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| **Title:** | TG-Cardio: Input for sub-topic - General framework of development and evaluation of artificial intelligence in coronary computed tomography angiography |
| **Purpose:** | Discussion |
| **Contact:** | Ning GuoShuKun Technology, China | Tel: +8618101131921E-mail: guoning@shukun.net |
| **Contact:** | Shan XuMinistry of Industry and Information Technology (MIIT), China | Tel: +86-010-62300338E-mail: xushan@caict.ac.cn |

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| **Abstract:** | This document contains elements to be incorporated in the TDD document for the TG-Cardio activity, relevant to the sub-topic on artificial intelligence in coronary computed tomography angiography. |

**Keywords:** Cardiovascular Disease; Coronary Computed Tomography Angiography; Artificial Intelligence

# Background

Cardiovascular disease has become one of the most important diseases with high mortality all around the world. Coronary CT angiography (CCTA) is widely used in populations with low to middle risk of coronary artery disease (CAD) as a non-invasive method to rule out coronary artery disease, due to its high diagnostic accuracy and low invasiveness. Clinically, the diagnostic process of CAD through CCTA requires complex image post-processing of 3D visualization for disease diagnosis. With the increase of CCTA examination, radiologists have great workload, which may threat the accuracy of CAD diagnosis. There are large requirements of new techniques help to increase the efficiency and accuracy of CAD diagnosis.

Coronary CT angiography (CCTA) has recognized as the first choice of imaging modality for patients with low to intermediate risk coronary heart disease, and widely used in clinical practice. CCTA requires complex imaging post-processing and 3-dimentional visualization for interpretation. How to reduce the workload of imaging post-processing and ensure the diagnosis accuracy of CCTA is one vital problem in the field. Application of artificial intelligence (AI) in cardiovascular imaging may help to increase the efficiency and improve the workflow of CCTA. AI has been reported to apply in blood vessel segmentation, stenosis detection and plaque analysis et al. However, the standards for database construction, image annotation, imaging post-processing and clinical evaluation method have not been built. This paper introduces the methodology based on expert consensus on database construction of CCTA, data specification and quality control, functions of image post-processing and assisted diagnosis and clinical evaluation. It may help to get consensus in medical imaging field and facilitate the development and application of artificial intelligence assisted diagnostic technique in cardiovascular imaging.

# Proposal

With the development of the intelligent diagnosis of radiology and the requirement of complex imaging post-processing and analysis, AI has become a research hotspot in radiology field in recent years. AI has been reported to apply in blood vessel segmentation, stenosis detection and plaque analysis et al. However, the standards for database construction, image annotation, imaging post-processing and clinical evaluation method have not been built. Security ethics and privacy are not unified in the system development and implementation, so the applications of AI in the assisted diagnosis of CAD need guideline of standardization, which may help to provide reference for the industry development of AI assisted CAD diagnosis and application.

# Scope

1) Image acquisition and data set construction

* Image acquisition and reconstruction
* Data type and distribution
* Data diversity and database capacity requirements
* Data set partitioning standard

2) Data annotation and quality control

* Ethical approval and patient privacy protection
* Data desensitization
* Image quality evaluation criteria
* Data annotation guidelines

3) Requirements on AI post-processing and assisted diagnostic function

* Segmentation and extraction of coronary tree:
* 3D reconstruction and image post-processing
* Coronary artery segmentation
* Coronary plaque and stenosis detection

4) Clinical evaluation of AI assisted diagnostic function

* Accuracy of AI assisted diagnostic technique
* Efficiency gain of AI assisted diagnostic technique

# Summary

Cardiovascular disease has become one of the most important diseases with high mortality all around the world. Coronary CT angiography (CCTA) is widely used in populations with low to middle risk of coronary artery disease (CAD) as a non-invasive method to rule out coronary artery disease. There are large requirements of new techniques help to increase the efficiency and accuracy of CAD diagnosis.

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