

An Opportunity To Seize From Low Hanging Fruit: Capitalizing On Incidentally Reported Coronary Artery Calcification

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Introduction

- Coronary Artery Calcification (CAC) is an established biomarker for atherosclerosis and improves risk stratification compared to traditional risk factor calculators [1]
- CAC score is traditionally evaluated using non-contrast ECG-gated cardiac CT, quantified through the entire epicardial coronary system.
- However, CAC can also be detected on non-gated CT with excellent diagnostic accuracy and often underreported[2,3].
- There are limited data about incidental CAC on non-gated CT imaging in Australia.
- Current guideline recommends presence of CAC should be identified and quantified using a simple visual quantification (none, mild, moderate, severe) [4].
- The aim of the study is to investigate the prevalence of reported incidental CAC from non ECG-gated CT chest (both contrast and non-contrast) for inpatients with no history of coronary artery disease and their hospital mortality.
- We also studied if further diagnostic modalities and risk factor modification therapy such as statin were initiated by the inpatient team.

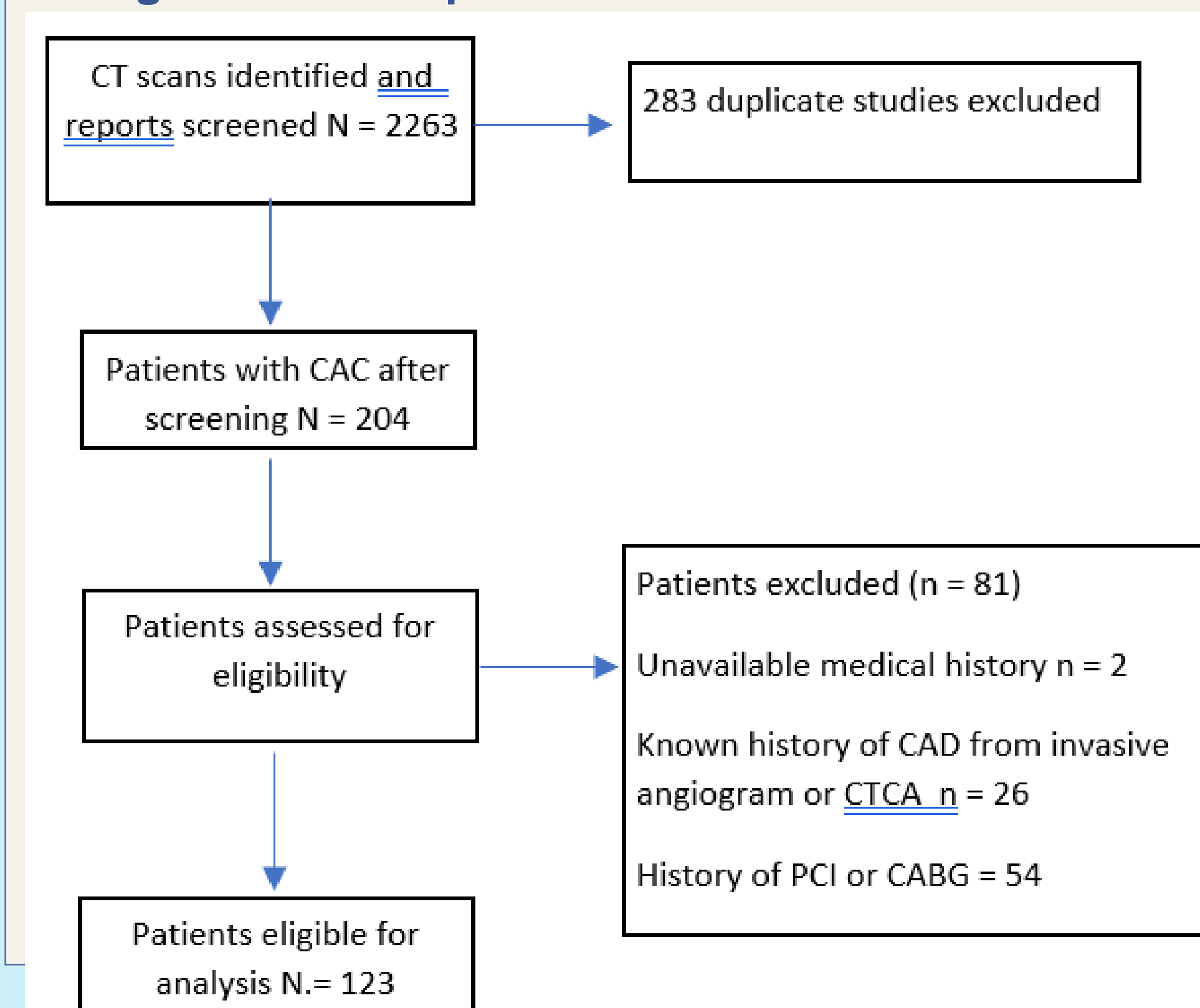
Methods

- A single-centre retrospective observational study was performed for inpatients from Peninsula Health from 1 January 2022 to 31 December 2022 who had CAC identified on a non ECG-gated CT thorax.
- From an initial 2263 scans completed, the results were limited to 204 individual cases where CAC was described in the report, ensuring no duplication.
- Each CT report was reviewed for the presence of CAC and if included, the location, presence of valve involvement, whether contrast was administered, and the indication was recorded.
- If multiple scans were conducted for the same patient each scan was reviewed, however only the first that described CAC in the report was analyzed for subsequent follow-up or intervention

Table 1: Inclusion and Exclusion Criteria

Inclusion	Exclusion Criteria
Aged 18 years of age and older	< 18 years of age
Presence of Coronary Artery Calcification reported CT completed as inpatients	Unavailable medical history or incomplete documentation in the electronic medical record History of known coronary artery disease from invasive angiogram or CT coronary angiography (including mild lesions with < 50% occlusion) History of PCI or Coronary Artery Bypass Graft Presence of Pacemaker or Implantable Cardiac Defibrillator

Figure 1: Flowchart showing selection of patients during recruitment process



Results

- 123 patients were included for analysis in the end, which makes the prevalence at 6.2%
- The median age is 76 year old and largely Caucasian in ethnicity. Male comprised of 54.5% of the study cohort.
- 34% and 24% of these patients were on statins and aspirin respectively.
- Of all the 123 CT reports, only 3 (2.4%) of them had CAC reported in the conclusion.
- 20 (16.3%) patients had further investigations performed as inpatient or ordered as outpatient investigation.
- Our cohort shows 81 out of 123 patients with no previous coronary artery disease (65.8%) were not on statin therapy prior to admission, and only 1 patient (1.2%) were prescribed with new statin therapy on discharge
- There were 10 (8.1%) hospital mortality detected from this study cohort .

Table 2: Baseline Characteristics of Study Cohort

Characteristic	Values (N = 123)	Characteristic	Values (N = 123)
Age^a (IQR)	76 (69 – 85)	Stroke/TIA	19 (15.4%)
Race		Others	6 (4.9%)
Caucasian	112 (94.1%)	Symptoms	
Aboriginal	1 (0.8%)	Asymptomatic	42 (34.1%)
Asian	4 (3.4%)	Chest Pain	24 (19.5%)
Others	2 (1.7%)	Dyspnea	38 (30.9%)
Sex		Syncope	6 (4.9%)
Female	56 (45.5%)	Palpitations	1 (0.8%)
Male	67(54.5%)	Diaphoresis	1 (0.8%)
Risk Factors		Others	26 (21.1%)
Hypertension	83 (67.5%)	Home	
Diabetes	30 (24.4%)	Medications	
Dyslipidemia	37 (30.1%)	Nil	54 (43.9%)
Smoking	18 (14.6%)	Aspirin	29 (23.6%)
Obesity	18 (14.6%)	Other antiplatelet	6 (4.9%)
Family history	1 (0.8%)	Beta Blockers	23 (18.7%)
of CAD		Statins	42 (34.1%)
History of	15 (12.2%)	Other Lipid	5 (4.1%)
PAD		lowering agents	

Table 3: Indication of Inpatient CT chest with positive incidental CAC

Indication	N = 123
Pulmonary Embolism	49 (39.8%)
Others	40 (32.5%)
Trauma	24 (19.5%)
Long nodule assessment	10 (8.1%)
Vascular Injury	6 (4.9%)
Chronic Obstructive Pulmonary Disease (COPD)	3 (2.4%)
Interstitial lung disease	1 (0.8%)

Table 4: Severity of Coronary Artery calcifications – Visual quantification

Mild	15 (12.2%)
Moderate	9 (7.3%)
Severe	9 (7.3%)
Not Specified	90 (73.2%)

Table 5: Cause of death for inpatient mortality

Cardiovascular Death (N = 1)	
Congestive Cardiac Failure	1
Non-Cardiovascular Death (N = 9)	
Malignancy	2
Respiratory Failure	3
Pneumonia	2
Sepsis	1
Other	1

Discussion

- This is the first observational study in Australia which reports the prevalence of incidental CAC for both contrast and non-contrast study of non- ECG gated CT chest done for non -cardiac indication.
- It is also the first Australian study which examines the downstream effect of reported incidental CAC on inpatient settings. .
- Ordering physicians may have missed or not aware of importance of CAC when it is buried in the body of the CT report, especially during their busy routine inpatient ward tasks.
- Study by Yu et al found patients with visible CAC is associated with increased risk of MACE compared with non-visible CAC over a median follow up of 3.5 years with a hazard ratio of 3.2 after adjusting for age, sex and cardiovascular risk factors[3].
- Our limitation includes a single-center retrospective observational study and small sample size which has limited generalizability to other health systems.
- It is also difficult to ascertain whether the symptoms documented on the electronic medical records is related to possible CAC in retrospect
- Despite these limitations, our study highlights a tremendous opportunity for clinicians to improve patients' cardiovascular risk profile from opportunistic screening for a very commonly performed test for inpatient settings

Conclusions

Incidental CAC is prevalent in inpatient setting and remains under-recognized by ordering clinicians, which resulted in low prescription rate of statin therapy. Practice changing measure to standardize reporting of incidental CAC is needed to seize opportunity to identify patients with subclinical coronary disease and initiate preventive interventions.

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