



**INDIAN
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HEALTH**
GANDHINAGAR

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GUJARAT STATE PETRONET LTD.
HO, GANDHINAGAR.
ADMINISTRATION DEPARTMENT

20 JUN 2024

INW. No. 1605

18th June 2024

To,

Gujarat State Petronet Limited (GSPL)

Gandhinagar – 382027

Respected Madam,

Enclosed herewith is the Assessment Report of CSR Project for Establishing Robotic Surgery System for Cardiothoracic and Vascular Surgery Department for Performing Robotic Assisted Minimal Invasive Complex Cardiac Surgeries supported by Gujarat State Petronet Limited in FY 2022-2023, from **31st March 2024 to 30th April 2024**, as per our agreement.

Throughout the assessment process, the team diligently examined the experiences of the participants with robotic surgery. We have also provided recommendations and conclusions, outlining any necessary enhancements to optimize the project's overall impact as identified during the survey.

We are confident that the Assessment Report, with its comprehensive evaluation and clear recommendations, will be a valuable tool for GSPL in assessing the effectiveness of the initiatives undertaken. It will significantly contribute to the overall success of the project.

We appreciate the opportunity to work with GSPL. Thank you for entrusting us with this responsibility.

Looking forward to further collaboration to achieve mutual support and success.

Thanks & Regards,

Prof. (Dr.) Deepak B. Saxena
Director,
IIPH Gandhinagar

INDIAN INSTITUTE OF PUBLIC HEALTH GANDHINAGAR

[A University established under IIPHG Act, 2015 of Gujarat State]

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**Impact Assessment Study for CSR Project for Establishing
Robotic Surgery System for Cardiothoracic and Vascular
Surgery Department for Performing Robotic Assisted
Minimal Invasive Complex Cardiac Surgeries supported
by Gujarat State Petronet Limited in FY 2022 – 2023**

Submitted to

Gujarat State Petronet Limited



Gujarat State Petronet Limited

The Energy Lifeline of Gujarat

Submitted by

Indian Institute of Public Health Gandhinagar



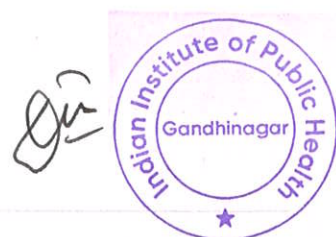
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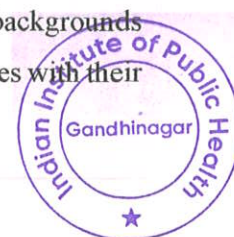


1. Executive summary

Gujarat State Petronet Limited, India's one of the largest natural gas company, has contributed to various research activities under Corporate Social Responsibility (CSR). U. N. Mehta Institute of Cardiology & Research Centre (UNMICRC) is located in Ahmedabad, Gujarat, in the western part of India - a Unique world-class cardiac tertiary care teaching hospital where the motto is to give compassionate & quality cardiac care at concessional or no cost to all-class people especially the poorest of poor. The Institute is affiliated with the B. J. Medical College, Civil Hospital Campus, Asarwa, Ahmedabad, a Government Medical College for academic purposes. U. N. Mehta Institute of Cardiology & Research Centre (UNMICRC), Ahmedabad, for Robotic Surgery Systems for performing robotic-assisted minimal invasive complex cardiac surgeries for upgradation for patient care and treatment facilities, upgradation of academic, training, teaching activity of tertiary care cardiac super-specialty teaching institute & for Heart-lung transplant program.

The GSPL has requested the assessment of the impact of robotic surgery services at UNMICRC, Ahmedabad to the Indian Institute of Public Health Gandhinagar (IIPHG). The IIPH Gandhinagar is India's first public health university to enact the IIPH Act 2015 by the Government of Gujarat, which aims to strengthen the health system through education, research & innovations. In the same line, IIPHG conducted the impact assessment of the Robotic surgery services through the patients who underwent robotic surgery at UNMICRC in 31st March 2023 - 30th April 2024.

Robotic surgery was recognised for its benefits, particularly for patients with multiple co-morbid conditions, offering reduced infection risks and faster recovery times. The in-depth interviews conducted with cardiothoracic surgeons and patients at UNMICRC shed light on the adoption and outcomes of robotic surgery in cardiac care. During the initial implementation phase, the surgeons and specialists underwent rigorous training to integrate robotic techniques into practice, positioning UNMICRC as a pioneer in the region. Various cardiac procedures were successfully performed using robotic assistance, demonstrating its versatility in cardiac care. Patients expressed positive perceptions of robotic surgery, appreciating its minimally invasive nature and faster recovery times. Access to healthcare was facilitated through government programs like PMJAY, enabling patients from diverse socioeconomic backgrounds to receive high-quality surgical care at no cost. Patients reported positive experiences with their



surgeries, highlighting minimal scarring and reduced post-operative pain associated with robotic-assisted procedures. This ultimately enhanced the quality of life of the patients.

Despite robotic surgery's success, a few challenges, such as high costs and technical complexities, persist. To enhance the overall patient experience further, improved patient education and diagnostic processes are recommended.



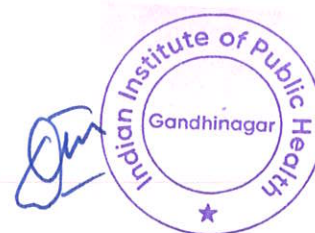
2. Background

Robotic Surgery (RS) is an advanced minimally invasive surgery that integrates medical science, robotics, and engineering. Also known as robot-assisted surgery, it involves using specialised robotic platforms during surgical procedures to enhance the precision of surgeons' movements in complex procedures and small anatomical spaces. RS can filter hand tremors, improve flexibility, and minimise involuntary inaccuracies. This leads to fewer surgical complications such as surgical site infection, less pain, less blood loss, shorter hospital stays, quicker recovery, and more minor, less noticeable scars.

Surgical robotics is a promising new technology and is often considered a revolutionary advancement in surgery. However, the market has primarily driven the development and acquisition of robotic devices. While they are expected to become an essential tool in the surgical armamentarium, the extent of their use is still evolving.

Gujarat State Petronet Limited (GSPL) has taken the initiative to support the Robotic Surgery Systems for Cardio Thoracic and Vascular Surgery through its CSR activity to U. N. Mehta Institute of Cardiology & Research Centre (UNMICRC), Ahmedabad. The Robotic Surgery System is meant for performing robotic-assisted minimal invasive complex cardiac surgeries for the upgradation of patient care and treatment facilities, upgradation of academic training, and teaching activity of tertiary care cardiac super-speciality teaching institute & for Heart-lung transplant program.

This assessment aimed to evaluate the benefits of a Robotic Surgery System for cardiothoracic and Vascular Surgery in the targeted communities of Gujarat and was conducted by the Indian Institute of Public Health Gandhinagar during 31st March, 2023 to 30th April, 2024.



2.1 About IIPHG

Indian Institute of Public Health Gandhinagar (IIPHG) is a joint initiative of the Public Health Foundation of India (PHFI) and the Government of Gujarat (GoG) established in 2008. IIPHG offers full-time post-graduation courses like Master in Public Health (MPH), Master in Hospital Administration (MHA), Post Graduate Diploma in Public Health Management (PGDPHM), And Associate Fellow in Industrial Health (AFIH). IIPHG is recognized as the first public health university in the country by enacting the IIPH Act 2015 by the Government of Gujarat (on 25th February 2015).



In addition to academic courses, IIPHG and its faculty are actively engaged in various health systems research and advocacy activities supported by national and international agencies. The institute has worked on maternal health, child health, infectious and non-communicable diseases, environmental and occupational health, health policy and health systems, and public health nutrition.

IIPHG has also developed research collaborations and received funding from national and international agencies, including the Indian Council for Medical, Department of Biotechnology, NRDC USA, University of Aberdeen UK, Karolinska Institute Sweden, Liverpool Institute of Tropical Medicine, UK, and other national and international organizations.

IIPHG is a Regional Resource Center for Health Technology Assessment (HTA) in India recognized by the Department of Health Research, Government of India. IIPHG has also evaluated the impact of various government and non-government organizations' projects.



3. Study Methods

3.1 Study Site:

The U N Mehta Institute of Cardiology and Research Centre is located in Ahmedabad, Gujarat, India, and is a leading healthcare institute in the region.



3.2 Study Type

This assessment was cross-sectional in nature and followed the qualitative data collection method. In-depth interviews with cardiac surgeons practising at UNMICRC were conducted to gather their insights on training, the rationale for adopting robotic surgery, the advantages and disadvantages of robotic surgeries etc. The in-depth interviews were also conducted with the patients who underwent robotic-assisted cardiac surgeries to document their perception, experience, and outcome of surgery. The pre-structured interview guide was used to conduct these interviews. A full list of all the patients who underwent robotics surgery at UNMICRC in 2023-24 was requested for further assessment; however, due to confidentiality, the list was not shared with the IIPHG. Therefore, this assessment is based only on qualitative data collection.

3.3 Study Sample

In this assessment, cardiac surgeons from the Department of Cardiothoracic Surgery at UNMICRC were included. The administration of UNMICRC helped recruit patients who underwent robotic surgery in the year 2023 from the hospital records.

4 Data Collection and Data Analysis

4.1 Data collection

An interview guide was developed for both surgeons and patients to ensure consistency and comprehensiveness in the data collection. The guide included open-ended questions covering topics such as training in robotic surgery, selection of the patients, patient outcome, access to healthcare, and improvement in quality of life. Verbal informed consent was taken prior to data collection. Measures were taken to ensure the confidentiality of the participants.

4.2 Data analysis

Thematic analysis was used to identify key themes in the interviews. The transcripts of the interviews were coded and analysed using thematic coding techniques to identify recurrent information across participants. Themes were interpreted and synthesised to comprehensively understand the assessment findings.



5 Result

5.1 Results from in-depth interviews with Cardiac Surgeons

Training and Adoption of Robotic Surgery: Surgeons underwent comprehensive training, including stimulation training and practical orientation to robot docking, before performing robotic surgeries on patients. The UNMICRC has been performing robotic surgery since December 2022 and positioned itself as a pioneer in the region by offering robotic surgery, reflecting a strategic decision to embrace technological advancements in cardiac care.

"We proudly say UNMICRC is 1251 first bedded hospital which offers robotic surgery with latest technology in Western India." - The Cardiac Surgeons, UNMICRC.

Rationale for Robotic Surgery: The hospital recognised the global trend of adopting robotic surgery in cardiology and aimed to provide its patients with the latest technology. Robotic surgery was seen as particularly beneficial for patients with multiple co-morbid conditions, reducing the risk of post-operative infections associated with conventional surgery. The decision to perform robotic surgery was made collaboratively by the cardiothoracic surgery team, emphasising the importance of patient selection and clinical experience in determining suitability for robotic procedures.

Types of Robotic Procedures: Various cardiac conditions, including coronary artery grafting, thymectomy, mitral valve replacement, and thoracic procedures involving cysts or tumours, were mentioned as suitable for robotic surgery, highlighting the versatility of robotic techniques in cardiac care.

Comparison with Conventional Surgery: Robotic surgery was preferred over conventional surgery due to its reduced risk of infection, faster recovery times, and superior cosmesis. Patients undergoing robotic surgery experienced shorter ICU and hospital stays, lower pain scores, and quicker return to routine activities than conventional surgery.

Advantages for Surgeons: Surgeons benefited from improved visibility, reduced ergonomic strain, and enhanced wrist movements afforded by robotic surgery, despite initial challenges with robot docking, adherence to protocols ensured the safe and efficient operation of robotic systems.

"In conventional surgery, the surgeon needs assistance to see the operative site while robotic surgery offers 360-degree vision and articulation." – Dr Ketav Lakhia, Cardiac Surgeon, UNMICRC.



Merits and Demerits to Patients: Patients undergoing robotic surgery experienced shorter hospital stays, less post-operative pain, and quicker resumption of normal activities than conventional surgery. However, limitations such as restricted patient positioning during sleep and potential complications were acknowledged as inherent to both robotic and conventional surgical approaches.

"The duration of ICU and hospital stay decreases in robotic surgery. Pain score is also less than the pain felt by patients underwent conventional surgery." – Dr Anil Sharma, Cardiac Surgeon, UNMICRC.

Cost-effectiveness and Limitations: Robotic surgery was acknowledged as expensive, but UNMICRC addressed this barrier by offering robotic procedures free of cost under government programs like PMJAY, thereby increasing access for lower socioeconomic patients. Challenges such as high instrument costs, steep learning curves, and occasional technical issues with robotic arms were noted as limitations of robotic surgery.

"We can offer robotic assisted surgery to lower socioeconomic classes because of CSR funding from Gujarat State Petronet Limited. Otherwise, the cost is very high, around 4-5 lac in addition to a normal package of cardiac surgery." – Dr Ketav Lakhia, Cardiac Surgeon, UNMICRC

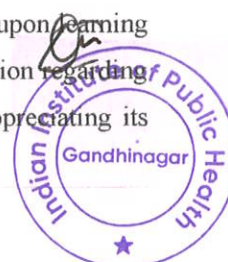
Standardisation and Quality of Care: Standard operating procedures ensured consistent care for patients undergoing both robotic and conventional surgeries, with no compromise in quality of care or post-operative management.

"We have SOP for admitted patients – hence, we follow the same protocol for both patients. ICU, IPD, and operation theatre remain the same. Only the ward is different." – Dr Ketav Lakhia, Cardiac Surgeon, UNMICRC.

Overall, the qualitative analysis highlights the strategic adoption of robotic surgery at UNMICRC to provide advanced cardiac care, focusing on patient outcomes, surgeon benefits, and cost-effectiveness. Challenges such as high costs and technical complexities underscore the need for ongoing innovation and resource optimisation in robotic cardiac surgery.

5.2 Results from in-depth interviews with patients

Perception of Robotic Surgery: Patients expressed surprise and sometimes confusion upon learning that their surgeries would be robotically assisted. This highlights a gap in patient education regarding surgical techniques. However, patients generally viewed robotic surgery positively, appreciating its



minimally invasive nature and the potential for reduced post-operative follow-ups. There was a contrast between the expectation of large incisions with conventional surgery and the reality of smaller incisions with robotic assistance. This led to overall satisfaction and faster recovery for patients.

Access to Healthcare: Patients cited various pathways leading them to UNMICRC, including referrals from other hospitals, recommendations from acquaintances, and awareness through media and advertisements. The availability of government programs like PMJAY facilitated access to care for patients who might not be able to afford such procedures otherwise. Patients from diverse socioeconomic backgrounds, including farmers and individuals with lower incomes, were able to access high-quality surgical care at no cost.

I express my sincere gratitude to the doctors and nursing staff working at UNMICRC who did my surgery robotic-assisted and free of cost. I lost hope for life because other doctors said it was a very difficult case to operate on. The cost at different hospitals were more than five lacs. – 41 years female

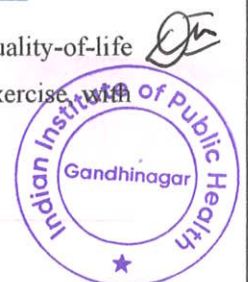
Patient Experience and Recovery: Overall, patients reported positive experiences with their surgeries and recoveries. They expressed gratitude to the doctors and nursing staff for their care and support. Robotic assistance contributed to faster recovery times compared to conventional surgery, allowing patients to resume their daily activities sooner. Patients appreciated the minimal scarring and reduced post-operative pain associated with robotic-assisted procedures.

"I had only three stitches in 2 holes and two stitches in 1 hole, which means it was done by minimum invasive. It did not leave any scar." – 26 years female

Diagnostic Journey: Patients often underwent multiple consultations and diagnostic tests before arriving at UNMICRC, highlighting the complexity of diagnosing and treating their conditions. Instances where patients' symptoms were initially dismissed or misdiagnosed underscored the importance of thorough evaluations and second opinions.

"...the ECG and 2D echo were normal when I visited other hospitals. I thought chest pain was because of exercise. Trade-mill and Angiography revealed arteries get blocked." – 42 male

Impact on Daily Life: Patients expressed relief and satisfaction with improving their quality-of-life following surgery. They were able to return to their routine activities, such as work and exercise, with



minimal hindrance. Some patients noted ancillary benefits, such as alleviating unrelated symptoms like knee pain, following their cardiac surgeries.

"I walk now around 1500 steps daily. After I lost my lower extremities, I had knee pain while walking but after robotic heart surgery I walk without realising I had ever knee pain. The knee pain is also gone now." – 65 years male

Psychological Well-being: Patients generally reported feeling reassured and confident about their surgeries, mainly due to the promise of minimal scarring and faster recovery associated with robotic assistance. The absence of visible scars from robotic surgery contributed to patients' positive psychological outlook post-operatively.

Overall, the qualitative analysis suggests that patients undergoing robotic-assisted surgeries at UNMICRC experienced favourable outcomes, including reduced post-operative discomfort, faster recovery times, and improved quality of life. However, patient education and diagnostic processes can be improved to enhance the overall patient experience further.



6 Conclusion:

The insights from the interview with cardiothoracic surgeons at UNMICRC highlight the transformative impact of robotic surgery in cardiac care. Through meticulous training and strategic adoption, UNMICRC has positioned itself as a pioneering institution in the region, offering advanced robotic procedures alongside conventional techniques. Robotic surgery has emerged as a preferred option for patients, offering reduced post-operative complications, shorter hospital stays, and faster recovery times compared to conventional surgery. Surgeons benefit from enhanced visibility, reduced ergonomic strain, and precise instrumentation, improving surgical outcomes. Patients who underwent robotics surgery immensely benefited from its minimally invasive nature, quick recovery and thus improved quality of life.

Despite its advantages, challenges such as high instrument costs, steep learning curves, and occasional technical issues persist. However, UNMICRC has effectively addressed barriers to access by offering robotic procedures free of cost under government programs, ensuring equitable healthcare delivery to lower socioeconomic-class patients. Standardised protocols and quality assurance measures guarantee consistent patient care, irrespective of the surgical approach.

7 Recommendations:

The current assessment documented the high satisfaction level among the surgeons and also the patients. As a way forward, strong emphasis must be given to continuous training and education programs to enhance surgeons' proficiency in robotic surgery techniques. Additionally, patient-related information, education & communication in vernacular language is recommended for optimizing the benefits of the robotics surgery. This investment will ensure that surgeons can utilise robotic systems effectively, optimizing patient outcomes and minimising procedural risks. Encourage collaborative initiatives and knowledge-sharing platforms among healthcare institutions, industry partners, and academic researchers to foster innovation and best practices in robotic surgery. By facilitating collaboration and information exchange, funders can catalyse advancements in the field of robotic surgery and accelerate the translation of research findings into clinical practice. Prioritise funding for initiatives to reduce the costs associated with robotic surgery, such as negotiating instrument prices, maximising warranty coverage, and exploring alternative financing models.

