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## The da Vinci Robotic Surgical Systems In Atrial Septal Defect Repair, Coronary Artery Bypass Graft and Mitral Valve Repair

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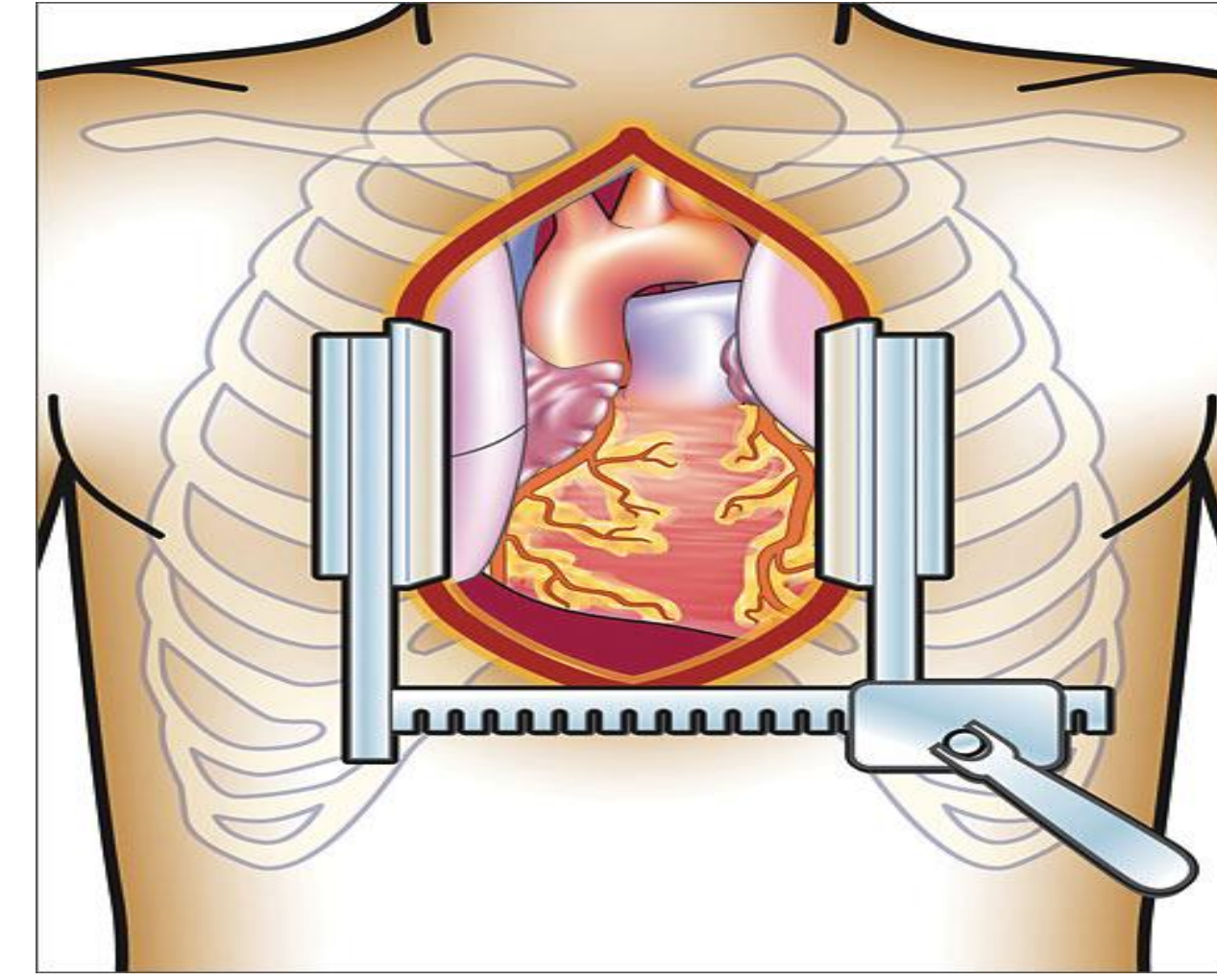
# The da Vinci Robotic Surgical Systems In Atrial Septal Defect Repair, Coronary Artery Bypass Graft and Mitral Valve Repair

## By Randy Yergenson

### Abstract

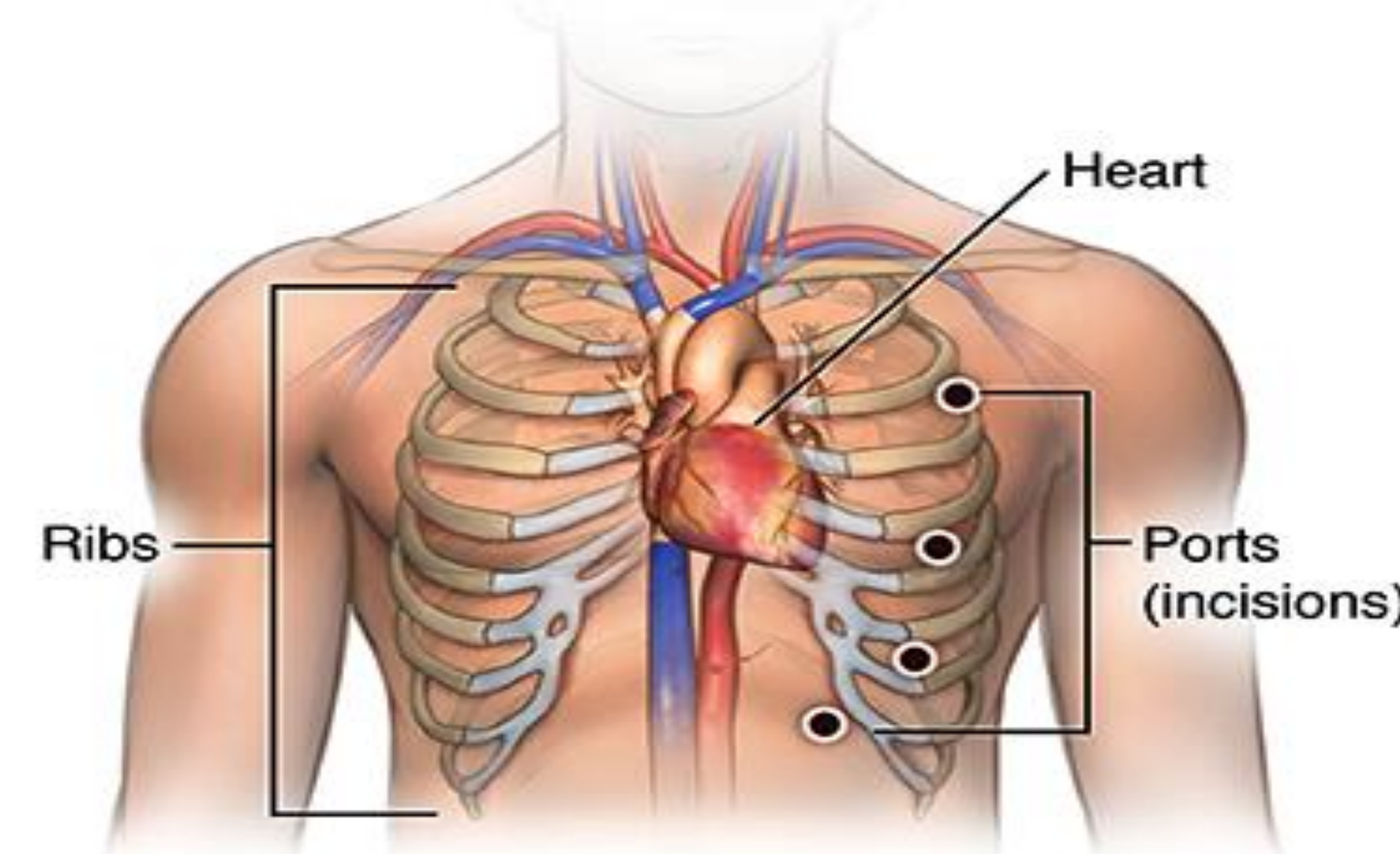
Historically, these cardiac interventions have been performed using partial or complete open sternotomy.

1. Coronary artery bypass grafting (CABG)
2. Atrial septal defect (ASD) repair,
3. Mitral valve repair and/or replacement



In 2000, the Federal Food and Drug Administration approved the use of the da Vinci Robotic Surgical System. Less invasive surgical option.

Robotic surgery incisions



### Introduction

- One of the most **significant advancements in medicine** has been the development of the **da Vinci Robotic Surgical System**.
- Manufactured by **Intuitive Surgical Incorporated**, headquartered in Sunnyvale, California.
- Intuitive Surgical is the **only surgical robotic manufacturer** in the world.
- The **first robotic cardiac procedure**, a coronary artery by-pass graft, was performed in **Germany in 1998**.
- Since the late 1990's **approximately 4,000 peer reviewed articles** and studies have been written **regarding the use of the da Vinci Robot** surgical system. **720** have reflected the use of the da Vinci Robot in **cardiothoracic interventions**.
- Research has demonstrated** that robotic interventions **Increased Accuracy of incisions, Instrumentation articulation, Organ manipulation. Reduced exposure to radiation and contrast agents, surgical trauma, overall hospitalization, and post-operative recovery time.**
- Robotic surgery **more technically demanding procedure than traditional open thoracic surgeries**. This can be seen in many robotic cardiac procedures where **surgical times are often increased**. In addition, the **high cost of installation and maintenance**, coupled with the **lack of device manufacturers** has kept the **cost of robotic surgery approximately 13 percent higher** per patient than traditional surgical approaches.

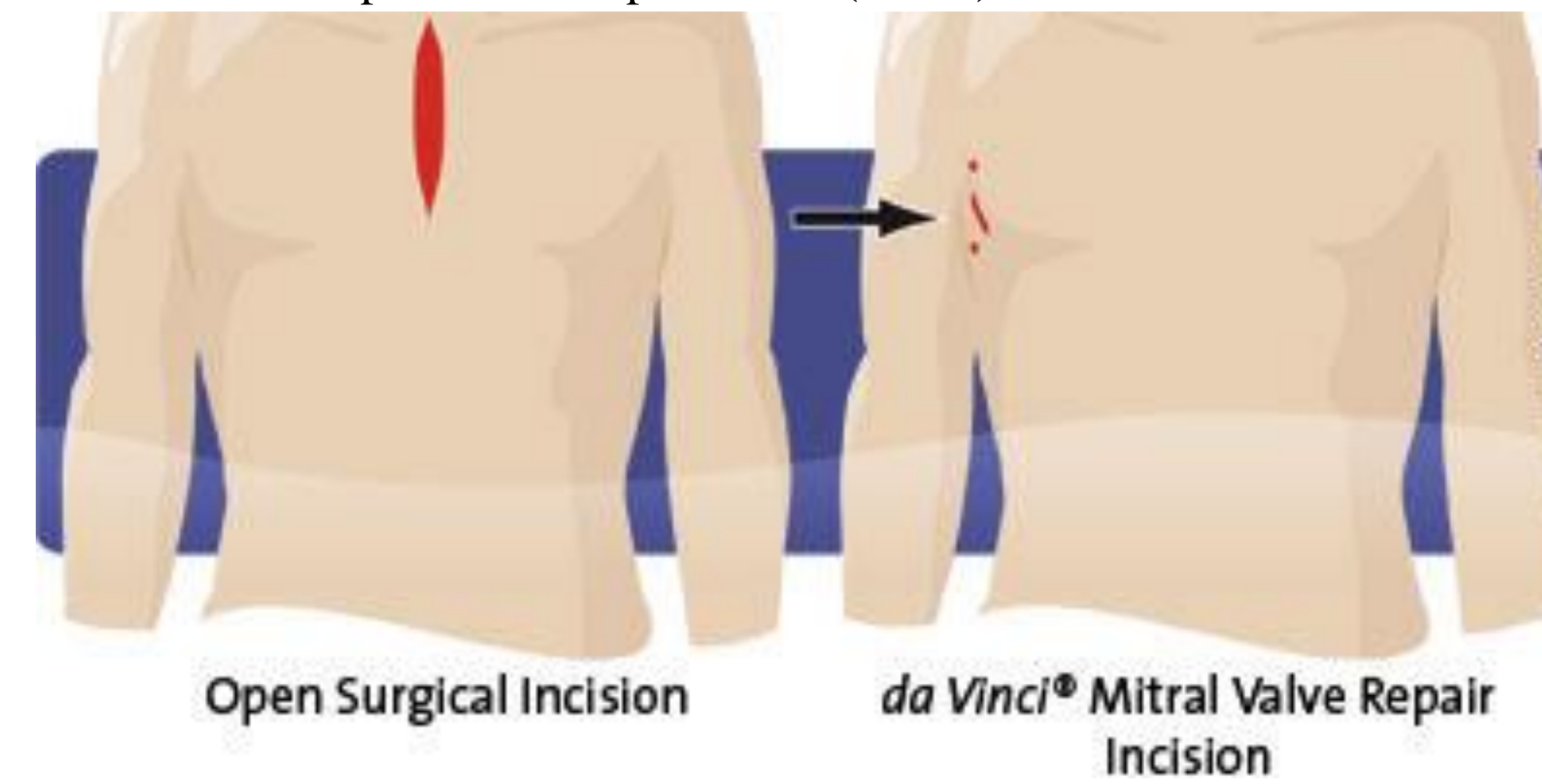
### Statement of the Problem

•This study was designed to expand the clinical and economical knowledge of cardiac robotic surgery by answering the following questions:

### Research Questions

•Is the use of the **da Vinci Robot System** safe, less inferior, and economically feasible as **compared** to those who undergo **traditional open sternotomy** surgery in the following cardiac procedures:

1. Atrial septal defect repair (ASD)
2. Coronary artery bypass grafting (CABG)
3. Mitral valve repair and/or replacement (MVR)



### Literature Review

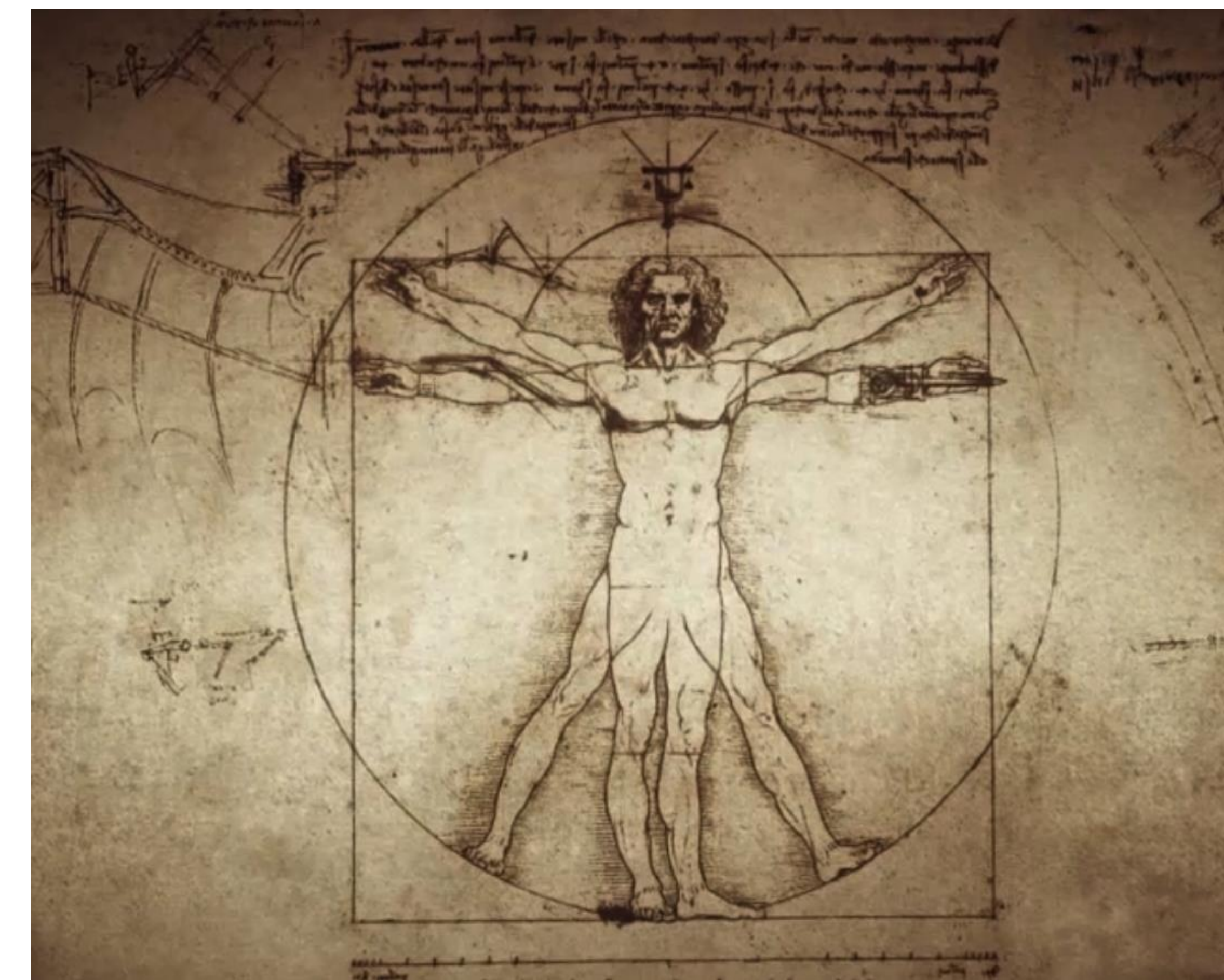
A review of the available studies using **PubMed, Cochran Library and Clinical Consult** revealed numerous studies investigating the utilization of robotically performed coronary artery bypass graft (CABG), arterial septal defect repair (ASD) and mitral valve repair (MVR) compared to their traditional counterparts. **Textbooks published within the last five years** were used to describe the **pathophysiology, and clinical signs and symptoms** of atherosclerotic heart disease, atrial septal defect and mitral valve dysfunction. The search **results provided three suitable ASD repair studies** including, 1. **Xiao**, 2014 study and evaluation of **totally robotic atrial septal defect closures** performed over a **7-year period**, 2. **Senay** 2014 demonstrated **robotic surgery in atrial septal defect closures over a two year period** on 92 patients carefully documenting surgical techniques and patient intra- and postoperative outcomes and 3. **Lewis**, 2014 reviewing the performance of **robotic surgery in the unique sinus venosus atrial septal defect** with partial anomalous pulmonary venous return, in a three patient case series. Search results **provided three suitable studies for the use of robotic repair in coronary artery by-pass graft**. These studies included, 1. **Leyvi** who in 2014 studied assisted post **robotic coronary artery bypass grafting for 30-day complication rates**, and average length of hospital stays as compared to conventional surgery. 2. **Buehler** in the same year performed a systematic review of **robotic coronary artery bypass grafting intra- and post-operative complication rates as compared to conventional open sternotomy**. Lastly, **Bayramoglu** 2013 research on serial transthoracic echocardiograms to evaluate **post-operative robotic coronary by-pass graft patency** in an attempt to determine short and long-term durability of robotic grafts. Search results **discovered three suitable studies on the use of robotic surgery in mitral valve repair**. **Ramzy**, 2014 performed research on **three hundred robotic assisted mitral valve repairs** at Cedars-Sinai over a **seven year period**. The goal was to evaluate the safety and effectiveness of robotic mitral valve repair. **Senay** in 2014 performed a **comparative study** of patients undergoing **robotic MVR** with severe **rheumatic mitral valve disease as compared to conventional surgery**, as well as, the overall technical feasibility of robotic MVR. **Yoo** in the same year performed a retrospective study to assess the **overall outcomes of robotic MVR surgical intervention, long term prognosis, and durability** of the procedures in **200 patients** using serial postoperative echocardiograms.

### Discussion

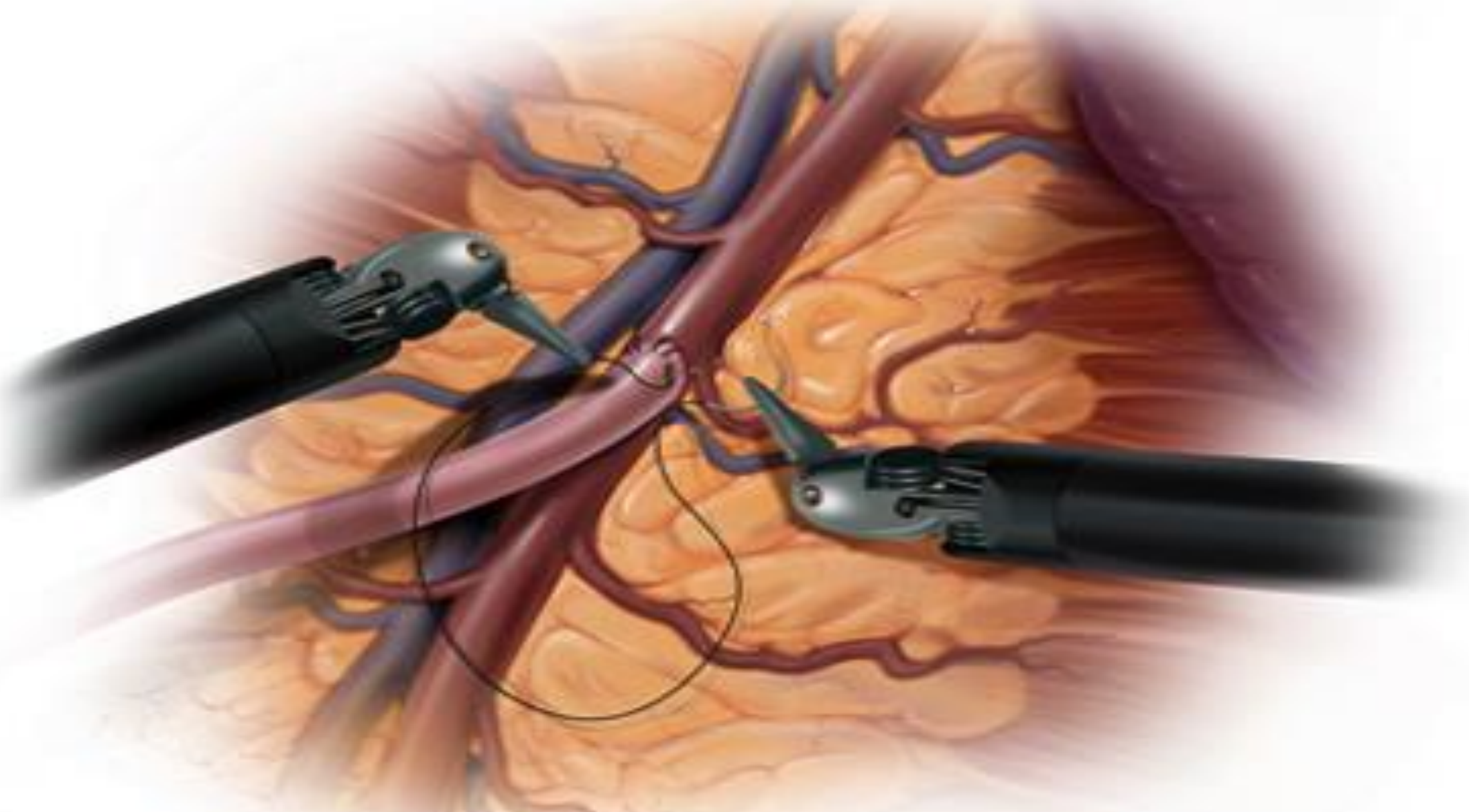
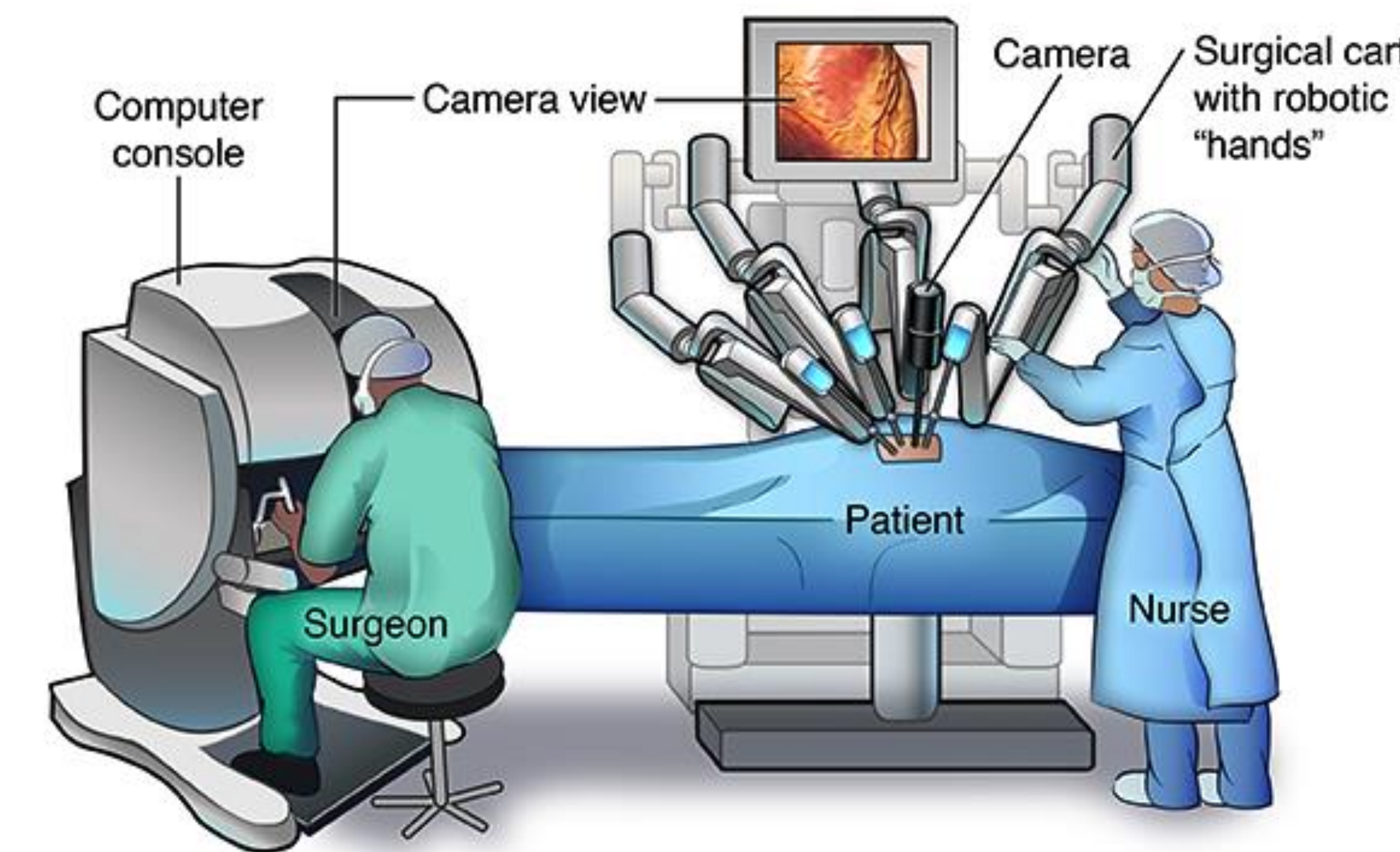
The use of the da Vinci Robot System was safe, less inferior, and economically feasible in atrial septal defect repair as compared to those who undergo traditional open sternotomy surgery cardiac procedures.

The use of the da Vinci Robot System safe, less inferior, and economically feasible in coronary artery bypass grafting compared to those who undergo traditional open sternotomy surgery cardiac procedures.

The use of the da Vinci Robot System safe, less inferior, and economically feasible in mitral valve repair and/or replacement as compared to those who undergo traditional open sternotomy surgery cardiac procedures.



Robotic cardiac surgery



### Applicability to Clinical Practice

•The da Vinci Robotic Surgical System has been shown to **reduce intra and post operative complications**, as well as, reduce **post operative pain, scar formation and faster recovery times**. This is particularly important for **younger, more active patients, wishing** to reducing scar formation, and **return to activities of daily life** as soon as possible. **Any patient** with symptomatic **ASD, CABG, or mitral valve disease** encountered in clinical practice should be **referred to a facility, which offers both robotic and convectional surgical approaches**. **Hospitals with high volume patient surgical procedures** may choose to use the da Vinci Robot to reduce costly intra and post operative complications, as well as to **reduce costly intensive care unit stays, hospital stays**. With **modern day healthcare reimbursement** hospitals may **benefit from reducing the amount of patients returning with the same pathology**. Since **robotic surgery** is presumed to be more **durable procedure**, and **reduce the rates of post operative atrial fibrillation, and myocardial infarction**.



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