The Workload of the Interventional Cardiology Centers from Romania: a 2021 Overview and 2014-2021 Trends

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Abstract
This article provides data on the workload of the interventional cardiology centers in Romania during 2021. Members from all interventional cardiology centers in Romania were requested to fill out a standard form about the total number of various procedures they performed during 2021. The report highlights the total number of coronary interventions, peripheral interventions, and interventions for structural heart diseases that were performed in 2021 in Romania. A comparison of the workload of the interventional cardiology centers from Romania between 2014 to 2021 was completed.

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 2021. 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 2021. Raportul evidenţiază numărul total de intervenţii coronariene, intervenţii periferice şi intervenţii pentru boli structurale cardiace, care au fost efectuate în 2021 în România. S-a făcut o comparaţie între volumul de lucru al centrelor de cardiologie intervenţională din România între anii 2014 şi 2021.

Cuvinte cheie
cardiologie intervenţională, intervenţii coronariene percutane, stenturi

This article provides data of the workload of the interventional cardiology centers from Romania during 2021, highlighting the trends in coronary and peripheral interventions between 2014 and 2021[1-7]. Members from all interventional cardiology centers from Romania were requested to fill a standardized form about the total number of various procedures performed during 2021. Data was collected at the initiative of the Interventional Cardiology Working Group of Romanian Society of Cardiology.

Table 1 summarizes the data from 2021 provided by 40 public and private interventional cardiology centers from Romania. Currently, there are 40 interventional cardiology centers in Romania, of which 15 are private centers and 25 are public. In 2021, in Romania were 44 interventional cardiologists in training, 133 full interventional cardiologists and 55 functional angiografs. The exact number of full interventional cardiologist is difficult to know because of some interventional cardiologists are working in public and private hospitals, also.

The annual number of PCIs in every interventional cardiology center from Romania is represented in Figure 1. A direct comparison of data from 2014 to 2021 was completed, highlighting the continuous increase of workload of the interventional cardiology centers from Romania until 2021 when we have a clear decrease (Figure 2). In 2021, the number of PCIs increased, approaching the number of the pre-pandemic era. In 2021, in Romania, 19862 PCIs were performed compared to 15879 in 2019, that represent an increase by 25%. The total number of primary PCIs increased in 2021 with 10.8% compared to 2020 (Figure 3).

Although the total number of peripheral angioplasties doubled from 2014 to 2018, in 2019 there was a decrease in this regard by 13%, further decreasing in 2020 by 38% compared to 2019 (Figure 4). However, in 2021, 1695 peripheral angioplasties were performed, marking a 52% increase.

The number of TAVI procedures doubled every year between 2015-2019, and the trend was maintained in 2021 with an increase of 43% compared to 2020 (Figure 5). The number of procedures performed in structural heart diseases increased from 2020 to 2021 by 15.2% (Figure 5).

There is a continuous need for the implementation of a Mandatory Interventional Cardiology National Registry capable of objectively monitoring these key healthcare services in a standard manner. This national registry can guide further development of interventional cardiology in Romania[1-6].

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Table 1 - Reported data from all Interventional Cardiology Centers from Romania in 2021

CITY	Bucharest							
Hospital	**CC Iliescu**	**SUUB**	**Floreasca**	**Agrippa Ionescu**	**Militar**	**Bagdasar**	**Elias**	**Sf Ioan**
Nr. of Cathlabs	3	2	1	1	3	1	1	1
Nr. of independent operators	7	5	4	2	5	4	6	2
Nr. of in-training operators	6	8	0	0	1	1	5	0
Coronary Interventions								
Coronarographies	2371	1640	1450	612	2512	568	1135	56
Total nr. of PCI	1070	909	920	117	986	176	636	32
PCI without stents	50	40	UR	14	12	12	41	2
PCI with stents	1020	869	UR	103	974	164	595	30
STEMI with primary PCI	485	574	660	6	375	46	450	0
PCI left main	114	52	UR	1	45	14	58	0
CTO	UR	20	25	11	63	18	42	0
Stents per patient[2]	1.42	1.39	UR	1.57	2.1	1.58	1.3	1.5
Total nr. of stents	1458	1264	UR	184	2045	266	831	44
Nr. of DES	1458	1264	UR	184	2033	266	831	44
DES/stents ratio (%)	100%	100%	UR	100	99%	100%	100%	100%
Cutting, Scoring	15	5	UR	1	22	0	0	0
Rotablation	8	0	10	1	12	0	0	0
Shockwave	0	0	4	0	0	0	0	0
FFR/IFR	15	9	49	10	2	0	0	0
IVUS	17	0	16	3	0	0	0	0
OCT	5	10	29	1	0	0	0	0
Peripheral interventions								
Peripheral PTA [3]	198	0	UR	4	230	0	24	2
Renal PTA	18	0	UR	0	12	1	0	0
Carotid PTA	9	0	UR	15	47	0	2	0
Total nr. of stents in peripheral PTA	80	0	UR	5	188	1	7	2
Peripheral angiography	475	70	UR	141	869	48	158	52
Other interventions								
TAVI	177	29	3	6	13	0	0	0
MitraClip	0	0	0	0	0	0	0	0
Aortic endoprostheses	4	0	0	0	12	0	0	0
Interventions in structural heart disease[4]	24	12	0	3	10	0	0	0

Continued Table 1 - Reported data from all Interventional Cardiology Centers from Romania in 2021

CITY	Bucharest				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	2	1	1	2
Nr. of independent operators	3	2	1	7	10	6	UR	2
Nr. of in-training operators	0	0	1	0	0	5	UR	0
Coronary Interventions								
Coronarographies	1071	1070	175	663	2638	1091	366	335
Total nr. of PCI	159	493	58	141	2336	620	246	156
PCI without stents	0	1	0	4	64	26	2	20
PCI with stents	159	492	58	77	2272	594	244	136
STEMI with primary PCI	18	0	1	2	618	184	0	0
PCI left main	10	0	UR	7	68	41	0	15
CTO	UR	17	UR	27	20	10	7	8
Stents per patient[2]	1.42	1.55	1.39	1.64	2.1	2.24	1.4	1.7
Total nr. of stents	UR	763	81	232	2632	1312	344	260
Nr. of DES	UR	763	81	232	2632	1312	344	250
DES/stents ratio (%)	UR		100%	100%	100%	100%	100%	96%
Cutting, Scoring	0	5	0	3	16	1	2	0
Rotablation	0	7	0	0	6	6	2	0
Shockwave	0	19	0	2	5	1	0	0
FFR/IFR	0	0	0	0	90	0	13	0
IVUS	0	3	0	0	30	0	0	0
OCT	0	0	0	0	22	8	0	0
Peripheral interventions								
Peripheral PTA [3]	73	55	6	22	120	184	59	87
Renal PTA	1	2	0	1	8	7	2	5
Carotid PTA	0	21	0	3	31	2	27	0
Total nr. of stents in peripheral PTA	18	78	4	39	232	156	59	35
Peripheral angiography	540	24	34	185	220	323	56	170
Other interventions								
TAVI	33	74	0	0	107	0	0	0
MitraClip	0	5	0	0	0	0	0	0
Aortic endoprostheses	4	1	0	0	16	0	0	0
Interventions in structural heart disease[4]	1	32	0	5	8	0	8	0

Continued Table 1 - Reported data from all Interventional Cardiology Centers from Romania in 2021

CITY	Iasi			Târgu Mureș			
Hospital	**IBCV Iași**	**Arcadia Iasi**	**Sp. Sf. Spiridon**	**IBCV Tg Mureș**	**CardioMed Tg. Mures**	**SCJU Tg Mureș**	**Topmed**
Nr. of Cathlabs	3	1	1	2	1	2	1
Nr. of independent operators	6	3	UR	6	6	6	4
Nr. of in-training operators	6	0	UR	3	0	2	0
Coronary Interventions							
Coronarographies	2667	1208	575	1306	577	892	1206
Total nr. of PCI	1674	150	598	831	236	777	192
PCI without stents	96	2	54	76	14	16	4
PCI with stents	1494	148	544	755	222	761	188
STEMI with primary PCI	655	41	150	327	0	385	0
PCI left main	UR	12	39	56	7	31	16
CTO	UR	UR	29	UR	8	23	13
Stents per patient[2]	1.44	1.5	1.6	1.5	1.32	1.16	1.11
Total nr. of stents	2408	208	877	1238	293	878	215
Nr. of DES	2405	208	868	1234	293	878	215
DES/stents ratio (%)	99%	100%	98%	99,7%	100%	100%	100%
Cutting, Scoring	0	0	1	UR	0	4	12
Rotablation	0	0	1	6	0	5	7
Shockwave	0	0	0	0	0	0	2
FFR/IFR	0	0	7	29	9	20	0
IVUS	0	0	6	0	11	15	0
OCT	0		0	14	21	43	0
Peripheral interventions							
Peripheral PTA[3]	46	42	7	66	86	38	20
Renal PTA	12	0	5	1	0	1	1
Carotid PTA	1	8	2	28	1	2	5
Total nr. of stents in peripheral PTA	29	0	8	45	12	12	19
Peripheral angiography	385	108	78	57	94	96	140
Other interventions							
TAVI	47	0	0	66	0	2	0
MitraClip	0	0	0	0	0	0	0
Aortic endoprostheses	15	0	0	24	0	0	0
Interventions in structural heart disease[4]	0	5	0	73	0	0	0

Continued Table 1 - Reported data from all Interventional Cardiology Centers from Romania in 2021

CITY	Timișoara	Brașov			Oradea	Suceava
Hospital	IBCV Timișoara	Clinicco Brasov	Sp. Jud. Brasov	Sp. Sf. Constantin	Sp. Jud. Oradea	Sp. Jud. Suceava
Nr. of Cathlabs	2	1	2	1	2	UR
Nr. of independent operators	7	2	4	3	4	UR
Nr. of in-training operators	2	0	0	0	2	UR
Coronary Interventions						
Coronarographies	2653	880	2337	1042	1120	UR
Total nr. of PCI	1453	391	775	197	557	UR
PCI without stents	49	7	5	1	29	UR
PCI with stents	804	384	770	196	526	UR
STEMI with primary PCI	683	2	374	3	242	UR
PCI left main	UR	36	20	6	29	UR
CTO	UR	UR	30	0	53	UR
Stents per patient[2]	1.93	1.48	1.4	1	1.9	UR
Total nr. of stents	2814	579	1282	233	1003	UR
Nr. of DES	2774	579	1282	233	1003	UR
DES/stents ratio (%)	99%	100%	100%	100%	100%	UR
Cutting, Scoring	0	0	20	3	8	UR
Rotablation	0	0	0	8	19	UR
Shockwave	0	21	0	7	2	UR
FFR/IFR	6	0	50	0	19	UR
IVUS	0	0	0	0	9	UR
OCT	2	0	15	0	0	UR
Peripheral interventions						
Peripheral PTA [3]	39	15	UR	66	16	UR
Renal PTA	7	0	UR	0	2	UR
Carotid PTA	90	1	15	0	9	UR
Total nr. of stents in peripheral PTA	137	9	UR	72	15	UR
Peripheral angiography	466	11	UR	80	163	UR
Other interventions						
TAVI	44	3	0	42	0	UR
MitraClip	0	0	0	0	0	UR
Aortic endoprostheses	19	1	0	24	12	UR
Interventions in structural heart disease[4]	12	1	0	0	0	UR

Continued Table 1 - Reported data from all Interventional Cardiology Centers from Romania in 2021

CITY	Baia Mare	Sibiu		Constanta	Ploiesti	Pitesti
Hospital	**Sp. Jud. Baia Mare**	**Polisano Sibiu**	**Sp. Jud. Sibiu**	**Monza - Ares Constanta**	**Sp. Jud. Ploiesti**	**Sp. Jud. Pitesti**
Nr. of Cathlabs	3	1	1	1	1	1
Nr. of independent operators	3	1	1	1	2	3
Nr. of in-training operators	0	0	0	1	0	0
Coronary Interventions						
Coronarographies	295	800	486	814	560	625
Total nr. of PCI	483	328	163	516	346	387
PCI without stents	44	6	5	2	6	33
PCI with stents	439	322	158	514	340	354
STEMI with primary PCI	177	0	19	210	135	195
PCI left main	8	12	5	0	10	31
CTO	10	30	18	0	5	23
Stents per patient[2]	1.2	1.5	1.43	1.16	1.48	1.3
Total nr. of stents	580	484	234	600	505	454
Nr. of DES	577	484	234	600	505	454
DES/stents ratio (%)	99%	100%	100%	100%	100%	100%
Cutting, Scoring	11	0	3	0	5	14
Rotablation	0	10	0	0	0	5
Shockwave	0	3	0	0	0	4
FFR/IFR	13	0	0	0	0	10
IVUS	0	0	0	0	0	17
OCT	2	0	0	0	0	0
Peripheral interventions						
Peripheral PTA [3]	23	15	49	2	7	69
Renal PTA	3	0	0	0	0	2
Carotid PTA	0	0	0	0	0	10
Total nr. of stents in peripheral PTA	13	0	5	0	0	13
Peripheral angiography	102	328	73	1	46	174
Other interventions						
TAVI	0	60	0	0	0	0
MitraClip	0	0	0	0	0	0
Aortic endoprostheses	3	3	0	0	0	0
Interventions in structural heart disease[4]	0	3	0	0	0	0

Continued Table 1 - Reported data from all Interventional Cardiology Centers from Romania in 2021

CITY	Pitesti	Craiova	Tulcea	Buzau
Hospital	**Sp. Muntenia**	**Sp. Jud. Craiova**	**Monza - Ares Tulcea**	**Sp. Jud. Buzau**
Nr. of Cathlabs	1	1	1	1
Nr. of independent operators	2	1	1	1
Nr. of in-training operators	0	0	0	1
Coronary Interventions				
Coronarographies	18	1392	25	212
Total nr. of PCI	4	658	17	74
PCI without stents	1	18	1	6
PCI with stents	3	640	16	68
STEMI with primary PCI	0	274	0	10
PCI left main	0	18	0	6
CTO	0	4	0	5
Stents per patient[2]	1.2	1.83	1.5	1.54
Total nr. of stents	5	1171	26	105
Nr. of DES	5	1171	26	105
DES/stents ratio (%)	100%	100%	0	100%
Cutting, Scoring	0	16	0	0
Rotablation	0	0	0	0
Shockwave	0	0	0	0
FFR/IFR	0	2	0	0
IVUS	0	0	0	0
OCT	0	0	0	0
Peripheral interventions				
Peripheral PTA[3]	3	21	0	1
Renal PTA	0	0	0	0
Carotid PTA	0	0	0	0
Total nr. of stents in peripheral PTA	0	0	0	1
Peripheral angiography	10	21	0	24
Other interventions				
TAVI	0	0	0	0
MitraClip	0	0	0	0
Aortic endoprostheses	0	0	0	0
Interventions in structural heart disease[4]	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)

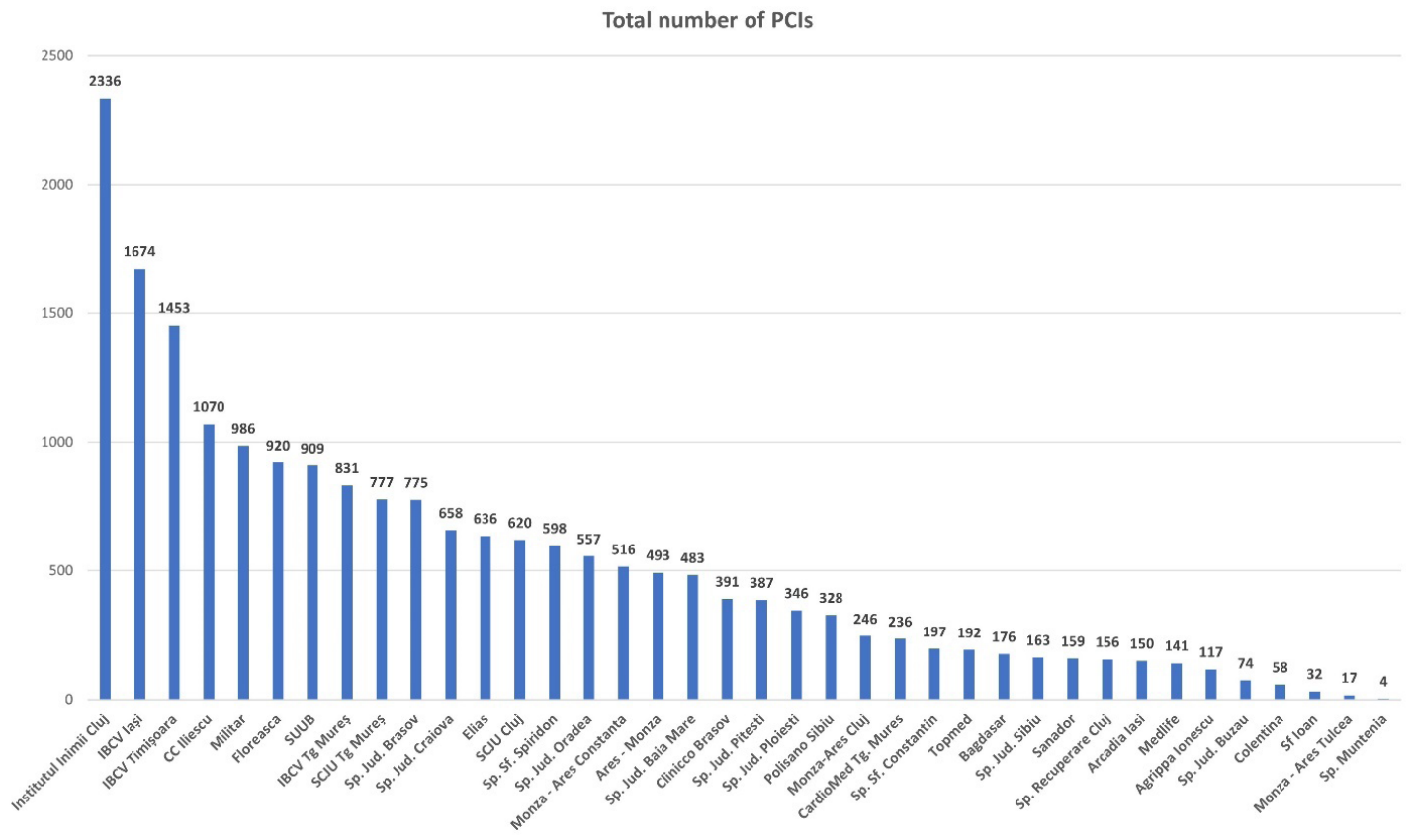


Figure 1 - Total number of PCIs in 2021 in all interventional centers from Romania (PCI: percutaneous coronary intervention)

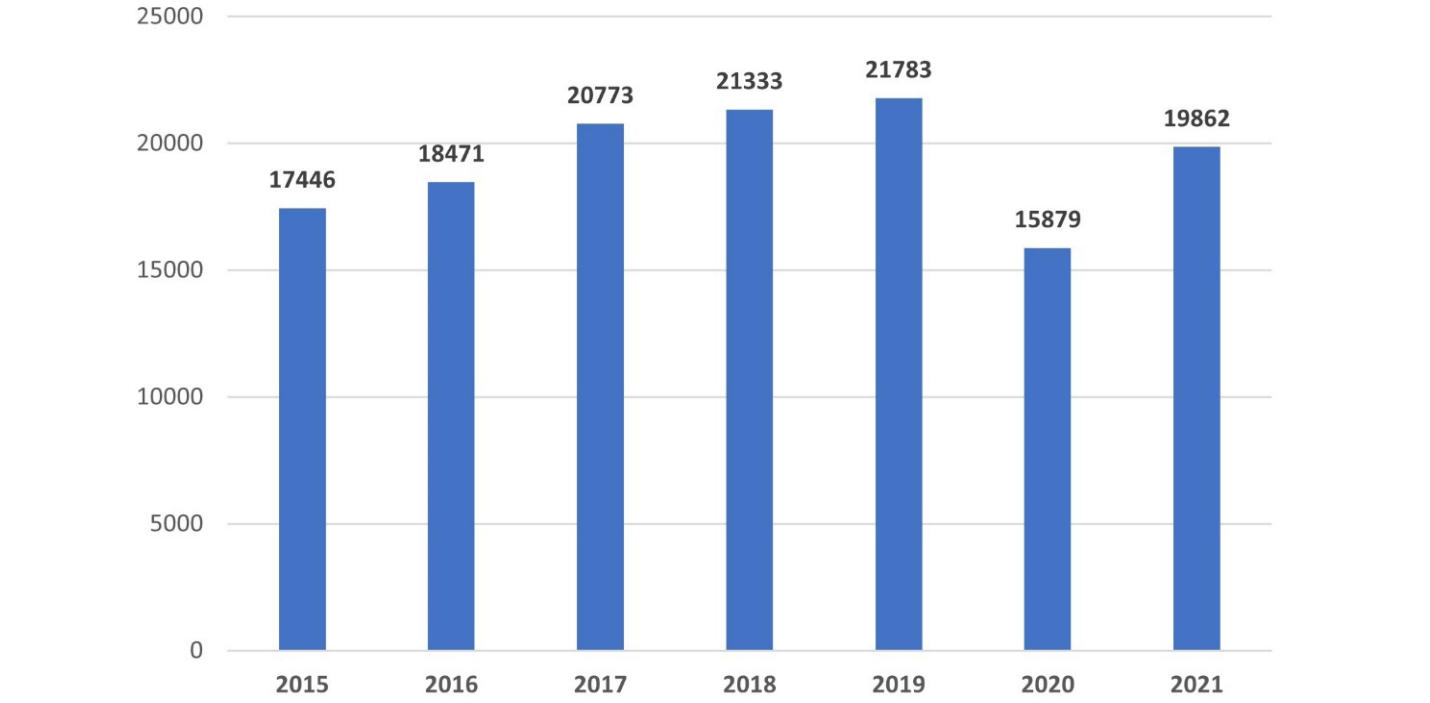


Figure 2 - Total number of percutaneous coronary interventions from 2014 to 2021 in Romania.

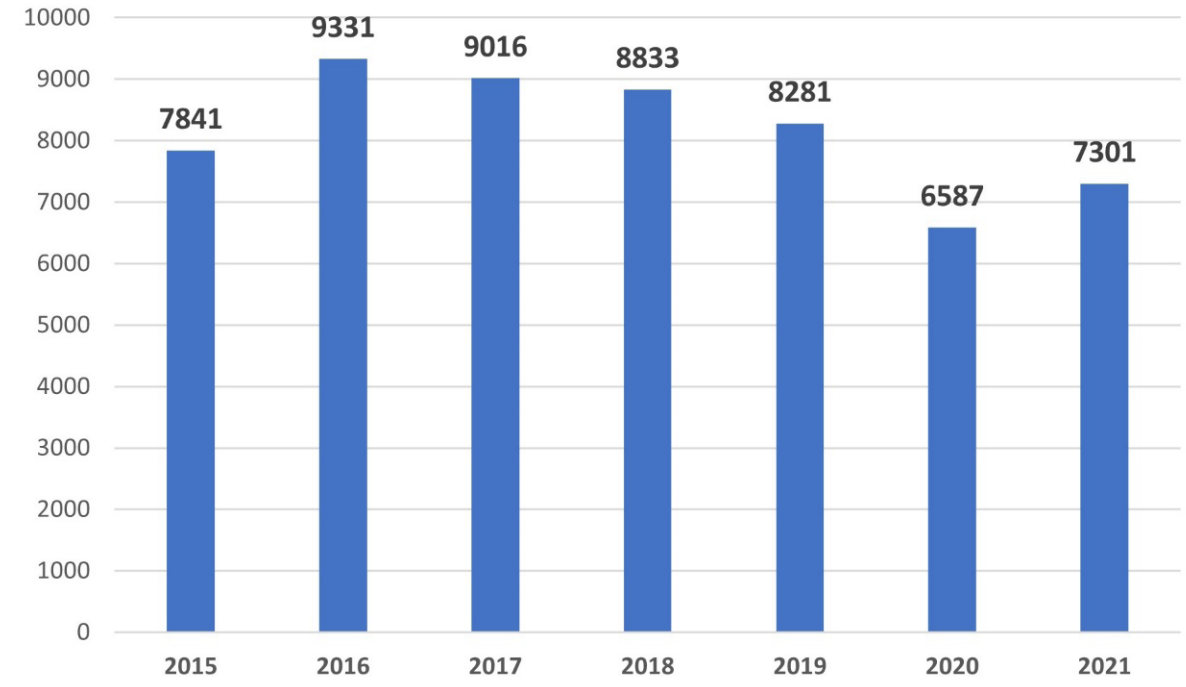


Figure 3 - Total number of primary PCIs in STEMI patients from 2015 to 2021 in interventional centers from Romania (PCI: percutaneous coronary intervention; STEMI: ST segment elevation myocardial infarction)

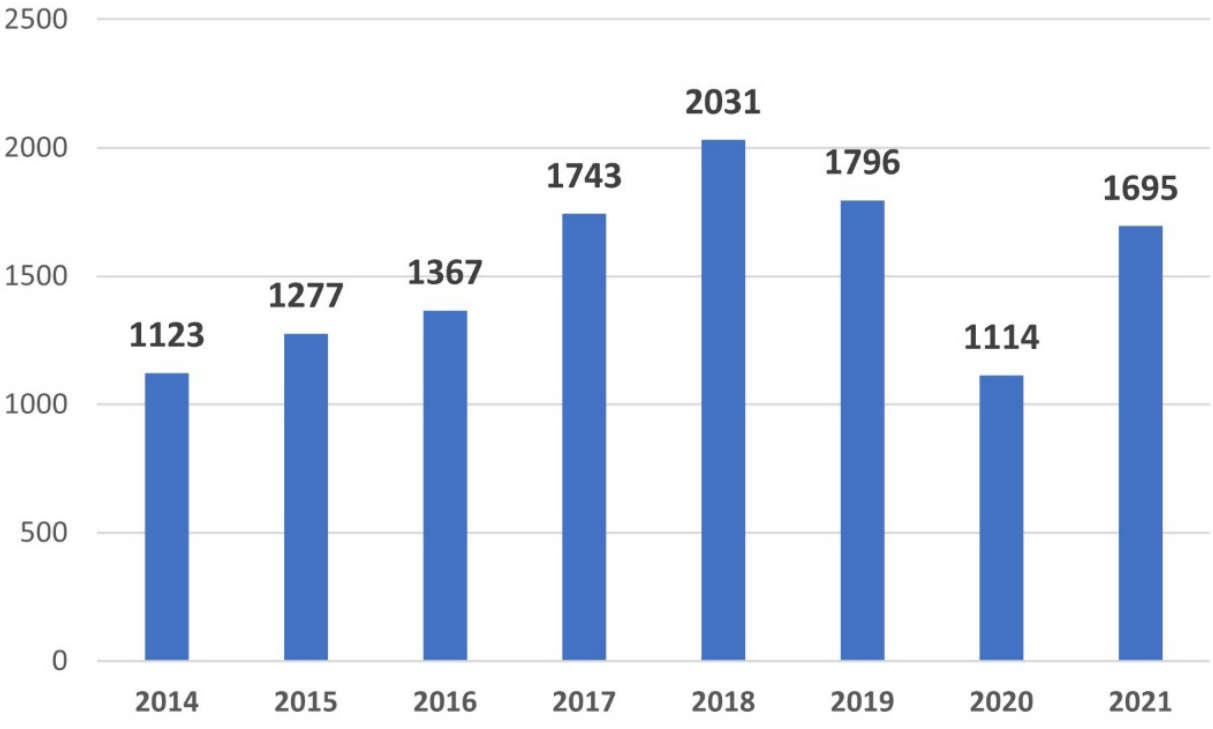


Figure 4 - Total number of peripheral angioplasties from 2014 to 2021 in Romania (only in interventional cardiology centers)

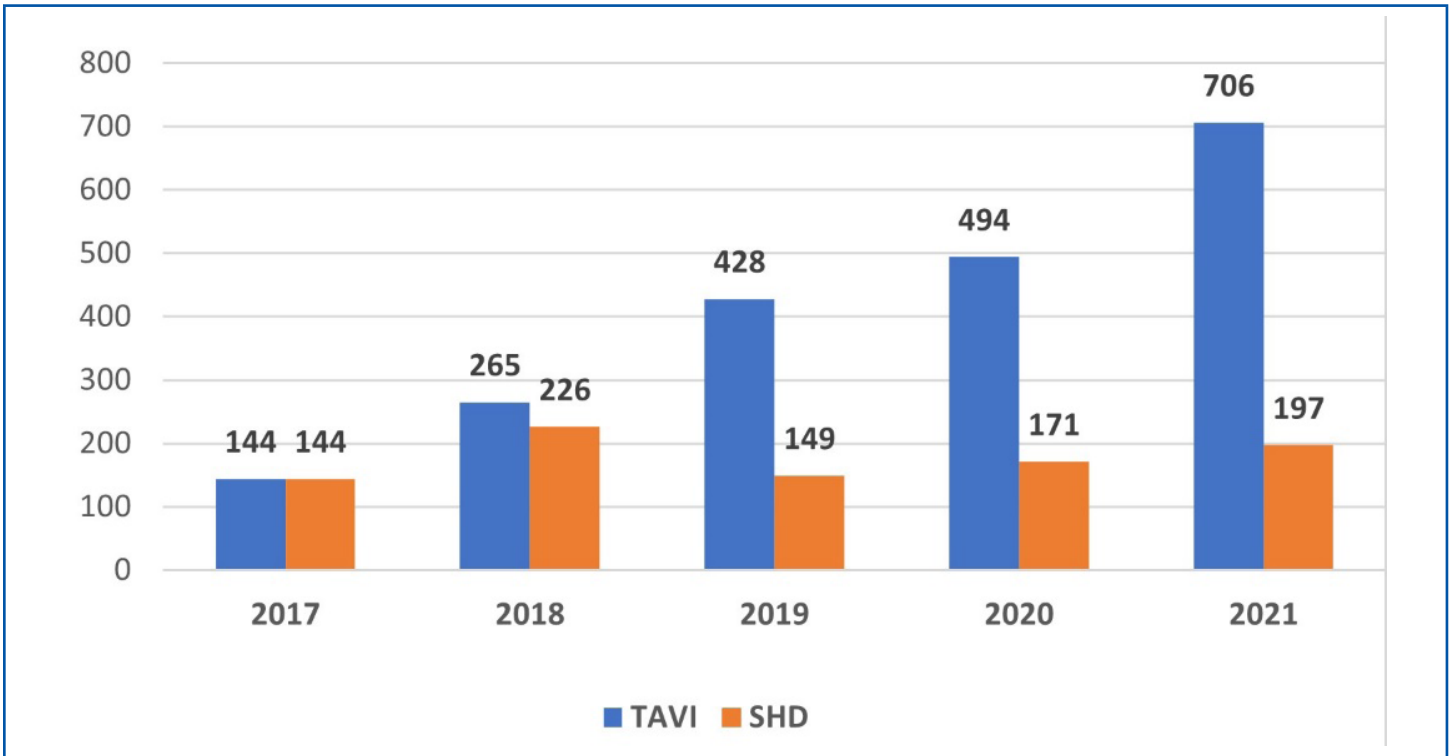


Figure 5 - Total number of TAVI and interventions in SHDs performed from 2017 to 2021 in Romania (TAVI - transcatheter aortic valve implantation, SHDs – structural heart diseases)

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