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Optimizing Radiology Workflow Through Pharmacist-Led Interventions: A Study FROM A Tertiary Hospital IN Saudi Arabia

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Abstract

Background: Disruptions in radiology scheduling frequently stem from complications associated with contrast media, most notably nephrotoxicity and hypersensitivity reactions. Integrating a clinical pharmacist into this environment has emerged as a viable strategy to streamline procedures and strengthen patient safety.

Objective: This investigation sought to quantify the influence of pharmacist integration on operational efficiency and clinical outcomes in the imaging department of a tertiary Saudi hospital.

Methods: In a prospective observational design, adult patients scheduled for contrast-enhanced studies were enrolled. The pharmacist conducted risk assessments, oversees premedication, and orchestrates nephroprotection measures. Workflow metrics and adverse event rates were analyzed before and after the intervention.

Results: The median interval from registration to completion fell from 8.4 hours to 5.2 hours. Cancellations linked to contrast precautions declined from 12.5% to 4.3%. Rates of contrast-induced nephropathy and allergic events dropped by more than 60%. Ninety-three distinct interventions were documented, underscoring the pharmacists contribution to safety and efficiency.

Conclusion: Embedding a pharmacist in radiology markedly acceleres workflow and reduces harm. These results advocate for structured interprofessional collaboration as a blueprint for refining diagnostic services in tertiary centers.

Keywords: *Radiology Workflow, Pharmacist Intervention, Contrast Media, Nephrotoxicity, Premedication, Imaging Efficiency, Tertiary Hospital, Patient Safety.*

INTRODUCTION

Because contemporary healthcare systems are larger and more interconnected than ever, managing each patient from first referral through discharge now relies on coordinated action rather than isolated specialty decisions. This is particularly true in tertiary hospitals, where patients arrive with multiple comorbidities and expectations for rapid diagnosis and treatment. In the radiology suite, however, delays caused by issues surrounding contrast media—nephrotoxicity, hypersensitivity, and inadvertent drug interactions—can stall entire imaging schedules, skew clinical findings, and in the worst cases, harm patients.

Pharmacists sit at the centre of medication expertise and risk stratification, a position that increasingly positions them as key allies on the imaging team. Evidence now shows that pharmacist-led actions such as reviewing renal function before contrast, managing premedication for allergic patients, and tracking nephrotoxicity afterwards significantly trim turnaround times and boost clinical outcomes. For example, a recent project in a large teaching hospital found that a pharmacy-driven iodinated contrast review cut pre-imaging delays, eased workflow and made better use of expensive scanning time (Jiang et al., 2023).

The need for this partnership becomes clearer when one considers that multiple nephrotoxic drugs raise the danger of radiocontrast-induced kidney injury, yet these medications often appear on the records of patients scheduled for contrast-enhanced CT (Ho et al., 2015). Furthermore, the long-standing practice of having pharmacists monitor adverse events after imaging has consistently shown that such surveillance catches problems early, allowing providers to intervene before complications escalate (Damiani & Swanson, 1994).

National guidelines and recent clinical reviews encourage health-care teams to adopt formal, cross-disciplinary strategies for managing contrast media, positioning the pharmacist-radiologist partnership as a key element in achieving both safe and efficient imaging processes (Macdonald et al., 2022; Beckett et al., 2015).

Against this backdrop, the present study investigates the effects of embedding pharmacists within radiology operations at a large tertiary center in Saudi Arabia, examining whether systematic pharmaceutical input can shorten study wait times, reduce contrast-related risks, and foster smoother collaboration among departments.

LITERATURE REVIEW

Embedding pharmacists within radiology departments has quickly become a practical move for smoothing day-to-day operations and boosting patient safety, especially during contrast studies. Studies from the past twenty years consistently highlight how pharmacists can screen for underlying problems, supervise premedication regimens, and check in with patients after the procedure.

CONTRAST MEDIA RISK ASSESSMENT:

Jiang and colleagues (2023) showed that a pharmacist-driven risk-assessment clinic for iodinated agents reduced adverse events in a large urban hospital. By flagging patients with known allergies or borderline kidney function before the study, the team minimized last-minute cancellations and kept the imaging schedule on track. Their tailored prophylaxis plans also narrowed communication gaps between the pharmacy and the radiology unit.

NEPHROTOXICITY PREVENTION:

Strong evidence links some common drugs with a higher chance of contrast-induced nephropathy (CIN). In a landmark trial, Ho et al. (2015) reported that hospitalized adults taking multiple nephrotoxic agents faced about triple the risk. The authors urged hospitals to rely on pharmacist-led medication reviews before any contrast study; doing so not only guards kidneys but also cuts the downstream delays seen after emergency admissions or prolonged stays.

PREMEDICATION AND ADVERSE EVENT MONITORING:

Pharmacists are vital to premedication plans for patients with a history of contrast allergy. Early work by Damiani and Swanson (1994) first documented pharmacist-run monitoring, showing that trained pharmacy staff catch and address adverse reactions sooner. This proactive system boosts patient safety and keeps the imaging schedule moving by averting many emergency calls and last-minute cancellations.

GUIDELINE SUPPORT FOR MULTIDISCIPLINARY COLLABORATION:

Current institutional and national guidelines promote teamwork when managing contrast media. Canadas 2022 Radiologists Association policy now calls for pharmacists to help evaluate risk and safeguard kidney function. This recommendation echoes earlier reviews, such as the one by Beckett et al. (2015), which asserted that radiologists should know drug protocols and regularly consult pharmacy colleagues to ensure safe, efficient imaging.

WORKFLOW AND SYSTEM-LEVEL IMPACT:

Beyond clinical gains, pharmacists influence the broader workflow, a benefit institutions cannot overlook. Facilities report clearer interdepartmental communication, fewer imaging delays, and smoother patient flow after integrating pharmacynto the contrast review team. Such operational improvements strengthen the case for embedding pharmacists in radiology, especially in high-demand tertiary care centres that process large volumes of procedures.

METHODOLOGY

STUDY DESIGN AND SETTING

This research took the form of a six-month, prospective observational study at a tertiary Saudi hospital. Its principal objective was to assess how pharmacist-led interventions influence imaging workflows and patient outcomes linked to contrast media use in the radiology department.

STUDY POPULATION

Eligible participants were adult patients aged 18 years and older scheduled for contrast-enhanced CT or MRI scans. Inclusion required at least one of the following conditions: known contrast allergy, renal insufficiency (eGFR <60 mL/min/1.73 m2), or concurrent use of drugs that damage the kidney. Patients in the intensive-care unit or requiring emergency imaging were excluded to limit variability in clinical workflow.

INTERVENTION AND WORKFLOW INTEGRATION

A dedicated clinical pharmacist was embedded within the radiology department throughout the study period. The intervention included:

- Pre-imaging risk assessment: Evaluation of patient medication profiles, renal function, and allergy history.
- Premedication protocols: Development and administration of individualized corticosteroid-antihistamine regimens for patients with prior contrast media reactions.
- Nephrotoxicity management: Temporary suspension or adjustment of nephrotoxic medications in coordination with prescribing physicians, and administration of hydration protocols as indicated.
- Communication and documentation: All pharmacist assessments were documented in the electronic health record and discussed with the radiology team during daily imaging rounds.

Data Collection

Data were collected from hospital records, imaging logs, and pharmacist intervention forms. Primary outcomes included:

- Imaging workflow metrics: Time from imaging order to scan completion, imaging cancellations, and rescheduling rates.
- Clinical outcomes: Incidence of contrast-induced nephropathy (defined as ≥25% increase in serum creatinine within 72 hours), allergic reactions, and emergency interventions.
- Pharmacist interventions: Number and type of interventions performed, including premedication initiation, drug withholding recommendations, and hydration protocols.

DATA ANALYSIS

Descriptive statistics summarized patient demographics and types of interventions. For continuous variables, t-tests or Mann-Whitney U tests were applied, and for categorical variables, chi-square tests were used. A pre-post analysis compared workflow and clinical outcomes before and after the implementation of the pharmacist-integrated protocol.

ETHICAL CONSIDERATIONS

The study received approval from the hospitals Institutional Review Board. Informed consent was waived because the interventions were part of routine care and classified as a quality-improvement project.

FINDINGS

IMAGING WORKFLOW METRICS

Introducing pharmacist-led protocols in the radiology department has noticeably streamlined departmental workflow. The median interval from when an imaging order is placed to when the scan actually occurs dropped by more than three hours. There was also a marked reduction in cancellations and rescheduling stemming from contrast-related complications. Complete performance metrics appear in Table 1.

Table 1. Imaging Workflow Metrics (Pre- vs. Post-Intervention)

Metric	Pre-Intervention	Post-Intervention
Median time from imaging order to scan (hours)	8.4	5.2
Imaging cancellations (%)	12.5	4.3
Rescheduling due to contrast issues (%)	9.1	2.7

CLINICAL OUTCOMES

When pharmacists participated in patient care, safety outcomes improved noticeably. The rate of contrast-induced nephropathy, for example, fell from 6.8 percent to just 2.3 percent. Rates of allergic reactions and the subsequent need for emergency interventions related to contrast media also dropped substantially, as summarised in Table 2.

Table 2. Clinical Outcomes (Pre- vs. Post-Intervention)

Outcome	Pre-Intervention	Post-Intervention
Contrast-induced nephropathy (%)	6.8	2.3
Allergic reactions (%)	3.4	1.1
Emergency interventions needed (%)	2.9	0.5

PHARMACIST INTERVENTIONS

During the observation window, pharmacists logged 199 separate, written interventions directed at streamlining imaging procedures and enhancing patient safety. The specifics of these actions appear in Table 3.

Table 3. Summary of Pharmacist Interventions

Intervention Type	Count
Premedication protocol initiated	56
Medication withholding for nephrotoxicity	48
Hydration protocol recommended	34
Medication review and adjustment	61

DISCUSSION

The data from this study underscore the positive implications of embedding pharmacists within the radiology workflow of a tertiary hospital in Saudi Arabia. Faster imaging turnaround, fewer contrast-associated complications, and tighter medication oversight together affirm that cross-disciplinary teamwork enhances the performance of diagnostic imaging.

WORKFLOW OPTIMIZATION

A drop in median imaging turnaround from 8.4 to 5.2 hours demonstrates that pharmacist-led risk checks and medication audits can move radiology work forward. By flagging patients vulnerable to contrast-related harms and setting preventive plans in motion, pharmacists cut scheduling interruptions and preserve the timely imaging that is vital in a tertiary centre; delays in diagnosis here often spiral into delayed treatment.

The substantial decline in cancellations and rescheduling reinforces the operational gains. These trends signal more thorough pre-procedure readiness, smoother communication between pharmacy and radiology, and more judicious use of scarce imaging slots. Similar improvements have emerged in the literature, including work by Jiang et al. (2023), who linked pharmacist-managed contrast-risk clinics to greater procedural efficiency.

CLINICAL IMPACT

Patients who received pharmacist-led care showed far fewer cases of contrast-induced nephropathy, allergic reactions, or the need for emergency procedures. These improvements mirror earlier findings from Ho et al. (2015) and Damiani and Swanson (1994), which also reported lower complication rates in high-risk populations when pharmacists were closely involved.

By starting intravenous hydration and temporarily stopping drugs known to harm the kidneys, pharmacists eased the strain on these patients in real time. They further crafted tailored premedication regimens for people with prior contrast allergies, an advance that prevented many last-minute test cancellations and reduced the burden on acute-care services.

INSTITUTIONAL AND POLICY IMPLICATIONS

Together, the data argue for hospitals with busy imaging suites to give pharmacists a permanent seat at the table. Professional groups like the Canadian Association of Radiologists have championed this idea, stating that coordinated, team-based care boosts both patient outcomes and overall system efficiency.

Though helpful, the findings come from a single-center, observational study, so their reach may not yet extend to every setting. Even so, the pattern of benefits seen in clinical markers and workflow metrics suggests that adding pharmacists is a safe, broadly portable change any large facility could adopt.

CONCLUSION

Embedding pharmacists within the radiology workflow at a tertiary care hospital markedly enhanced operational efficiency and patient safety. Pharmacist-led activities-such as assessing contrast-media risk, managing premedication, and mitigating nephrotoxicity-pared imaging delays, lowered adverse events, and strengthened coordination among departments. These results endorse a multidisciplinary, collaborative approach for optimizing imaging services in high-volume healthcare settings.

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