

AWARENESS AND PRACTICE OF INTERVENTIONAL RADIOLOGY PROCEDURES AMONG GENERAL PHYSICIANS AND SURGEONS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Interventional Radiology (IR) has emerged as an important subspecialty that offers minimally invasive image-guided diagnostic and therapeutic procedures. Despite rapid advancements, awareness and utilization of IR services among referring clinicians remain variable, potentially limiting patient access to these procedures.

Aim: To assess the awareness, knowledge, referral practices, and perceptions regarding Interventional Radiology procedures among general physicians and surgeons working in tertiary care hospitals.

Materials and Methods: A hospital-based cross-sectional questionnaire study was conducted over six months (June 2025 to January 2026) among 220 general physicians and surgeons employed in tertiary care teaching hospitals. Participants were selected using stratified random sampling. A validated, structured, self-administered questionnaire assessed demographic characteristics, awareness of IR procedures, referral practices, previous exposure to IR, perceived barriers, and educational needs. Data were analyzed using descriptive statistics, Chi-square test, and logistic regression. A p-value <0.05 was considered statistically significant.

Results: Among the 220 participants, 128 (58.2%) were physicians and 92 (41.8%) were surgeons. Overall awareness regarding IR was moderate (71.4%), whereas only 46.8% demonstrated adequate knowledge regarding available procedures and indications. Nearly 52.3% had referred patients for IR procedures at least once during the preceding year. Physicians with previous academic exposure to IR showed significantly higher awareness scores than those without exposure (p<0.001). The major barriers identified were inadequate knowledge (68.6%), limited interaction with interventional radiologists (55.0%), uncertainty regarding referral criteria (49.1%), and lack of institutional awareness programs (46.4%).

Conclusion: Although awareness of Interventional Radiology is reasonably good among physicians and surgeons, detailed knowledge and referral practices remain suboptimal. Regular Continuing Medical Education (CME) programs, multidisciplinary meetings, and structured undergraduate and postgraduate teaching may significantly improve appropriate utilization of IR services.

KEYWORDS: Interventional Radiology, Awareness, Referral Practice, General Physicians, Surgeons, Cross-sectional Study

INTRODUCTION

Interventional Radiology (IR) is a rapidly evolving subspecialty of radiology that utilizes image-guided, minimally invasive techniques for the diagnosis and treatment of a wide variety of vascular and non-vascular diseases. Using advanced imaging modalities such as fluoroscopy, ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI), interventional radiologists perform procedures with high precision while minimizing trauma to surrounding tissues. Over the past few decades, IR has transformed the management of numerous clinical conditions by providing effective alternatives to conventional surgical interventions.¹⁻³

Compared with traditional open surgery, IR procedures are associated with several well-established advantages, including smaller incisions, reduced postoperative pain, lower morbidity and mortality, shorter hospital stay, faster recovery, decreased blood loss, reduced healthcare costs, and improved patient satisfaction. These benefits have led to the increasing incorporation of IR into routine clinical practice across multiple specialties, including vascular surgery, oncology, gastroenterology, nephrology, obstetrics and gynecology, urology, orthopedics, and trauma care.²⁻⁵

Modern Interventional Radiology encompasses a broad spectrum of diagnostic and therapeutic procedures, including angiography, angioplasty, vascular stenting, thrombolysis, embolization, transarterial chemoembolization (TACE), radiofrequency and microwave tumor ablation, image-guided biopsies, percutaneous abscess drainage, nephrostomy, biliary drainage and stenting, vertebroplasty, kyphoplasty, uterine artery embolization, inferior vena cava filter placement, dialysis access interventions, and treatment of peripheral vascular disease and varicose veins.⁵⁻⁶ The expanding role of IR continues to provide minimally invasive solutions for conditions that previously required major surgical procedures.

Despite these remarkable advancements, the successful utilization of Interventional Radiology services depends largely on timely recognition of appropriate clinical indications and prompt referral by primary treating physicians and surgeons. Since patients generally access IR services through referrals rather than direct consultation, the awareness, knowledge, and confidence of referring clinicians significantly influence the utilization of these procedures. Inadequate understanding of the indications, benefits, limitations, and availability of IR may result in delayed referrals, underutilization of minimally invasive treatment options, increased patient morbidity, and unnecessary surgical interventions.⁶⁻⁸

Several international studies have demonstrated varying levels of awareness regarding Interventional Radiology among clinicians, medical students, and surgical trainees. Although general awareness of the specialty has improved over time, detailed knowledge regarding specific procedures, referral pathways, and clinical indications remains inadequate in many healthcare settings. Commonly identified barriers include insufficient undergraduate exposure, lack of formal teaching during postgraduate training, limited interaction with interventional radiologists, and inadequate multidisciplinary collaboration.⁷⁻¹⁰

In India, where the burden of chronic diseases, cancer, peripheral vascular disorders, hepatobiliary diseases, and trauma continues to increase, the demand for minimally invasive image-guided interventions is rapidly growing. However, published literature assessing awareness, knowledge, referral practices, and perceptions regarding Interventional Radiology among clinicians remains limited. Furthermore, variations in institutional infrastructure and access to IR services may further influence referral behavior. Understanding these knowledge gaps is essential for designing targeted educational interventions, strengthening multidisciplinary teamwork, improving referral pathways, and ensuring optimal utilization of Interventional Radiology services for enhanced patient care.⁸⁻¹¹

Therefore, the present study was undertaken to evaluate the awareness, knowledge, perception, and referral practices related to Interventional Radiology among general physicians and surgeons working in tertiary care teaching hospitals, and to identify existing barriers and educational needs that may facilitate better integration of Interventional Radiology into routine clinical practice.¹¹

MATERIALS AND METHODS

This hospital-based cross-sectional observational study was conducted among general physicians and general surgeons working in tertiary care teaching hospitals over a period of six months (June 2026 to January 2026). The study aimed to assess the awareness, knowledge, and referral practices regarding Interventional Radiology (IR) procedures.

The sample size was calculated using the standard formula for estimating a single population proportion at a 95% confidence level with a 7% margin of error. After considering a 10% non-response rate, a total of 220 participants were included in the study using stratified random sampling, comprising 120 general physicians and 100 general surgeons.

Eligible participants included consultants, senior residents, junior residents, and medical officers from the Departments of General Medicine and General Surgery who consented to participate. Radiologists, interventional radiologists, specialists from other disciplines, interns, and participants with incomplete questionnaires were excluded.

Data were collected using a pre-validated, structured, self-administered questionnaire, which included four domains as shown in Table 1.

Table 1. Questionnaire Domains

Section	Variables Assessed
A	Demographic details (age, gender, qualification, specialty, years of experience)
B	Awareness of Interventional Radiology (knowledge of IR specialty, source of information, availability of IR services)
C	Knowledge of common IR procedures (angioplasty, embolization, biopsy, drainage, TIPS, vertebroplasty, uterine artery embolization, nephrostomy, radiofrequency ablation, varicose vein treatment)
D	Practice and perception (referral practices, confidence in referral, barriers, and need for continuing medical education)

Institutional Ethics Committee approval was obtained before commencement of the study, and written informed consent was obtained from all participants. The completed questionnaires were collected anonymously and analyzed using SPSS software. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. The Chi-square test, independent Student's *t*-test, and logistic regression analysis were used where appropriate. A *p*-value of <0.05 was considered statistically significant.

RESULTS

A total of 220 clinicians participated in the study, comprising 128 (58.2%) general physicians and 92 (41.8%) general surgeons. The mean age of the participants was 38.6 ± 8.9 years, with a mean clinical experience of 10.2 ± 7.1 years (Table 1).

Awareness and Knowledge: Overall, 157 (71.4%) participants were aware of Interventional Radiology as a medical specialty. Physicians demonstrated significantly higher awareness compared with surgeons (78.9% vs. 60.9%, $p = 0.004$). Similarly, adequate knowledge regarding common IR procedures was significantly higher among physicians (53.1%) than surgeons (38.0%, $p = 0.028$). Previous academic exposure to Interventional Radiology was also significantly greater among physicians (62.5% vs. 40.2%, $p = 0.001$) (Table 2).

Referral Practices: Among the study participants, 115 (52.3%) had referred patients for Interventional Radiology procedures at least once in their clinical practice. Referral rates were significantly higher among physicians than surgeons (60.2% vs. 41.3%, $p = 0.007$) (Table 3).

Factors Associated with Awareness: Logistic regression analysis demonstrated that previous academic exposure to Interventional Radiology was independently associated with better awareness (OR = 3.21; 95% CI: 1.82–5.66; $p < 0.001$). Being a physician was also an independent predictor of higher awareness (OR = 2.14; 95% CI: 1.23–3.73; $p = 0.007$), whereas years of clinical experience were not significantly associated with awareness ($p = 0.118$) (Table 4).

Perceived Barriers: The most commonly reported barriers to referral for Interventional Radiology procedures were inadequate knowledge (68.6%), limited interaction with interventional radiologists (55.0%), uncertainty regarding referral indications (49.1%), and lack of institutional awareness programs (46.4%). Additionally, 79.5% of participants expressed the need for Continuing Medical Education (CME) programs to improve their knowledge and referral practices related to Interventional Radiology (Table 5).

Table 1. Demographic and Professional Characteristics of the Study Participants (N = 220)

Variable	Total (n=220)
Mean age (years)	38.6 ± 8.9
Male	148 (67.3%)
Female	72 (32.7%)
Mean clinical experience (years)	10.2 ± 7.1
Physicians	128 (58.2%)
Surgeons	92 (41.8%)

Table 2. Comparison of Awareness and Knowledge of Interventional Radiology Between General Physicians and General Surgeons

Variable	Physicians n=128	Surgeons n=92	Total n=220	p-value
Aware of IR	101 (78.9%)	56 (60.9%)	157 (71.4%)	0.004
Adequate knowledge	68 (53.1%)	35 (38.0%)	103 (46.8%)	0.028
Previous academic exposure	80 (62.5%)	37 (40.2%)	117 (53.2%)	0.001

Table 3. Comparison of Referral Practices for Interventional Radiology Procedures Between General Physicians and General Surgeons

Variable	Physicians n=128	Surgeons n=92	Total n=220	p-value
Referred patients for IR	77 (60.2%)	38 (41.3%)	115 (52.3%)	0.007
Never referred	51 (39.8%)	54 (58.7%)	105 (47.7%)	

Table 4. Logistic Regression Analysis of Factors Associated with Adequate Awareness of Interventional Radiology

Factor	OR	95% CI	p-value
Previous academic exposure	3.21	1.82-5.66	<0.001
Clinical experience (>10 years)	1.54	0.89-2.68	0.118
Physician specialty	2.14	1.23-3.73	0.007

Table 5. Perceived Barriers to Referral for Interventional Radiology Procedures and Educational Needs Among the Study Participants

Barrier	Frequency (%)	n
Limited familiarity with Interventional Radiology procedures	151 (68.6)	
Limited interaction with interventional radiologists	121 (55.0)	
Uncertainty regarding referral indications	108 (49.1)	
Limited institutional awareness initiatives	102 (46.4)	
Limited availability of IR services	87 (39.5)	
Interest in CME/workshops on Interventional Radiology	175 (79.5)	

Figure 1. Distribution of study participants according to specialty (Physicians vs. Surgeons).

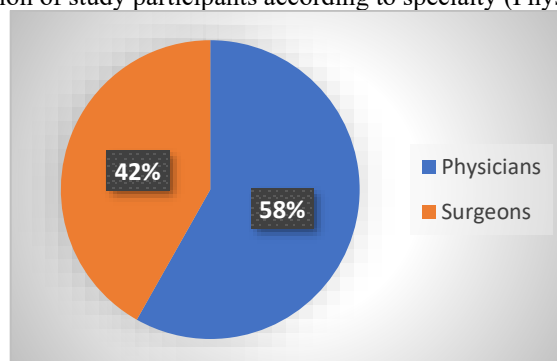


Figure 2. Awareness and knowledge of Interventional Radiology among participants.

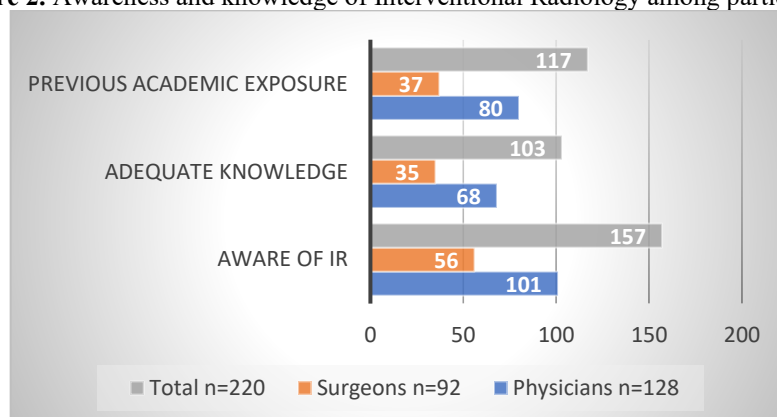


Figure 3. Referral practices for Interventional Radiology procedures

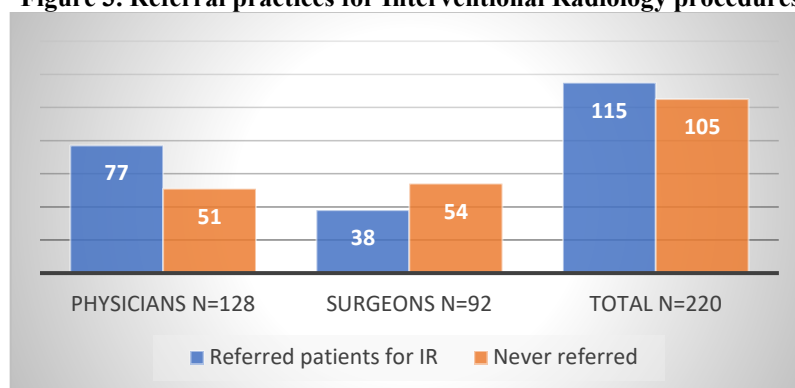
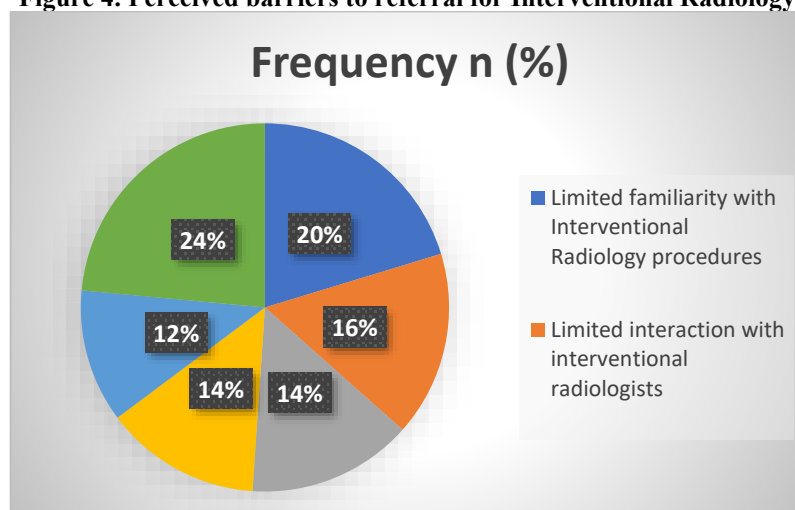


Figure 4. Perceived barriers to referral for Interventional Radiology.



DISCUSSION

Interventional Radiology (IR) has become an integral component of modern healthcare by providing minimally invasive diagnostic and therapeutic procedures that offer reduced morbidity, shorter hospital stays, faster recovery, and improved patient outcomes compared with conventional surgery.¹⁻³ However, the effective utilization of IR services largely depends on the awareness, knowledge, and referral practices of treating clinicians.

In the present study, 71.4% of participants were aware of Interventional Radiology as a specialty, while 46.8% demonstrated adequate knowledge regarding common IR procedures and their clinical indications. These findings indicate that although clinicians possess a reasonable level of awareness regarding IR, there is still considerable scope for improving familiarity with its expanding clinical applications. Shaikh et al. reported that introducing a structured undergraduate IR curriculum significantly improved knowledge and interest among medical students.⁵ Similarly, Atiiga et al. observed that although participants were aware of Interventional Radiology as a specialty, their understanding of specific procedures, indications, and referral pathways remained limited.⁶ de Gregorio et al. also reported that increased educational exposure was associated with greater knowledge and interest in IR among medical trainees.⁷

The present study demonstrated significantly higher awareness among general physicians than surgeons. This difference may be attributed to greater exposure of physicians to image-guided procedures during routine patient management and multidisciplinary clinical practice. Similar findings have been reported by Shaikh et al., Atiiga et al., and de Gregorio et al., who concluded that previous academic exposure and interaction with interventional radiologists positively influenced awareness and understanding of IR.⁵⁻⁷

Only 52.3% of participants had referred patients for Interventional Radiology procedures during the preceding year. This finding suggests that referral practices remain suboptimal despite increasing availability of minimally invasive IR procedures. Appropriate referrals depend not only on awareness of available procedures but also on confidence in identifying suitable clinical indications. Atiiga et al., Ojha et al., and Emin et al. similarly reported that clinicians and medical trainees recognized the importance of IR but lacked confidence regarding referral indications and procedural selection.^{6,8-10}

The most frequently reported barriers in the present study were limited familiarity with IR procedures, limited interaction with interventional radiologists, uncertainty regarding referral indications, and limited institutional awareness initiatives. Comparable findings were reported by Ojha et al., who emphasized the need for greater undergraduate exposure to Interventional Radiology, while Emin et al., in their systematic review, concluded that inadequate educational exposure remains one of the major reasons for the underutilization of IR services worldwide.⁸⁻¹⁰ These findings highlight the importance of strengthening institutional educational initiatives to improve referral practices.

Another important finding of the present study was the significant association between previous academic exposure to IR and higher awareness scores. Participants who had attended lectures, workshops, Continuing Medical Education (CME) programs, or conferences related to Interventional Radiology demonstrated significantly better awareness than those without prior exposure. Similar observations were reported by Shaikh et al., who demonstrated a significant improvement in knowledge following the introduction of an undergraduate IR curriculum.⁵ Likewise, Ojha et al. reported that increased educational exposure significantly improved awareness and interest in pursuing Interventional Radiology as a career.^{8,10}

The findings of the present study further support the recommendations of the European Society of Radiology (ESR) and the Cardiovascular and Interventional Radiological Society of Europe (CIRSE), both of which advocate the incorporation of structured Interventional Radiology teaching into undergraduate and postgraduate medical curricula.^{4,11} These organizations recommend classroom teaching, clinical postings, simulation-based training, and multidisciplinary case discussions to improve understanding of IR among future clinicians.

With the expanding role of minimally invasive therapies in oncology, vascular disorders, hepatobiliary diseases, trauma, and emergency medicine, multidisciplinary collaboration has become increasingly important. Regular multidisciplinary meetings and tumor board discussions involving interventional radiologists, physicians, surgeons, oncologists, and other specialists facilitate timely referrals, improve treatment planning, and optimize patient outcomes.¹⁻³

The present study has certain limitations. As a cross-sectional questionnaire-based study conducted in tertiary care teaching hospitals, the findings may not be generalizable to clinicians practicing in primary or secondary healthcare settings. In addition, the responses were self-reported and therefore may be subject to recall and response bias. Nevertheless, the study provides valuable baseline information regarding clinicians' awareness, knowledge, and referral practices related to Interventional Radiology.

Overall, the findings indicate that although awareness of Interventional Radiology among physicians and surgeons is encouraging, continued efforts are required to enhance familiarity with IR procedures, strengthen referral confidence, and promote interdisciplinary collaboration. Regular Continuing Medical Education (CME) programs, workshops, multidisciplinary meetings, and curriculum-based teaching at both undergraduate and postgraduate levels are likely to improve appropriate utilization of Interventional Radiology services and ultimately contribute to better patient care.

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CONCLUSION

The present study demonstrated that general physicians and surgeons had a satisfactory level of awareness regarding Interventional Radiology; however, familiarity with specific IR procedures and referral practices remains limited. Previous academic exposure was significantly associated with better awareness and confidence in referral. Strengthening undergraduate and postgraduate teaching, regular Continuing Medical Education (CME) programs, and multidisciplinary collaboration may enhance the appropriate utilization of Interventional Radiology services and improve patient care.

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