4.1.2. eGFR

Buratti, 2021

Bibliographic Reference	Buratti, Stefano; Crimi, Gabriele; Somaschini, Alberto; Cornara, Stefano; Camporotondo, Rita; Cosentino, Nicola; Moltrasio, Marco; Rubino, Mara; De Metrio, Monica; Marana, Ivana; De Servi, Stefano; Marenzi, Giancarlo; De Ferrari, Gaetano M; A preprocedural risk score predicts acute kidney injury following primary percutaneous coronary intervention.; Catheterization and cardiovascular interventions : official journal of the Society for Cardiac Angiography & Interventions; 2021; vol. 98 (no. 2); 197-205

Study details

Secondary publication of another included study- see primary study for details	No additional information
Other publications associated with this study included in review	No additional information
Trial name / registration number	No additional information
Study type	Prospective cohort study
Study location	Italy
Study setting	Two hospitals
Study dates	2004 - 2015
Sources of funding	None reported

Recruitment / selection of participants	Consecutive ST-elevated myocardial infarction patients admitted to two hospitals
Inclusion criteria	Undergoing percutaneous coronary intervention
Exclusion criteria	On haemodialysis Undergoing rescue PCI or urgent cardiac surgery Died during procedure or before consecutive creatinine measurements could be taken
Intervention details	Primary PCI was performed by interventional cardiologists, according to standard clinical practice. Iso-osmolar contrast agents were used.
Contrast administration route	Intra-arterial
Prognostic variable(s)	eGFR
Acute kidney injury definition	Contrast-induced acute kidney injury, defined as: an absolute serum creatinine increase ≥0.5 mg/dl in the first 72 hours
Confounders OR Stratifiction strategy	Multivariate logistic regression model that included all variables shown to be significant in univariate analysis: Age >75 years Diabetes Anterior myocardial infarction Killip class at admission

Duration of follow-up	Unclear
Indirectness	None
Additional comments	None

Study arms

eGFR <60 (N = 1954)

Characteristics

Study-level characteristics

Characteristic	**Study (N = 1954)**
Mean age (SD) Mean (SD)	62.48 (12.14)
% Female Sample size	n = 427 ; % = 21.9
Ethnicity Nominal	NR
Diabetes Sample size	n = 311 ; % = 15.9

Characteristic	Study (N = 1954)
Killip Class II-III Sample size	n = 290 ; % = 14.8
Killip class IV Sample size	n = 100 ; % = 5.1
Hypertension Sample size	n = 1039 ; % = 53.2
Contrast volume Nominal	NR
Number of AKI events Sample size	n = 93 ; % = 4.8

Outcomes

Acute kidney injury

Outcome	eGFR <60, , N = 1954
Adjusted OR Mean (95% CI)	5.04 (3.05 to 8.32)

Referent value: ≥60

Caspi, 2017

Bibliographic Reference	Caspi, Oren; Habib, Manhal; Cohen, Yuval; Kerner, Arthur; Roguin, Ariel; Abergel, Eitan; Boulos, Monther; Kapeliovich, Michael R; Beyar, Rafael; Nikolsky, Eugenia; Aronson, Doron; Acute Kidney Injury After Primary Angioplasty: Is Contrast-Induced Nephropathy the Culprit?.; Journal of the American Heart Association; 2017; vol. 6 (no. 6)

Study details

Secondary publication of another included study- see primary study for details	No additional information
Other publications associated with this study included in review	No additional information
Trial name / registration number	No additional information
Study type	Prospective cohort study
Study location	Israel
Study setting	Intensive care unit
Study dates	January 2000 to September 2015
Sources of funding	None reported

Recruitment / selection of participants	All patients admitted to intensive care with ST-segment-elevation myocardial infarction (STEMI) receiving percutaneous coronary intervention (PCI) *Study also included people who did not undergo PCI - excluded from this review*
Inclusion criteria	Admitted with STEMI and undergoing PCI
Exclusion criteria	None specified
Intervention details	All participants with STEMI underwent PCI with non-ionic, low-osmolar, iodinated contrast agents
Contrast administration route	Intra-arterial
Prognostic variable(s)	eGFR
Acute kidney injury definition	Increase in serum creatinine concentration ≥0.5 mg/dL compared with admission value or a >25% relative rise during the first 72 hours after the procedure
Confounders OR Stratifiction strategy	All factors found to be significant in the univariate analysis were included in the multivariate model: Age ≥70 years Hypertension Diabetes Anterior infarction Haemoglobin Killip class

	Left ventricular ejection fraction <45% Diuretic therapy
Duration of follow-up	One year
Indirectness	None
Additional comments	None

Study arms

eGFR <30 (N = 2025)

eGFR 30-59 (N = 2025)

Characteristics

Study-level characteristics

Characteristic	**Study (N = 2025)**
Mean age (SD) Mean (SD)	59.72 (12.93)
% Female	n = 375 ; % = 18.5

Characteristic	Study (N = 2025)
Sample size	
Ethnicity Nominal	NR
Diabetes Sample size	n = 92 ; % = 4.5
Killip Class II-III Sample size	n = 238 ; % = 11.8
Killip Class IV or IABP use Sample size	n = 139 ; % = 6.7
Contrast volume Nominal	NR
Number of AKI events Sample size	n = 209 ; % = 10.3

Outcomes

Study timepoints
72 hour

Acute kidney injury

Outcome	eGFR <30, 72 hour, N = 2025	eGFR 30-59, 72 hour, N = 2025
Adjusted OR Mean (95% CI)	6.27 (3.15 to 12.49)	1.71 (1.17 to 2.5)

Referent value: ≥60

Liu, 2015

Bibliographic Reference	Liu, Yong; He, Yi-ting; Tan, Ning; Chen, Ji-yan; Liu, Yuan-hui; Yang, Da-hao; Huang, Shui-jin; Ye, Piao; Li, Hua-long; Ran, Peng; Duan, Chong-yang; Chen, Shi-qun; Zhou, Ying-ling; Chen, Ping-yan; Preprocedural N-terminal pro-brain natriuretic peptide (NT-proBNP) is similar to the Mehran contrast-induced nephropathy (CIN) score in predicting CIN following elective coronary angiography.; Journal of the American Heart Association; 2015; vol. 4 (no. 4)

Study details

Secondary publication of another included study- see primary study for details	No additional information
Other publications associated with this study included in review	No additional information
Trial name / registration number	No additional information
Study type	Prospective cohort study
Study location	China
Study setting	Cardiovascular institute of a general hospital
Study dates	October 2008 - December 2012
Sources of funding	Supported by Science and Technology Planning Project of Guangdong Province, Guangdong Cardiovascular Institute; and Guangdong Provincial Cardiovascular Clinical Medicine Research Fund

Recruitment / selection of participants	Consecutive patients undergoing coronary angiography or percutaneous coronary intervention
Inclusion criteria	Aged >18 years Underwent coronary angiography or percutaneous coronary intervention
Exclusion criteria	Pregnant or lactating Intravascular administration of contrast within 7 days, or 3 days post operation Cardiovascular surgery or endovascular repair End-stage renal disease or on renal replacement Missing pre-operative or post-operate creatinine values Malignancy Emergent coronary intervention No pre-procedural evaluation of NT-proBNP
Intervention details	Coronary angiography or PCI was performed using standard techniques. The contrast type and dose were left to the discretion of the interventional cardiologist, according to the patient's need. The use of adrenergic blocking agents, angiotensin-converting enzyme inhibitors, diuretics, intra-aortic balloon pump support, or inotropic drugs was left to the discretion of the interventional cardiologist and the physicians responsible for the patients. Patients received intravenous normal (0.9%) saline at a rate of 1 mL/kg per hour, 2 to 12 hours before and 6 to 24 hours after the administration of contrast medium. In patients with a left ventricular ejection fraction (LVEF) <40% or overt heart failure, the hydration rate was reduced to 0.5 mL/kg per hour
Contrast administration route	Intra-arterial

Prognostic variable(s)	eGFR - evaluated using the level-modified Modification of Diet in Renal Disease equation.
Acute kidney injury definition	Increase in serum creatinine of >0.5 mg/ dL over the baseline value within 48 to 72 hours after the administration of contrast medium
Confounders OR Stratifiction strategy	Logistic regression analysis was performed to identify the independent risk factors for CIN, which were included in the multivariate model: Higher NT-proBNP group Congestive heart failure Age >75 years Diabetes mellitus Contrast dose >200 mL
Duration of follow-up	Two years
Indirectness	None
Additional comments	None

Study arms

eGFR <60 (N = 2248)

Characteristics

Study-level characteristics

Characteristic	Study (N = 2248)
Mean age (SD) Mean (SD)	63.48 (10.72)
% Female Sample size	n = 571 ; % = 25.4
Ethnicity Nominal	NR
Diabetes Sample size	n = 565 ; % = 25.1
Heart failure Sample size	n = 324 ; % = 14.4
Hypertension Sample size	n = 909 ; % = 40.4
Contrast volume mL Mean (SD)	124.09 (68.24)
Number of AKI events Sample size	n = 50 ; % = 2.2

Outcomes

Acute kidney injury

Outcome	eGFR <60, , N = 2248
Adjusted OR OR (95%CI) Mean (95% CI)	5.12 (2.27 to 11.54)

Referent value: ≥60

Lunyera, 2021

Bibliographic Reference	Lunyera, Joseph; Clare, Robert M; Chiswell, Karen; Scialla, Julia J; Pun, Patrick H; Thomas, Kevin L; Starks, Monique A; Diamantidis, Clarissa J; Racial Differences in AKI Incidence Following Percutaneous Coronary Intervention.; Journal of the American Society of Nephrology : JASN; 2021; vol. 32 (no. 3); 654-662

Study details

Secondary publication of another included study- see primary study for details	No additional information
Other publications associated with this study included in review	No additional information
Trial name / registration number	No additional information
Study type	Retrospective cohort study
Study location	USA
Study setting	University medical centre
Study dates	January 2003 - December 2013
Sources of funding	Supported by Research, Education, and Training Subcore Research Voucher from the Duke Center for Research to Advance Health Equity

Recruitment / selection of participants	All patients undergoing cardiac catheterization and cardiac surgery
Inclusion criteria	Underwent percutaneous coronary intervention (PCI) Had data for assessment of race and AKI incidence post-PCI First PCI procedure in the study period
Exclusion criteria	<18 years of age On chronic dialysis at the time of PCI Subsequent repeat PCI procedures for participants who underwent multiple PCI procedures during the study period
Intervention details	No additional information
Contrast administration route	Intra-arterial
Prognostic variable(s)	eGFR, split into five categories: >90 60 to <90 30 to <60 15 to <30 <15

	Only values <60 were included in this review, as per the protocol specification
Acute kidney injury definition	Kidney Disease Improving Global Outcomes (KDIGO) criteria: a 1.5-fold or greater relative elevation in serum creatinine from the reference value to the highest value within 7 days after the date and time of PCI, or a 0.3 mg/dl absolute increase in serum creatinine from the reference value within 48 hours after the date and time of PCI
Confounders OR Stratifiction strategy	Year of index PCI Sex Age Tobacco use PCI setting (elective versus nonelective) Number of stents placed Contrast volume Systolic and diastolic BP RAAS inhibitors Diuretics Nonsteroidal anti-inflammatory drugs Administration of intravascular fluid and N-acetylcysteine BMI

	Acute coronary status pre-CATH (ST-elevation myocardial infarction (STEMI), non-STEMI, MI unspecified, unstable angina) Pre-existing cardiovascular disease (prior MI, prior PCI, prior coronary artery bypass grafting, history of angina, congestive heart failure, cerebrovascular disease, peripheral vascular disease, carotid bruits) History of hyperlipidaemia Diabetes and diabetes with end organ damage Marital status Median household income
Duration of follow-up	14 days
Indirectness	None
Additional comments	None

Study arms

eGFR 30-59 (N = 9422)

eGFR 15-29 (N = 9422)

eGFR <15 (N = 9422)

Characteristics

Study-level characteristics

Characteristic	Study (N = 9422)
Mean age (SD) Median (IQR)	63 (54 to 72)
% Female Sample size	n = 3097 ; % = 33
White Sample size	n = NR ; % = 75
Black Sample size	n = NR ; % = 20
Other Sample size	n = NR ; % = 5
Diabetes Sample size	n = 2804 ; % = 30
Heart failure Sample size	n = 1592 ; % = 17
SBP Median (IQR)	141 (127 to 160)

Characteristic	Study (N = 9422)
DBP Median (IQR)	81 (72 to 90)
Contrast volume (ml) Median (IQR)	250 (190 to 335)
Number of AKI events Sample size	n = 865 ; % = 9

Outcomes

Acute kidney injury

Outcome	eGFR 30-59, , N = 9422	eGFR 15-29, , N = 9422	eGFR <15, , N = 9422
Adjusted OR OR (95%CI) Nominal	2.29	5.77	15.71
Adjusted OR OR (95%CI) Range	1.77 to 2.97	3.96 to 8.41	9.97 to 24.77

Referent value: ≥90

Mohebi, 2022

Bibliographic Reference	Mohebi, Reza; Karimi Galougahi, Keyvan; Garcia, Javier Jas; Horst, Jennifer; Ben-Yehuda, Ori; Radhakrishnan, Jai; Chertow, Glenn M; Jeremias, Allen; Cohen, David J; Cohen, David J; Maehara, Akiko; Mintz, Gary S; Chen, Shmuel; Redfors, Bjorn; Leon, Martin B; Stuckey, Thomas D; Rinaldi, Michael J; Weisz, Giora; Witzenbichler, Bernhard; Kirtane, Ajay J; Mehran, Roxana; Dangas, George D; Stone, Gregg W; Ali, Ziad A; Long-Term Clinical Impact of Contrast-Associated Acute Kidney Injury Following PCI: An ADAPT-DES Substudy.; JACC. Cardiovascular interventions; 2022; vol. 15 (no. 7); 753-766

Study details

Secondary publication of another included study- see primary study for details	No additional information
Other publications associated with this study included in review	No additional information
Trial name / registration number	No additional information
Study type	Retrospective cohort study
Study location	USA and Germany
Study setting	No additional information
Study dates	January 2008 - January 2013
Sources of funding	Sponsored by the Cardiovascular Research Foundation, with funding provided by Boston Scientific, Abbott Vascular, Medtronic, Cordis, Biosensors, The Medicines Company, Daiichi Sankyo, Eli Lilly, Volcano, and Accumetrics

Recruitment / selection of participants	Consecutive patients successfully treated with drug-eluting stents
Inclusion criteria	Treated with drug-eluting stents Loaded with aspirin and clopidogrel
Exclusion criteria	Major complication during the procedure, or before platelet function testing Planned bypass surgery after PCI
Intervention details	No details, other than that all participants were treated with aspirin indefinitely, and clopidogrel was recommended for at least 1 year
Contrast administration route	Intra-arterial
Prognostic variable(s)	eGFR
Acute kidney injury definition	European Society of Urogenital Radiology definition: absolute increase of ≥0.5 mg/dL or ≥25% relative increase in serum creatinine after PCI compared with the pre-PCI serum creatinine level occurring within 3 days of the intravascular administration of contrast medium when no alternative etiology for AKI was identified
Confounders OR Stratifiction strategy	Multivariate model adjusted for: Age Sex Self-reported race BMI Peripheral arterial disease

	Congenital heart failure Diabetes mellitus Hypertension Hyperlipidaemia CKD Smoking Anaemia ST-elevation myocardial infarction Killip class Cardiogenic shock Hypotension Intra-aortic balloon pump use Baseline TIMI flow grade Number of stents
Duration of follow-up	2 years
Indirectness	None
Additional comments	None

Study arms

eGFR <60 (N = 7287)

Characteristics

Study-level characteristics

Characteristic	Study (N = 7287)
Mean age (SD) Mean (SD)	63.84 (10.85)
% Female Sample size	n = 1852 ; % = 25.4
Ethnicity Nominal	NR
Diabetes Sample size	n = 2350 ; % = 32.2
Heart failure Sample size	n = 612 ; % = 8.4
Hypertension	n = 5783 ; % = 79.4

Characteristic	Study (N = 7287)
Sample size	
Contrast volume Nominal	NR
Number of AKI events Sample size	n = 476 ; % = 6.5

Outcomes

Acute kidney injury

Outcome	eGFR <60, , N = 7287
Adjusted OR OR (95%CI) Mean (95% CI)	1.65 (1.21 to 2.21)

Paper reports OR for CKD, defined as an eGFR <60 mL/kg/min
Referent value: ≥60

Shacham, 2016

Bibliographic Reference	Shacham, Y.; Gal-Oz, A.; Flint, N.; Keren, G.; Arbel, Y.; Serum uric acid levels and renal impairment among st-segment elevation myocardial infarction patients undergoing primary percutaneous intervention; CardioRenal Medicine; 2016; vol. 6 (no. 3); 191-197

Study details

Secondary publication of another included study- see primary study for details	No additional information
Other publications associated with this study included in review	No additional information
Trial name / registration number	No additional information
Study type	Retrospective cohort study
Study location	Israel
Study setting	Tertiary referral hospital
Study dates	January 2008 - February 2015
Sources of funding	None reported

Recruitment / selection of participants	Consecutive patients referred with ST-elevated myocardial infarction (STEMI) undergoing primary PCI
Inclusion criteria	None specified
Exclusion criteria	Treated either conservatively or by thrombolysis Final diagnosis on discharge was other than STEMI (e.g. myocarditis or Takotsubo cardiomyopathy) Died within 24 h of admission Required chronic peritoneal dialysis or haemodialysis treatment No information regarding serum uric acid levels
Intervention details	Primary percutaneous coronary intervention (PCI) was performed on patients with symptoms lasting for ≤12 hours as well as in patients with symptoms lasting for 12–24 hours if the symptoms persisted at the time of admission. Following coronary interventional procedures, physiologic (0.9%) saline was given intravenously at a rate of 1 ml/kg/h for 12 h after contrast exposure. In patients with overt heart failure, the hydration rate was reduced at the discretion of the attending physician. The contrast medium used in the procedures was iodixanol or iohexol
Contrast administration route	Intra-arterial
Prognostic variable(s)	eGFR - estimated using the abbreviated Modification of Diet in Renal Disease equation
Acute kidney injury definition	AKI was determined using the AKI network criteria - a rise in serum creatinine >0.3 mg/dl, compared with the admission value
Confounders OR Stratifiction strategy	Independent predictors of AKI were identified by logistic regression model, adjusted for: Age Gender

	Diabetes mellitus Hypertension Heart failure Left ventricular ejection fraction Serum uric acid levels
Duration of follow-up	Unclear
Indirectness	None
Additional comments	None

Study arms

eGFR ≤60 (N = 1372)

Characteristics

Study-level characteristics

Characteristic	**Study (N = 1372)**
Mean age (SD) Mean (SD)	61.5 (12.83)

Characteristic	Study (N = 1372)
% Female Sample size	n = 271 ; % = 19.8
Ethnicity Nominal	NR
Diabetes Sample size	n = 302 ; % = 22
Heart failure Nominal	NR
Hypertension Sample size	n = 587 ; % = 42.8
Contrast volume (ml) Mean (SD)	139.12 (31.44)
Number of AKI events Sample size	n = 153 ; % = 11

Outcomes

Acute kidney injury

Outcome	eGFR ≤60, , N = 1372
Adjusted OR OR (95%CI) Mean (95% CI)	1.67 (1.02 to 2.75)

Referent value: >60