# CLINICAL EFFECTIVENESS OF PACEMAKER IN HIGH-RISK PATIENTS WITH CARDIOVASCULAR DISEASES: A SYSTEMATIC REVIEW AND METANALYSIS

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## ABSTRACT

Aim: To evaluate the clinical effectiveness of pacemaker as an intervention in high-risk cardiovascular diseases patients.

Objectives: A cardiac pacemaker (PM) is a medical device that uses electrical impulses delivered by electrodes to contract the heart muscle and regulate the heart rate. The main purpose of this device is to maintain a proper heart rate. Pacemakers are essential not only for the treatment of arrhythmias and heart failure, but also for the treatment of cardiovascular diseases. Therefore, this review hypothesizes that cardiovascular disease patients receiving treatment 'with or without pacemaker may increase or decrease the risk of mortality. The objectives of this study were to analyse the pacemaker evidence to conduct a systematic review to determine the clinical efficacy of pacemaker implantation in high-risk patients requiring surgery with outcomes with reduced of risk mortality.

Methods: A comprehensive search was performed at various electronic databases using PubMed, Web of Science, Google Scholar and Cochrane. A PRISMA method is used to curate and collocate the studies. Quantitative data were pooled into statistical meta-analyses using the Cochrane Review Manager (RevMan) to compare clinical efficacy with and without pacemakers.

Results: A total of 3451 articles were obtained and after evaluation, 24 articles were accepted that answered the research questions and met the criteria for systematic review and meta-analysis. Therefore, the metanalysis found that the risk of mortality was increased in patients treated without a pacemaker and decreased mortality in those patients treated with a pacemaker showing (risk ratio 1.23, (1.15 to 1.32) with a 95% confidence interval.

Conclusion: In this review we found that pacemakers played an important role in patients' recovery and reduced risk of Mortality. This adds to the confidence that pacemakers will become more prevalent in the next few years.

## INTRODUCTION

Pacemakers are electronic devices that stimulate the heart with electrical impulses to maintain or restore a normal heartbeat. Pacemakers can be placed in the body, usually by surgery, to support the electrical system in the heart. They can stabilize abnormal heart rhythms and prevent problems in life. Pacemaker implant rates have increased exponentially in the last few years, especially in the elderly. The aging of the population, the technological advances of these devices, and the growing number of clinical indications are the main factors that contribute to the increase of this rate. It is estimated that each year 1.25 million permanent pacemakers are implanted worldwide. The primary purpose of this device is to maintain an adequate heart rate, either because the heart's natural Pacemaker (PM) is not fast enough, or there is a block in the heart's electrical conduction system. Modern PMs are externally programmable and allow the cardiologist to select the optimum pacing modes for individual patients. PMs can be temporary or permanent. Temporary PMs are used to treat short-term heart problems, such as a slow heartbeat that's caused by a heart attack, heart surgery, or an overdose of medicine. Permanent PMs are used to control long-term heart rhythm problems.

## METHODS

Search Strategy: A comprehensive search was performed with the databased like Cochrane Central Register of Controlled Trials (CENTRAL), PubMed, JBI Evidence Synthesis and Google scholar.

Study Selection: Quantitative data was pooled in statistical meta-analysis using Cochrane Review Manager (RevMan). Those studies where statistical pooling was not possible the findings are presented in narrative form. Data from all the available sources were collected. Data extraction: Data was extracted from studies included in the review by two independent reviewers using the standardized JBI data extraction tool. The data extracted included specific details about the participants, study methods, interventions, and outcomes of significance to the review objectives.

Literature search database: The systematic review was conducted by primary electronic database search. Searches were conducted in PubMed, Google scholar and Cochrane data bases. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was developed for this project.

Screening process: All articles identified by the search were initially screened for eligibility on title and abstracts. The search results were exported to the reference management software EndNote X7.

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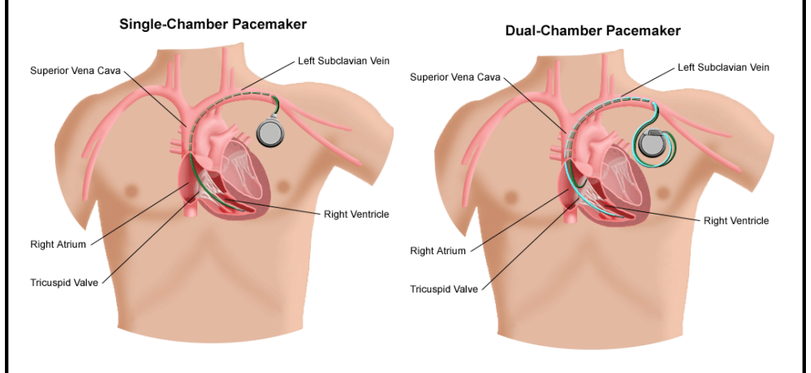
## PICO – CLINICAL EFFECTIVENESS

Population(P): Patients with the following conditions requires pacemaker Bradycardia, Tachycardia, Heart beat arrhythmia or Atrial fibrillation, Heart block, Sick sinus syndrome, Heart palpitations and Chest pain, Heart attack, heart surgery, Heart muscle problems, congenital heart disease & heart transplant, Shortness of breath and Dizziness or light headedness.

Interventions(I): With Permanent Pacemaker (PPM)

Comparators(C): Without Permanent Pacemaker (PPM)

Outcomes (O): All cause Mortality

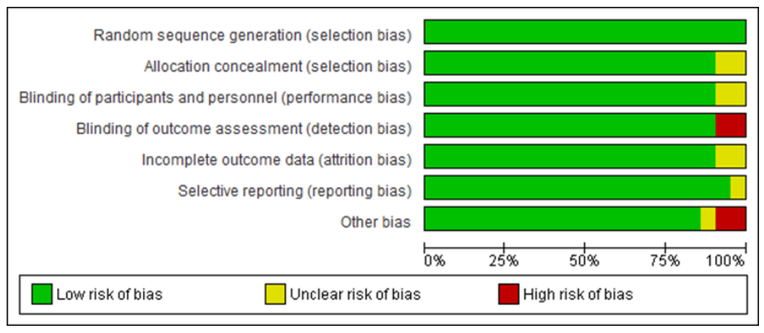



## RESULTS

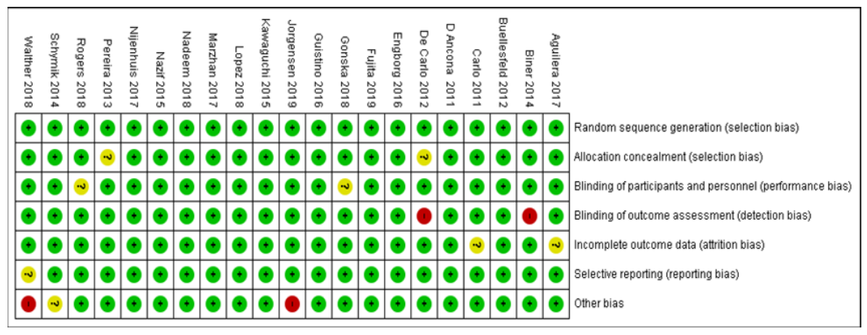
Study Selection

A total of 3334 articles were identified by the search strategy of different databases like PubMed, Google scholar and Cochrane of which 2200 were removed based on duplicates, 520 articles were removed based the title and abstract. The full texts of 154 articles were screened, of which 20 articles met the inclusion criteria and were included in this review and 4 meta-analyses included.

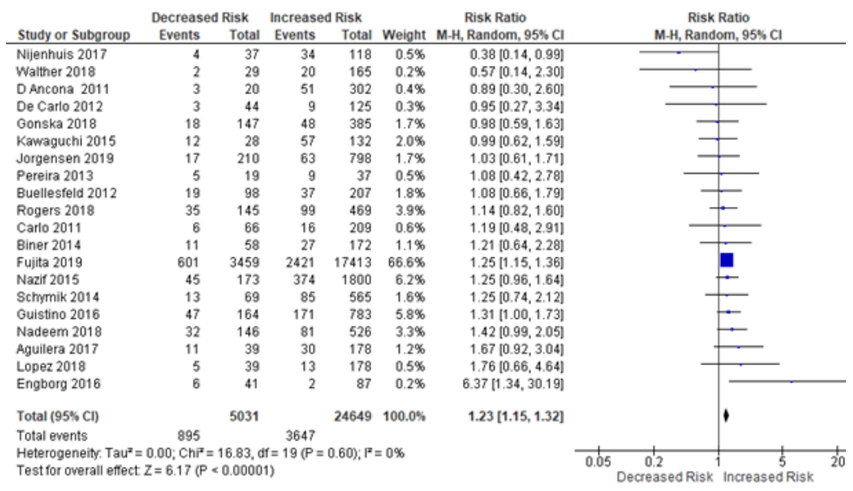
**Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.**




**Risk of bias summary: review authors' judgements about each risk of bias item for each study included.**




All-cause Mortality with and without Pacemaker




The meta-analysis show risk of mortality with PPM compared with risk of mortality without PPM. The forest plot showing out of 24649 participants 5031 was treated with with out PPM has increased risk of mortality and patients out of 3647 participants 895 was treated with PPM has decreased risk of mortality (risk ratio 1.23, 95% confidence interval 1.15 to 1.32). It is represented graphically by the diamond; the centre of the diamond equals the total overall estimated risk ratio and the ends of the diamond indicate the limits of the 95% confidence interval. The vertical dotted line through the centre of the diamond represents the total overall estimated relative risk. The meta-analysis therefore showed PPM was reducing mortality by 23% as compared to without PPM.

## DISCUSSION

This meta-analysis shows the key points with the intervention of with pacemaker is compared without pacemaker reduce all-cause mortality outcomes in patients with high and low to intermediate risk. Pacemaker implantation reduces all-cause mortality rate in patients with certain diseases like Bradycardia, Tachycardia, Heart beat arrhythmia or Atrial fibrillation, Heart block, Sick sinus syndrome, Heart palpitations and Chest pain, Heart attack, heart surgery, Heart muscle problems, congenital heart disease & heart transplant, Shortness of breath and Dizziness or light headedness. In this study all-cause mortality as the most relevant outcome for many reasons, including its clinical implications, frequent reporting, etc. Hence, meta-analysis therefore showed PPM was reducing mortality by 23% as compared to without PPM. However, increasing expertise, new-generation of pacemaker devices, and the transfemoral approach might lead to better long-term comparative results from in the near future, as suggested by the most of the studies. Indeed, pacemaker techniques continue to improve, newer valves address the issue of certain highly complicated diseases Future mortality studies will assess the net effects of emerging technical improvements and potential long-term clinical gains versus a possible increase in the late adverse consequences of pacemaker implantation.

## CONCLUSION

In conclusion, the present meta-analysis provides decreased risk of death with pacemaker implantation. Further evidence of the negative clinical impact of conduction disturbances, in pacemaker implantation, and certain complications and hospitalization etc. This meta-analysis highlights several key points. Compared with and without PPM, with PPM reduced the risk of mortality. The findings, of forest plot showed out of 24649 participants 5031 was treated without PPM has increased risk of mortality and patients out of 3647 participants 895 was treated with PPM has decreased risk of mortality (risk ratio 1.23, 95% confidence interval 1.15 to 1.32). Future mortality studies will assess the net effects of emerging technical improvements in pacemaker implantation. This reinforces the clinical relevance of preventive measures, particularly regarding modifiable factors in implantation techniques. Also, further studies are needed to identify those patients at highest risk among those exhibiting conduction disturbances after implantation. This would need to implement optimized and more uniform treatment strategies in order to improve clinical outcomes. This has become an urgent need considering the likely expansion of pacemaker treatments with certain diseases in majority of patients in the near future.

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