

# Percutaneous coronary intervention for high-risk chest pain

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## Description of condition and intervention

The high-risk Percutaneous coronary intervention (PCI) is referring to the patient with unprotected left main coronary artery disease (CAD), intervention of the last patent vessel left ventricular ejection fraction (LVEF) <35%, complex 3-vessel disease, or comorbidities such as severe aortic stenosis or mitral regurgitation. The common symptoms of this disease are chest pain, shortness of breath, fatigue, and heart failure. This health problem can be treated by elective placement of mechanical circulatory support (MCS), either with intraaortic balloon pump (IABP) or impella. The clinical results of the patients with this disease includes acute ST-elevation myocardial infarction (STEMI), non-ST-elevation acute coronary syndrome (NSTEMI-ACS), anginal equivalent, high risk stress test results, unstable and stable angina. Use of percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI) where resources permit. This intervention is not costed for low-income countries as per 2014 WDI estimates of GNI per capita in DCP3.

## International guidelines

Organization	Indications/recommendations
AHA/ACC, 2021	Guideline for the evaluation and diagnosis of chest pain

## Intervention attributes

### Type of interventions

Curative

## Delivery platform

This intervention is most effective when delivered at referral and speciality hospital.

## Equity

In addition to considerations like cost-effectiveness and health systems factors, dimensions of equity can be relevant for priority setting. The opportunity for a long and healthy life varies according to the severity of a health condition that individuals might have, so there are inequities in individuals' opportunities for long and healthy lives based on the health conditions they face. Metrics used to estimate the severity of illness at an individual level can be used to help prioritize those with less opportunity for lifetime health. FairChoices: DCP Analytics Tool uses Health adjusted age of death (HAAD), which is a metric that estimates the number of years lived from birth to death, discounting years lived with disability. A high HAAD thus represents a disease less severe in terms of lifetime health loss, while a low HAAD represents a disease that is severe on average, causing early death or a long period of severe disability. It is also possible to estimate the distribution of HAAD across individuals with a health condition. FairChoices shows for each intervention an average HAAD value of the conditions that are affected by respective interventions that have health effects. Additionally, a plot shows HAAD values for around 290 conditions (Johansson KA et al 2020). All incident cases irrespective of gender, income group are eligible to receive the intervention.

## Time dependence

High level of urgency. Treatment outcomes may be highly affected by some hours of delay.

## Population in need of interventions

Treated Population: Incident cases aged 30 to 99 years with acute myocardial infarction (MI cases), both genders are likely to have 41% of MI cases with ST-segment elevation myocardial infarctions (STEMI). This condition requires PCI intervention, that is assumed to be primarily available in urban settings (50% in low-middle income countries as per World Bank). Treated fraction is assumed to be 20.5% ( $41\% \times 50\%$ ) based on abovementioned assumptions.

Affected population and fraction is same as treated population and fraction.

## Disease state addressed

This intervention targets acute myocardial infarction cases due to ischaemic heart disease.

## Intervention effect and safety

Table 1: Effect and safety of percutaneous coronary intervention

Effect of intervention		Certainty of evidence
Mortality (due to condition)	<p>Efficacy of PCI on acute MI (at 28-day mortality) was reported to be 61% compared to no intervention (Tolla, 2016). Here we assumed that approximately 70% of IHD deaths are attributable to acute MI and 30% of IHD deaths are from heart failure. We also assume 41% of MI events are ST-segment elevation myocardial infarctions (STEMI) and require PCI (Schamroth 2012). Further, we assume that this intervention is only available in urban settings, which according to the World Bank would comprise 50% of most low-middle income countries. (<a href="https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS">https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS</a>)</p> <p>Estimated effect size = <math>0.61 * 0.37 * 0.41 * 0.5 = 0.046</math></p>	See appendix

## Model assumptions

Table 2: Summary of model parameters and values used in FairChoices – DCP Analytical Tool

Category	Model parameter	Notes
Intervention	Percutaneous coronary intervention for acute myocardial infarction	
<b>Cost calculation</b>		
Treated population	Incident cases of myocardial infarction due to IHD	Global Burden of Disease Study 2019
Gender	Both male & female	
Age	30-99 years	
Treated fraction	0.205	Estimated as 41%*50% where 41% of MI events are ST-segment elevation MI & require PCI. Further, assuming that this intervention is only available in urban settings, comprising 50% of most LMIC as per

		World Bank (NCD countdown appendix)
<b>Effect calculation</b>		
Affected population	Incident cases of myocardial infarction due to IHD	Global Burden of Disease Study 2019
Affected gender	Both male & female	
Affected fraction age	30 to 99 years	
Affected fraction	0.205	
Comparison	No intervention	
Mortality reduction (RRR)	0.046	See Table 1

\*Relative risk reduction (RRR)

## Intervention cost

The average cost of PCI is \$RM 13,467 among 5 health centres in Malaysia in 2014, where US\$1=Malaysia Ringgit (RM) 3.60 (Lee et al 2016).

## References

Johansson KA et al 2020: Johansson KA, Coates MM, Økland JM, Tsuchiya A, Bukhman G, Norheim OF, Haaland Ø. Health by disease categories. Distributional Cost-Effectiveness Analysis: Quantifying Health Equity Impacts and Trade-Offs. 2020 Sep 30:105.

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Malaysia: a multicentre cross-sectional costing study. *BMJ Open*. 2017 May 28;7(5):e014307. doi: 10.1136/bmjopen-2016-014307. PMID: 28552843; PMCID: PMC5541416.

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## Appendix

### Literature Review for effectiveness & safety

This literature search is an example of Level 1 search for intervention inputs taken from DCP3 or generated in an ad hoc manner (e.g., quick google search found one study of cervical cancer screening cost-effectiveness that was used to create an effectiveness parameter for that intervention).

Level of evidence of efficacy studies:

1. low (expert opinions, case series, reports, low-quality case control studies)
2. moderate (high quality case control studies, low quality cohort studies)
3. high (high quality cohort studies, individual RCTs)
4. very high (multiple RCTs, metaanalysis, systematic review, clinical practice guidelines).