

South African National Essential Medicine List
Primary Healthcare and Adult Hospital Level Medication Review Process
Component: Cardiovascular conditions

EVIDENCE SUMMARY

Title: Evidence review of the use of aspirin for primary cardiovascular disease prevention.

Date: 11 February 2022

Reviewer: Nqoba Tsabedze, Trudy Leong

Affiliation and declaration of interests: NT (Division of Cardiology, Department of Medicine, Charlotte Maxeke Johannesburg Academic Hospital and the University of the Witwatersrand. NT has received honoraria for speaker and advisory board consulting fees relating to cardiovascular therapies from Acino Health Care Group, Boehringer – Ingelheim, Boston Scientific, Eli Lilly, Medtronic, Merck, Novartis Pharmaceuticals, Novo Nordisk, Pfizer, Phillips, Sanofi- Aventis, Servier and Takeda) and TL (National Department of Health, Essential Drugs Programme) have no interests to declare pertaining to aspirin.

Background:

Recently, several requests were received from healthcare professionals for the evidence review that informed the decision of not recommending aspirin for the primary prevention of cardiovascular disease and stroke. However, aspirin for primary prevention has historically **not** been included in the Standard Treatment Guidelines and Essential Medicine List since 2006.

There is a substantial body of evidence that collectively supports the use of aspirin for the secondary prevention of established cardiovascular disease.^{1,2} However, current data on the role of aspirin in primary prevention of cardiovascular disease is conflicting and controversial with potential benefits limited by an increased bleeding risk. Early trials done before year 2000, evaluating aspirin for primary prevention, suggested reductions in myocardial infarction and stroke (although not mortality), and an increased risk of bleeding.³⁻⁷ In order to balance the risks and benefits of aspirin on primary prevention of cardiovascular disease, the majority of international guidelines have recommended aspirin only when a significant 10-year risk of cardiovascular events exists.⁸⁻¹¹ This evidence summary will present the findings of the most recent systematic review and meta-analysis of RCTs evaluating the role for aspirin in cardiovascular primary prevention looking at potential benefits and possible harms from increased bleeding risk. This review has an AMSTAR rating of low to moderate quality (see Appendix 1).

Meta-Analysis of all the Aspirin in Primary Cardiovascular Disease Prevention Trails¹²

This meta-analysis included 13 RCTs (n=164 225) published until November 1, 2018, that enrolled at least 1000 participants with no known cardiovascular disease and a follow-up of at least 12 months (1 050 511 patient-years of follow up). Included RCTs comparing aspirin use with no aspirin (placebo or no treatment). Data were screened and extracted independently by both investigators. Bayesian and frequentist meta-analyses were performed.

The median age of trial participants was 62 years (range, 53 to 74), 77 501 (47%) were men, 30 361 (19%) had diabetes, and the median baseline 10-year risk for a primary cardiovascular outcome was 10.2% (range, 2.6 to 30.9%). Aspirin dose-range was 75 to 500mg daily, with 11 of the 13 RCTs investigating aspirin at a dose of 75-100mg daily.

Results:

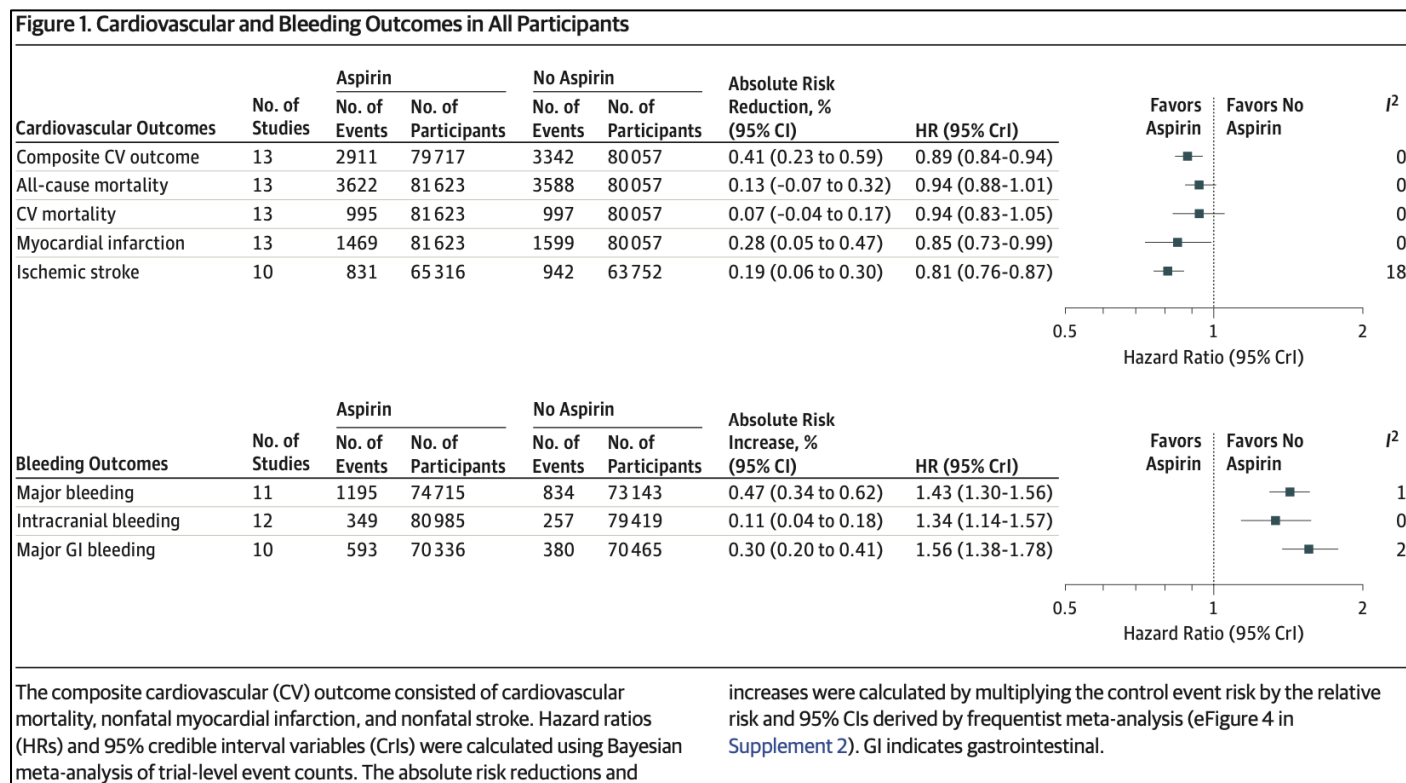
Efficacy

- Composite primary endpoint of cardiovascular mortality, nonfatal myocardial infarction, and nonfatal stroke:
 - Aspirin use was associated with significant reductions in the composite cardiovascular outcome compared with no aspirin (60.2 per 10 000 participant-years with aspirin and 65.2 per 10 000 participant-years with no aspirin) - hazard ratio (HR) 0.89, 95% confidence interval (CI) 0.84 to 0.94; absolute risk reduction (ARR) 0.41%, 95% CI, 0.23 to 0.59; number needed to treat (NNT) 241, 95% CI 169 to 435.

Safety

- The primary bleeding outcome was any major bleeding (defined by the individual studies).
 - Aspirin use was associated with an increased risk of major bleeding events compared with no aspirin (23.1 per 10 000 participant-years with aspirin and 16.4 per 10 000 participant-years with no aspirin): HR 1.43, 95% CI 1.30 to 1.56; absolute risk increase 0.47% ,95% CI 0.34 to 0.62; number needed to harm (NNH) 210, 95% CI 161 to 294.

Therefore, the use of aspirin in individuals without cardiovascular disease was associated with a lower risk of cardiovascular events and an increased risk of major bleeding.



SUB GROUP ANALYSES:

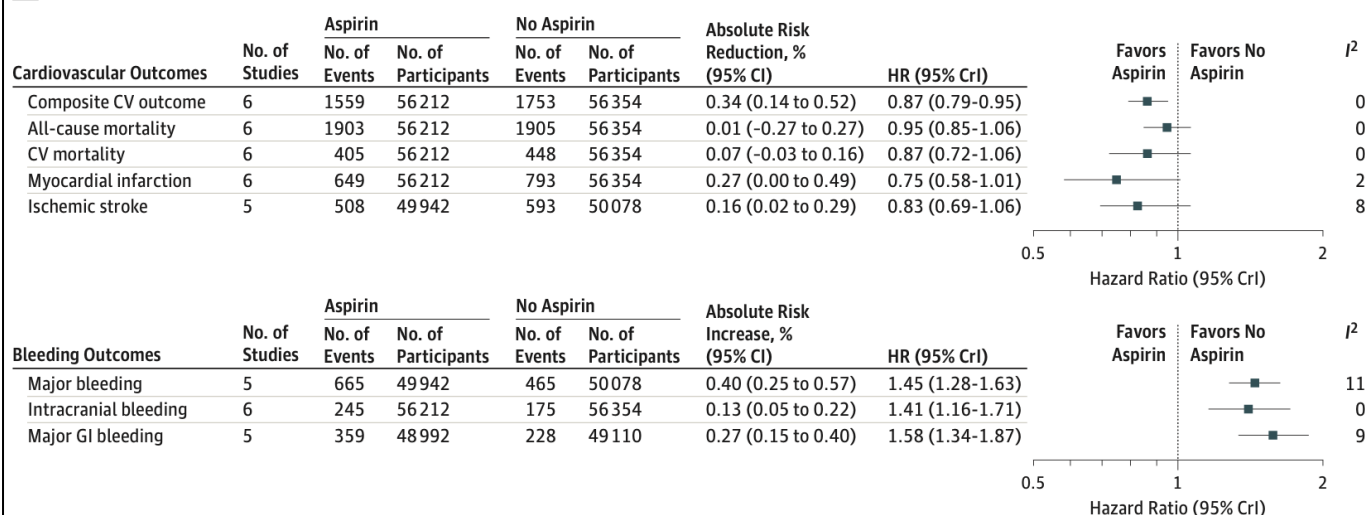
Low CV risk subgroup

In studies where the primary 10-year risk for a cardiovascular outcome was low, heterogeneity was low for all outcomes in patients (I² range, 0%-11%).

- Efficacy:** Aspirin use was associated with reductions in the primary composite cardiovascular outcome compared to no aspirin - HR 0.87 (95% CI 0.79 to 0.95); ARR 0.34% (95% CI 0.14 to 0.52); NNT 160 (95% CI 192 to 714).
- Safety:** Aspirin use was associated with increased risk of major bleeding compared to no aspirin - HR 1.45 (95% CI 1.28 to 1.63); absolute risk increase 0.40% (95% CI 0.25 to 0.57); NNH 249 (95% CI 175 to 400). Intracranial bleeding (HR 1.41, 95% CI 1.16 to 1.71) major gastrointestinal bleeding (HR 1.58, 95% CI 1.34 to 1.87) were also more common with aspirin use compared to no aspirin.

Figure 2. Cardiovascular and Bleeding Outcomes for Studies With Patients at High and Low Risk for the Primary CV Outcome and With Diabetes

A Participants with low CV risk

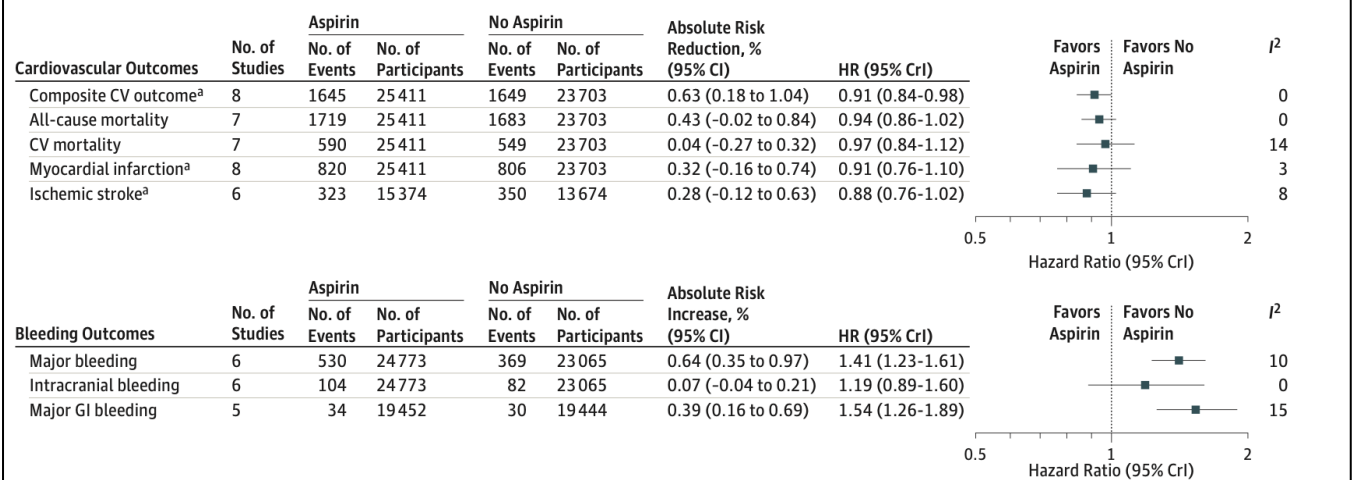


High CV risk subgroup

In studies where the primary 10-year risk of the cardiovascular outcome was high, heterogeneity was low for all outcomes in participants with high risk of the cardiovascular outcome (*I*² range, 0%-15%).

- **Efficacy:** Aspirin use was associated with reductions in the primary composite cardiovascular outcome compared with no aspirin - HR 0.91 (95% CI 0.84 to 0.98); ARR 0.63% (95% CI 0.18 to 1.03%); NNT 160 (95% CI 96 to 555).
- **Safety:** Aspirin use was associated with an increase in major bleeding compared to no bleeding - HR 1.41 (95% CI 1.23 to 1.61); absolute risk increase 0.64% (95% CI 0.35 to 0.97); NNH 152 (95% CI 103 to 286). Aspirin use was also associated with an increased risk of major gastrointestinal bleeding (HR 1.54, 95% CI 1.26 to 1.89) but not in intracranial bleeding (HR 1.19, 95% CI 0.89 to 1.60)

B Participants with high CV risk



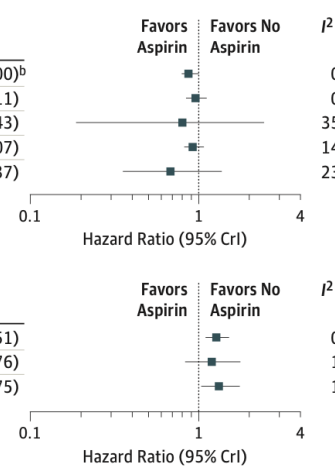
Diabetes subgroup

Data for participants with diabetes was reported in 10 studies, accounting for 30448 participants. There was evidence of moderate heterogeneity for cardiovascular mortality in patients with diabetes (*I*² = 35%). Heterogeneity was low for all other outcomes in patients with diabetes (*I*² range, 0%-23%).

- **Efficacy:** Aspirin use was associated with reductions in the primary composite cardiovascular outcome – HR. 0.90 (95% CI 0.82 to 1.00); ARR 0.65% (95% CI 0.09 to 1.17); no difference shown.
- **Safety:** Aspirin use was associated with an increase in major bleeding compared to no bleeding - HR 1.29 (95% CI 1.11 to 1.51); absolute risk increase 0.80% (95% CI 0.29 to 1.39); NNH 121 (95% CI 72 to 345). Aspirin use was also associated with an increased risk of major gastrointestinal bleeding (HR, 1.35, 95% CI 1.05 to 1.75) but not in intracranial bleeding (HR 1.21 95% CI 0.84 to 1.76).

C Participants with diabetes								
Cardiovascular Outcomes	No. of Studies	Aspirin		No Aspirin		Absolute Risk Reduction, % (95% CI)	HR (95% CrI)	I^2
		No. of Events	No. of Participants	No. of Events	No. of Participants			
Composite CV outcome	8	977	14916	1072	14898	0.65 (0.09 to 1.17)	0.90 (0.82-1.00) ^b	0
All-cause mortality	5	1028	11938	1055	11946	0.24 (-0.49 to 0.91)	0.97 (0.85-1.11)	0
CV mortality	4	264	10159	279	10167	0.05 (-1.27 to 0.94)	0.82 (0.19-2.43)	35
Myocardial infarction	8	472	11788	490	11700	0.26 (-0.47 to 0.88)	0.94 (0.83-1.07)	14
Ischemic stroke	3	275	9535	317	9511	0.83 (-0.50 to 1.70)	0.70 (0.36-1.37)	23

Bleeding Outcomes	No. of Studies	Aspirin		No Aspirin		Absolute Risk Increase, % (95% CI)	HR (95% CrI)	I^2
		No. of Events	No. of Participants	No. of Events	No. of Participants			
Major bleeding	3	370	10029	287	10047	0.80 (0.29 to 1.39)	1.29 (1.11-1.51)	0
Intracranial bleeding	2	63	9002	52	9017	0.12 (-0.09 to 0.43)	1.21 (0.84-1.76)	1
Major GI bleeding	2	142	9002	105	9017	0.41 (0.06 to 0.86)	1.35 (1.05-1.75)	1



Comparative table (aspirin vs no aspirin):

Study population	NNT (composite CV outcome)	NNH (Major bleeding)
All	241 (95% CI 169 to 435)	210 (95% CI 161 to 294)
Low CV risk	160 (95% CI 192 to 714)	249 (95% CI 175 to 400)
High CV risk	160 (95% CI 96 to 555)	152 (95% CI 103 to 286)
Diabetics	No difference shown	121 (95% CI 72 to 345)

Conclusions

This recently published systematic review of aspirin in primary cardiovascular disease prevention trial found that aspirin for primary prevention prevents cardiovascular events, but increases risk of major bleeds. NNT and NNH are similar. Aspirin did not reduce all cause or cardiovascular mortality. Aspirin for primary prevention reduces the risk of non-fatal ischaemic events but increases non-fatal bleeding events. This is observed in both high and low 10-year risk for cardiovascular events sub-groups as well as the diabetic subgroup.

PHC/ADULT HOSPITAL LEVEL EXPERT REVIEW COMMITTEE RECOMMENDATION:					
Type of recommendation	We recommend against the option and for the alternative (strong)	We suggest not to use the option (conditional)	We suggest using either the option or the alternative (conditional)	We suggest using the option (conditional)	We recommend the option (strong)
		X			
<p>Recommendation: The PHC/Adult Hospital Level Committee does not recommend the use of aspirin as primary prevention of IHD.</p> <p>Rationale: Systematic review of RCTs (n = 164 225) found that the use of aspirin for primary cardiovascular disease prevention did not decrease all-cause cardiovascular mortality. Aspirin use decreased risk of cardiovascular events but increased major bleeding risk.</p> <p>Level of Evidence: High certainty evidence</p> <p>Review indicator: Long-term follow-up data of efficacy with lower harms</p>					
<p>NEMLC RECOMMENDATION (24 FEBRUARY 2022):</p> <ul style="list-style-type: none"> Enteric-coated aspirin: Query was raised if there would be a difference in bleeding if the enteric coated formulation was used. However, it was noted that a historic review by NEMLC had found that there was no difference with associated gastro-intestinal bleeds, despite the dosage formulation that is used¹. Furthermore, absorption of enteric coated aspirin and effectiveness were not comparable to non-enteric coated aspirin². Outcomes: The balance between the composite outcomes versus risk associated with aspirin favoured that aspirin not be used for primary prevention (including amongst diabetics, or patients at low or high risk). However, more importantly no mortality benefit was seen with aspirin. <p>Recommendation: NEMLC accepted the PHC/Adult Hospital Level ERC's proposal and recommended that the evidence summary be circulated for external comment with the PHC Cardiovascular chapter.</p>					
<p>Monitoring and evaluation considerations</p>					

Refer to Appendix 2: Evidence to decision framework

¹ Citation provided post-meeting: Haastrup PF, Grønlykke T, Jarbøl DE. Enteric coating can lead to reduced antiplatelet effect of low-dose acetylsalicylic acid. Basic Clin Pharmacol Toxicol. 2015 Mar;116(3):212-5. doi: 10.1111/bcpt.12362.

² Citation provided post-meeting: Cox D, Maree AO, Dooley M, Conroy R, Byrne MF, Fitzgerald DJ. Effect of enteric coating on antiplatelet activity of low-dose aspirin in healthy volunteers. Stroke. 2006 Aug;37(8):2153-8. <https://pubmed.ncbi.nlm.nih.gov/16794200/>

Appendix 1: Evaluating the methodological quality of the Zheng et al (2021)³ systematic review and meta-analysis – AMSTAR 2 tool (Shea 2017⁴)

No.	Criteria	Yes/ Partial Yes/ No	Comment
1	Research questions and inclusion criteria for the review included the components of PICO	Yes	Explicitly described in the protocol
2*	Report of the review contained an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol	Yes	-
3	Review authors explained selection of the study designs for inclusion in the review	No	In the protocol they mention type of studies to be included. It is self-explanatory why they would have chosen RCTs, but not explicitly stated
4*	Review authors used a comprehensive literature search strategy	Partial yes	Search restricted to English language, but rationale not provided
5	Review authors perform study selection in duplicate	Yes	-
6	Review authors perform data extraction in duplicate	Yes	-
7*	Review authors provided a list of excluded studies and justify the exclusions	No	PRISMA flow diagram summarises the excluded studies but no details were provided
8	Review authors described the included studies in adequate detail	Yes	-
9*	Review authors used a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review	Yes	Cochrane Risk of Bias Assessment Tool (RoB 2)
10	Review authors reported on the sources of funding for the studies included in the review.	No	-
11*	For meta-analyses, review authors used appropriate methods for statistical combination of results	Yes	-
12	For meta-analyses, review authors assessed the potential impact of RoB in individual RCTs on the results of the meta-analysis or other evidence synthesis	Yes	Sensitivity analysis conducted, excluding RCTs of high risk of bias (mostly open-label RCTs)
13*	Review authors accounted for RoB in individual RCTs when interpreting/ discussing the results of the review	Yes	-
14	Review authors provided a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review	Yes	There was no significant heterogeneity in the results
15*	For quantitative synthesis, review authors carried out an adequate investigation of publication bias (small study bias) and discussed its likely impact on the results of the review	Yes	The Egger test was used to identify asymmetry of funnel plots for publication bias
16	Review authors reported any potential sources of conflict of interest, including any funding they received for conducting the review	Yes	The authors have no conflicts of interest to disclose

* Critical domains = 2, 4, 7, 9, 11, 13, 15

Rating overall confidence in the results of the review

• **High:** No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest

• **Moderate:** More than one non-critical weakness*: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review

• **Low:** One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest

• **Critically low:** More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies

(*Multiple non-critical weaknesses may diminish confidence in the review and it may be appropriate to move the overall appraisal down from moderate to low confidence).

OVERALL ASSESSMENT: Low to moderate quality

Rationale: More than one non-critical weakness (# 3,10) with a critical flaw (#7)

³ Zheng SL, Roddick AJ. Association of Aspirin Use for Primary Prevention With Cardiovascular Events and Bleeding Events: A Systematic Review and Meta-analysis. JAMA. 2019 Jan 22;321(3):277-287. doi: 10.1001/jama.2018.20578. Erratum in: JAMA. 2019 Jun 11;321(22):2245. <https://pubmed.ncbi.nlm.nih.gov/30667501/>

⁴ Shea BJ, Reeves BC, Wells G, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ. 2017 Sep 21;358:j4008. <https://pubmed.ncbi.nlm.nih.gov/28935701/>

Appendix 2: Evidence to decision framework

	JUDGEMENT	EVIDENCE & ADDITIONAL CONSIDERATIONS
QUALITY OF EVIDENCE OF BENEFIT	<p>What is the certainty/quality of evidence?</p> <p>High <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Low <input type="checkbox"/> Very low <input type="checkbox"/></p> <p><i>High quality:</i> confident in the evidence <i>Moderate quality:</i> mostly confident, but further research may change the effect <i>Low quality:</i> some confidence, further research likely to change the effect <i>Very low quality:</i> findings indicate uncertain effect</p>	<p>Large, well-designed randomised controlled trials demonstrating conflicting results. Benefit may be subgroup dependent. However other strategies for primary prevention could be mitigating the magnitude of the benefit seen with aspirin.</p> <p>“9 of the 13 included RCTs were at low risk of bias and 4 were at high risk. There were 9 double-blind and 4 open-label studies. There was no evidence of publication bias for the primary outcome (Egger test: -0.47; $p=0.57$)”</p>
EVIDENCE OF BENEFIT	<p>What is the size of the effect for beneficial outcomes?</p> <p>Large <input type="checkbox"/> Moderate <input type="checkbox"/> Small <input checked="" type="checkbox"/> None <input type="checkbox"/></p>	<p><u>Aspirin vs no aspirin:</u></p> <p>Primary outcome: Composite cardiovascular outcome (cardiovascular mortality, nonfatal myocardial infarction, and nonfatal stroke):</p> <ul style="list-style-type: none"> 60.2 per 10 000 participant-years vs 65.2 per 10 000 participant-years with no aspirin HR 0.89, 95% CI 0.84-0.94 ARR 0.41%, 95% CI 0.23%-0.59% NNT 241, 95% CI 169 to 435 <p>Advances in other primary prevention strategies are proving more impactful and safer than aspirin.</p>
QUALITY OF EVIDENCE OF HARM	<p>What is the certainty/quality of evidence?</p> <p>High <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Low <input type="checkbox"/> Very low <input type="checkbox"/></p> <p><i>High quality:</i> confident in the evidence <i>Moderate quality:</i> mostly confident, but further research may change the effect <i>Low quality:</i> some confidence, further research likely to change the effect <i>Very low quality:</i> findings indicate uncertain effect</p>	<p>Large, well-designed randomised controlled trials all consistently demonstrating significant harms.</p>
EVIDENCE OF HARM	<p>What is the size of the effect for harmful outcomes?</p> <p>Large <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Small <input type="checkbox"/> None <input type="checkbox"/></p>	<p>Moderately to large as the major bleeding risks are significant.</p> <p><u>Aspirin vs no aspirin:</u></p> <p>Increased risk of bleeding¹⁵:</p> <ul style="list-style-type: none"> Difference of 6.7 per 10 000 participant-years HR, 1.43, 95% CI, 1.30-1.56 Absolute risk increase, 0.47%, 95% CI, 0.34%-0.62% NNH 210, 95% CI 161 to 294
BENEFITS & HARM	<p>Do the desirable effects outweigh the undesirable harms?</p> <p>Favours intervention <input type="checkbox"/> Favours control <input checked="" type="checkbox"/> Intervention = Control or Uncertain <input type="checkbox"/></p>	
THERAPEUTIC INTERCHANGE	<p>Therapeutic alternatives available: n/a</p>	
FEASIBILITY	<p>Is implementation of this recommendation feasible?</p> <p>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Uncertain <input type="checkbox"/></p>	<p>Aspirin is available as part of established cardiovascular disease secondary prevention strategies. However, the evidence does not support its use for primary prevention of IHD would be irrational.</p>

RESOURCE USE	<p>How large are the resource requirements?</p> <p>More intensive Less intensive Uncertain</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p>	<p>Price of medicines/ month (28 days) – Aspirin up to 150mg/daily</p> <table border="1"> <thead> <tr> <th>Medicine</th> <th>Price (ZAR)*</th> </tr> </thead> <tbody> <tr> <td>Aspirin 300mg tablet (14)*</td> <td>4.37</td> </tr> <tr> <td>Aspirin 80-81 mg tablet **</td> <td>25.20</td> </tr> <tr> <td>Aspirin 100mg tablet***</td> <td>27.52</td> </tr> </tbody> </table> <p><small>* Contract circular HP09-2021SD, accessed 6 Sep 2021 – (average weighted price) www.health.gov.za</small></p> <p><small>** SEP Database 26 November 2021: Aspirin Teva 80@</small></p> <p><small>*** SEP Database 26 November 2021: Myoprin® 100mg tablet</small></p>	Medicine	Price (ZAR)*	Aspirin 300mg tablet (14)*	4.37	Aspirin 80-81 mg tablet **	25.20	Aspirin 100mg tablet***	27.52
	Medicine	Price (ZAR)*								
Aspirin 300mg tablet (14)*	4.37									
Aspirin 80-81 mg tablet **	25.20									
Aspirin 100mg tablet***	27.52									
VALUES, PREFERENCES, ACCEPTABILITY	<p>Is there important uncertainty or variability about how much people value the options?</p> <p>Minor Major Uncertain</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> <p>Is the option acceptable to key stakeholders?</p> <p>Yes No Uncertain</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>No local survey data is available, but based on expert opinion there is uncertainty whether patients would value the option, but prescribers considers aspirin to be acceptable as primary prevention for ischaemic heart disease.</p>								
EQUITY	<p>Would there be an impact on health inequity?</p> <p>Yes No Uncertain</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p>	<p>No significant impact on equity in health for marginalized groups were identified.</p>								

Version	Date	Reviewer(s)	Recommendation and Rationale
Initial	11 February 2022	NT, TL	Aspirin not recommended for primary prevention of IHD as aspirin associated with major bleeding risk and a small benefit of cardiovascular mortality, nonfatal myocardial infarction, and nonfatal stroke compared to no aspirin. Aspirin was also associated with a lower benefit compared to higher bleeding risk in populations with a low and high primary 10-year cardiovascular risk; and amongst diabetics.

References

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