ALS 3406 Data Tables

Table 1. Incidence and outcome of cardiac arrest in the cardiac intervention laboratory

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| Author/year | Study design/period | Cardiac arrests in Cath lab n/x (%) | Initial rhythms | Outcomes | Comments |
| Sharma 2019 | Retrospective cohort study  (2012–2016) | 63/13,112 (0.5%) | PEA 29 (46%); VF/VT 15 (24%); hypotension 19 (30%) | Survived catheterization lab 42 (67%);  1-year Survival 30 (37%) |  |
| Sprung 2006 | Retrospective cohort study  (1990–2000) | 114/51,985 (0.2%) | VF 72 (63.7%);  Asystole 30 (26.6%);  PEA 11 (9.7%) | Survived procedure: 88/114 (77.2%)  Survival to discharge: 64/114 (56.1%) | Long-Term Survival for survivors after cardiac arrest not significantly worse than those who did not have a cardiac arrest: hazard ratio 1.47 (95% CI 0.88-2.46, p = 0.14) |
| Elkaryoni 2022 | Prospective cohort study  (2000–2019) | 6865 / ? | Asystole 1337 (19.5%),  PEA 2951 (43.0%),  Pulseless VT 680 (9.9%), VF 1897 (27.6%) | Overall Survival to discharge: 38.1% | GWTG-R |

Table 2. Incidence and outcome of cardiac arrest during PCI in the cardiac intervention laboratory among an unselected population

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| **First Author, Year** | **Study Design / period** | **Purpose/Primary Objective** | **Population** | **Denominator** | **Number of cardiac arrests** | **Initial rhythm** | **Outcome** | **comments** |
| Addala, 2005 | Observational Retrospective | Incidence of VF | Unselected (Elective and non-elective procedures) | 19,497 | 164 (0.84%) | VF | Survival to discharge 164 (100%) | * Single centre in Michigan. * Cardiogenic shock excluded. All patients successfully defibrillated within 1 min from initiation of VF. * VF developed during right coronary injection in 98 patients, left coronary injection in 64 patients, and during bypass graft injection in 2 patients (p< 0.05) |
| Webb, 2002 | Observational Retrospective  1996–1999 | Incidence of CA | Unselected but with separate reports for stable angina, CS, MI, Cariogenic Shock | 4363 | * Cardiac arrest during PCI 27 (0.6%) * All 57 cardiac arrests incidence:1.3% * Elective: 0.02% * Unstable angina: 0.5%, * AMI: 15%, * Cardiogenic Shock: 10% | All 57 arrests:   * VF: 36%, * VT 28%, bradycardia: 24% * asystole: 8% * PEA: 2% | 24-h survival for all cardiac arrests 37% | * Single centre in Vancouver. * 57 patients who had CA either during the procedure or later the same day as the procedure. * 47% (N=27) had CA during PCI. * Of those who had CA during PCI CA occurred after the initial injection of radiographic contrast into a coronary artery in 12%, after the initial balloon inflation in 60%, and after stent implantation in 13% |
| Huang, 2002 | Observational Prospective | Incidence of VF | Elective Procedures: angina despite adequate medical therapy, or ischemia demonstrated during stress testing; and (2) diameter stenosis of >75% | Overall 905,  LCA 561,  RCA 344 | Overall: 2%,  LCA 0.5%,  RCA 4.6% | VF | NR | * Single centre in Taiwan. * VF more frequent in RCA PCI |

Table 3. Incidence and outcome of cardiac arrest during Primary PCI in the cardiac intervention laboratory among patients with ST-elevation myocardial infarction.

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| **First Author, Year** | **Study Design / period** | **Purpose/Primary Objective** | **Population** | **Denominator** | **Number of cardiac arrests** | **Initial rhythm** | **Survival to discharge** | **comments** |
| Mehta, 2009 | Observational Retrospective  2004–2006 | To evaluate risk factors for and outcomes of patients with VT/VF | STEMI adults presenting within 12 h of symptom onset | 5745 | 180 (3%)\* | VT/VF | 83.8%\* | * 296 hospitals in 17 countries, (APEX AMI trial) * Excluded - Patients with isolated inferior STEMI, pregnant, known or suspected complement deficiency or active infection, other serious medical problems likely to hamper their recovery, or fibrinolytic therapy for the treatment of their qualifying events * \* Including all patients with VT/VF until the end of catheterisation |
| Demidova, 2015 | Observational Retrospective  2007–2012 | To analyse clinical predictors of reperfusion VF | STEMI | 3274 | 71 (1.9%) | VF | 81.7% | * Single centre Lund, Sweden * All patients who had VF during reperfusion |
| Gigliolli, 2006 | Observational Retrospective  2002–2003 | Evaluate incidence, timing and complications from primary PCI in STEMI patients | STEMI within 12 h of onset of symptoms, or within 24 h if signs of persistent ischemia or shock were present. | 689 | 38 (5.5%) | VF | NR | VF was statistically more frequent in patients with inferior AMI than in those with anterior AMI (47 versus 29 patients, P<0.001). |
| Mehta, 2004 | Observational Prospective (1990s) | To examine the incidence, predictors, and outcomes of VT/VF occurring in the cardiac catheterization laboratory among patients undergoing primary PCI for STEMI. | STEMI, >=18 years, <12 h form symptom onset | 3065 | 133 (4.3%) | VT/VF | 129/133 99.2% | * Patients enrolled in 4 Primary Angioplasty in MI trials in the North America/South America/Europe/Middle East and Asia in the 1990’s * Excluded - Patients with: Contraindications to reperfusion, thrombolytic therapy for index STEMI, renal failure, cardiogenic shock, life expectancy <1 year, child-bearing potential, contraindications to aspirin, heparin, or ticlopidine in later PAMI trials. * Sustained VT as well as VF included * Patients randomized to the thrombolytic arm in PAMI-1 79% of these patients required defibrillation. So at least 21% were not in CA. * CPR was necessary in only 8 patients (6%) |
| Henriques, 2005 | Observational Prospective  1995 – 2001 | To compare characteristics of patients with VF during PCI versus patients with VF before PCI | STEMI | 2628 | 74 (3%) | VF | NR | * Single centre in the Netherlands. * Patients with out-of-hospital resuscitation and VF on arrival of the ambulance were excluded. * Patients with VF during PCI had more often RCA-related MI and more frequently TIMI 0 before PCI |

Table 4. Mechanical chest compression (MCC) CPR in the cardiac intervention laboratory

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| **Author & Year** | **Study Design/period** | **Number of cardiac arrests in Cath Lab** | **Initial rhythm** | **Outcomes** | **Comments** |
| Mechanical piston device (LUCAS) | | | | | |
| Wagner, 2016 | Prospective observational study  2009–2013 | * n=32 LUCAS MCC application in cath lab * n=10 historical control with manual CPR in cath lab (1999-2003) | LUCAS MCC group   * PEA 22/32 (69%) * Asystole 5/32 (16%) * VF/VT 5/32 (16%)   Historical control   * PEA 4/10 (40%) * Asystole 2/10 (20%) * VF/VT 2/10 (20%) | LUCAS MCC group   * Hospital Discharge CPC 1-2: 8/32 (25%) * 1 year survival CPC 1–2: 7/32 (22%)   Historical control   * Survival (unspecified) 1/10 (10%) | Prospective vs historical groups not readily comparable due to different treatment periods and other characteristics |
| Wagner, 2010 | Retrospective registry analysis  2004–2008 | n=43 LUCAS MCC | * PEA 28/43 (65%) * Asystole 9/43 (21%) * VF/VT 6/43 (14%) | * Survived cath lab 17 patients (39%) (16 with ROSC and 1 with ongoing MCC). * Survival to Hospital Discharge: 12/43 (28%) * Survival to Hospital Discharge CPC 1-2: 11/43 (26%) | * All 43 included patients arrested in the cath lab * Use of LUCAS MCC during PCI or pericardiocentesis after cardiac arrest in the cath-lab * Procedure success rate: 27/42 (76%) of the PCI procedures done during MCC were successful. * Complications: All survivors experienced rib fractures, and one patient suffered a ruptured spleen due to incorrect application of the device. * 4 patients were treated with manual chest compressions and all 4 died. |
| Larsen, 2007 | Retrospective study - LUCAS MCC application during PCI  2005–2006 | * n=6 LUCAS MCC applied in cath lab * n=6 LUCAS MCC applied after OHCA before cath lab arrival | * n=6 (VF 2, PEA 1, hypotension 3) LUCAS applied in the cath lab * n=6 (VF 5, asystole 1) resuscitated from OHCA before cath lab arrival | * n=3 patients survived the intervention * no patients were discharged alive. | * LUCAS was applied on the cardiac cath table for 6 (for VF in 2, for PEA in 1 & for bradycardia or hypotension in 3). * LUCAS was applied after resuscitation from OHCA & before coronary angiography for 6 : for severe hypotension & bradycardia in 5 & VF in 1. * LUCAS was applied prehospital for 1 OHCA. * Autopsies were performed in 11 of the cases, revealing sternal and costal fractures in 7/11 patients and liver laceration in 1/11 patient. In 2/11 patients small sub-capsular haematomas in the liver were reported. * There was 1 case of excessive intra-thoracic bleeding in the catheterisation laboratory (managed by thoracotomy). * Lucas device tended to drift distally requiring strap securement. |
| Venturini, 2017 | Retrospective registry analysis  2011–2016 | n=43 total cardiac arrests   * n=20 cath lab arrests (15 LUCAS MCC, 5 Manual CPR). * n=11 OHCA (9 LUCAS CPR, 2 Manual CPR). * n= 8 ED cardiac arrest (4 LUCAS MCC, 4 Manual CPR) * n=3 LUCAS MCC not specified by initial site but eventually received in cath lab * n=1 manual CPR not specified by initial site but eventually received in cath lab | * LUCAS MCC VF/VT 13/31 (42%) * Manual CPR VF/VT 5/12 (42%) | * ROSC: LUCAS MCC 22/31 (74%) versus manual CPR 5/12 (42%) * 30-day Survival: LUCAS MCC 19% versus manual CPR 8% * Survival to Hospital Discharge: LUCAS MCC 13% versus manual CPR 8% | * 43 patients required chest compressions for cardiac arrest in the cath lab (12 manual CPR, 31 received LUCAS MCC) * All patients had the possibility of transitioning to percutaneous mechanical circulatory support (MCS) (MCS - IABP or Impella), or ECLS during resuscitation. * 22/31 patients with LUCAS MCC received MCS: 95% of patients who received MCS achieved ROSC compared to 11% without MCS (p = 0.004). * 14/31 (45%) with LUCAS were bridged to ECLS. * Patients receiving ECLS were more likely to achieve ROSC (100% vs. 53%, p = 0.003). |
| Chyrchel, 2022 | Retrospective cohort study  2013–2020 | n= 48 total cardiac arrests received LUCAS MCC   * 23/48 (48%) had cardiac arrest in the cath lab | * PEA 22/48 (46%) * Asystole 8/48 (17%) * VF/VT 13/48 (27%) * Unknown 5/48 (10%) | * ROSC was achieved in 31% of patients (15/48). * Survival to hospital discharge = 17% (8/48). | * Small single hospital group of patients who arrested either before or during angiography. 30 patients who could have been analysed were excluded due to lack of data and clinical history in the notes. * In patients with hyperkalemia, survival rate was 50%, while survival rate for those with potassium < 5.0 mmol/L was only 4% (p = 0.0007). |
| Madsen Hardig, 2019 | Retrospective observational study  2004–2013 | n=35 total cardiac arrests received LUCAS MCC   * n=27/35 (77%) in cath lab * n=8/35 (23%) taken to cath lab with ongoing CPR. | * PEA 17/35 (49%) * Asystole 4/35 (11%) * Bradycardia 7/35 (20%) * VF/VT 7/35 (20%) | * ROSC 18/35 (51%) * ROSC 14/27 (53%) for arrest in cath lab * Survival CPC 1–2 9/35 (26%) * Survival CPC 1-2 9/27 (33%) among cath lab arrests * ROSC and survival did not differ across presenting rhythms of VF/VT, PEA, asystole or bradycardia. * No survivors among those with ongoing CPR on arrival in cath lab | * No patient survived who arrived at the cath-lab still requiring CPR (potential candidate for ECPR) * The median time of MCC in the cath-lab for those who did survive was 10min versus 45min for those patients not surviving. * Initial arrest rhythm did not predict outcome. * If a diastolic arterial BP of 30 mmHg can't be achieved, consider escalation to ECPR. This decision should be made within the first 10–20 min of resuscitation efforts in the cath-lab, as longer periods are associated with a decrease in survival. * LUCAS CPR time was shorter for those who gained ROSC and survived. * Those that arrived at the cath-lab with ongoing CPR had a lower chance of obtaining ROSC than if the arrest occurred in the cath lab (22% vs 53%,p = 0.086). * None of the patients survived if resuscitation was ongoing when they were admitted to the cath-lab. |
| Load-distributing band device (Autopulse) | | | | | |
| Spiro 2015 | Retrospective observational study in-hospital cardiac arrest  2011–2013 | n=25 received Autopulse-CPR during in-hospital cardiac arrest   * 15/25 cardiac arrest during invasive procedures (14/15 in cath lab) | 14 patients had Autopulse -CPR started in the cath lab due to:   * VF/T 7/14 (50%) * PEA 7/14 (50%) | * ROSC 12/25 (48%) with Autopulse-CPR * 7/25 (28%) survived to hospital discharge * 3/9 (33%) patients who received Autopulse CPR with simultaneous PCI survived to hospital discharge with normal cerebral function (CPC 1- 2) | * 15/25 (60%) of patients received Autopulse-CPR at some stage during an invasive procedure (14/15 in cath lab). * In 9/15 (60%) Autopulse -CPR received simultaneous with invasive procedure (4/9 with PCI, 4/9 with angiography+TEE+temp pacer, and 1/9 pericardial drainage) & in 6/15 there was a pause in the invasive procedure whilst the A-Pulse was attached. * Complications: Battery depletion (1), difficult backboard placement (1) compression band twist (1), clip detachment (1) |

Table 5. ECPR in the cardiac intervention laboratory

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| **Author/**  **year** | **Study Design** | **Number of cardiac arrests** | **Initial rhythm** | **Outcomes** | **Comments** |
| Shawl, 1990 | Case series  (time frame not reported) | 7 | VF or asystole | * 4 out of 7 patients survived (57%). * All survivors NYHA class 1 at 6 months. | * Percutaneous cardiopulmonary bypass was instituted for cardiac arrest in cath lab refractory to ACLS (mean cannulation time from cardiac arrest: 21 min). * Subsequent interventions included coronary bypass surgery (n=3) and coronary angioplasty (n=2) |
| Mooney, 1991 | Case series (1988 - 1989) | 11 (5 arrests in cath lab) | N/A | 5/5 (100%) survival (cath lab)  2/6 (33%) survival (outside cath lab) | * Percutaneous cardiopulmonary bypass was instituted in 5 patients with cardiac arrest during percutaneous coronary procedures, and 6 patients with cardiac arrest outside the cath lab. * Subsequent interventions included coronary bypass surgery (5/5 in the cath lab group, 2/6 in the non-cath lab group. |
| Grambow, 1994 | Retrospective observational study  (1988 - 1992) | * 7 cardiac arrests * 23 cardiogenic shock | N/A | 0/7 (0%) survival in cardiac arrest  6/23 (26%) survival in cardiogenic shock | * Percutaneous cardiopulmonary bypass was initiated after cardiac arrest (mean time: 21 min) or shock during diagnostic or therapeutic cardiac procedures in the cath lab (mean cannulation time 17 min) using portable Bard PCB system - via FA and FV access * Subsequent interventions included emergent cardiac surgery (n=14), coronary angioplasty (n=13) and medical therapy (n=3). |
| Nagao, 1999 | Prospective observational study  (1994–1997) | * 32 with refractory VF and STEMI * 19 OHCA * 13 IHCA (ER) | Refractory VF | * ROSC: 28/32 (87.5%) * Weaned from ECMO 6 (18.8%) * Good Neurological outcome 3/32 (9.4%) | * Percutaneous coronary bypass was instituted in 32/32 patients with refractory VF complicating STEMI who were transferred to the cath lab of the Emergency Room. * Intravenous rTPA was administered to those patients with MI diagnosed before VF. * Subsequent interventions included coronary angiography/ angioplasty if adequate reperfusion had not been achieved. |
| Goslar, 2016 | Retrospective observational study  (2010-2015) | * 12 cardiac arrests in cath lab * 11 cardiogenic shock | N/A | * Weaned off ECMO 6/12 (50%) * Survived to hospital discharge 2 (17%) | * VA-ECMO was instituted in patients with refractory cardiac arrest (n=12) or cardiogenic shock (n=11) in the cath lab, and in 33 patients outside the cath lab (ICU, n=8; operating room, n=25). * Subsequent interventions included coronary angiography/angioplasty, pulmonary angiography or CT followed by thrombolysis if pulmonary embolism. N=9/23 patients (39%) had concomitant IABP |
| Parr, 2020 | Retrospective observational study  (2010–2018) | * 39 cardiac arrests in the cath lab * 23 Cardiogenic shock | * VF/VT 19/39 (48.7%) * PEA 20/39 (51.3%) | * 30-day Survival: 17/39 (44%) cardiac arrest; 12/23 (52%) cardiogenic shock * 1-year Survival: 16/39 (44%) cardiac arrest; 11/23 (48%) cardiogenic shock | * VA-ECMO was instituted in patients with cardiac arrest or cardiogenic shock during percutaneous procedures in the cath lab (median cannulation time from collapse: 38 min). * Complications included stroke (32.3%), hemorrhage at the cannula site (33.9%), extremity malperfusion (19.4%), and new acute kidney insufficiency requiring renal replacement therapy (38.7%). * Subsequent interventions included IABP (n=13 cardiac arrest, n=3 shock), ventricular assist device (n=2 cardiac arrest, n= 4 shock) and coronary bypass surgery (n=7 cardiac arrest, n=5 shock). |
| Hryniewicz, 2021 | Retrospective observational study  (2012 – 2017) | * 8 cardiac arrests in the cath lab * 11 in other in-hospital locations * 7 OHCA | **Cath lab:**   * VF/VT 6 (75%); * PEA/asystole 2 (25%)   **IHCA:**   * VF/VT 7 (64%); * PEA/asystole 4 (36%)   **OHCA:**   * VF/VT 4 (57%); * PEA/asystole 3 (43%) | * Cath lab: 7/8 (88%) survival to discharge and at 6 months; 88% with CPC 1-2 * Other IHCA: 6/11 (55%) survival to discharge and at 6 months; 45% with CPC 1-2 * OHCA: 5/7 (71%) survival to discharge and at 6 months 71% with CPC 1-2 | * VA-ECMO was instituted in 8 patients with cardiac arrest in the cath lab, 11 patients in other in-hospital locations and 7 patients with OHCA who were transferred to the cath lab (median cannulation time: 39 min cath lab, 45 min IHCA, 72 min OHCA). * Subsequent interventions for patients with cardiac arrest in the cath lab included revascularization (n=7/8 patients), hypothermia (n=2/8 patients). * Outcomes were better in patients with initial rhythm VF/VT versus PEA/asystole. |
| Radsel, 2021 | Prospective observational study  (2010–2020) | * 52 cardiac arrests (n=36, 69.2% were cannulated in cath lab) * 78 cardiogenic shocks | N/A | Cardiac arrest survival to discharge (CPC 1 or 2) 15/52 (29%). | * VA-ECMO was instituted in n=23 patients before percutaneous or surgical interventions and n=17 immediately after these. * Settings of cardiac arrests included OHCA or IHCA (Emergency Room, cardiac ICU, the ward or the cath lab). N=36 patients (69.2%) were cannulated in the cath lab. * Interventions before VA-ECMO E-CPR included PCI (15/52, 28.8%), TAVI (1, 1.9%) and electrophysiology procedure (1, 1.9%). * Subsequent interventions on VA-ECMO included coronary angiography (38, 73.1%), PCI (n=24, 46.2%)), CABG (4, 7.7%), aortic surgery (3, 5.8%), pericardiotomy, left ventricular assist device, pulmonary embolectomy, abdominal surgery (1 each, 1.9%). |
| Mazzeffi, 2024 | Retrospective cohort study (2020–2023 | * Total 2515 cardiac arrests * 602 cardiac arrests in cath lab | Cath lab arrests:   * VT 68 (11.3%) * VF 167 (27.7%) * PEA 222 (36.9%) * Asystole 57 (9.5%) * Unknown 88 (14.6%) | Survival to discharge 235 (39%) | * Extracorporeal Life Support Organization (ELSO) registry data. * Objective: to explore whether ECPR mortality differs by IHCA location and whether moving patients for cannulation impacts outcome. * Pre-ECPR interventions for cardiac arrest in cath lab group:   + IABP 51 (8.5%)   + RV assist device 2 (0.3%)   + Impella 65 (10.8%) * Conventional CPR time 25 (14–39) minutes. * Adjusted odds ratio (aOR) for mortality higher in patients with cardiac arrest in the ICU (aOR, 1.85; 95% CI, 1.45–2.38; p <0.001) and in patients with cardiac arrest in acute care bed (aOR, 1.68; 95% CI, 1.09–2.58; p = 0.02) compared with in the cath lab. * Survival to discharge for cardiac arrests in other locations (and ECPR):   + ICU = 243/939 (25.9%)   + Acute care bed = 67/242 (27.7%) |

Table 6. Mechanical circulatory support in the cardiac intervention laboratory

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| **Author/Year** | **Study design/ period** | **Cardiac arrests in Cath lab n/x (%)** | **Initial rhythms** | **Outcome** | **Comments** |
| Bagai Y, 2011 | Case series  2006–2009 | 8/8 (100%) | N/R | * 7/8 (87.5%) successful support in cardiac arrest or cardiogenic shock; 3/7 (43%) survival to hospital discharge for in-lab cardiac arrest patients treated with Multifunctional Percutaneous Heart (MPH) |  |
| Loehn, 2020 | Retrospective observational study  (Impella)  2014–2016 | 43/73 (59%) | Asystole 9/43 (21%),  PEA 11/43,  VF/VT 23/43 (54%) | * Impella implantation during ongoing CPR versus implantation after ROSC had no significant impact on survival to discharge (28.5% vs. 27.2%, p=0.92). * Among whole group (those with cardiac arrest and those with cardiogenic shock without cardiac arrest) the overall survival rate at discharge was low in Impella recipients (35.6%) but better when Impella placed pre-PCI (50%) than post PCI (23.1%) p=0.027. * In whole group (regardless of when impella was placed), impella was the sole independent predictor of survival at discharge and at 30, 90 & 180 days. |  |
| Vase, 2017 | Observational study  (Impella)  2014–2016 | 8 | VF 5 (62%),  PEA 3 (37%). | * For those with rCA, survival to discharge was 4/8 (50%) compared with 7/12 (58%) for those with cardiogenic shock. * All patients survived 6 months and were CPC 1–2, | * 8 patients with refractory CA & 12 with cardiogenic shock. * At the time of receiving the Impella device all cardiac arrests were in PEA. |
| Gerfer, 2023 | Retrospective cohort study  2014–2016 | 59/729 (8%) | 37% of CPR patients underwent defibrillation but no further details given about the arrest rhythms | 49/59 (83%) survived to hospital discharge | * 16/59 (27%) cardiac arrest patients required ‘heart-lung circulatory support’ but their outcomes are not reported separately. * Patients who required CPR had a lower ejection fraction and lower aortic gradients than those who did not. * Patients with intra-procedural complications such as tamponade and valve displacement had higher incidence of CPR. * All complications were higher in the group needing CPR. |
| Almajed, 2023 | Retrospective cohort study (Impella)  2013–2022 | 6 (5 during TAVR; 1 during BAV) | Not stated | 30-day survival 5/6 (83%) 4/5 for TAVR and 1/1 for BAV | * 2680 procedures: 1965 TAVR and 715 BAV. 120 used Impella support, 26 TAVR and 94 BAV, but only 5 and 1 for cardiac arrest. * Cardiogenic shock TAVR Impella cases mortality 35.7 % and cardiogenic shock BAV 44.2% |
| Orvin, 2021 | Observational study (Impella, VA ECMO, TandemHeart)  2011–2020 | 41/87 (47%) | Not stated | * Overall survival to hospital discharge after TAVI with pMCS insertion was 72.5%. * 1 yr survival was close to 50%. | * For all 87 cases (75.9% VA ECMO, 19.5% Impella CP, 4.6% TandemHeart). * No separate data for the 41 cardiac arrest cases. |

Table 7. Intracoronary epinephrine in the cardiac intervention laboratory.

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| **First Author** | **Study Design/period** | **Number of cardiac arrests** | **Initial rhythm** | **Outcomes** | **Comments** |
| Tantawy, 2024 | Prospective Cohort (2015–2022)  2 centres in Egypt | 162 | Shockable 66 (40.7%) | * Survival to discharge: IC 44/52 (84.6%) versus IV 59/110 (53.6%); p <0.001 * ROSC: IC 49/52 (94.2%) versus IV 70/110 (63.6%); p <0.001 * mRS ≤3: IC 40/52 (77%) versus IV 52/110 (47.3%); p<0.001 | * Primary outcome = survival to discharge * Patients resuscitated using ACLS guidelines. * If coronary catheter was already in a coronary artery, epinephrine injected through IC route or IV route, at physician's discretion. * 1 mg used for both routes. * 52 received IC epinephrine and 110 received IV epinephrine |
| Aldujeli, 2022 | Prospective Cohort (2018–2021)  2 centres in Lithuania | 158 | * VF 92 (58%); * PEA 66 (42%) | * ROSC: Central 41/48 (85%); IC 43/50 (86%); IV 27/60 (45%). * ROSC Peripheral vs. Central and IC OR = 0.18 (0.07, 0.49). * Survival to discharge: Central 29 (60%); IC 38 (76%); IV 12 (20%). * CPC 1-2: all patients 75 (47%); central 29 (60%); IC 35 (70%); 11 (18%). | * Primary outcome = ROSC * If central line already in place it was used for epinephrine delivery. If no central line at time of cardiac arrest physician had choice of IC or IV epinephrine. 1 mg dose used for all routes * 158 participants: central 48 (30.4%), IC 50 (31.6%), and IV 60 (38.0%) |