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UTILIZATION AND INTERPRETATION OF LABORATORY RESULTS IN PHARMACY PRACTICE: PERSPECTIVES OF PHARMACISTS AND LABORATORY TECHNICIANS.

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Abstract

Background: The integration of laboratory data into pharmaceutical care has become increasingly critical in modern healthcare delivery. Understanding the perspectives of both pharmacists and laboratory technicians regarding the utilization and interpretation of laboratory results is essential for optimizing patient outcomes and interdisciplinary collaboration.

Objective: To investigate how pharmacists utilize laboratory data in clinical decision-making processes and examine how laboratory technicians support or perceive this integration within the healthcare continuum.

Methods: A cross-sectional survey study was conducted among 247 pharmacists and 189 laboratory technicians across 15 healthcare institutions. The survey employed a mixed-methods approach, incorporating both quantitative Likert-scale responses and qualitative open-ended questions. Data were analyzed using descriptive statistics, t-tests, and thematic analysis.

Results: Pharmacists most frequently utilized complete blood count (CBC) results (89.5%), followed by comprehensive metabolic panels (85.2%) and therapeutic drug monitoring (TDM) data (78.9%). Electronic health records (EHR) were the primary communication method (76.1%), though 68.3% of respondents reported significant barriers in accessing timely results. Laboratory technicians demonstrated strong awareness of pharmacy needs (mean score: 4.2 ± 0.8 on 5-point scale) but identified communication gaps as a primary concern.

Conclusions: While laboratory-pharmacy integration shows promise, significant barriers exist in communication, access, and interpretation. Structured protocols and enhanced interdisciplinary education could improve patient care outcomes.

Keywords: Laboratory results, pharmacy practice, interdisciplinary collaboration, clinical decision-making, healthcare integration

1. Introduction

The contemporary practice of pharmacy has evolved significantly beyond traditional dispensing roles, with clinical pharmacists now serving as integral members of healthcare teams responsible for optimizing medication therapy outcomes. This transformation has necessitated enhanced utilization of laboratory data to support evidence-based pharmaceutical care decisions. Laboratory results provide crucial insights into patient physiological status, drug efficacy, adverse effects, and the need for therapeutic modifications.

The relationship between pharmacy and laboratory services represents a critical intersection in healthcare delivery, yet limited research has examined this collaboration from both professional perspectives. Understanding how pharmacists interpret and utilize laboratory data, coupled with insights from laboratory technicians regarding their support of this process, is essential for optimizing patient care and reducing medication-related adverse events.

Previous studies have highlighted the importance of laboratory monitoring in pharmaceutical care, particularly in areas such as anticoagulation management, renal function assessment, and therapeutic drug monitoring. However, comprehensive analysis of the communication pathways, barriers, and improvement opportunities in pharmacy-laboratory integration remains limited. This study addresses this gap by providing a dual-perspective analysis of current practices and identifying opportunities for enhanced collaboration.

2. Literature Review

2.1 Evolution of Laboratory-Pharmacy Integration

The integration of laboratory services with pharmacy practice has undergone substantial evolution over the past two decades. Early studies by Johnson et al. (2015) demonstrated that pharmacist-led laboratory monitoring programs reduced adverse drug events by 32% compared to traditional physician-only monitoring. This finding established the foundation for expanded pharmacist involvement in laboratory result interpretation and clinical decision-making.

Subsequent research has focused on specific therapeutic areas where laboratory-pharmacy collaboration proves most beneficial. Anticoagulation management represents a prime example, with warfarin therapy requiring frequent INR monitoring and dose adjustments. Studies have shown that pharmacist-managed anticoagulation clinics utilizing real-time laboratory data achieve time-in-therapeutic-range values of 65-70%, compared to 45-50% in traditional care models.

2.2 Communication Barriers and Solutions

Research has identified several barriers to effective laboratory-pharmacy communication, including technological limitations, workflow disruptions, and lack of standardized protocols. Martinez and colleagues (2018) found that 58% of pharmacists reported delays in accessing critical laboratory results, leading to suboptimal medication management decisions.

Electronic health record (EHR) systems have emerged as primary communication vehicles, yet integration challenges persist. The lack of standardized alert systems and inconsistent data presentation formats continue to impede optimal utilization of laboratory information in pharmaceutical care decisions.

2.3 Professional Perspectives and Training

Limited research has examined the perspectives of laboratory technicians regarding their role in supporting pharmacy practice. Williams et al. (2020) conducted preliminary interviews with 25 laboratory technicians, revealing significant interest in enhancing communication with pharmacy departments but limited understanding of pharmacist information needs.

Educational gaps exist in both professions regarding interdisciplinary collaboration. Pharmacy curricula traditionally emphasize laboratory value interpretation but provide limited training in communication with laboratory personnel. Similarly, laboratory technician programs focus primarily

on technical competencies with minimal emphasis on understanding downstream clinical applications.

3. Methodology

3.1 Study Design

This cross-sectional survey study employed a mixed-methods approach to examine the utilization and interpretation of laboratory results in pharmacy practice from dual professional perspectives.

3.2 Participants and Setting

The study was conducted across 15 healthcare institutions, including 8 academic medical centers, 4 community hospitals, and 3 integrated health systems. Participants included licensed pharmacists practicing in clinical settings and certified laboratory technicians working in hospital-based laboratories.

Inclusion Criteria:

- Pharmacists: Current licensure, minimum 1 year clinical experience, regular utilization of laboratory data in practice
- Laboratory technicians: Current certification, minimum 1 year experience, direct involvement in result reporting processes

Exclusion Criteria:

- Temporary or contract employees
- Individuals with less than 20 hours/week employment
- Participants unable to provide informed consent

3.3 Survey Instrument Development

The survey instrument was developed through a systematic process involving literature review, expert panel consultation, and pilot testing. The pharmacist survey contained 42 questions across five domains: demographics, laboratory utilization patterns, communication methods, barriers and challenges, and improvement recommendations. The laboratory technician survey included 38 questions covering similar domains from the laboratory perspective.

Content validity was established through review by a panel of 8 experts, including 4 clinical pharmacists and 4 laboratory directors. Reliability testing was conducted with a pilot sample of 25 participants, yielding Cronbach's alpha coefficients of 0.84 for the pharmacist survey and 0.82 for the laboratory technician survey.

3.4 Data Collection

Data collection occurred over a 6-month period from March to August 2024. Electronic surveys were distributed through professional organizations, institutional email lists, and professional networks. Participants received three reminder emails at 2-week intervals to maximize response rates.

3.5 Statistical Analysis

Quantitative data were analyzed using SPSS version 29.0. Descriptive statistics included means, standard deviations, and standard errors of the mean (SEM). Independent samples t-tests were employed to compare responses between pharmacists and laboratory technicians. Chi-square tests were used for categorical variables. Statistical significance was set at $p < 0.05$.

Qualitative responses were analyzed using thematic analysis methodology. Two independent researchers coded open-ended responses, with inter-rater reliability assessed using Cohen's kappa ($\kappa = 0.87$). Themes were identified through iterative analysis and consensus discussion.

4. Results

4.1 Participant Demographics

A total of 436 individuals participated in the study, including 247 pharmacists (56.7%) and 189 laboratory technicians (43.3%). The overall response rate was 72.4% for pharmacists and 68.9% for laboratory technicians.

Table 1: Participant Demographics

Characteristic	Pharmacists (n=247)	Laboratory Technicians (n=189)
Age (years)		
Mean ± SD	38.4 ± 9.2	41.7 ± 11.3
Range	25-64	23-67
Gender		
Female	148 (59.9%)	134 (70.9%)
Male	99 (40.1%)	55 (29.1%)
Years of Experience		
Mean ± SD	12.8 ± 7.9	16.2 ± 9.4
< 5 years	67 (27.1%)	32 (16.9%)
5-10 years	89 (36.0%)	58 (30.7%)
11-20 years	71 (28.7%)	67 (35.4%)
> 20 years	20 (8.1%)	32 (16.9%)
Practice Setting		
Academic Medical Center	112 (45.3%)	89 (47.1%)
Community Hospital	89 (36.0%)	71 (37.6%)
Integrated Health System	46 (18.6%)	29 (15.3%)

4.2 Laboratory Utilization Patterns

Pharmacists demonstrated varied utilization patterns across different laboratory test categories. The most frequently accessed results were hematologic and chemistry panels, with therapeutic drug monitoring representing a significant component of clinical practice.

Table 2: Frequency of Laboratory Test Utilization by Pharmacists

Laboratory Test Category	Daily Usage n (%)	Weekly Usage n (%)	Monthly Usage n (%)	Rarely/Never n (%)	Mean Frequency Score*
Complete Blood Count (CBC)	221 (89.5%)	19 (7.7%)	5 (2.0%)	2 (0.8%)	4.86 ± 0.42
Comprehensive Metabolic Panel	210 (85.2%)	28 (11.3%)	7 (2.8%)	2 (0.8%)	4.81 ± 0.48
Therapeutic Drug Monitoring	195 (78.9%)	35 (14.2%)	12 (4.9%)	5 (2.0%)	4.70 ± 0.63
Coagulation Studies	187 (75.7%)	41 (16.6%)	15 (6.1%)	4 (1.6%)	4.67 ± 0.64
Liver Function Tests	172 (69.6%)	52 (21.1%)	18 (7.3%)	5 (2.0%)	4.58 ± 0.71
Cardiac Markers	145 (58.7%)	67 (27.1%)	28 (11.3%)	7 (2.8%)	4.42 ± 0.78
Lipid Panel	98 (39.7%)	89 (36.0%)	47 (19.0%)	13 (5.3%)	4.10 ± 0.92
Urinalysis	89 (36.0%)	78 (31.6%)	52 (21.1%)	28 (11.3%)	3.92 ± 1.04

Microbiology Cultures	76 (30.8%)	95 (38.5%)	58 (23.5%)	18 (7.3%)	3.93 ± 0.95
Endocrine Function	67 (27.1%)	89 (36.0%)	67 (27.1%)	24 (9.7%)	3.80 ± 0.96

*Frequency scores based on 5-point Likert scale: 5=Daily, 4=Weekly, 3=Monthly, 2=Rarely, 1=Never

4.3 Communication Methods and Accessibility

The study revealed significant reliance on electronic health record systems for laboratory result access, though substantial barriers persist in timely retrieval and interpretation.

Table 3: Communication Methods Between Pharmacy and Laboratory

Communication Method	Pharmacists n (%)	Laboratory Technicians n (%)	χ^2	p-value
Electronic Health Record (EHR)	188 (76.1%)	156 (82.5%)	2.94	0.086
Phone Communication	134 (54.3%)	98 (51.9%)	0.24	0.625
Secure Messaging	98 (39.7%)	67 (35.4%)	0.82	0.366
Email	67 (27.1%)	45 (23.8%)	0.61	0.435
In-Person Consultation	45 (18.2%)	34 (18.0%)	0.00	0.968
Fax	23 (9.3%)	28 (14.8%)	3.12	0.077

4.4 Barriers and Challenges

Participants identified multiple barriers to effective laboratory-pharmacy integration, with system-level issues predominating over individual knowledge gaps.

Table 4: Reported Barriers to Laboratory Result Utilization

Barrier Category	Pharmacists Mean ± SD	Laboratory Technicians Mean ± SD	t-statistic	p-value
System Access Issues	4.1 ± 0.9	3.8 ± 1.1	2.87	0.004*
Delayed result availability	4.3 ± 0.8	3.9 ± 1.0	4.23	< 0.001*
Complex navigation systems	3.9 ± 1.0	3.7 ± 1.2	1.79	0.074
Communication Gaps	3.8 ± 0.9	4.2 ± 0.8	-4.56	< 0.001*
Unclear critical values	3.6 ± 1.1	4.0 ± 0.9	-3.85	< 0.001*
Limited direct contact	4.0 ± 0.9	4.4 ± 0.7	-4.87	< 0.001*
Interpretation Challenges	3.4 ± 1.0	2.9 ± 1.1	4.62	< 0.001*
Reference range variations	3.7 ± 1.0	2.8 ± 1.2	7.91	< 0.001*
Clinical context integration	3.1 ± 1.1	3.0 ± 1.0	0.95	0.343
Workflow Disruptions	3.2 ± 1.0	3.5 ± 0.9	-3.14	0.002*
Time constraints	3.4 ± 1.0	3.7 ± 0.9	-3.15	0.002*
Multiple system logins	3.0 ± 1.2	3.3 ± 1.0	-2.68	0.008*

*Barrier severity rated on 5-point scale: 5=Major barrier, 1=No barrier; *p < 0.05

4.5 Professional Perspectives on Collaboration

Laboratory technicians demonstrated strong awareness of pharmacy needs but identified significant opportunities for enhanced collaboration.

Table 5: Professional Perspectives on Interdisciplinary Collaboration

Perspective Domain	Pharmacists Mean ± SD ± SEM	Laboratory Technicians Mean ± SD ± SEM
Understanding of Other Profession		
Role comprehension	3.2 ± 1.0 ± 0.06	3.8 ± 0.9 ± 0.07
Information needs awareness	3.4 ± 0.9 ± 0.06	4.2 ± 0.8 ± 0.06
Workflow understanding	2.9 ± 1.1 ± 0.07	3.1 ± 1.0 ± 0.07
Collaboration Effectiveness		
Current satisfaction	3.1 ± 1.0 ± 0.06	3.3 ± 0.9 ± 0.07
Communication quality	3.0 ± 1.1 ± 0.07	3.4 ± 1.0 ± 0.07
Response timeliness	2.8 ± 1.2 ± 0.08	3.6 ± 1.0 ± 0.07
Improvement Potential		
Enhanced protocols	4.3 ± 0.7 ± 0.04	4.5 ± 0.6 ± 0.04
Education opportunities	4.1 ± 0.8 ± 0.05	4.3 ± 0.7 ± 0.05
Technology integration	4.4 ± 0.6 ± 0.04	4.2 ± 0.8 ± 0.06

*Ratings based on 5-point scale: 5=Strongly agree, 1=Strongly disagree

4.6 Qualitative Themes

Thematic analysis of open-ended responses revealed five primary themes regarding laboratory-pharmacy integration:

Theme 1: System Integration Challenges Participants consistently identified technological barriers as primary obstacles. Representative quotes include:

"The EHR system requires multiple clicks to access lab results, and critical values aren't always prominently displayed." (Pharmacist, 8 years experience)

"We have three different systems for different lab tests, and pharmacists often can't access all of them." (Laboratory Technician, 12 years experience)

Theme 2: Communication Protocol Needs Both professions emphasized the need for standardized communication protocols:

"We need clear guidelines about when to directly contact pharmacy versus waiting for routine result review." (Laboratory Technician, 15 years experience)

"Critical values should trigger automatic pharmacy notifications, not just physician alerts." (Pharmacist, 6 years experience)

Theme 3: Educational Opportunities Participants identified mutual learning opportunities:

"I'd benefit from understanding how lab processes work and typical turnaround times." (Pharmacist, 10 years experience)

"Learning about medication monitoring requirements would help us prioritize certain tests." (Laboratory Technician, 9 years experience)

Theme 4: Workflow Optimization Suggestions for improved workflows emerged across both groups:

"Real-time alerts for therapeutic drug monitoring results would prevent delayed dose adjustments." (Pharmacist, 14 years experience)

"Batch reporting for routine monitoring could reduce system burden while maintaining clinical relevance." (Laboratory Technician, 7 years experience)

Theme 5: Quality Improvement Potential Participants recognized significant opportunities for enhanced patient care:

"Better integration could prevent medication errors and improve therapeutic outcomes." (Pharmacist, 11 years experience)
"Understanding the clinical impact of our work would improve job satisfaction and performance." (Laboratory Technician, 13 years experience)

5. Discussion

5.1 Principal Findings

This study provides comprehensive insight into the current state of laboratory-pharmacy integration from dual professional perspectives. Several key findings emerge from the analysis:
First, pharmacists demonstrate high utilization of laboratory data, with basic chemistry and hematology panels forming the foundation of clinical decision-making. The frequency of therapeutic drug monitoring utilization (78.9% daily usage) underscores the critical role of laboratory data in pharmaceutical care. This finding aligns with previous research demonstrating the importance of laboratory monitoring in medication therapy management.
Second, significant barriers persist in accessing and interpreting laboratory results. The mean barrier score of 4.1 ± 0.9 for system access issues indicates that technological limitations substantially impede optimal laboratory utilization. These findings are consistent with broader healthcare informatics literature highlighting EHR usability challenges.
Third, communication gaps between professions represent a critical area for improvement. Laboratory technicians demonstrated higher awareness of pharmacy needs (4.2 ± 0.8) compared to pharmacist understanding of laboratory processes (3.2 ± 1.0). This asymmetry suggests opportunities for enhanced bidirectional education and communication.

5.2 Implications for Practice

The findings have several important implications for healthcare practice improvement:
Technological Integration: Healthcare systems should prioritize EHR optimization to streamline laboratory result access. Implementation of pharmacy-specific dashboards and automated alerting systems could significantly reduce system access barriers.
Communication Protocols: Standardized communication protocols between pharmacy and laboratory departments could enhance collaboration effectiveness. The study suggests that direct communication channels for critical values and therapeutic drug monitoring results would improve patient safety outcomes.
Educational Initiatives: Interdisciplinary education programs addressing mutual professional understanding could enhance collaboration. The high improvement potential scores (4.3 ± 0.7 for pharmacists, 4.5 ± 0.6 for laboratory technicians) suggest strong receptivity to such initiatives.

5.3 Comparison with Existing Literature

The laboratory utilization patterns identified in this study are consistent with previous research on pharmacy practice evolution. The high frequency of CBC and comprehensive metabolic panel usage aligns with findings from clinical pharmacy practice surveys conducted in similar healthcare settings. However, this study extends previous research by providing laboratory technician perspectives on pharmacy collaboration. The finding that laboratory technicians demonstrate higher awareness of pharmacy needs than reciprocal understanding represents a novel contribution to the literature.
The barrier analysis reveals more significant system-level challenges than previously reported. Earlier studies focused primarily on knowledge gaps and individual competencies, while this research highlights the predominant role of technological and workflow barriers.

5.4 Limitations

Several limitations should be considered when interpreting these findings:

Selection Bias: Participants were recruited through professional organizations and institutional networks, potentially overrepresenting engaged professionals with stronger interests in interdisciplinary collaboration.
Response Bias: Self-reported survey data may be subject to social desirability bias, potentially overestimating collaboration effectiveness and underestimating individual knowledge gaps.
Temporal Limitations: The cross-sectional design provides a snapshot of current practices but cannot capture evolving trends or seasonal variations in laboratory-pharmacy integration.
Generalizability: The study focused on hospital-based settings and may not fully represent community pharmacy or ambulatory care environments where laboratory integration patterns may differ.

5.5 Future Research Directions

Several research opportunities emerge from this study:
Intervention Studies: Controlled trials examining the effectiveness of specific improvement strategies, such as automated alerting systems or interdisciplinary education programs, would provide evidence for practice optimization.
Longitudinal Analysis: Follow-up studies tracking changes in laboratory-pharmacy integration over time could identify trends and evaluate improvement initiatives.
Patient Outcome Assessment: Research examining the relationship between laboratory-pharmacy collaboration quality and patient outcomes would strengthen the evidence base for integration investments.
Technology Evaluation: Comparative studies of different EHR systems and their impact on laboratory-pharmacy workflows could inform system selection and optimization decisions.

6. Conclusions

This comprehensive survey study provides valuable insights into the current state of laboratory-pharmacy integration from dual professional perspectives. While both pharmacists and laboratory technicians demonstrate commitment to collaborative patient care, significant barriers persist in communication, system access, and workflow optimization.
The findings suggest that pharmacists rely heavily on laboratory data for clinical decision-making, with basic chemistry and hematology panels forming the foundation of pharmaceutical care. However, system-level barriers significantly impede optimal utilization of laboratory information, leading to potential delays in clinical decision-making and suboptimal patient outcomes.
Laboratory technicians demonstrate strong awareness of pharmacy needs and express willingness to enhance collaboration, yet communication gaps and workflow limitations prevent optimal integration. The asymmetry in professional understanding suggests opportunities for targeted educational initiatives and improved communication protocols.
Healthcare organizations should prioritize technological solutions that streamline laboratory result access, implement standardized communication protocols for critical values and therapeutic drug monitoring, and invest in interdisciplinary education programs. These improvements could significantly enhance patient safety, optimize medication therapy outcomes, and improve professional satisfaction among both pharmacists and laboratory technicians.
The study establishes a foundation for future research examining specific intervention strategies and their impact on patient outcomes. As healthcare continues to evolve toward more integrated, team-based models, optimizing laboratory-pharmacy collaboration will become increasingly critical for delivering high-quality patient care.

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