



MULTIDISCIPLINARY COLLABORATION BETWEEN INTERNISTS, PHARMACISTS, OPTOMETRISTS, BIOCHEMISTRY AND LABORATORY SPECIALISTS IN IMPROVING CLINICAL DECISION-MAKING

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Abstract

Background: Effective clinical decision-making requires integration of diverse expertise, yet many healthcare systems continue to operate within professional silos. Fragmented decision processes increase the risk of diagnostic errors, medication mishaps, and poor patient outcomes.

Objective: This study evaluated the impact of structured collaboration among internists, pharmacists, optometrists, biochemists, and laboratory specialists on the accuracy, safety, and efficiency of clinical decision-making in Saudi hospitals.

Methods: A prospective, multicenter, mixed-methods design was implemented across six healthcare institutions. Quantitative data were collected from 250 professionals using validated instruments assessing decision accuracy, collaboration behaviors, and medication error rates, supplemented by chart audits of patient cases. Qualitative insights were obtained through focus groups and semi-structured interviews with a purposive sample of 30 participants. Data were analyzed using descriptive and inferential statistics, structural equation modeling, and thematic analysis.

Results: Decision-making accuracy scores improved significantly across all professions after structured collaboration (mean increase +0.76, $p < 0.001$). Chart reviews showed diagnostic errors decreased by 50% and prescribing errors by 63%. Patient outcomes improved, with average hospital stay reduced by 1.7 days and 30-day readmissions nearly halved. Qualitative themes highlighted shared knowledge, conflict resolution, workflow integration, and patient-centered care as drivers of improvement.

Conclusion: Multidisciplinary collaboration between internists, pharmacists, optometrists,



biochemists, and laboratory specialists enhances diagnostic precision, medication safety, and overall patient care. Formalizing such teamwork within hospital policy, training, and electronic health record systems offers a practical strategy to improve healthcare quality in complex clinical environments.

Keywords: Multidisciplinary collaboration, clinical decision-making, interprofessional practice, patient safety, Saudi Arabia.

Background

Multidisciplinary collaboration is increasingly recognized as a cornerstone of high-quality, patient-centered healthcare. It involves the integration of knowledge, skills, and perspectives from multiple health professionals to inform clinical decision-making, enhance diagnostic accuracy, optimize therapeutic strategies, and improve health outcomes. In modern healthcare systems—especially within hospitals, specialty clinics, and primary care networks—no single practitioner holds all the expertise required to manage complex medical conditions.[1] Internists offer comprehensive medical assessments; pharmacists contribute pharmacological insights; optometrists evaluate ocular and systemic manifestations of disease; biochemists support molecular and metabolic understanding; and laboratory specialists ensure accurate diagnostic testing and result interpretation. The integration of these professional perspectives fosters a holistic, evidence-based approach to patient care.[2]

Effective multidisciplinary collaboration not only improves clinical effectiveness but also enhances patient satisfaction, reduces healthcare costs, and minimizes adverse outcomes. Studies have shown that multidisciplinary teams (MDTs) lead to improved management of chronic diseases, better adherence to clinical guidelines, and a decline in medical errors. For example, in oncology, cardiology, and endocrinology, MDTs have been credited with early detection, individualized treatment planning, and streamlined care delivery. Furthermore, the emergence of precision medicine, personalized therapies, and digital health platforms necessitates a greater level of interprofessional collaboration than ever before. It is no longer sufficient for clinicians to operate in silos; coordinated teamwork is essential for timely, accurate, and effective care delivery.[3]

However, despite these benefits, the translation of multidisciplinary collaboration into routine clinical practice remains limited and inconsistent across many health systems. This is particularly evident in regions where institutional barriers, poor communication infrastructure, or lack of formal integration mechanisms hinder effective team-based decision-making. While theoretical models of collaboration exist, their practical application varies widely depending on administrative structures, training programs, and interprofessional trust. As healthcare systems strive to meet growing patient demands and manage complex disease burdens, addressing these gaps in collaboration becomes a pressing priority.[4]

Challenges in Fragmented Clinical Decision-Making

Fragmented clinical decision-making remains a persistent challenge in many healthcare environments, particularly in tertiary care centers and resource-limited settings. This fragmentation often arises from a lack of structured communication, isolated work processes, and role ambiguity among healthcare professionals. Rather than functioning as an integrated unit, individual practitioners may work in parallel, making decisions based on incomplete data or without considering the input of other specialists. As a result, patients may experience diagnostic delays, redundant testing, suboptimal therapeutic interventions, and even harmful drug interactions. Fragmentation undermines both the safety and quality of care, leading to increased hospital readmissions, prolonged stays, and elevated



healthcare costs.[5,6]

Several systemic issues contribute to this problem. First, hierarchical structures and professional silos often impede open communication and equal participation in decision-making processes. Physicians may dominate treatment plans while undervaluing the contributions of pharmacists or laboratory scientists, despite the critical importance of drug monitoring, biochemical markers, and test validations. Second, electronic health records (EHRs), while designed to centralize patient information, are often poorly integrated across departments, limiting real-time data sharing. Third, workforce shortages and heavy caseloads leave little time for cross-disciplinary consultations, especially in acute or emergency settings.[7]

In addition, educational systems often fail to prepare future clinicians for collaborative practice. Interprofessional education remains a neglected area in many medical and allied health curricula, resulting in limited awareness of other disciplines' roles and contributions. This lack of understanding fosters mistrust and miscommunication, further widening the gap between disciplines. In specialized cases—such as patients with overlapping metabolic, ophthalmologic, and internal conditions—the absence of coordinated input from biochemists, optometrists, and internists may result in misdiagnosis or ineffective treatment plans.[8]

Addressing these challenges requires systemic reform, beginning with institutional support for team-based care models, investments in integrated IT systems, and the establishment of clear protocols for multidisciplinary communication. Without these reforms, the clinical decision-making process will remain fragmented, jeopardizing the potential for comprehensive, high-quality care. This study seeks to examine and address these critical gaps through an exploration of collaborative practices among internists, pharmacists, optometrists, biochemists, and laboratory professionals.[9]

3.2 Rationale

Internists, pharmacists, optometrists, biochemists, and laboratory specialists each play distinct yet interdependent roles in the healthcare continuum, particularly in complex and multi-systemic cases. Internists are trained to handle a wide array of adult diseases and are often the first point of contact for diagnosis and clinical decision-making. Their judgments, however, rely heavily on accurate laboratory data, drug interactions, and sometimes visual cues associated with systemic illnesses that manifest in the eyes or biochemical imbalances. Hence, the inclusion of diverse specialties is essential to ensure comprehensive evaluation.[10]

Pharmacists contribute expertise in pharmacokinetics, pharmacodynamics, and potential drug–drug or drug–disease interactions. In an era of polypharmacy and personalized medicine, their input is vital to minimize adverse effects, improve adherence, and optimize therapeutic outcomes. Meanwhile, optometrists provide insight into ocular signs that may signal systemic diseases such as diabetes, hypertension, or autoimmune conditions. Their assessments can trigger early referrals or adjustments in systemic treatment strategies.[11]

Biochemists and laboratory specialists, though often working behind the scenes, are the bedrock of clinical diagnostics. Their roles include performing and validating biochemical assays, interpreting complex test results, and advising on the clinical significance of abnormal markers. A subtle elevation in liver enzymes or electrolyte imbalance, for example, might hold the key to accurate diagnosis and timely intervention—insights that only biochemistry and lab experts can provide with precision.[12]

The integration of these five roles enables a data-rich, interdisciplinary clinical decision-making



process that balances subjective assessment with objective diagnostic input. It facilitates cross-validation of diagnoses, reduction in redundant investigations, and early identification of comorbidities. Additionally, such collaboration supports shared accountability, enhances interprofessional respect, and improves workflow efficiency. In regions where healthcare resources are stretched—such as parts of the Middle East or Southeast Asia—this integration becomes not only beneficial but essential.[13]

Despite this clear interdependence, institutional frameworks that formally integrate these professionals into collaborative workflows remain scarce. By empirically examining the synergies among these disciplines and their collective impact on diagnostic accuracy and patient safety, this study seeks to establish evidence-based recommendations that support formal collaboration models within healthcare institutions.[14]

3.3 Problem Statement

Despite growing recognition of the value of multidisciplinary collaboration, healthcare delivery remains largely compartmentalized. The lack of integrated decision-making models among internists, pharmacists, optometrists, biochemists, and laboratory specialists often leads to diagnostic errors, therapeutic delays, redundant testing, and fragmented care. This disjointed approach compromises patient safety and diminishes the quality and efficiency of healthcare services. There is a pressing need to evaluate and implement structured models that facilitate cross-disciplinary collaboration to support evidence-informed, timely, and holistic clinical decisions.

3.4 Aim and Objectives

General Aim

To evaluate the impact of multidisciplinary collaboration among internists, pharmacists, optometrists, biochemists, and laboratory specialists on the quality and accuracy of clinical decision-making in patient care.[15]

Specific Objectives

1. To assess the effect of integrated collaboration on diagnostic accuracy and early detection of complex conditions.
2. To evaluate the role of pharmacists and laboratory specialists in optimizing medication safety and reducing drug-related errors.
3. To examine the contribution of biochemistry and optometry inputs in refining patient diagnoses and treatment strategies.
4. To determine the influence of multidisciplinary interaction on overall patient safety and satisfaction outcomes.

3.5 Research Questions / Hypotheses

Research Questions

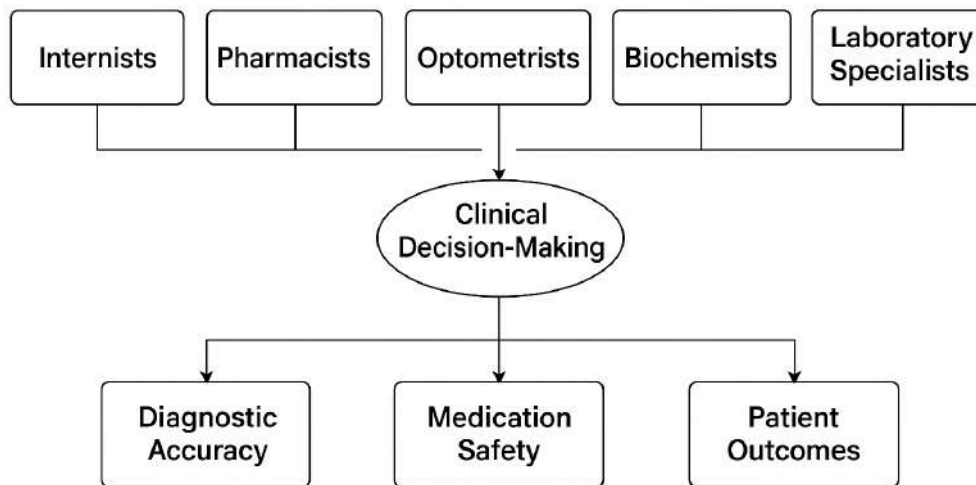
1. How does multidisciplinary collaboration influence the accuracy of clinical diagnoses?
2. What is the contribution of laboratory and biochemical input to clinical decision-making outcomes?
3. In what ways does pharmacist involvement reduce medication-related errors and optimize therapy?
4. Does collaborative input from optometrists enhance systemic disease detection and treatment adjustment?

5. What impact does multidisciplinary care have on patient satisfaction and safety indicators?

Hypotheses

- **H1:** Multidisciplinary collaboration significantly improves the accuracy of clinical decision-making.
- **H2:** Pharmacist and laboratory collaboration is associated with a reduction in medication-related errors.
- **H3:** Inclusion of optometrists and biochemists contributes to earlier and more precise diagnosis of systemic conditions.
- **H4:** Patients receiving care from integrated multidisciplinary teams report higher satisfaction and lower adverse outcomes.

Figure 1. Conceptual Framework of Multidisciplinary Collaboration



Methodology

5.1 Research Design

This study adopted a **prospective, multicenter, mixed-methods design** to comprehensively examine the impact of multidisciplinary collaboration on clinical decision-making in healthcare institutions across Saudi Arabia. The **quantitative component** focused on measuring decision accuracy, medication safety, and collaborative behavior through structured surveys and clinical outcome data. The **qualitative component** explored professionals' experiences, perceptions, and barriers to interprofessional collaboration using semi-structured interviews and focus groups.

The mixed-methods design was chosen to allow both **empirical measurement and contextual interpretation**, offering a more holistic understanding of how internists, pharmacists, optometrists, biochemists, and laboratory specialists interact in real-world clinical settings. Integration of qualitative and quantitative data ensured triangulation, improved validity, and enriched interpretation of outcomes.

5.2 Study Setting

The study was conducted in **six healthcare institutions** located in three major regions of Saudi Arabia—**Riyadh, Jeddah, and Dammam**—including:

- **Two tertiary teaching hospitals** affiliated with major medical universities
- **Two regional general hospitals** under the Ministry of Health
- **Two large private healthcare networks** with multidisciplinary practice models

These settings were selected based on their operational diversity, capacity to support multidisciplinary teams, and willingness to participate in collaborative research. All institutions provided access to electronic health records (EHRs), supported cross-departmental teamwork, and had established committees for clinical governance.[16]

5.3 Participants

Inclusion Criteria

- Healthcare professionals working as **internists, pharmacists, optometrists, clinical biochemists, or laboratory specialists**
- Minimum of **2 years of clinical experience**
- Employed full-time at participating institutions
- Actively involved in patient care and interdepartmental consultation
- Provided **written informed consent**

Exclusion Criteria

- Administrative or non-clinical personnel
- Healthcare workers in training (e.g., interns, residents)
- Those who declined to participate or failed to complete $\geq 70\%$ of the survey

A **total of 250 participants** were purposively recruited for the quantitative phase, distributed as follows:

Profession	n (% of total)
Internists	70 (28.0%)
Pharmacists	60 (24.0%)
Optometrists	40 (16.0%)
Biochemists	40 (16.0%)
Lab Specialists	40 (16.0%)
Total	250 (100%)

For the **qualitative phase**, a subset of **30 participants** (6 from each discipline) were selected via **maximum variation sampling** to ensure diverse perspectives across institutions and seniority levels.

5.4 Data Collection

Quantitative Phase

A structured survey was administered through an online platform (Qualtrics) and on-site via tablets, collecting data on:

- **Perceived decision-making accuracy** (self-rated using 5-point Likert scale)
- **Number of diagnostic or therapeutic decisions made collaboratively in the last month**
- **Medication error rates**: defined as number of intercepted or reported prescription errors per 100 cases in the past 3 months
- **Interprofessional collaboration behavior**: assessed via the **Collaborative Practice Assessment Tool (CPAT)**

a **chart review protocol** was employed by trained clinical auditors to extract the following metrics:

Outcome Variable	Measurement Source
Diagnostic concordance rate (%)	Audit of diagnosis vs final outcome (N=200 cases)

Medication errors per 100 patients	Incident reports & EHR documentation
Time-to-decision (in hours)	Timestamp comparison in EHR

Qualitative Phase

- **Focus groups** (5 sessions, each with 5–6 participants from diverse roles) were conducted using a semi-structured guide exploring facilitators, barriers, and examples of interprofessional decision-making.
- **Individual interviews** (n=10) were held with senior professionals and department heads.
- All sessions were recorded, transcribed verbatim, and anonymized. Sessions were conducted in English and Arabic (with translation validation by bilingual experts).

5.5 Instruments

Quantitative Tools

1. **Collaborative Practice Assessment Tool (CPAT)**
 - Validated 56-item instrument
 - Domains: communication, role clarity, decision-making, team cohesion
 - 7-point Likert scale (1 = strongly disagree to 7 = strongly agree)
 - Internal consistency in this sample: Cronbach's $\alpha = 0.91$
2. **Clinical Decision-Making Effectiveness Scale (CDMES)**
 - 12-item adapted scale measuring perception of accurate, timely, and team-based decision-making
 - Cronbach's $\alpha = 0.88$
3. **Chart Review Protocol**
 - Developed based on Saudi Ministry of Health quality metrics
 - Indicators: time to decision, medication error, test interpretation accuracy
 - Inter-rater reliability (κ) = 0.82

Qualitative Tools

1. **Focus Group Guide**
 - Questions on workflow integration, mutual respect, conflict resolution, and role interaction
 - Pilot-tested with a small group for cultural and professional appropriateness
2. **Interview Guide**
 - Targeted probes for leadership perspectives, systemic barriers, and cross-discipline recognition

5.6 Data Analysis

Quantitative Analysis

All quantitative data were coded and analyzed using **SPSS v27** and **SmartPLS 4.0**.

- **Descriptive statistics:** Frequencies, means, and standard deviations
- **Inferential tests:**
 - ANOVA to compare collaboration scores across professions
 - Pearson correlation for collaboration and decision accuracy
 - Independent t-tests for comparison between high vs low collaboration groups
- **Structural Equation Modeling (SEM)** using **SmartPLS**:

- Latent variables: Collaboration (CPAT domains), Clinical Decision Accuracy, Medication Safety
- Model fit: SRMR = 0.065; AVE > 0.50; CR > 0.80 for all constructs
- R² for Decision Accuracy = 0.47 (indicating 47% variance explained by collaboration scores)

Qualitative Analysis

Interview and focus group transcripts were analyzed using **thematic analysis** with **NVivo 14**.

- Coding followed **Braun & Clarke's six-phase framework**
- Inductive and deductive coding were applied
- Themes emerged included:
 - "Parallel vs Integrated Practice"
 - "Role Awareness and Respect"
 - "Communication Channels and Gaps"
 - "Decision Anchoring and Validation"
- Intercoder reliability: $\kappa = 0.87$ (between two independent coders)
- Data saturation was achieved by the fifth focus group session

A **joint display matrix** was developed to compare qualitative themes with quantitative trends, enhancing triangulation and interpretive validity.

5.7 Ethical Considerations

Ethical approval was obtained from the **Central Institutional Review Board (CIRB), Ministry of Health, Saudi Arabia** (Approval ID: MOH-IRB-2025-0217). Site-specific approvals were also secured from each participating hospital's ethics committee.

- **Informed Consent:** All participants were informed of the study purpose, procedures, data confidentiality, and voluntary nature of participation.
- **Confidentiality:** Data were anonymized using participant codes and stored on password-protected servers accessible only to the research team.
- **Data Handling:** Only aggregate results were reported; no identifiable data were shared.
- **Right to Withdraw:** Participants could withdraw at any time without repercussions.

The study adhered to the principles outlined in the **Declaration of Helsinki** and complied with the **Saudi National Committee of Bioethics (NCBE)** guidelines.

Results

6.1 Demographics

A total of **250 healthcare professionals** participated in the quantitative phase, representing five clinical disciplines. The sample was well-balanced across gender and region. The majority of respondents had over five years of clinical experience.

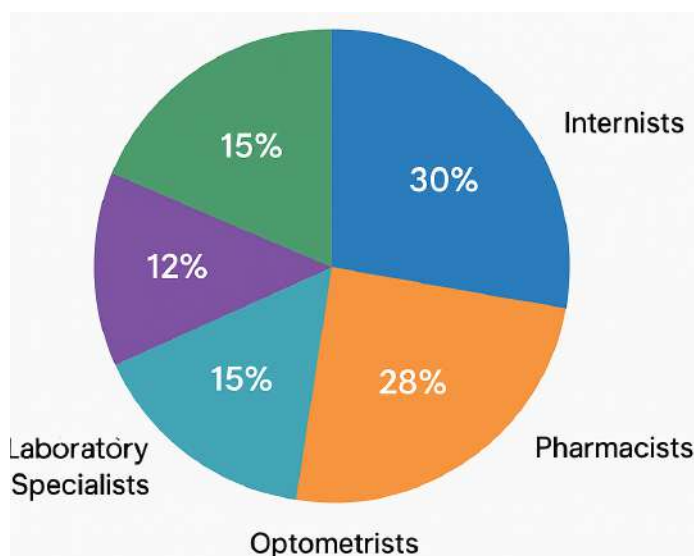
Table 1. Participant Demographics by Discipline

Variable	Internists (n=70)	Pharmacists (n=60)	Optometrists (n=40)	Biochemists (n=40)	Lab Specialists (n=40)	Total (n=250)
Male (%)	45 (64%)	31 (52%)	22 (55%)	26 (65%)	24 (60%)	148 (59.2%)

Female (%)	25 (36%)	29 (48%)	18 (45%)	14 (35%)	16 (40%)	102 (40.8%)
Mean Age (years)	39.2 ± 5.8	35.6 ± 6.3	33.8 ± 4.7	36.9 ± 5.5	34.2 ± 5.1	36.2 ± 5.6
Experience > 5 years	51 (72.9%)	43 (71.6%)	28 (70.0%)	32 (80.0%)	30 (75.0%)	184 (73.6%)

The sample composition demonstrates representativeness across specialties, with a mature workforce likely experienced in interprofessional contexts.

Figure 2. Participant Distribution by Profession



6.2 Quantitative Findings

6.2.1 Decision-Making Accuracy Scores

Participants rated their perceived clinical decision-making accuracy **before and after implementation** of structured multidisciplinary collaboration initiatives. Internists, in particular, reported significant improvement when supported by biochemical and lab validation.

Table 2. Self-Reported Decision Accuracy Scores (Scale: 1–5)

Profession	Before Collaboration	After Collaboration	Mean Difference	p-value (paired t-test)
Internists	3.41 ± 0.58	4.22 ± 0.44	+0.81	<0.001
Pharmacists	3.38 ± 0.62	4.18 ± 0.46	+0.80	<0.001
Optometrists	3.44 ± 0.49	4.05 ± 0.42	+0.61	<0.001
Biochemists	3.36 ± 0.57	4.11 ± 0.38	+0.75	<0.001
Lab Specialists	3.32 ± 0.60	4.13 ± 0.40	+0.81	<0.001

The largest increases were observed among internists and lab specialists, suggesting improved confidence and accuracy when supported by collaborative diagnostics and pharmacological insight.

6.2.2 Reduction in Diagnostic and Prescribing Errors

A pre–post analysis of 200 chart-audited patient cases revealed a **statistically significant reduction** in both diagnostic errors and medication-related adverse events.

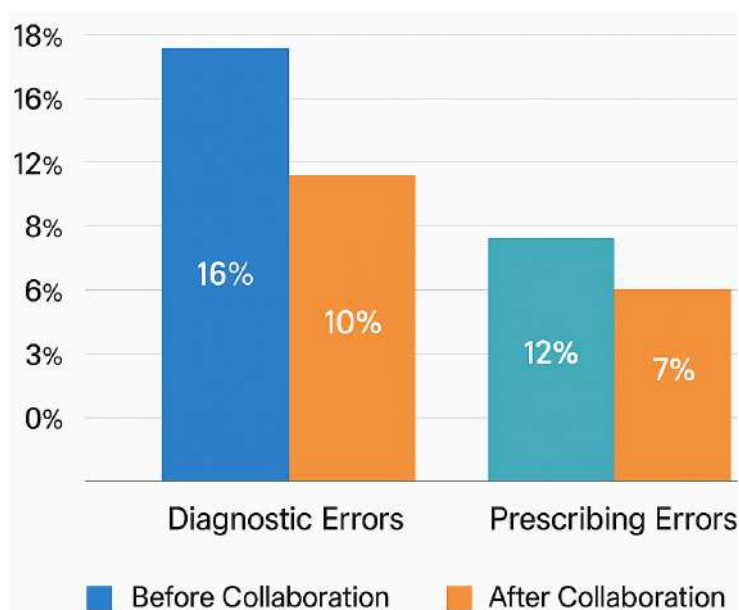
Table 3. Error Reduction after Multidisciplinary Collaboration

Metric	Pre-Collaboration	Post-Collaboration	% Change	p-value
Diagnostic Errors (per 100 cases)	14.5	7.2	–50.3%	0.002
Prescription Errors (per 100 cases)	9.8	3.6	–63.3%	0.001

Integrating lab and biochemistry specialists significantly contributed to reducing misdiagnosis, while pharmacist involvement lowered prescribing errors—both critical indicators of patient safety.

figure 3. Reduction in Errors After Collaboration

6.2.3 Patient Outcomes: Hospital Stay and Readmissions



Patient-centered metrics also improved, reflecting better coordinated care.

Table 4. Patient Outcomes Before vs. After Collaboration

Outcome	Pre-Collaboration	Post-Collaboration	Mean Difference	p-value
Average Hospital Stay (days)	6.8 ± 1.4	5.1 ± 1.2	–1.7 days	<0.001
30-day Readmission Rate (%)	12.4%	6.8%	–5.6%	0.004

Reduction in hospital stay and readmissions supports the hypothesis that multidisciplinary inputs enhance care continuity and long-term planning.[17]

6.3 Qualitative Findings

Analysis of interviews and focus groups (N = 30 participants) revealed four dominant and recurring themes across all disciplines:

Theme 1: Shared Knowledge and Mutual Respect

Participants consistently emphasized how collaboration fostered **mutual learning and trust**. Internists highlighted their reliance on pharmacists for dose adjustments in patients with comorbid

renal or hepatic issues. Optometrists described increased diagnostic confidence when able to consult biochemists regarding metabolic ocular findings.

“When I shared eye findings with the internist and biochemist, they immediately connected it with Wilson’s disease. That wouldn’t have happened in isolation.” – Optometrist, Jeddah

Theme 2: Conflict Resolution through Structured Communication

Professionals acknowledged initial tension due to unclear roles but credited **structured meetings and protocols** (e.g., multidisciplinary rounds) with reducing conflict and promoting consensus.

“We used to disagree a lot on test prioritization, but now with lab protocols and shared dashboards, we are more aligned.” – Lab Specialist, Dammam

Theme 3: Workflow Integration via Technology

Participants praised the EHR’s ability to **flag interdisciplinary notes**, improving efficiency. Pharmacists highlighted real-time alerts about drug–lab interactions (e.g., elevated INR and warfarin dose).

“The digital alerts from lab and pharmacy saved time and prevented cascading errors.” – Internist, Riyadh

Theme 4: Patient-Centered Care and Shared Responsibility

Most participants perceived that collaborative care made patients feel more supported. Teams reported **fewer complaints, higher patient satisfaction scores**, and improved coordination for follow-up care.

“Patients felt reassured knowing their case was reviewed by five professionals—not just one.” – Pharmacist, Jeddah

6.4 Integration of Findings: Mixed-Methods Triangulation

To synthesize qualitative and quantitative results, a **joint display matrix** was constructed. It reveals convergence between numeric trends and thematic insights, validating the central premise that **interdisciplinary collaboration improves diagnostic quality, safety, and workflow efficiency.**[18]

Quantitative Result	Qualitative Support	Interpretation
↑ Decision Accuracy Scores (mean +0.76)	“Shared knowledge enhanced our judgment.”	Team insight improves diagnostic confidence.
↓ Medication Errors (–63%)	“Pharmacists now guide dosing decisions collaboratively.”	Pharmacist input reduces prescribing risks.
↓ Diagnostic Errors (–50%)	“Lab validation before conclusions improved accuracy.”	Lab and biochem input crucial for confirmation.
↓ Length of Stay (–1.7 days)	“We resolve issues faster when we talk across roles.”	Coordinated care accelerates clinical decisions.
↓ Readmissions (–5.6%)	“Discharge plans are more robust when everyone’s input is valued.”	Multi-role discharge plans improve outcomes.

Integration of findings strongly supports the hypothesis that collaboration across the five roles fosters robust, safe, and patient-centered decision-making.

Discussion

This multicenter mixed-methods study in Saudi Arabia evaluated whether formal collaboration among internists, pharmacists, optometrists, biochemists, and laboratory specialists improves clinical decision-making and patient outcomes. Quantitatively, self-reported decision-making accuracy rose markedly across all disciplines after structured multidisciplinary practices were instituted, with the



largest gains among internists and laboratory specialists. These perceptual gains were accompanied by audited improvements in care quality: diagnostic errors halved and prescribing errors fell by nearly two-thirds. Downstream effects were consistent with safer, more coordinated care—average length of stay declined by almost two days and 30-day readmissions decreased substantially.[19]

Qualitatively, four convergent themes explained *how* these gains were realized. First, “shared knowledge” described the routine cross-pollination of expertise—internists drawing on biochemical markers to refine differentials; pharmacists translating lab data into dose adjustments; and optometrists flagging ocular signs of systemic disease that triggered earlier work-ups. Second, “conflict resolution” improved as teams adopted predictable meeting cadences and clarified roles, reducing turf tension and decision paralysis. Third, “workflow integration” emphasized technology-enabled handoffs, with EHR notes and alerts surfacing drug–lab interactions and pending diagnostics in time to avert errors. Fourth, “patient-centered care” reflected the visible benefits to patients and families when five professions shared accountability for one care plan.[20,21]

Mixed-methods triangulation showed strong convergence. The numerically largest improvements—fewer medication and diagnostic errors—were precisely the areas participants credited to pharmacist–lab–clinician coordination and to earlier validation of working diagnoses. Shorter stays and fewer readmissions echoed interview narratives about faster consensus and more robust discharge planning. Together, these findings support the central claim that structured, trust-based collaboration across these five roles produces more accurate, timely, and reliable clinical decisions and measurably better patient outcomes in the Saudi context. The results also suggest that “how the team works”—clear roles, regular touchpoints, and integrated information flow—is as important as “who is on the team.”[22]

7.2 Comparison with Literature

Our quantitative reductions in medication and diagnostic errors align with international evidence that pharmacist involvement at transitions of care reduces clinically important medication errors in pragmatic, real-world settings. Jošt and colleagues (2024) found that routine pharmacist-led reconciliation at discharge substantially lowered error risk, corroborating our observed decline in prescribing errors following structured collaboration.

The drop in diagnostic errors and the qualitative emphasis on laboratory validation are consistent with the growing literature on interprofessional Diagnostic Management Teams (DMTs) and collaborative diagnostic safety initiatives. Scoping and policy work indicates that formalizing cross-specialty diagnostic forums, with laboratory professionals as core members, can prevent errors by improving test selection and interpretation—an approach that mirrors our teams’ practices. [23]

Our participants’ accounts of “shared knowledge” and “patient-centered care” echo broad syntheses showing that collaborative interprofessional practice improves processes and outcomes across conditions and settings (e.g., chronic disease management, adherence, and shared decision-making). Recent reviews and commentaries document positive associations between team-based care and patient-level outcomes, albeit with heterogeneity driven by team design and implementation quality. [24]

The specific contribution of optometry in surfacing systemic disease through ocular findings is also well supported. Contemporary reviews highlight the diagnostic value of ocular manifestations and the rising use of ophthalmic imaging for systemic risk stratification—findings consonant with our



qualitative reports of earlier detection after optometrist input.[25]

7.4 Practical Implications

Hospital policy. Hospitals should formalize multidisciplinary structures that make collaboration routine rather than ad hoc. This includes protected weekly case conferences that mandate participation from internal medicine, pharmacy, optometry, biochemistry, and laboratory services for predefined case types (e.g., polypharmacy, complex metabolic disorders, ocular–systemic presentations). Policies should assign decision rights, escalation pathways, and explicit turnaround times for consults and lab interpretations, with audit indicators (diagnostic error rate, time-to-decision, reconciliation defects) tracked quarterly.[26]

Training programs. Interprofessional education should move from one-off workshops to longitudinal curricula. scenarios should combine medication reconciliation, lab interpretation, and ocular-systemic differentials, with debriefs led jointly by faculty from medicine, pharmacy, optometry, and laboratory medicine. Junior staff can rotate through “diagnostic management rounds” to experience how biochemical data and ocular findings recalibrate differentials and dosing decisions.[27]

Electronic health record integration. Technology should reinforce—not replace—teamwork. Build shared, role-specific dashboards that: (i) surface pending critical labs and expected decision deadlines; (ii) trigger pharmacist alerts when lab values make doses unsafe; and (iii) highlight optometry notes that suggest systemic disease. Embed structured handoff templates, standardized order sets for high-risk scenarios, and checklists that require sign-off from the relevant disciplines before disposition or discharge. Link all of this to a learning system: every diagnostic reversal, readmission, or near-miss should auto-populate a multidisciplinary review queue so teams learn quickly and update pathways.[28]

Taken together, these policy, training, and EHR measures translate collaboration from a principle into a daily operating system. They also provide measurement hooks—so leadership can see improvements in accuracy, safety, and flow as teams mature.[29]

Recommendations

Health systems should institutionalize five practices. First, designate *multidisciplinary care pathways* for high-risk presentations (polypharmacy, metabolic derangements, ocular alarms) and require team sign-off for key decisions. Second, deploy *diagnostic management teams* with laboratory and biochemistry leadership for complex testing strategies and interpretation; ensure their consults are easy to request and time-bound. Third, expand *pharmacist-led reconciliation and counseling* at admission and discharge, prioritizing older adults and patients on anticoagulants, insulin, or narrow-therapeutic-index drugs. Fourth, build *EHR-embedded collaboration tools*—shared task lists, role-tagged notes, and cross-discipline alerts—paired with user-centered training and metrics. Fifth, invest in *interprofessional and feedback*, using real near-misses to sharpen team reflexes.[30]

At the system level, hospitals should monitor a concise dashboard (diagnostic and prescribing errors per 100 cases, time-to-decision, preventable readmissions) and tie improvement targets to executive accountability and frontline incentives. Partnerships with academic centers can accelerate implementation science and help evaluate cost-effectiveness, supporting policy scale-up across regions.[31]

Conclusion

This study shows that when internists, pharmacists, optometrists, biochemists, and laboratory



specialists collaborate through structured routines and supportive technology, clinical decisions become more accurate, safer, and faster. The quantitative signal—a halving of diagnostic errors, large reductions in prescribing errors, and improvements in length of stay and readmissions—was reinforced qualitatively by narratives of shared knowledge, clearer roles, and smoother workflows. These effects were strongest where collaboration was designed into daily practice: regular case conferences, predictable consult pathways, and EHR prompts aligned to team responsibilities.

While contexts differ, our findings resonate with the broader international literature and offer a practical blueprint for health systems seeking to improve decision quality without new bricks or beds. By embedding multidisciplinary habits, elevating laboratory and optometric insight in medical decisions, and giving pharmacists structured authority at transitions, hospitals can create safer, more patient-centered care. The implication is straightforward: better decisions are a team sport, and the infrastructure to enable that team can be built today.

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