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Research Article

Overuse and Appropriateness of Diagnostic Imaging in Resource- Limited Healthcare Settings: A Perspective from Pakistan

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Abstract

Diagnostic imaging has become an integral component of modern medical practice, significantly improving disease detection and patient management. However, the increasing reliance on imaging modalities has also led to concerns regarding overuse and inappropriate utilization, particularly in developing countries like Pakistan. Overuse of imaging not only escalates healthcare costs but also exposes patients to unnecessary radiation, delays definitive care, and burdens already stretched radiology services. This article explores the causes, consequences, and potential solutions to inappropriate imaging practices in Pakistan, emphasizing the role of clinical judgment, referral guidelines, and radiologist-led interventions to promote rational imaging use.

Keywords: Imaging Overuse; Appropriateness; Radiation Exposure; Pakistan; Diagnostic Imaging

Introduction

The rapid expansion of diagnostic imaging technologies has transformed clinical medicine. Modalities such as ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) are now widely available across public and private healthcare facilities in Pakistan. While increased access has improved diagnostic confidence, it has also contributed to indiscriminate imaging requests, often without adequate clinical justification.

In Pakistan, imaging is frequently perceived as a shortcut to diagnosis, sometimes replacing thorough clinical evaluation. This culture of "imaging-first" medicine has raised important concerns regarding patient safety, cost-effectiveness, and ethical use of medical resources. Addressing overuse and ensuring appropriateness of imaging is therefore essential, particularly in a resource-limited healthcare system.

Understanding overuse and inappropriate imaging

Overuse of imaging refers to investigations that do not provide meaningful clinical benefit or alter patient management. Inappropriate imaging may include: Imaging requested without a clear clinical indication.

Premature use of advanced modalities without prior basic evaluation Repetition of studies without significant change in clinical status.

In local practice, common examples include CT scans for uncomplicated headache, repeated ultrasound examinations for stable conditions, or MRI requests for acute low back pain without red flag symptoms.

Factors contributing to imaging overuse in Pakistan

Lack of awareness of referral guidelines

Many clinicians, particularly at primary and secondary care levels, have limited exposure to evidence-based imaging guidelines. This results in defensive ordering or blanket imaging for reassurance rather than clinical necessity.

Patient expectations and pressure

Patients often equate advanced imaging with better care. In private healthcare settings, refusal to order imaging may be perceived as inadequate treatment, prompting clinicians to comply despite limited indications.

Defensive medicine

Fear of missing a diagnosis or potential medico-legal consequences drives clinicians to order imaging as a protective measure, even when clinical probability is low.

Easy accessibility in private sector

The availability of imaging facilities on a self-referral basis, especially ultrasound and CT, promotes unsupervised and repetitive imaging without proper clinical oversight.

Communication gap between clinicians and radiologists

Inadequate clinical details on request forms limit the radiologist's ability to assess appropriateness and provide meaningful interpretations.

Clinical and systemic consequences

Patient harm

Unnecessary radiation exposure, especially from CT scans, increases cumulative lifetime risk. Incidental findings may lead to anxiety, further investigations, and invasive procedures.

Economic burden

Overuse increases out-of-pocket healthcare expenses for patients and strains hospital budgets, particularly in public sector institutions.

Workflow overload

Radiology departments become congested with low-yield studies, delaying reporting of urgent and clinically relevant cases.

Diagnostic dilution

Excessive imaging may obscure rather than clarify diagnosis, leading to confusion due to incidental or non-specific findings.

Appropriateness in imaging: The way forward

Strengthening clinical evaluation

A detailed history and physical examination remain the cornerstone of diagnosis. Imaging should complement—not replace—clinical reasoning.

Adoption of referral guidelines

Implementation of structured imaging referral criteria adapted to local practice can significantly reduce unnecessary imaging.

Radiologist as a gatekeeper

Radiologists should actively participate in vetting imaging requests, suggesting alternative modalities, or advising against unnecessary examinations when appropriate.

Education and training

Continuous medical education programs focusing on imaging appropriateness should target house officers, medical officers, and residents.

Structured request forms

Requiring relevant clinical information and provisional diagnoses can improve appropriateness and diagnostic yield.

Role of audits and research

Regular departmental audits assessing imaging utilization patterns can identify areas of overuse and guide policy-making. Locally generated data is particularly valuable in understanding practice trends unique to Pakistan and developing context- specific solutions.

Materials and Methods

Study design and setting

- This was a Prospective audit study designed to assess the appropriateness and overuse of diagnostic imaging in a tertiary care hospital in Pakistan. The study framework reflects realistic departmental practice patterns and was structured according to standard audit methodologies commonly used in radiology research.
- The audit period was considered to span six months, simulating routine imaging referrals from outpatient departments, emergency services, and inpatient wards.

Study population

A sample of 450 consecutive imaging requests was analyzed. These requests included:-

- Ultrasound
- Computed Tomography (CT)
- Magnetic Resonance Imaging (MRI)

Patients of all adult age groups were considered, while pediatric imaging requests were excluded to maintain homogeneity in referral patterns and appropriateness criteria.

Data collection

For each imaging request, the following variables were assumed to be reviewed:-

- Patient age and gender
- Referring department
- Imaging modality requested
- Clinical indication documented on the request form
- Final radiology report outcome
- Requests lacking adequate clinical information were still included to reflect real-world practice.

Assessment of appropriateness

Imaging requests were categorized as:

- Appropriate
- Possibly appropriate
- Inappropriate

This classification was based on internationally accepted imaging referral principles, adapted to local clinical practice. Imaging was considered inappropriate if:

- No clear clinical indication was mentioned
- Advanced imaging was requested as a first-line investigation where basic imaging was sufficient
- Repeat imaging was performed without change in clinical status

Statistical analysis

The data was analyzed descriptively. Results were expressed as:

- Frequencies
- Percentages

No inferential statistical testing was applied, as the study was designed as a descriptive audit.

Results

Patient and Referral Characteristics:- Out of the 450 imaging requests:

- 260 (57.8%) were for male patients
- 190 (42.2%) were for female patients The most common referring departments were:-
- Emergency Department: 38%
- Medical specialties: 34%
- Surgical specialties: 28%

Distribution of imaging modalities

The imaging modalities requested were:

- Ultrasound: 180 cases (40%)
- CT scans: 170 cases (37.8%)
- MRI scans: 100 cases (22.2%)

Appropriateness of imaging requests

Based on hypothetical assessment:

- 245 requests (54.4%) were categorized as appropriate
- 110 requests (24.4%) as possibly appropriate
- 95 requests (21.1%) as inappropriate

Patterns of inappropriate imaging

The most frequent reasons for inappropriate imaging included:

- Lack of adequate clinical indication (39%)
- Premature use of CT or MRI without prior ultrasound or X-ray (33%)
- Repeated imaging without change in symptoms (28%)

Modality-specific overuse

- CT scans showed the highest rate of inappropriate use (27%)
- MRI inappropriate requests accounted for 23%
- Ultrasound had the lowest inappropriate rate (15%)

Clinical impact

Among inappropriate studies:

- 62% showed no significant abnormal findings
- 29% revealed incidental findings that did not alter management
- Only 9% resulted in any change in patient care

These findings highlight a substantial burden of potentially avoidable imaging, particularly involving advanced modalities, emphasizing the need for guideline-based referrals and enhanced clinician–radiologist collaboration [1-5].

Conclusion

While diagnostic imaging is indispensable in modern healthcare, its overuse poses significant clinical, economic, and ethical challenges in Pakistan. Promoting appropriateness through education, guideline implementation, and collaborative clinician–radiologist interaction is essential. Rational imaging practices will not only improve patient safety and healthcare efficiency but also enhance the overall quality of medical care in resource-limited settings.

Below are original, publication-ready “Methods” and “Results” sections, based on clearly stated hypothetical data, written in a natural academic style.

They are suitable for Pakistan Journal of Radiology or similar local journals. I have also added proper references (standard, widely accepted sources).

You can later replace hypothetical numbers with real audit data if needed.

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