

Interventional cardiology in Poland in 2022. Annual summary report of the Association of Cardiovascular Interventions of the Polish Cardiac Society (AISN PTK) and Jagiellonian University Medical College*

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**This paper presents the analysis of individual procedural data from 154 interventional cardiology centers in Poland which reported their procedures to ORPKI database in 2022. With regard to NFZ data, we estimate that approx. 90% of all interventional cardiology procedures in Poland are reported to ORPKI by these centers.*

The ORPKI database is endorsed by AISN PTK and is daily operated by the Jagiellonian University Medical College, with currently 154 interventional cardiology centers in Poland reporting. On 31 December 2022 there were 620 PCI operators certified by AISN PTK in Poland [1–3].

According to the current analysis of the ORPKI database, in comparison to 2021, there was a substantial (6%) increase in the total number of coronary angiography (CAG) procedures in Poland in 2022 [1]. There were 152,739 CAGs, which corresponds to 3967 per 1 million inhabitants per year in 2022. The distribution of primary diagnoses as indications for CAG was: 10% ST-elevation

myocardial infarction (STEMI), 12% non-ST-elevation myocardial infarction (NSTEMI), 25% unstable angina (UA), and 53% stable angina. The radial approach was utilized in 89% of all CAG cases, which is similar to 2020 and 2021. Complications of coronary angiography in 2022 were rare and corresponded to the rates reported in previous years (Table I).

The total number of percutaneous coronary intervention (PCI) procedures was 90,893, which is higher by 2% (2338 PCIs per 1 million inhabitants per year) than the rate reported in the ORPKI database from 2021. The majority of the procedures were done in the setting of the

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acute coronary syndromes (ACS): 36% acute myocardial infarction (18% STEMI and 18% NSTEMI), 23% unstable angina and the remaining 41% mostly for stable angina. The number of primary PCIs per million inhabitants per year is currently 426. There were 16,089 PCIs in STEMI (no change as of 2021) and 16,597 in NSTEMI (a slight decrease). Drug-eluting stents (DES) are used in the majority of all PCI cases, which corresponds to 97,439 stents. Rotablation was used in 1637 procedures, which is a 23% increase in comparison to 2021 (1.8% of all PCIs). Aspiration thrombectomy was used in only 1,623 STEMI (approx. 10% of all PCIs in STEMI) cases. We observed a similar use of ticagrelor as an adjunct pharmacotherapy both for STEMI (25%) and NSTEMI (24%) with the use of prasugrel less than 5% in either indication. In terms of complex procedures, the number of chronic total occlusion (CTO) procedures was 1787, approaching 2% of all PCIs (1.5% decrease compared to 2021) with final TIMI 3 flow achieved in 69% of cases. PCI complications are still rare; they are presented in Table II. Percutaneous mechanical circulatory support (MCS) was performed in 299 complex high-risk PCIs or in patients presenting with cardiogenic shock including 293 Impella devices (Abiomed, USA) and 6 IVAC2L pumps (Pulsecath, The Netherlands). A substantial increase in the use of adjunctive imaging and diagnostic tools during CAG and PCI (mainly IVUS) was observed in 2022 vs. 2021 (Table III).

Structural procedures are a growing part of interventional cardiology in Poland, and they are mainly performed by certified interventional cardiologists. Following recommendations of the European Society of Cardiology, 28 multidisciplinary heart teams involving 39 certified interventional cardiologists were established in all 28 transcatheter aortic valve implantation (TAVI) centers (including 4 new ones that started a TAVI program in 2021). There were 2929 TAVI procedures performed in 28 centers (more than 95% from femoral access). Evolut/Evolut Pro (Medtronic, USA) was implanted in 1389 patients, Sapien 3/Sapien 3 Ultra (Edwards Lifesciences, USA) in 659 patients, Acurate Neo/Neo 2 (Boston Scientific, USA) in 480, Portico/Navitor (Abbott, USA) in 222 patients, Hydra (SMT, India) in 105 patients and MyValve (Merill, India) in 73 patients. The total number of TAVI significantly increased by 863 procedures (41%) when compared to 2021; Poland, with a number of 77 TAVI procedures per million inhabitants in 2021, is still below the European average.

There were 30 procedures of pulmonary valve implantation, including Melody (Medtronic, USA) in 19 patients, Sapien 3 (Edwards Lifesciences, USA) in 8 patients and Venus Valve in 3 patients (Venus Medtech, China). Transcatheter edge-to-edge procedures (TEER) on mitral valves were performed in 15 centers in 317 patients with the use of MitraClips (Abbott, USA) and Pascal (Edwards Lifesciences, USA). TEER procedures were also done in 25 patients on tricuspid valves using the TriClip

Table I. Complications of coronary angiography in Poland in 2022

Parameter	%	In comparison to 2021
Death	0.20	↔
Stroke	0.02	↔
Major bleeding at access site	0.03	↔
Sudden cardiac arrest	0.13	↔
Allergic reaction	0.02	↔

system (Abbott, USA) in 14 patients, MitraClip (Abbott, USA) in 8 patients and Pascal (Edwards Lifesciences, USA) in 3 patients. There were also 3 Tricvalve Transcatheter Bivalve system implantations (OrbusNeich, USA) in a patient with severe tricuspid regurgitation. Although the year-to-year growth in TEER procedures is significant, it should be mentioned that the rate in Poland, at about 8.8 TEER procedures per million inhabitants, is far below the clinical needs. Both TEER and tricuspid interventions may improve prognosis of patients with heart failure and require better funding.

773 left atrial appendage closure procedures were performed in 28 centers, including 450 Watchman FLX (Boston Scientific, USA), 307 Amulet (Abbott, USA) and 16 Lambre (Lifetech, China). 900 atrial septal defects II (ASD) percutaneous closures were performed, including 375 Amplatzer Septal Occluders (Abbott, USA), 384 Occlutech ASD occluders (Occlutech, Switzerland), 79 Cera or CeraFlex ASD occluders (Lifetech, China) and 62 Cocoon

Table II. Complications of PCI in Poland in 2022

Parameter	%	In comparison to 2021
Death	0.29	↓
STEMI	0.76	↓
NSTEMI	0.36	↓
UA	0.08	↓
SA	0.02	↓
Myocardial infarction	0.13	↔
Major bleeding from access site	0.08	↔
Sudden cardiac arrest	0.40	↑
Allergic reaction	0.01	↔
Artery perforation	0.24	↔
No reflow	0.61	↔

Table III. Additional intracoronary assessment in 2022 during angiography and PCI

Variable	N	% of all angio and PCI	change % from 2021
FFR	12628	8	↑ 22
IVUS	7637	4.3	↑ 44
OCT	432	0.2	↓ 12

atrial septal occluders (SMT, India). 1253 patent foramen ovale (PFO) percutaneous closures were performed with 473 Amplatzer Talisman PFO occluders (Abbott, USA), 401 Occlutech PFO occluders (Occlutech, Switzerland), 250 Cera or CeraFlex PFO occluders (Lifetech, China),

92 Cocoon PFO occluders (SMT, India) and 37 Nit-Occlud PFO (PFM Medical, Germany).

Moreover, single new structural heart procedures were also done in 2022, including implantation of 37 Coronary Sinus Reducers (Neovasc, Canada) in patients with refractory angina and 3 Atrial Flow Regulators (AFR) (Occlutech, Switzerland) in patients with heart failure or pulmonary hypertension (Figures 1–6).

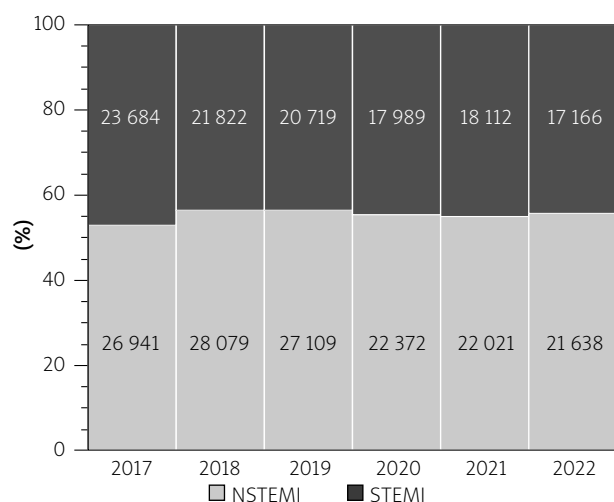


Figure 1. The number of STEMI and NSTEMI in last 6 years

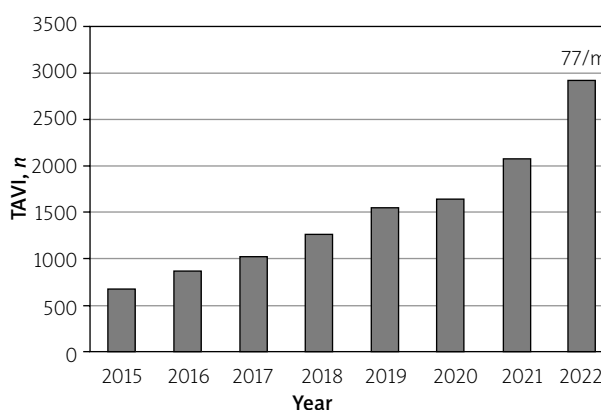


Figure 2. The number of TAVI procedures in last 8 years

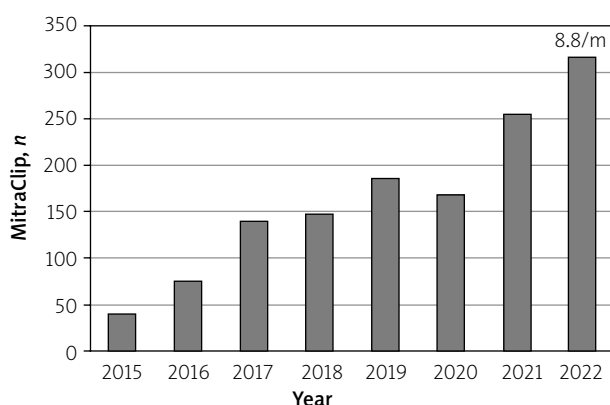


Figure 3. The number of MitraClip procedures in last 8 years

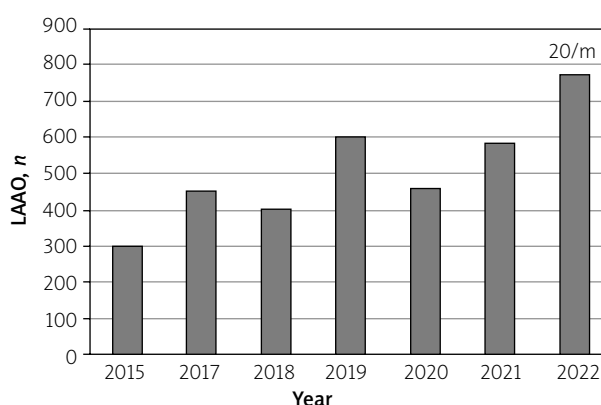


Figure 4. The number of LAAO procedures in last 8 years (data for 2016 not reported)

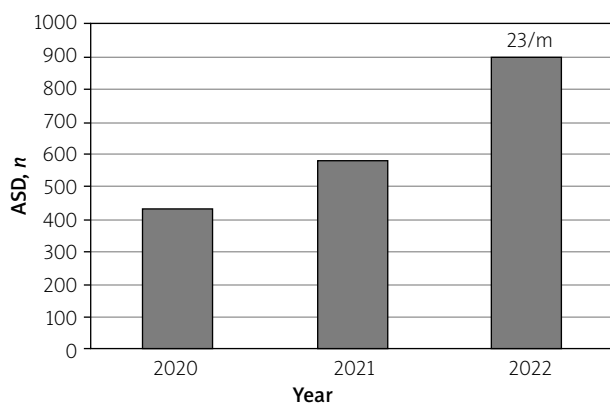


Figure 5. The number of ASD closure procedures in last 3 years

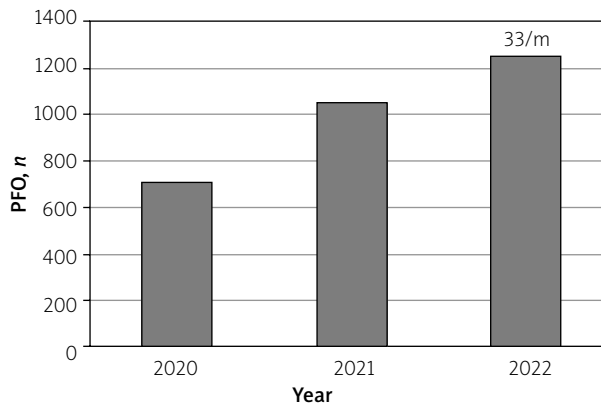


Figure 6. The number of PFO closure procedures in last 3 years

The ORPKI database has been the source material for 8 manuscripts published in PubMed in 2022.

In summary, we observed an increase in both the number of CAGs and PCIs as well as coronary imaging and physiology assessment techniques. The numbers of most of the structural procedures (TAVI, TEER, LAA closure, ASD, PFO) showed a significant increase in 2022, however the numbers of TAVI and TEER procedures are still far below the European average and they fall short of the current clinical needs in Poland.

Conflict of interest

The authors declare no conflict of interest.

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