

**Coronary artery bypass grafting and percutaneous
coronary intervention/stent in the treatment of triple
vessel disease:
update searches and screening
for
Universitätsklinikum Schleswig-Holstein/Campus Kiel**



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1. PROJECT OBJECTIVES

A key aim of the research project “Making SDM a reality” is to inform patients as part of shared decision making (SDM).

Kleijnen Systematic Reviews (KSR) Ltd has prepared an evidence report with a synthesis of the evidence of the coronary artery bypass grafting (CABG) and percutaneous coronary intervention/stent in the treatment of triple vessel disease.

2. METHODS

LITERATURE SEARCHES

Literature searches were conducted to identify systematic reviews and evidence-based guidelines about CABG to update the 2018 evidence report.

The search strategies were developed specifically for each database and the keywords adapted according to the configuration of each database. Searches were limited by date range for systematic reviews and guidelines to 2018-2021. Searches were not limited by language or publication status.

Systematic reviews and guidelines

The following systematic review and health technology assessment specific databases were searched:

- Cochrane Database of Systematic Reviews (CDSR) (Wiley): issue 9 of 12, September 2021
- KSR Evidence (Internet) (<https://ksrevidence.com/>): 2018-2021
- Epistemonikos (Internet) (<https://www.epistemonikos.org/>): 2018-2021
- International HTA Database (INAHTA) (<https://database.inahta.org/>): 2018-2021

The following guidelines resources were searched:

- Guidelines International Network (GIN) (Internet) (<https://www.g-i-n.net/home>): up to 10 September 2021
- NICE Evidence (Internet) (www.evidence.nhs.uk/): 2018-2021
- NICE Guidance (Internet) (<https://www.nice.org.uk/guidance>): 2018-2021
- ECRI Guidelines Trust (Internet) (<https://guidelines.ecri.org/>): 2018-2021
- Trip Database (<https://www.tripdatabase.com/>): 2018-2021
- Canadian Agency for Drugs and Technologies in Health (CADTH) (www.cadth.ca): 2018-2021

Full details of all search strategies are presented in Appendix 1.

Handling of citations

References identified from the searches were downloaded into EndNote bibliographic management software for further assessment and handling.

Supplementary searches

The bibliographies of included studies and review articles were also checked for additional relevant articles.

Prioritisation

During formal screening of titles and abstracts, studies were subject to a prioritisation process whereby the recency e.g., to most up-to-date clinical practice guidelines (CPG), methodological quality e.g., Cochrane systematic review (CSR), quality of the analyses per outcome (e.g., ratio of RCTs to observational studies), the number of included RCTs, the breadth of the timepoints reported etc. were considered to further prioritise which studies would be used to inform analyses. Studies were categorised into the following three categories: '1' = German, American, European or similar CPG; '2' = CSR or similar quality SR; '3' = potentially lower/other quality SR.

3. RESULTS

The original KSR searches were conducted on 18 July 2018; and of the 1,782 references screened, 10 studies were deemed eligible. In the current update, a total of 3,117 records were retrieved from the electronic literature searches (Table 3). After the removal of duplicate records 1,398 titles and abstracts were screened by two reviewers. 27 records were found to be potentially eligible and were longlisted after a consensus. Of those, four were short-listed and included in the analyses (Table 1).¹⁻⁴ See also Table 2 for an overview of primary studies included in the identified SRs/CPGs.

UPDATE – Concluding Assessment by SHARE-TO-CARE Evidence Team (28/03/22)

Based on the update searches conducted by KSR Ltd in September 2021, we want to highlight the following aspects: Recently published CPGs (Collet et al., 2020; Neumann et al., 2019) draw on data from the BEST, PRECOMBAT, or SYNTAX trials, that have also served as evidence basis for the 2018 evidence report. Thus, recommendations given in these CPGs are in accordance with the current version of the decision aid. Further, neither of the investigated bioresorbable stents or scaffolds proved suitable (EUnetHTA, 2019).

Conclusion regarding the evidence report: No evidence update required. The present evidence report (September, 2018) remains valid until further notice.

Table 1 Evidence sources

Study/year	Evidence type	Primary studies	Number of studies	Intervention	Comparator	Outcome	Date searched	Conclusions
European Society of Cardiology¹	CPG	Various	See section 6	Percutaneous coronary intervention	Coronary artery bypass surgery	Multiple	NR	“Taken together, evidence is limited from these aforementioned RCTs to support one revascularization strategy over the other, especially in NSTEMI patients.” “It is recommended to base the revascularization strategy (ad hoc culprit lesion PCI/multivessel PCI/CABG) on the patient’s clinical status and comorbidities, as well as their disease severity [i.e. the distribution and angiographic lesion characteristics (e.g. SYNTAX score)], according to the principles for stable CAD.”
Gaudino 2018²	SR/MA	RCTs, OS	8 RCTs, 17 OS	Drug eluting stents)	Single and multiple arterial grafting	Long-term mortality	June 2017	“Coronary artery bypass grafting was associated with reduced 5-year mortality and need for repeated revascularisation compared with drug eluting stents. Multiple arterial grafting was ranked as the best treatment for the primary and all secondary outcomes”
Lee 2019³	SR/MA	RCTs	15	Coronary artery bypass graft surgery	Percutaneous coronary intervention	Myocardial infarction at the longest available	NR	“The evidence suggests a significant benefit of coronary artery bypass grafting (CABG) over percutaneous coronary

Study/year	Evidence type	Primary studies	Number of studies	Intervention	Comparator	Outcome	Date searched	Conclusions
						follow-up		intervention (PCI) concerning the rate of myocardial infarction (MI) during a weighted follow-up of 4.5 years”
European Network for Health Technology Assessment⁴	HTA	RCTs, non-RCTs	8	Bioresorbable stents or scaffolds	Percutaneous coronary intervention or/ and coronary artery bypass graft surgery	Multiple	10, September 2018	“Based on evidence from eight RCTs, the fully bioresorbable everolimus-eluting stent Absorb® bioresorbable vascular scaffold is considered to be less effective and to have a worse safety profile compared with everolimus- or biolimus-eluting permanent metal stents” “There is insufficient evidence to determine whether the other four currently CE-certificated fully bioresorbable sent systems [DESolve®, Magmaris (Dreams 2G), Art Pure or Fantom®] are more effective than (or at least as effective as) and/or have better (or at least similar) safety profiles compared with drug-eluting permanent metal stents or other revascularisation strategies.”
HTA = health technology assessment; CGP = clinical practice guideline; MA = meta-analysis; NMA = network meta-analysis; NR = not reported; OS = observational studies; RCT = randomised controlled trial; SR = systematic review								

Table 2 Overview of primary studies included in the identified SRs/CPGs

Study/year	Primary study(ies)	Reference (first author & journal)
European Society of Cardiology¹	Various (RCT, NMA)	1. Chang M, et al. Comparison of outcome of coronary artery bypass grafting versus drug-eluting stent implantation for non-ST-elevation acute coronary syndrome. <i>Am J Cardiol</i> 2017;120:380386. 2. Ramanathan K, et al. Surgical versus percutaneous coronary revascularization in patients with diabetes and acute coronary syndromes. <i>J Am Coll Cardiol</i> 2017;70:29953006. 3. Farkouh ME, et al. and FREEDOM Trial Investigators. Strategies for multivessel revascularization in patients with diabetes. <i>N Engl J Med</i> 2012;367:23752384. 4. Mohr FW, et al. Coronary artery bypass graft surgery versus percutaneous coronary intervention in patients with three-vessel disease and left main coronary disease: 5- year follow-up of the randomised, clinical SYNTAX trial. <i>Lancet</i> 2013;381:629638. 5. Windecker S, et al. Revascularisation versus medical treatment in patients with stable coronary artery disease: network meta-analysis. <i>BMJ</i> 2014;348:g3859. 6. Palmerini T, et al. Prognostic value of the SYNTAX score in patients with acute coronary syndromes undergoing percutaneous coronary intervention: analysis from the ACUITY (Acute Catheterization and Urgent Intervention Triage Strategy) trial. <i>J Am Coll Cardiol</i> 2011;57:23892397. 7. Osnabrugge RL, et al. Performance of EuroSCORE II in a large US database: implications for transcatheter aortic valve implantation. <i>Eur J Cardiothorac Surg</i> 2014;46:400408; discussion 408.
Gaudino 2018²	RCTs, OS	1. Ahmed K, Jeong MH, Chakraborty R, Hong YJ, Sim DS, Hwang SH, Lee MG, Park KH, Kim JH, Ahn Y, Cho MC, Kim CJ, Kim YJ, Park JC, Kang JC, Korea Acute Myocardial Infarction Registry Investigators. Percutaneous coronary intervention with drug-eluting stent implantation vs. coronary artery bypass grafting for multivessel coronary artery disease in metabolic syndrome patients with acute myocardial infarction. <i>Circ J</i> 2012;76:721–728. 2. Ahn J-M, Roh J-H, Kim Y-H, Park D-W, Yun S-C, Lee PH, Chang M, Park HW, Lee S-W, Lee CW, Park S-W, Choo SJ, Chung C, Lee J, Lim D-S, Rha S-W, Lee S-G, Gwon H-C, Kim H-S, Chae I-H, Jang Y, Jeong M-H, Tahk S-J, Seung KB, Park S-J. Randomized Trial of Stents Versus Bypass Surgery for Left Main Coronary Artery Disease: 5-Year Outcomes of the PRECOMBAT Study. <i>J Am Coll Cardiol</i> 2015;65:2198–2206. 3. Park S-J, Kim Y-H, Park D-W, Yun S-C, Ahn J-M, Song HG, Lee J-Y, Kim W-J, Kang S-J, Lee S-W, Lee CW, Park S-W, Chung C-H, Lee J-W, Lim D-S, Rha S-W, Lee S-G, Gwon H-C, Kim H-S, Chae I-H, Jang Y, Jeong M-H, Tahk S-J, Seung KB. Randomized trial of stents versus bypass surgery for left main coronary artery disease. <i>N Engl J Med</i> 2011;364:1718–1727. 4. Ashrith G, Lee V-V, Elayda MA, Reul RM, Wilson JM. Short- and long-term outcomes of coronary artery

Study/year	Primary study(ies)	Reference (first author & journal)
		bypass grafting or drug-eluting stent implantation for multivessel coronary artery disease in patients with chronic kidney disease. <i>Am J Cardiol</i> 2010;106:348–353. 5. Baek CH, Kim S-O, Park S-J, Lee JW, Kim SB, Kim KM. Propensity-matched comparison of drug-eluting stent implantation and coronary artery bypass graft surgery in chronic hemodialysis patients. <i>J Nephrol</i> 2014;27:87–93. 6. Benedetto U, Caputo M, Vohra H, Bryan A, Angelini GD. State of the art in coronary revascularization: Everolimus eluting stents versus multiple arterial grafting. <i>Int J Cardiol</i> 2016;219:345–349. 7. Boudriot E, Thiele H, Walther T, Liebetrau C, Boeckstegers P, Pohl T, Reichart B, Mudra H, Beier F, Gansera B, Neumann F-J, Gick M, Zietak T, Desch S, Schuler G, Mohr F-W. Randomized comparison of percutaneous coronary intervention with sirolimus-eluting stents versus coronary artery bypass grafting in unprotected left main stem stenosis. <i>J Am Coll Cardiol</i> 2011;57:538–545. 8. Chieffo A, Meliga E, Latib A, Park S-J, Onuma Y, Capranzano P, Valgimigli M, Jegere S, Makkar RR, Palacios IF, Kim Y-H, Buszman PE, Chakravarty T, Sheiban I, Mehran R, Naber C, Margey R, Agnihotri A, Marra S, Capodanno D, Leon MB, Moses JW, Fajadet J, Lefevre T, Morice M-C, Erglis A, Tamburino C, Alfieri O, Serruys PW, Colombo A. Drug-eluting stent for left main coronary artery disease. The DELTA registry: a multicenter registry evaluating percutaneous coronary intervention versus coronary artery bypass grafting for left main treatment. <i>JACC Cardiovasc Interv</i> 2012;5:718–727. 9. Dohi S, Kajimoto K, Miyauchi K, Yamamoto T, Tambara K, Inaba H, Kuwaki K, Tamura H, Kojima T, Yokoyama K, Kurata T, Daida H, Amano A. Comparing outcomes after off-pump coronary artery bypass versus drug-eluting stent in diabetic patients. <i>J Cardiol</i> 2012;59:195–201. 10. Farkouh ME, Domanski M, Sleeper LA, Siami FS, Dangas G, Mack M, Yang M, Cohen DJ, Rosenberg Y, Solomon SD, Desai AS, Gersh BJ, Magnuson EA, Lansky A, Boineau R, Weinberger J, Ramanathan K, Sousa JE, Rankin J, Bhargava B, Buse J, Hueb W, Smith CR, Muratov V, Bansilal S, King S, Bertrand M, Fuster V, FREEDOM Trial Investigators. Strategies for multivessel revascularization in patients with diabetes. <i>N Engl J Med</i> 2012;367:2375–2384. 11. Fortuna D, Nicolini F, Guastaroba P, De Palma R, Di Bartolomeo S, Saia F, Pacini D, Grilli R, RERIC (Regional Registry of Cardiac Surgery), REAL (Regional Registry of Coronary Angioplasties) Investigators. Coronary artery bypass grafting vs percutaneous coronary intervention in a “real-world” setting: a comparative effectiveness study based on propensity score-matched cohorts. <i>Eur J Cardio-Thorac Surg Off J Eur Assoc Cardio-Thorac Surg</i> 2013;44:e16-24. 12. Javaid A, Steinberg DH, Buch AN, Corso PJ, Boyce SW, Pinto Slottow TL, Roy PK, Hill P, Okabe T, Torguson

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European Network for Health Technology Assessment ⁴	RCTs, non-RCTs	1. Xu B, Yang Y, Han Y, et al. Comparison of everolimus-eluting bioresorbable vascular scaffolds and metallic stents: three-year clinical outcomes from the ABSORB China randomised trial. <i>Eurointervention</i> 2018;14(5):e554–61. 2. Tijssen RYG, Kraak RP, Hofma SH, et al. Complete two-year follow-up with formal noninferiority testing on primary outcomes of the AIDA trial comparing the Absorb bioresorbable scaffold with the XIENCE drug-eluting metallic stent in routine PCI. <i>Eurointervention</i> 2018;14(4):e426–33. 3. Grundeken MJ, White RM, Hernandez JB, et al. The incidence and relevance of site-reported vs. patient-reported angina: insights from the ABSORB II randomized trial comparing Absorb everolimus-eluting bioresorbable scaffold with XIENCE everolimus-eluting metallic stent. <i>Eur Heart J Qual Care Clin Outcomes</i> 2016;2(2):108–16. 4. Chevalier B, Cequier A, Dudek D, et al. Four-year follow-up of the randomised comparison between an everolimus-eluting bioresorbable scaffold and an everolimus-eluting metallic stent for the treatment of coronary artery stenosis (ABSORB II Trial). <i>Eurointervention</i> 2018;13(13):1561–4. 5. de la Torre Hernandez JM, Garcia Camarero T, Lee D-H, et al. Procedural resources utilization and clinical outcomes with bioresorbable everolimus-eluting scaffolds and Pt-Cr everolimus-eluting stent with resorbable abluminal polymer in clinical practice. A randomized trial. <i>Catheter Cardiovasc Interv</i> 2017;90(2):E25–30. 6. Arroyo D, Gendre G, Schukraft S, et al. Comparison of everolimus- and biolimus-eluting coronary stents with everolimus-eluting bioresorbable vascular scaffolds: two-year clinical outcomes of the EVERBIO II trial. <i>Int J Cardiol</i> 2017;243:121–5. 7. Serruys PW, Chevalier B, Sotomi Y, et al. Comparison of an everolimus-eluting bioresorbable scaffold with an everolimus-eluting metallic stent for the treatment of coronary artery stenosis (ABSORB II): a 3 year, randomised, controlled, single-blind, multicentre clinical trial [Erratum in <i>Lancet</i> 2017;389(10071):804;PMID: 28248178]. <i>Lancet</i> 2016;388(10059):2479–91. 8. Kereiakes DJ, Ellis SG, Metzger C, et al. 3-Year clinical outcomes with everolimus-eluting bioresorbable coronary scaffolds: the ABSORB III trial. <i>J Am Coll Cardiol</i> 2017;70(23):2852–62. 9. Wykrzykowska JJ, Kraak RP, Hofma SH, et al. Bioresorbable scaffolds versus metallic stents in routine PCI. <i>N Engl J Med</i> 2017;376(24):2319–28. 10. Onuma Y, Sotomi Y, Shiomi H, et al. Two-year clinical, angiographic, and serial optical coherence tomographic follow-up after implantation of an everolimus-eluting bioresorbable scaffold and an everolimus-eluting metallic stent: insights from the randomised ABSORB Japan trial. <i>Eurointervention</i>

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OS = observational studies; RCT = randomised controlled trial		

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APPENDIX 1: SEARCH STRATEGIES

Table: Systematic reviews and guideline update search results

Database	Dates	Results
CDSR	2018 - Issue 9, September 2021	70
KSR Evidence	2018-2021	984
Epistemonikos	2018-2021	416
INAHTA	2018-2021	13
NICE Evidence	01/01/2018 - 13/09/2021	760
NICE Guidance	2018-2021	12
GIN	2018-2021	40
ECRI	2018-2021	5
Trip	2018-2021	817
CADTH	2018-2021	0
Total		3117
Total after de-duplication		1599
Total after de-duplication v original results		1398

Search strategies

Cochrane Database of Systematic Reviews (CDSR) (Wiley): Issue 9 of 12, September 2021
Searched: 13.9.21

#1 MeSH descriptor: [Coronary Artery Bypass] explode all trees 5518
 #2 (coronary or artery or aortocoron* or myocard* or heart) near/3 (bypass* or by-pass* or graft* or surgery or revascular*):ti,ab,kw 26437
 #3 CABG:ti,ab,kw 5868
 #4 (bypass* surgery or (valve near/4 surgery)):ti,ab,kw 18510
 #5 #1 or #2 or #3 or #4 32720
 #6 MeSH descriptor: [Percutaneous Coronary Intervention] explode all trees 5777
 #7 ((percutaneous or transluminal) near/3 (revascular* or intervention* or angioplast*)):ti,ab,kw 14311
 #8 (PCI or PPCI or PTCA):ti,ab 10415
 #9 ((primary or balloon* or coronary) near/2 angioplast*):ti,ab,kw 6931
 #10 #6 or #7 or #8 or #9 19422
 #11 #5 or #10 46282
 #12 (triple next vessel or three next vessel or 3vd):ti,ab,kw 359
 #13 #11 or #12 with Cochrane Library publication date Between Jan 2018 and Dec 2021, in Cochrane Reviews, Cochrane Protocols 70

KSR Evidence (Internet): Database last updated 2021 Sep 13

www.ksrevidence.com

Searched: 13.9.21

Query Results

1 "coronary bypass" or "coronary artery bypass" or aortocoron* or "heart bypass" in Title 320 results

2 "coronary bypass" or "coronary artery bypass" or aortocoron* or "heart bypass" in Bottom line 43 results

3 "coronary graft" or "bypass graft" or "artery graft" or "heart graft" or "coronary grafting" or "bypass grafting" or "artery grafting" or "heart grafting" in Title 260 results

4 "coronary graft" or "bypass graft" or "artery graft" or "heart graft" or "coronary grafting" or "bypass grafting" or "artery grafting" or "heart grafting" in Bottom line 39 results

5 CABG in All text 425 results

6 "bypass surgery" or "valve surgery" in All text 400 results

7 "percutaneous coronary intervention" or "coronary angioplasty" in Title 580 results

8 "percutaneous coronary intervention" or "coronary angioplasty" in Bottom line 60 results

9 PCI or PPCI or PTCA in Title 63 results

10 PCI or PPCI or PTCA in Bottom line 23 results

11 ((primary or balloon* or coronary) AND angioplast*) in All text 354 results

12 "triple vessel" or "three vessel" or 3vd in All text 16 results

13 #12 or #11 or #10 or #9 or #8 or #7 or #6 or #5 or #4 or #3 or #2 or #1 in All text Date published: 2018 - 2021 984 results

Search run Mon Sep 13 2021

Epistemonikos (Internet): up to 2021 Sep 13

<https://www.epistemonikos.org/en/>

Searched: 13.9.21

(title:("coronary bypass" OR "coronary artery bypass" OR aortocoron* OR "heart bypass") OR abstract:("coronary bypass" OR "coronary artery bypass" OR aortocoron* OR "heart bypass")) Publication type: Systematic Review; Publication year: Custom year range: From 2018 To 2021

416 records retrieved

International HTA Database (INAHTA): up to 13 September 2021

<https://database.inahta.org/>

Searched: 13.9.21

("coronary angioplasty" OR "heart angioplasty" OR "primary angioplasty" OR "balloon angioplasty" OR PCI OR PPCI OR PTCA OR "percutaneous coronary intervention") OR ("Percutaneous Coronary Intervention"[mh]) OR ("coronary bypass" OR "artery bypass" OR "myocardial bypass" OR "heart bypass" OR "coronary graft" OR "artery graft" OR "myocardial graft" OR "heart graft" OR CABG OR "bypass surgery") OR ("Coronary Artery Bypass"[mh]) YEAR 2018 TO 2021

13 records retrieved

NICE Evidence Search: limited to guidance and SRs only (Internet): 2021/09/13

<https://www.evidence.nhs.uk/>

Searched 13.9.21

Search terms	Results (Guidance; Systematic Reviews): 01/01/2018-13/09/2021
coronary bypass	209
heart bypass	141
artery bypass	239
coronary graft*	199
bypass graft*	211
artery graft*	260
heart graft*	170
CABG	112
percutaneous coronary intervention	322
coronary angioplasty	56
PCI or PPCI or PTCA	251
primary angioplast*	97
balloon angioplast*	66
Total retrieved	2287
Total (without duplicates)	760

National Institute for Health and Care Excellence (NICE): Guidelines

Searched 13.9.21

<https://www.nice.org.uk/>

NICE Guidance; Conditions and diseases; Cardiovascular conditions; Acute coronary syndromes

2018-2021

Guidance 5

Quality Standards 0

NICE Pathways 3

NICE Advice 4

NICE Guidance; Conditions and diseases; Cardiovascular conditions; Stable angina

2018-2021

Guidance 1

Quality Standards 0

NICE Pathways 0

NICE Advice 0

Total after removal of duplicates (2018-2021): 12

International Guideline Library (GIN) (Internet): up to 13 Sep 2021

Searched 13.9.21

<https://g-i-n.net/international-guidelines-library/>

Search terms	Results: 2018-2021
cardiovascular	29
coronary	7
cardiac	8
myocardial	8
coronary artery bypass	0
percutaneous coronary intervention	0
triple vessel	0
angina	5
chest pain	2
Total retrieved	59
Total (without duplicates)	40

ECRI Institute Guidelines Trust (Internet): up to 13 September 2021

<https://guidelines.ecri.org/>

Searched: 13.9.21

coronary artery bypass OR CABG

2018-2021

5 records retrieved

Trip Database: up to 13 September 2021

<https://www.tripdatabase.com/>

Strategy: SBD_SDM_CABG_Update_TRIP1

"coronary bypass"~3 OR "artery bypass"~3 OR cabg OR "coronary graft"~3 OR "artery graft"~3 OR cabg, 2018, 2021

Systematic Reviews: 525 records retrieved

Guidelines: 292 records retrieved

Total: 817 records retrieved

Canadian Agency for Drugs and Technologies in Health (CADTH): up to 13 September 2021

<https://www.cadth.ca/>

Searched: 13.9.21

Coronary Artery Bypass [Contains all words]: Health Technology Review

0 records retrieved