

Simplified AHA/ACC ASCVD risk score implementation in a community-driven approach to initiate statin primary prevention



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ABSTRACT

Introduction: One of the objectives of the third Sustainable Development Goal is to lower the prevalence of non-communicable diseases (NCD). Cardiovascular disease (CVD) is one of the NCDs that remains the primary cause of mortality in Indonesia and the rest of the world. The most common CVD is coronary artery disease (CAD). It is crucial to perform risk factor assessments on individuals to facilitate early intervention and prevention. A simple instrument to stratify the population's CVD risk factor is the atherosclerotic cardiovascular disease (ASCVD) Risk Score. This study aims to determine the CAD risk stratification through screening using the ASCVD Risk Score in the Sumberadi, Mlati, Sleman, Yogyakarta populations.

Methods: A descriptive study screening for CAD was conducted in a population of Sumberadi aged >15 years, especially those aged 40-75 years old. The instrument used in this study was the simplified ASCVD Risk Score. The risk factors for CAD, including blood pressure, blood glucose, and cholesterol, were measured with Indonesian-standard instruments. Data was collected by *Posbindu* cadres with the aid of the research team. Data was analyzed univariately and presented in the form of a descriptive table.

Results: This study's sample is mainly female (87%), and the age average is 48.4 ± 9.6 years old. The samples mostly have normal random blood glucose (RBG) levels (82.6%) with a mean of 117.9 ± 55.2 mg/dL. Meanwhile, the total cholesterol level of the samples is mainly normal (51.6%) with a mean of 201.4 ± 40.2 mg/dL. Four samples of people aged >75 years old needed expert consultation. The remaining 403 samples were classified based on the statin requirements (no statin required, moderate-intensity statin, and high-intensity statin). The 148 samples require moderate-intensity statin, and 64 require high-intensity statin.

Conclusion: Half of the subjects in this study were included in the statin-required group. And none of them received statin as CAD primary prevention strategy. Most CAD risk factors are conditions that have no symptoms and remain neglected in the population. Therefore, screening CAD risk in the population with simple and easy instruments is still needed to detect individual CAD-risk profiling early. The screening program enables delegates to the *Posbindu*'s cadres who the expertise had trained.

Keywords: good health and well-being; coronary artery disease; ASCVD risk score.

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INTRODUCTION

Non-communicable diseases (NCDs) are the primary cause of both morbidity and mortality in Indonesia and worldwide. This urgent issue aligns with the Sustainable Development Goals (SDGs), particularly goal three, which seeks to reduce avoidable deaths caused by NCDs. One of the most common NCDs is cardiovascular disease (CVD). CVD risk is common among Indonesian adults aged >40 years, with low utilization of

preventive therapeutic interventions.¹ According to *Risikedas* 2013 analysis, 0.5% of Indonesians were estimated to have cardiovascular disease. However, the 2018 *Risikedas* survey showed a significant rise in this rate of over 1.5%, with Yogyakarta coming up as the second-highest recorded case of CVD after North Kalimantan. The incident rates within Yogyakarta increased significantly to about 2%, indicating that these populations bear considerable health burdens.

These emerging patterns and data were carefully documented and emphasized by the Indonesian Ministry of Health in its 2018 report, underscoring the urgent need for specific interventions aimed at reducing morbidity and mortality resulting from CVD among the Indonesian population. Focusing on the trend of high NCDs burden, the Indonesian Ministry of Health promotes a community engagement program called *Pos Pembinaan Terpadu (Posbindu)*. The main objective of *Posbindu* is to monitor and early screen NCDs risk factors, including CAD, done by the cadres. Cadres are agents that are closer to the residents. Through this study, the author and team empower the cadre's capabilities to do CAD risk screening and classify the CAD risk to determine the follow-up step. The CAD risk screening and its earlier modification show the improvement in clinical outcomes of CAD patients and decreased cardiovascular death in the general population.²

Cardiovascular diseases (CVD) are a group of several complex conditions primarily affecting the heart and/or blood vessels. The most common form of CVD is coronary artery disease (CAD). CAD is caused by the formation of atherosclerotic plaques in the coronary arterial lumen, leading to myocardial hypoxia. In cardiology, this pathological state is considered a medical emergency, and its morbidity and mortality rates have been rising over time. The causes of CAD vary widely, with no single factor being solely responsible. There are two groups of CAD risk factors: modifiable and non-modifiable. Previous studies have shown that the Indonesian population has a high burden of CAD from modifiable risk factors, such as hypertension, obesity, hyperglycemia, dyslipidemia, active tobacco use, etc.^{1,3} On the other hand, the non-modifiable CAD risk factors are age, gender, ethnicity, and family history of CVD.⁴ As we know, one of the main components of the CAD plaques is lipid. Based on recent studies, dyslipidemia status is significantly associated with the risk of CAD. Dyslipidemia is the most important independent predictor of CAD.⁵ The first line of therapy for CAD primary prevention is statin. Statin gives a moderate reduction in LDL-C levels,

is safe to use, has demonstrated clinical benefits, is cheap, and is easy to access, either in primary healthcare or pharmacies in Indonesia.⁶

To combat the prevalence and influence of CAD, it is essential to screen, prevent, and control its risk factors. Some CAD risk factors scoring systems include Framingham, SCORE, SCORE2, WHO CVD Risk Score, and ASCVD Scoring System by ACC/AHA. The components needed in ASCVD (Atherosclerotic Cardiovascular Disease) Scoring system are more straightforward than the system arranged by WHO. ASCVD Scoring System also includes newer recommendations for statin use as primary prevention of CAD. ASCVD Scoring System can be a CAD risk screening tool for younger patients, unlike the one arranged by WHO. In conclusion, the more suitable CAD risk screening tool in this study is the ASCVD Scoring System by ACC/AHA.

ASCVD Scoring system incorporates several key elements such as age, gender, race, blood pressure, lipid profile, glucose profile, diabetes history, smoking history, use of antihypertensive medications, administration of statins, and aspirin use. Meanwhile, in this study, the author and team simplified these components to facilitate the *Posyandu* cadres. The components needed in this study are age, diabetes mellitus (DM) status from random blood glucose (RBG), and total cholesterol (TC). In this study, the simplified classification for statin supplementation to prevent CAD, such as subjects aged >75 years old should do expertise consultation. The <75-year-old subjects with TC ≥ 240 should use high-intensity statin; meanwhile, subjects with TC 200-239 should use moderate-intensity statin. Subjects aged 40-75 years old with DM should use moderate-intensity statin when their TC <240.

Screening is a critical aspect of the preventive effort, and it serves as a fundamental instrument for identifying individuals at higher risk of developing CAD. By early recognition and management of these risk factors, healthcare professionals can implement targeted preventive measures, facilitate lifestyle adjustments, and administer medications, all aimed at reducing the

likelihood of CAD. As a result, this study seeks to determine CAD risk stratification through screening using the simplified ASCVD Risk Score in the Sumberadi, Mlati, Sleman, and Yogyakarta populations.

METHOD

Study Population

This study is conducted in 15 *padukuhan* of Kelurahan Sumberadi, Mlati, Sleman, Yogyakarta during June 18th to August 27th, 2023. The population size of Kelurahan Sumberadi is 16.698 individuals. The study sample was drawn from each *padukuhan* in Kelurahan Sumberadi according to inclusion and exclusion criteria. All residents of Sumberadi aged >15 years who participate in ASCVD Risk Score screening and have complete data (blood pressure, body weight, total cholesterol, and random blood glucose) are eligible to be respondents. Exclusion criteria include individuals previously diagnosed with CAD. Based on the accidental sampling technique, the sample size of this study that met the inclusion and exclusion criteria is 407 individuals.

Study Design

This quantitative descriptive study, with a cross-sectional design, was conducted in a population of Sumberadi aged >15 years old to screen for CAD risk factors using the ASCVD Risk Score. The risk factors for CAD, including blood pressure, random blood sugar, and total cholesterol, were measured with Indonesian standard instruments. *Posbindu* cadres will record the data with the aid of the research team.

Data Collection

This study's data was collected from June 18 to August 27, 2023, by the *Posbindu's* cadres, with supervision from the research team. The cadres once underwent training about CAD screening using the ASCVD Risk Score. The cadres also trained in the proper steps to measure blood pressure, random blood glucose, and total cholesterol. The blood pressure was measured using a digital sphygmomanometer (Omron) while sitting. The random blood glucose and total cholesterol were measured using finger capillary blood samples using

Table 1. Simplified Reference Range of Lipid Profile by ATP III

LDL-C: low-density lipid cholesterol; HDL-C: high-density lipid cholesterol

Parameters	Normal	Warning	Danger
Total cholesterol	<200	200-239	≥240
LDL-C	<130	130-159	≥160
HDL-C	≥60	40-59	<40

Table 1 above.

The adjustment of LDL-C to total cholesterol for CAD risk stratification using the ASCVD Risk Score resulted in a more straightforward form of this algorithm. This simplified form of the ASCVD Risk Score can make CAD risk screening easier and cheaper. This algorithm hopes to increase the spectrum of CAD risk screening in the broad population done by cadres.

Statistical Analysis

This descriptive study examined the risk factors associated with CAD within the Sumberadi population. Data are analyzed using univariate methods and presented in a descriptive table to offer a clear overview of the prevalence and significance of these risk factors and determine subsequent management as a form of primary prevention.

RESULT

This descriptive study was done in 15 *padukuhan* in Sumberadi, Mlati, Sleman, and Yogyakarta. Based on the data collected during June – August 2023, 407 subjects were included in this study. Initially, 655 Sumberadi population participated in this study, but the 248 samples didn't have the required data. This study's sample is mainly female (87%), and the age average is 48.4 ± 9.6 years old. Based on the measurement, the samples mostly have normal random blood glucose levels (82.6%) with a mean of 117.9 ± 55.2 mg/dL. Meanwhile, the total cholesterol level of the samples is mainly normal (51.6%) with a mean of 201.4 ± 40.2 mg/dL. The samples' further baseline characteristics can be seen in Table 2 below.

The data collected (age, RBG, and total cholesterol) were used to stratify the CAD risk. The data were stratified using the simplified ASCVD Risk Score algorithm. After the analysis was done, four samples aged >75 years old needed expert consultation, and the remaining 403 samples were classified based on the statin requirements (no statin required, moderate-intensity statin, and high-intensity statin). No statin required group is for subjects with normal FBG and TC. The group, which includes moderate intensity, is subjects aged <75 with TC 200-

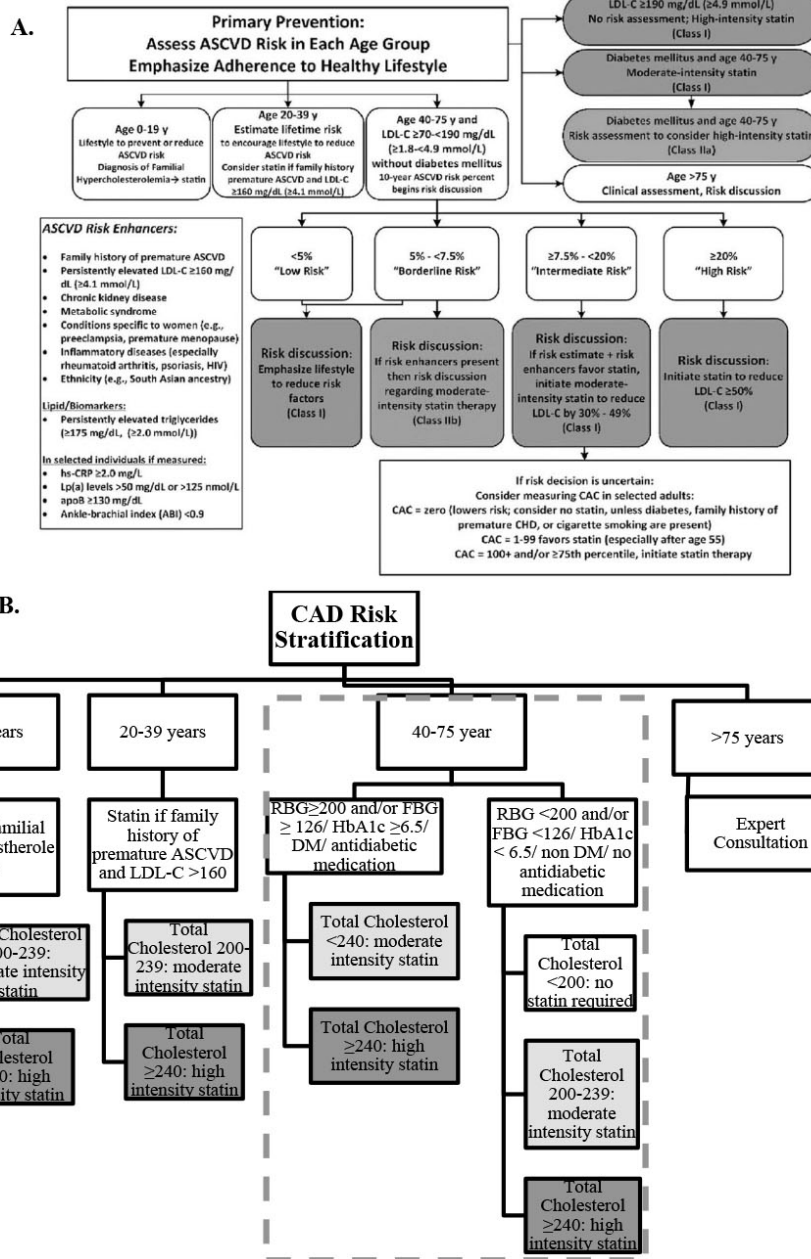


Figure 1. A. Original Version of CAD Risk Stratification by ACC/AHA B. Simplified AHA/ACC ASCVD Risk Score. RBG: random blood glucose; FBG: fasting blood glucose; LDL-C: low density lipid cholesterol. Example of moderate intensity statin: atorvastatin 10-20 mg, simvastatin 20-40 mg, while the high intensity statin: atorvastatin 40-80 mg.

Autocheck tools. The data conducted was then stratified. To facilitate the screening of CAD in the population, the researchers compare the LDL-C that is included in the

ASCVD Risk Score to total cholesterol, which is cheaper and easier to measure by the *Posbindu's* cadres. The equivalence of LDL-C to total cholesterol is shown in

Table 2. Baseline Characteristics

Parameter	Classification	Mean ± SD or n (%)
Age		48.4 ± 9.6
	0-19	7 (1.7)
	20-39	85 (20.9)
	40-75	311 (76.4)
	>75	4 (1)
Sex	Female	354 (87)
Bodyweight		60.8 ± 12.8
Blood pressure	Systole	134.6 ± 21.9
	Diastole	82.4 ± 12.8
Random blood glucose		117.9 ± 55.2
	Normal (<140)	336 (82.6)
	Prediabetes (140-199)	44 (10.8)
	Diabetes Mellitus (>199)	27 (6.6)
Total Cholesterol		201.4 ± 40.2
	Normal (<200)	210 (51.6)
	Warning (200-239)	133 (32.7)
	Danger (≥240)	64 (15.7)

Table 3. Statin Requirement Stratification

Classification	n (%)
No-statin required	191 (47.4)
Moderate intensity statin	148 (36.7)
High intensity statin	64 (15.9)
Total Sample	403 (100)

239 and subjects aged 40-75 with DM and TC <240. The high-intensity statin group are subjects aged <75 years old subjects with TC ≥240. The 212 (52.6%) samples require statin as the primary prevention of CAD. The 148 need moderate-intensity statin, and the remaining 64 require high-intensity statin. Meanwhile, the 191 other samples do not require the statin to prevent CAD.

DISCUSSION

Non-communicable disease (NCDs) is the leading cause of death worldwide. About 74% of mortality in the world is caused by NCDs.⁷ This condition led the world to pay more attention to this, which is synchronized with the goal of the third SDG, good health and well-being. The third SDG's goal aims to prevent preventable diseases and premature death. The third SDG's goal is to focus on boosting the overall population's health, especially the population with the highest burden of disease and neglect.⁸ One of the most common NCDs that lead to cause of death is CVD, which is responsible for

the third of all deaths globally (33%) for around 18 million in 2019.⁷ Death from CVD surged 60% globally over the last 30 years, from 12.1 million in 1990 to 20.5 million in 2021 according to the data from World Heart Federation. Four in five CVD deaths occur in low and middle-income countries like Indonesia.⁹

CVD has continued to be the leading cause of death worldwide, as well as in Indonesia. According to Riskesdas 2013 analysis, 0.5% of Indonesians were estimated to have CVD. However, the 2018 Riskesdas survey showed a significant rise in this rate of over 1.5%, with Yogyakarta coming up as the second-highest recorded case of CVD after North Kalimantan. The incident rates within Yogyakarta increased significantly to about 2%, indicating that these populations bear considerable health burdens.¹⁰ These emerging patterns and data were carefully documented and emphasized by the Indonesian Ministry of Health in its 2018 report, underscoring the urgent need for specific interventions to reduce morbidity and mortality resulting from CVD among the Indonesian population.

CAD Risk Screening

CAD, also known as coronary heart disease (CHD), is characterized by the narrowing or blockage of the coronary arteries, which supply oxygen to the heart muscle, leading to reduced blood flow to the myocardium.¹¹ CAD conditions typically manifest because of the accumulation of risk factors over an extended period rather than an acute emergence. There are two categories of CAD risk factors: modifiable and non-modifiable. Previous studies have shown that the increased burden of CAD among the Indonesian population originates from modifiable vascular risk factors such as hypertension, dyslipidemia, obesity, and active tobacco use. Meanwhile, non-modifiable risk factors include gender, age, genetic predisposition, and family history. The primary prevention of CAD is to modify these modifiable risk factors.

Screening at the population level is one of the public health strategies to reduce the burden of overall diseases in society.¹² CAD risk screening is fundamental for identifying individuals at higher risk of developing CAD. A valuable tool for organizing and assessing these risk factors is the ASCVD Risk Score. This scoring integrates several crucial components, such as age, sex, race, blood pressure, cholesterol levels, diabetic status, smoking status, and the use of antihypertensive medications, statins, or aspirin.¹³

This population-based study addresses CAD risk screening using a simplified ASCVD Risk Score developed by AHA/ACC in 2018. We simplify the measurement components so *Posbindu's* cadres can screen independently. The ASCVD Risk Score has two main measurement components: LDL-C and RBG. Based on the simplified ATP III lipid profile classification, we equate the LDL-C level to total cholesterol. Total cholesterol is easier and cheaper in the population setting.

CAD risk screening is part of the Global Action Plan for preventing and controlling NCDs. These screening strategies include the management that recommends drug therapy and counseling for CAD patients or high-risk CAD individuals.¹⁴ Based on the analysis, it was found that 48.4% of the samples had abnormal total cholesterol levels. Previous studies found that an

increase in cholesterol levels is significantly associated with high CAD risk. People with lower cholesterol levels can decrease the risk of CAD.^{15,16} Meanwhile, this study dominated older adult subjects (40-75 years) and found that 6.6% have DM, and 10.8% are in a pre-diabetes state. DM itself is closely related with CAD.¹⁷⁻¹⁹ DM patients have about 17 times the risk of experiencing CAD compared to patients with normal blood glucose regulation.¹⁸ Women with DM had an extremely high risk for CAD compared to men with DM.²⁰ Either DM or hypercholesterolemia is a condition that is asymptomatic in most cases. Meanwhile both are significantly associated with CAD as one of Indonesia's major health problems. This condition supports the importance of screening CAD risk in the population to know residents' DM and cholesterol status earlier. The earlier detected can prevent further severe conditions through earlier intervention.

The Role of Cadres

Previous studies stated that cadres have a role in improving the population's health status.⁶ Cadres are central to *Posbindu* activities. Cadres have roles as motivators, administrators, and educators during *Posbindu* activities. Cadres are responsible for achieving *Posbindu*'s objectives. The main aim of *Posbindu* activities is to monitor and early screen NCD risk factors, including CAD. This study empowers the cadre, who are civilians, with the capability to do the simple measurement of CAD risk screening. Cadres were trained to correctly measure body weight, height, blood pressure, TC, and RBG. After plenty of training sessions with the pre-post examination, the cadres facilitate practice to the general population in Sumberadi. Not only do the measurements, but the cadres also interpret the data and stratify according to the simplified ASCVD risk algorithm we arranged.

Education and training sessions are needed to improve and update cadre skills in achieving the correct monitoring and screening of NCDs. Cadres are educated and trained to maintain their competence in providing valid, reliable, and up-to-date data to establish the early detection and primary prevention of NCDs, especially CAD, in this study.

The training sessions can increase cadre motivation and capability to perform their role in the environment and during *Posbindu* activities.²¹⁻²⁴ Not only training and education, but cadre performance can also improve with strong motivation, good leadership, strong social network support, and appropriate fund.²⁴

Role of Statin as Primary Prevention of CAD

Statin is a lipid-lowering agent that can effectively decrease LDL-C levels. LDL-C is a significant causal risk of atherosclerosis. Based on several evidence found, practical guidelines strongly recommend statin as the primary and secondary preventive therapy in high-risk CAD.²⁵⁻²⁷ Statin is not limited to decreasing the LDL-C level but also has cardiovascular protective characteristics, such as elevated nitric oxide, preventing thrombosis, enhance fibrinolysis, prevent proliferation, stabilize endothelium, reduce inflammatory and oxidative stress, etc.²⁷ Based on the ASCVD Risk Score the statins that are used as CAD primary prevention are the moderate and high-intensity statins. The moderate intensity statin can be accessed easily, and some primary healthcare facilities in Indonesia provide it.

Lowering LDL-C with statin significantly reduces the incidence of major vascular events, including CAD. Statin also has significant benefits for patients with CAD but is also significantly associated with improving CAD risk subjects. Statin group medicine has an advantage on CAD mortality and overall mortality among patients with CVD. Not only has the benefit of lowering LDL-C levels, but statin can also decrease the risk of stroke among patients with a history of stroke or transient ischemic attack (TIA).²⁸ In conclusion, statin is essential as the preventive agent of CAD incidence.

Indonesian Family Life Survey (IFLS4) data in 2008 revealed that less than one-third of individuals in Indonesia with moderate to high risk of cardiovascular events were not receiving appropriate treatment and, therefore, require considerable attention. A study revealed that an elevated cardiovascular risk is shared among Indonesian adults aged >40 years, with low utilization of preventive

therapeutic interventions. Only 11% of those with high cardiovascular risk receive treatment to lower blood pressure, and 1% receive drugs to lower cholesterol (statin), revealing a notable deficiency in therapeutic intervention.¹ The synchronized result was also found in this study; about half of the subjects (52.6%) were stratified as statin-required groups, of which 36.7% required moderate-intensity statin and 15.9% required high-intensity statin. And none of them received statin as CAD's primary prevention strategy. This is one of the ironies that we get in population. The high prevalence of individuals in Sumberadi, Mlati, Sleman, Yogyakarta that need statin can be the judgment about the importance of screening CAD risk in the population. The screening program enables delegates to the *Posbindu*'s cadres who the expertise had trained.

Study Impact to Health Policy and Clinical Practice

This study found that almost half of the subjects had abnormal TC levels. Hypercholesterolemia often presents with no symptoms at all. This condition is one of the main reasons why hypercholesterolemia remains neglected and not treated properly. Meanwhile, this study also found that half of the Sumberadi, Mlati, Sleman, and Yogyakarta subjects were included in the statin-required group. And none of them received statin as CAD's primary prevention strategy. Moreover, in Indonesia, healthcare facilities and pharmacies provide statin, even at the primary level. Statin is easy to reach by the residents, but this preventive strategy is still not implanted well, and the CAD incidence remains high. This is one of the ironies that we get in population. We hope this study's result will impact health policy and clinical practice regarding using statin as a CAD prevention strategy locally or nationally.

This study is limited to the total subjects. As a population-based study, the sample size of this study is still limited, so the result can not represent the general population. Further study with a broader spectrum of sample size is still needed to support this study result. The CAD-risk screening instrument used in this study is more straightforward but still not

standardized. The standardized instrument can make the data more reliable. The data analysis in this study is still limited. For a more comprehensive result, the data need further analysis.

CONCLUSION

Half of the subjects in this study were included in the statin-required group. And none of them received statin as CAD primary prevention strategy. Most CAD risk factors are conditions that have no symptoms and remain neglected in the population. Therefore, screening CAD risk in the population with simple and easy instruments is still needed to detect individual CAD-risk profiling early. The screening program enables delegates to the *Posbindu's* cadres who the expertise had trained.

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CONFLICT OF INTERESTS

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Concepts	V	V	V	V	V	V
Design	V					
Definition of intellectual content	V	V	V	V	V	V
Literature search	V	V				
Data acquisition	V	V	V	V	V	V
Data analysis	V	V				
Statistical analysis						
Manuscript preparation	V	V				
Manuscript editing	V					
Manuscript review	V	V	V	V	V	V
Guarantor	V					

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Concepts	V	V	V	V			V
Design			V				
Definition of intellectual content	V	V	V				V
Literature search			V	V	V	V	
Data acquisition	V	V	V	V	V	V	V
Data analysis			V				
Statistical analysis			V				
Manuscript preparation			V	V			V
Manuscript editing			V				V
Manuscript review	V	V	V				V
Guarantor							V