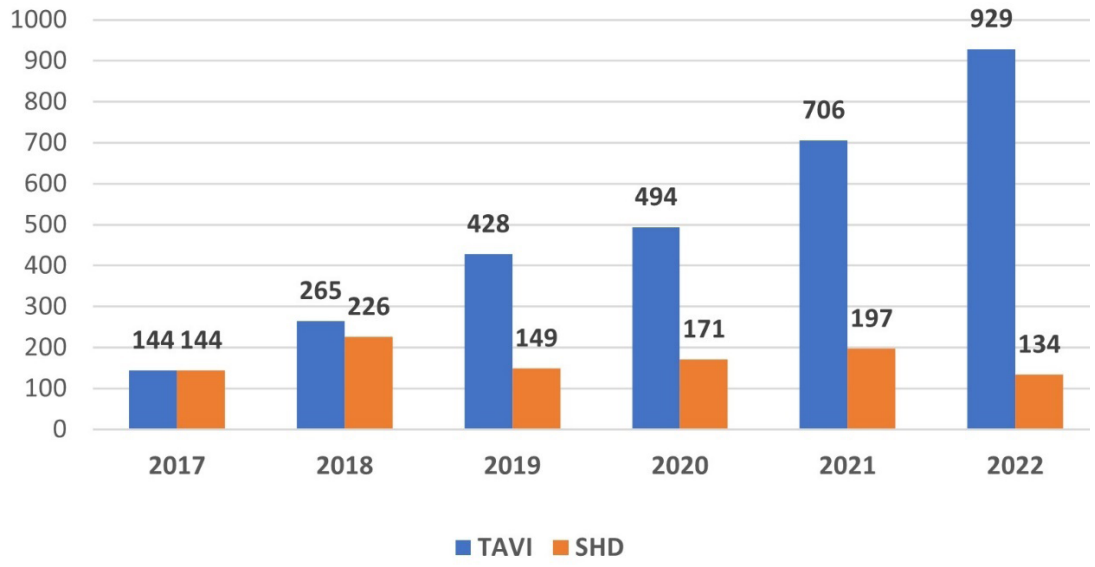


Figure 5. Total number of TAVI and interventions in SHDs performed from 2017 to 2022 in Romania (TAVI - transcatheter aortic valve implantation, SHDs – structural heart diseases)

Acknowledgement

We want to thank for their vital contributions to data collection: Dr. Adrian Bucsa and Prof. Dr. Vlad Iliescu, „Prof. Dr. CC Iliescu" Emergency Institute for Cardiovascular Diseases, Bucharest; Dr. Cristian Udroiu and Prof. Dr. Dragos Vinereanu, Emergency University Hospital, Bucharest; Dr. Lucian Calmac, Emergency Clinic Hospital, Bucharest; Dr. Emanuel Radu, Emergency Clinical Hospital „Prof. Dr. Agrippa Ionescu „, Bucharest; Dr. Sebastian Botezatu and Dr. Cristina Spînu, Central Military Emergency University Hospital „Dr. Carol Davila", Bucharest; Dr. Valentin Chioncel, „Bagdasar-Arseni" Clinical Emergency Hospital, Bucharest; Dr. Mihai Melnic, Elias Emergency University Hospital, Bucharest; Dr. Octavian Zara, „Sf. Ioan" Clinical Emergency Hospital, Bucharest; Dr. Rodica Niculescu, Sanador Clinical Hospital, Bucharest; Dr. Iulian Calin, ARES Centers of Excellence in Cardiology and Radiology, Bucharest and Ares-Monza, Constanta and Cluj Napoca; Prof. Dr. Gheorghe Dan and Dr. Emilian Mihai, Colentina Clinical Hospital, Bucharest; Dr. Florina Pinte, Medlife, Bucharest; Dr. Stefan Mot and Dr. Mihai Cocoi, Heart Institute „Niculae Stancioiu", Cluj-Napoca; Prof. Dr. Dan Olinic and Dr. Dan Tataru, County Emergency Hospital, Cluj-Napoca; Dr. Amin Bazyani, Institute of Cardiovascular Diseases „Prof. Dr. George IM Georgescu", Dr. Igor Nedelciuc, Arcadia, Iasi; Prof. Dr. Imre Benedek and Prof. Dr. Teodora Benedek, County Emergency Hospital and CardioMed, Targu Mures, Dr. Ayman Elkahlout and Dr. Viorel Nicolae, Emergency Institute For Cardiovascular Diseases, Targu Mures; Conf. Dr. Ioan Tilea, Topmed, Targu Mures; Conf. Dr. Cristian Mornos, Institute Of Cardiovascular Disease, Timisoara; Dr. Mihai Ursu, Clinicco, Brasov; Dr. Florin Ortan and Dr. Cristina Popica, County Emergency Hospital, Brasov; Dr. Virgil Popa and Dr. Mihnea Nichita, County Emergency Clinical Hospital, Oradea; Dr. Dan Filip, County Emergency Hospital "Dr. Constantin Opris", Baia Mare; Dr. Nicolae Florescu, Polisano, Sibiu; Dr. Ioan Bitea, County Emergency Hospital, Sibiu; Dr. Marian Albu and Dr. Victor Iorga, County Emergency Hospital, Ploiesti; Dr. Elvis Botu and Dr. Gabriel Stanica, County Emergency Hospital, Pitesti; Dr. Radu Stavaru and Dr. Paul Trasca; County Emergency Hospital, Craiova; Dr. Matei Florin, County Emergency Hospital, Buzau.

Author Contributions

All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Informed Consent Statement

Written informed consent for the procedure and to publish this paper has been obtained from the patient.

Acknowledgments

none

Conflicts of Interest

The authors declare no conflict of interest.

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