Adapting To Innovation in Robotic Assisted Surgery among Nurses

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ABSTRACT

Aiming to research the experiences, readiness, and perspectives of nurses working with robotic-assisted operations in a chosen hospital in Ernakulam, this study named "Adapting to Innovation in Robotic Assisted Surgery among Nurses" set out to do just that. Nursing personnel participating in this sophisticated surgical technique had their knowledge, training, and confidence levels assessed using a descriptive cross-sectional survey approach. Four hundred and twenty-two nurses with some familiarity with robotic-assisted surgery, either directly or indirectly, were chosen using a selective sample approach. Participants' demographic information, level of experience with robotic surgery, and confidence in their own abilities to help with these operations were all part of the standardized, validated questionnaire used to gather data. The bulks of the nurses were in the middle of their careers and had a range of years of experience in surgical nursing, according to the findings. The majority of nurses claimed to have undergone robotic-assisted surgical training, while a sizeable minority had not, revealing a lack of official education in the area. While some nurses were apprehensive or lacked confidence in their ability to help with robotic procedures, the majority of nurses felt confident or very confident. The research highlights the need of ongoing training programs that cover all bases in order to close these knowledge gaps, boost nurse confidence, and increase overall efficiency in robotic surgical units. Improving surgical results and patient care in contemporary healthcare facilities depends on assisting nurses in using these cutting-edge technologies.

Keywords: Robotic-Assisted Surgery, Nursing Adaptation, Technological Integration, Surgical Innovation, Interprofessional Collaboration.

INTRODUCTION

One revolutionary step in the development of surgical procedures is the introduction of robotic-assisted surgery (RAS). Robotic assisted surgery (RAS) has changed the face of conventional surgery by making operations more accurate, efficient, and safe via the use of cutting-edge technology including robotic arms, high-definition 3D imaging, and precise instrument control. Although surgeons have received a disproportionate amount of focus for their use of this invention, the crucial involvement of nurses in preoperative planning, intraoperative support, and postoperative care is just as important and merits equal emphasis. When it comes to surgical treatment, nurses are the vital connection between technology and the patient. The entire effectiveness of surgical operations and patient outcomes are strongly impacted by their capacity to adapt to RAS developments. The nursing profession faces new possibilities and threats with the advent of robotic-assisted surgery. Ergonomic improvements, less physical strain, and access to cutting-edge educational opportunities are all positive aspects. Conversely, it calls for major shifts in psychological preparedness, teamwork, technical proficiency, and clinical competence. In contrast to traditional surgery, RAS necessitates a different level of nurse engagement, one that is more focused on technology and less on providing direct surgical assistance. Operating robotic systems, resolving technological difficulties, and handling unexpected events that may emerge from machine-human interactions are increasingly skills that nurses need to have in addition to aseptic methods and surgical tools.

Changes in hospital culture, as well as formal training and ongoing education, are necessary for staff to adapt to robotic technology. As a first step in the change, several institutions provide official certification courses in robotic system handling. After that, students learn the ropes via simulations and eventually get supervised real-time experience in the operating room. An essential part of this process of adaptation is the backing of institutions. In order to encourage nurses to use technology, hospitals should make sure there are enough staff members, provide learning settings where nurses can work together, and encourage multidisciplinary teams. Equally important is attending to people's emotional and psychological preparedness. Particularly for those who have been in the field for a long time and are used to the status quo, nurses may experience anxiety and reluctance when faced with new ideas and technology due to concerns about technological failure, the loss of old roles, and resistance to change. Individual characteristics including age, background, tech literacy, and intrinsic drive all play a role in the adaption process. Some nurses may find the learning curve for robotic systems to be less steep than for younger nurses or those with greater experience with digital technologies. Important organizational factors include leadership buy-in, mentorship programs, and access to necessary technology. Encouraging, mentoring, and providing nurses with opportunities for hands-on robotic training greatly boosts their confidence and competence.

Work across different fields of expertise is also crucial while adapting. Surgeons, anesthesiologists, and nurses must work together seamlessly in RAS to ensure patient safety. Nurses often have to understand signals from both the surgical team and the technology in order to quickly react to crises, maintain sterile fields, predict surgical requirements, handle the robotic cart and docking stations, and more. To pull this off, you need to be very perceptive, articulate, and quick on your feet while making decisions. Therefore, adaptation entails a whole change in practice, attitude, and interprofessional dynamics, not simply a technological modification. The nurse's experience in RAS situations is further influenced by ethical and legal issues.

Concerns about responsibility, informed permission, and patient autonomy have grown in recent years due to the increasing use of machines in surgical operations. In order to provide patients correct information during preoperative counseling and postoperative treatment, nurses—who are essentially their patients' advocates—must keep themselves educated on these aspects. To make sure that technology doesn't get in the way of compassion, dignity, or personalized treatment, they should also keep an eye on patient safety from a humanistic standpoint. The surgical field is seeing a technological revolution, and nurses are leading the charge. Acquiring new skills, changing one's perspective, being emotionally prepared, and having organizational support are all parts of the complex process of successfully adapting to robotic-assisted surgery. The functions, obligations, and instructional models for nurses will need to change in tandem with RAS. Making sure that innovation improves, not destroys, the core of caring and skilled nursing care requires funding for nurse education, encouraging a love of technology, and constructing robust clinical ecosystems.

LITERATURE REVIEW

Moloney, Rita et al., (2023) in order to locate and analyze existing material about nurses' perspectives and encounters with RAS. From its inception in the 1980s to its current increase in popularity across a number of surgical subspecialties, robotic-assisted surgery (RAS) has quickly become the gold standard in surgical procedures. Perioperative nurses are said to be the ones that keep the patient's journey going. Because nurses are present for patients through every step of RAS, understanding their perspectives and experiences is crucial for determining where nurses need more training and education. Medline, CINAHL, Academic Search Complete, EMBASE, Scopus, and ADA Psycinfo were among the databases that were searched for peer-reviewed papers. In accordance with PRISMA standards, a thorough search of databases was carried out. Out of 523, 523 were found to be eligible after searching six databases. The review included ten papers, seven of which were qualitative and three of which were quantitative.

After identifying ten papers, we used theme analysis to critically assess them and synthesise their findings. Researchers in every study worked with nurses in a perioperative setting. The primary results indicated that surgeons get greater attention in terms of RAS education and training, whereas nurses receive less attention. Nurses' stress levels were shown to be higher due to the fact that they faced obstacles in their roles caused by a lack of knowledge, training, and information. There is strong evidence that nurses who deal with RAS need further education and training. Care is provided in the community before to, during, and after surgery by nurses who work with RAS. Nevertheless, studies involving nurses in settings other than perioperative care have not been carried out. Nurses' perspectives and experiences caring with RAS patients across all care settings need to be better understood in order to determine their training and education requirements.

Yıldız, Kerem et al., (2022) Improvements to the workflow, development rate, and quality of patient care are all outcomes of innovative thinking. Technological methods for sickness prevention, shorter hospital stays, more patient comfort, and improved treatment are all components of innovative goods. "We should change life instead of complying with it," Florence Nightingale said, highlighting the need of utilizing novel goods, which led to significant changes in health. While making decisions on the technology to be used in surgical patient care, nurses should consider the techniques' applicability, employability, creditworthiness, legality, and ethics. The widespread usage of cutting-edge surgical equipment highlights the significance of innovation in the field. Research examining the implementation of new nursing practices is lacking in our nation. This is why new approaches to nursing care are considered necessary. The purpose of this review is to highlight the value and relevance of nursing innovation.

Suriaga, Armiel. (2019). the method in which nurses provide care is being transformed by the rapid development of healthcare technology. Emerging technologies that need nursing care, such as robotic surgery, electronic medical records, data analytics, artificial intelligence, and humanoid healthcare robots, shed light on the ongoing importance of nurse care. Being tech-savvy is definitely a must in today's fast-paced workplace. Nevertheless, meeting the intricate requirements of patients requires more than just technical proficiency. It is essential for nurses to have a solid grasp of both the how and the why of these technologies in order to provide optimal patient care.

Kang, Min et al., (2016) Perioperative nurses who perform robotic surgery were the focus of this investigation. The research was descriptive and qualitative in nature. A total of fifteen registered nurses from five different big Seoul university hospitals who had previously worked as part of a robotic surgical team took part. There was one male nurse and fourteen female nurses who took part, with ages ranging from 25 to 41 years old with a mean age of 31.33 (SD, 4.19). Their time spent caring for patients undergoing robotic surgery varied from eight months to six years. The four main themes that emerged from the nurses' experiences with robotic surgery were as follows: (1) the need to constantly monitor both the patients' and the robot's safety; (2) the occurrence of unexpected errors or malfunctions in the robotic machines; (3) the sensation of being burdened by being a part of the robotic surgical team; and (4) the desire and need for additional education and information. Findings from this research highlight widespread worries among nurses about patient safety and the potential for robot system failure-related crises. If we want nurses to play an increasingly important role in robotic surgery, we need to make sure they have the resources they need.

Dwivedi, Jyotsna & Mahgoub, Imadeldin. (2012). A game-changer in the field of surgery, robotic surgery has been available for more than 20 years. Robots have become ubiquitous in the medical field within the last decade. Researchers are pushing themselves to unprecedented levels in their pursuit of smaller, more efficient, and less costly equipment in response to the widespread adoption of robotic surgery. Robotic surgery has gained widespread acceptance and has been successfully used in several hospitals worldwide. An overview of current robotic surgical technologies is the main purpose of this article. We evaluate the surgical robotic systems, group them into categories, and talk about where they're going from here.

Benmessaoud, Christine et al., (2011) the use of robotics in surgery is still in its early stages and it is only widely used in a small number of surgical subspecialties. Within the context of robotic-assisted surgery, this belief-elicitation research sought to contextualize and augment components of the unified theory of acceptance and use of technology (UTAUT) in order to better understand the factors that promote and hinder their adoption. Two sets of twenty-one surgeons, those who utilize and those who do not, were interviewed individually using a semi-structured interview format. Perceived usefulness and enabling conditions were the most important factors in adoption, regardless of whether one was a user or not. Next came attitude toward using technology and extrinsic motivation. Perceived usefulness, perceived behavioral control, and perceived ease of use and complexity were the three primary factors preventing adoption for both users and nonusers. The results of this study may help surgeons, administrators of hospitals and medical schools, and policymakers determine how to best use robotic-assisted surgery, and they can also direct the direction of future studies by providing a framework for how to formulate hypotheses and build theories.

RESEARCH METHODOLOGY

Research Design

A quantitative descriptive cross-sectional survey design was adopted to evaluate nurses' knowledge, training, and confidence related to robotic-assisted surgery.

Study Setting

The study was conducted in the surgical and robotic surgery departments of a tertiary care hospital in Ernakulam, Kerala.

Population and Sample

Target population: Registered nurses working in surgical and robotic units.

Sample size

30 nurses.

Sampling technique

Purposive sampling was used to select nurses with at least six months of exposure to robotic-assisted surgery.

Inclusion Criteria

- Registered nurses working in surgical and robotic departments.
- Nurses with prior exposure (direct or indirect) to robotic-assisted surgeries.
- Willingness to participate.

Exclusion Criteria

- Nurses without experience or exposure to RAS.
- Nurses on extended leave or those unwilling to give consent.

Tool for Data Collection

A structured questionnaire was used as the data collection tool, consisting of the following sections:

Section A: Demographic Profile (age, gender, years of experience, area of posting)
Section B: Knowledge Assessment (10 multiple-choice questions on robotic surgery)
Section C: Training Exposure (formal/informal training, duration, content)
Section D: Confidence Level Scale (5-point Likert scale ranging from "Very Not Confident" to "Very Confident")
Validation: The tool was reviewed by 5 nursing experts and piloted with 5 nurses (excluded from final study) for clarity and reliability.
Reliability: Cronbach's Alpha = 0.82 (acceptable reliability)

Data Collection Procedure

- Formal permission was obtained from hospital authorities and the Institutional Ethics Committee.
- Informed written consent was obtained from participants.
- Data were collected during working hours over one week using the printed questionnaire.

Data Analysis

Data were entered in Microsoft Excel and analyzed using SPSS v25.
Descriptive statistics (frequency, percentage, mean, SD) were used to summarize demographic and core variables.
Inferential statistics (Chi-square test and Pearson correlation) were used to explore relationships between variables.

RESULTS AND ANALYSIS

Table 1: Demographic Profile of Nurses (n = 30)

Variable	Categories	Frequency	Percentage
Age	21–30 years	12	40.0%
	31–40 years	10	33.3%
	41–50 years	6	20.0%
	Above 50	2	6.7%
	Total	**30**	**100**
Variable	**Categories**	**Frequency**	**Percentage**
Gender	Female	24	80.0%
	Male	6	20.0%
	Total	**30**	**100**
Variable	**Categories**	**Frequency**	**Percentage**
Experience in years	<5 years	8	26.7%
	5–10 years	12	40.0%
	>10 years	10	33.3%
	Total	**30**	**100**

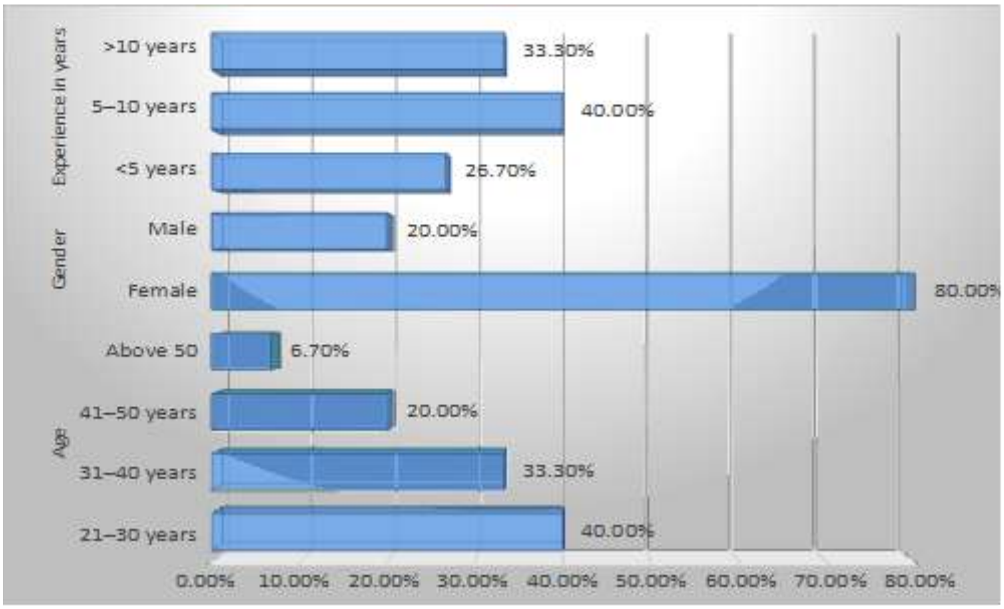

Figure 1: Demographic Profile of Nurses (n = 30)

The demographic profile of the 30 nurses included in the study reveals a diverse distribution in terms of age, gender, and professional experience. In terms of age, the majority of participants were between 21–30 years old, accounting for 40.0% (n=12), followed by those aged 31–40 years at 33.3% (n=10). A smaller portion fell within the 41–50 age range, comprising 20.0% (n=6), while only 6.7% (n=2) were above 50 years old.

Regarding gender, the sample was predominantly female, with 80.0% (n=24) identifying as such, while males made up the remaining 20.0% (n=6).

In terms of professional experience, 40.0% (n=12) of the nurses had between 5 to 10 years of experience. Nurses with more than 10 years of experience constituted 33.3% (n=10), and those with less than 5 years of experience made up 26.7% (n=8). This distribution indicates a balanced mix of early-career, mid-level, and experienced nursing professionals in the study.

Table 2: Knowledge Scores on Robotic-Assisted Surgery

Knowledge Level	Frequency	Percentage
Good (8–10)	9	30.0%
Average (5–7)	15	50.0%
Poor (<5)	6	20.0%
Total	**30**	**100**

Mean knowledge score = 6.4 ± 1.9 (Average level)

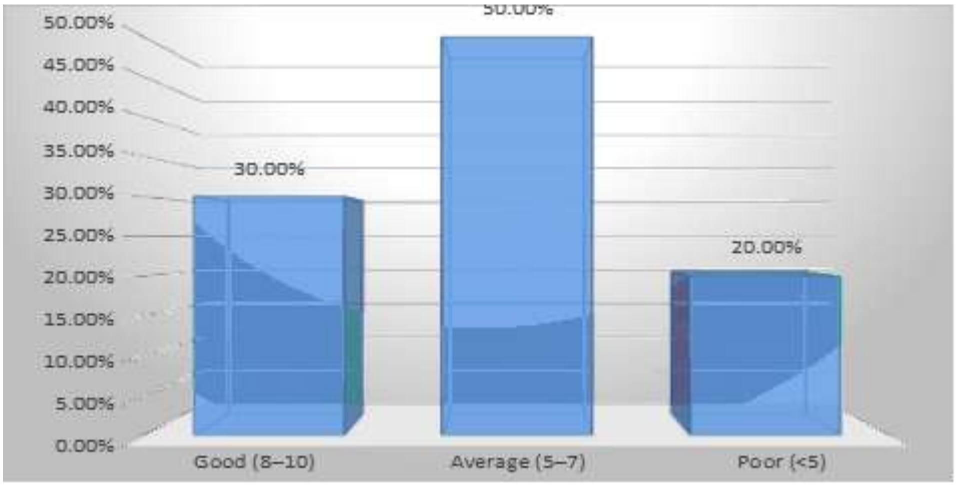

Figure 2: Knowledge Scores on Robotic-Assisted Surgery

Table 2 presents the knowledge scores of nurses regarding robotic-assisted surgery. Among the 30 participants, half (50.0%, n=15) demonstrated an average level of knowledge, with scores ranging from 5 to 7. A smaller portion, 30.0% (n=9), achieved a good level of knowledge with scores between 8 and 10. Meanwhile, 20.0% (n=6) of the nurses had poor knowledge, scoring below 5. These findings indicate that while a majority of the nurses possess at least an average understanding of robotic-assisted surgery, there is still a notable proportion with limited knowledge, highlighting a potential area for further training and education.

Table 3: Training in Robotic Surgery

Training Status	Frequency	Percentage
Yes (Formal/Informal)	21	70.0%
No Training	9	30.0%
Total	**30**	**100**

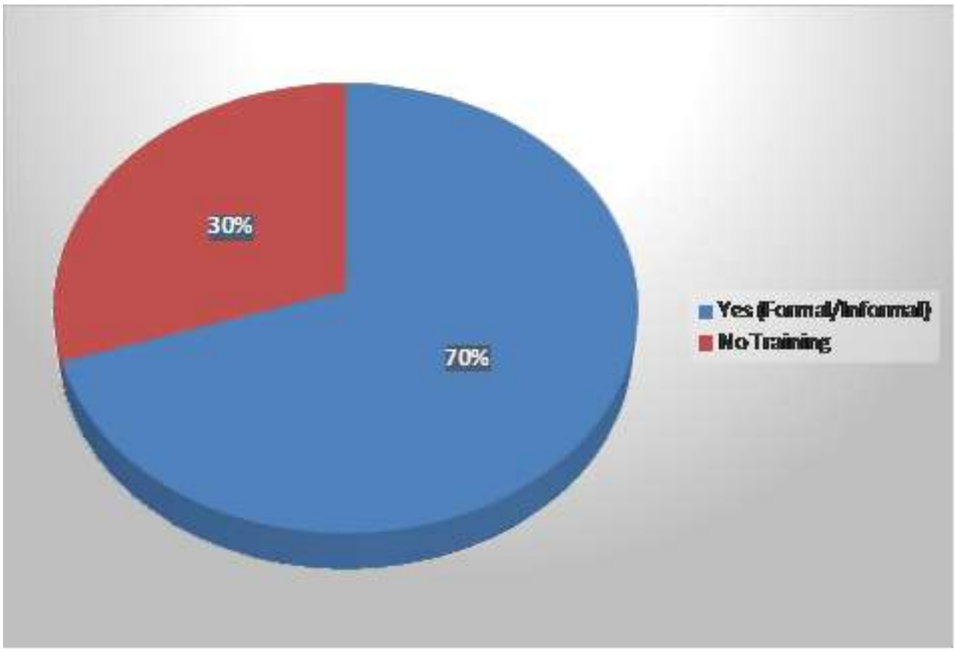

Figure 3: Training in Robotic Surgery

Table 3 outlines the training status of nurses in robotic surgery. Out of the 30 participants, a majority—70.0% (n=21)—reported having received some form of training, either formal or informal, in robotic surgery. In contrast, 30.0% (n=9) indicated that they had not received any training in this area.

This suggests that while most nurses have had exposure to robotic surgical techniques, a significant minority remain untrained, which could impact their readiness to effectively support such procedures.

Table 4: Confidence Level in Assisting Robotic Surgeries

Confidence Level	Frequency	Percentage
Very Confident	3	10.0%
Confident	13	43.3%
Neutral	7	23.3%
Not Confident	5	16.7%
Very Not Confident	2	6.7%
Total	**30**	**100**

Mean confidence score = 3.28 ± 1.1 on a 5-point scale (Moderate confidence)

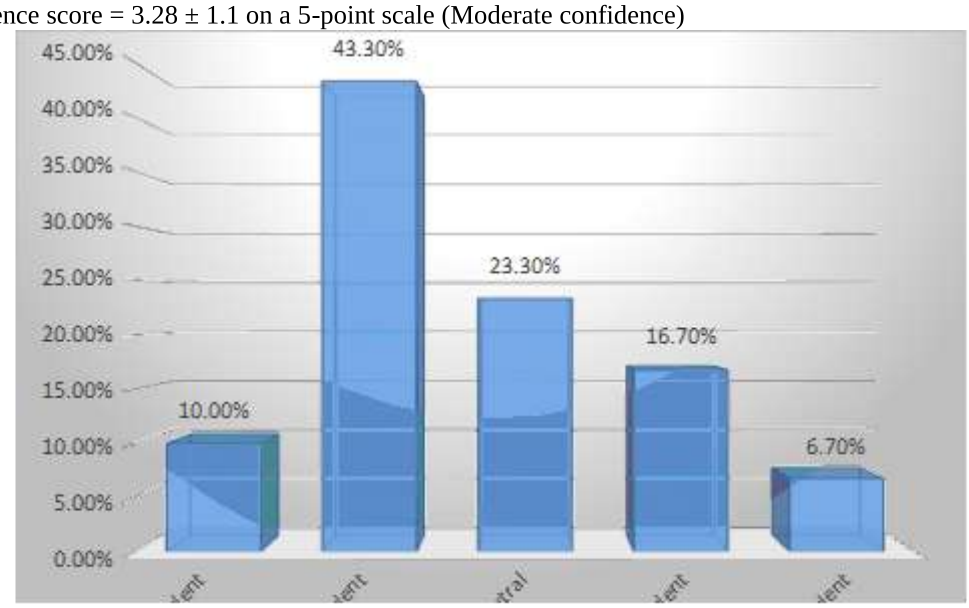

Figure 4: Confidence Level in Assisting Robotic Surgeries

Table 4 illustrates the confidence levels of nurses in assisting with robotic surgeries. Among the 30 participants, 43.3% (n=13) reported feeling confident in their ability to assist, while only 10.0% (n=3) felt very confident.

A neutral stance was taken by 23.3% (n=7) of the nurses, indicating uncertainty or ambivalence about their confidence level. On the lower end of the spectrum, 16.7% (n=5) reported not feeling confident, and 6.7% (n=2) expressed being very unconfident.

Overall, while a majority show at least some level of confidence, there remains a notable proportion who feel unprepared, underscoring the need for further support and training in this area.

Table 5: Association between Training & Confidence Level (Chi-square Test)

Variable	Chi-square value	df	p-value
Training vs. Confidence Level	6.48	2	0.039*

Significant association at $p < 0.05$ — training significantly improves nurse confidence.
Table 5 presents the results of a Chi-square test examining the association between training in robotic surgery and nurses' confidence levels in assisting with such procedures. The analysis yielded a Chi-square value of 6.48 with 2 degrees of freedom and a p-value of 0.039. Since the p-value is less than 0.05, the result is statistically significant, indicating a meaningful association between training and confidence. This suggests that nurses who have received training—whether formal or informal—are significantly more likely to feel confident in assisting with robotic surgeries compared to those without training.

CONCLUSION

This quantitative study highlights that while a majority of nurses in surgical and robotic units had received some form of training, only one-third demonstrated high knowledge or confidence in assisting robotic-assisted surgeries. The results suggest a positive impact of training on nurse confidence, and underscore the necessity for structured in-service programs and simulation-based learning to bridge the gap between technology and clinical nursing practice.

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