Saudi Journal of Medicine and Public Health

The Role of Nurses in Interpreting and Communicating Laboratory Results to Patients

Awwad Bin Dakhil Bin Abdullah Al-Shammari[1]**, Ibrahim Freed Kuwaiti**[2]**, Salman Ahmed Awaji**[3]**, Hind Mohammed Ghaythan Alshehri**[4]**, Yousef Dhaifallah Dabi Alsharari**[5]**, Tariq Maqbul Awadh Alsharari**[5]**, Sayer Hamdan Salem Alsharari**[5]**, Fatimah Yassen Abdullah Alalawi**[6]**, Hassan Ali Abdullah Alnazr**[7]**, Khlood Muhammad Humod Alblawi**[8]

[1]*Northern Border General Division Hospital, Ministry of Health, Saudi Arabia*
[2]*King Fahad Hospital, Medina, Ministry of Health, Saudi Arabia*
[3]*Western Al-Arija Health Center, Ministry of Health, Saudi Arabia*
[4]*Aseer Health Cluster,Alnamas General Hospital, Primary Healthcare Sector, Ministry of Health, Saudi Arabia*
[5]*Qurayyat General Hospital Qurayyat, Al-Jouf Health Cluster, Ministry of Health, Saudi Arabia*
[6]*Maternity and Children Hospital, Alahsa, Ministry of Health, Saudi Arabia*
[7]*Al-Ahsa Psychiatric Hospital, Ministry of Health, Saudi Arabia*
[8]*Alkhaldiah Dispensary In alwajh , Ministry of Health, Saudi Arabia*

Abstract

Nurses serve as critical intermediaries in the healthcare ecosystem, facilitating the translation of complex laboratory results into accessible information for patients. This integrative review aims to elucidate the multifaceted role of nurses in interpreting and communicating laboratory findings. The review delineates the competencies required for accurate interpretation, including clinical knowledge, critical thinking, and cultural sensitivity, while examining effective communication strategies that enhance patient understanding and engagement. Barriers such as linguistic diversity, heavy workloads, and institutional constraints are critically analyzed, alongside the impact of technological advancements and continuous professional development on nursing practice. The review underscores the significance of nurses in fostering health literacy, promoting treatment adherence, and supporting shared decision-making, which collectively contribute to improved patient outcomes and satisfaction. Tables detailing common laboratory tests, reference ranges, and evidence-based communication strategies provide practical guidance for clinical practice. Key findings advocate for standardized protocols, robust interdisciplinary collaboration, and targeted training to strengthen nurses' capacity in this domain. By bridging the divide between technical laboratory data and patient comprehension, nurses play an indispensable role in advancing patient-centered care and optimizing healthcare delivery.

Keywords: Nursing Practice, Laboratory Result Interpretation, Patient-Centered Communication, Health Literacy, Evidence-Based Nursing.

1. Introduction

Laboratory results constitute a cornerstone of modern healthcare, providing critical data for the accurate diagnosis, treatment, and longitudinal management of diverse patient health conditions. These results, encompassing a wide array of diagnostic tests such as complete blood counts (CBC), comprehensive metabolic panels (CMP), arterial blood gases (ABGs), and specialized assays, serve as objective markers that guide clinical decision-making (NursingCE, 2023). Nurses, as frontline healthcare providers, occupy a unique and indispensable position in the healthcare ecosystem, bridging the gap between complex laboratory data and patient comprehension. Their role extends far beyond the execution of clinical tasks, encompassing the interpretation of laboratory findings, effective communication of these results to patients, and the provision of emotional support and advocacy to foster patient-centered care (McEwen & Wills, 2023). By translating technical data into accessible, meaningful information, nurses empower patients to understand their health status, make informed decisions, and adhere to prescribed therapeutic regimens, thereby enhancing clinical outcomes and patient satisfaction (Peet et al., 2019).

The effective communication of laboratory results by nurses is pivotal in mitigating patient anxiety, building trust, and promoting engagement in care processes. Explaining the implications of an elevated hemoglobin A1c level to a patient with diabetes can facilitate adherence to dietary and pharmacological interventions, ultimately improving glycemic control (Shrimanker & Bhattarai, 2023). However, this critical function is not without challenges. Nurses frequently encounter barriers such as linguistic and cultural differences, which

---

complicate effective communication, particularly in diverse patient populations (LG et al., 2020). Additionally, systemic issues such as high patient-to-nurse ratios, time constraints driven by staffing shortages, and institutional policies that lack standardization further impede nurses' ability to engage in thorough, patient-focused discussions (Ddumba-Nyanzia et al., 2020; TJC, 2023). Varying levels of patient health literacy also pose significant obstacles, as patients with limited understanding of medical terminology may struggle to grasp the significance of their laboratory results, potentially leading to non-adherence or poor health outcomes (Kosteniuk et al., 2019).

This integrative review aims to provide a comprehensive exploration of the multifaceted role of nurses in interpreting and communicating laboratory results. The review delineates the scope of nurses' responsibilities, which include not only the technical interpretation of laboratory data but also patient education, emotional support, and interdisciplinary care coordination. It further examines the essential competencies required for effective practice, such as clinical knowledge, critical thinking, cultural competence, and technological proficiency (AACN, 2023; Brown et al., 2020). Barriers to optimal performance, including institutional constraints, language barriers, and environmental factors, are critically analyzed to highlight areas for improvement. Additionally, the review proposes evidence-based strategies, such as standardized communication protocols, continuing professional development, and the integration of technology, to enhance nurses' contributions to patient care. By drawing on recent literature and incorporating practical tools such as tables summarizing laboratory tests and communication strategies, this review aims to provide a robust framework for understanding and strengthening the pivotal role of nurses in this essential aspect of healthcare delivery.

The Scope of Nurses' Responsibilities

Nurses' roles in managing laboratory results are multifaceted, encompassing a spectrum of critical functions that include interpretation, communication, patient education, and care coordination. These responsibilities position nurses as pivotal intermediaries in the healthcare system, ensuring that laboratory data is not only accurately interpreted but also effectively translated into actionable insights for patients and interdisciplinary teams. The American Association of Colleges of Nursing (AACN) emphasizes that nurses with advanced education, such as those holding a Bachelor of Science in Nursing (BSN) or higher, possess the requisite knowledge and critical thinking skills to navigate the complexities of laboratory data in diverse clinical settings (AACN, 2023). These competencies enable nurses to identify abnormal results, correlate them with clinical

manifestations, and facilitate timely communication with patients and healthcare providers, thereby enhancing patient safety and care quality.

Interpretation of Laboratory Results

The accurate interpretation of laboratory results is a cornerstone of nursing practice, requiring a comprehensive understanding of a wide array of diagnostic tests, including complete blood counts (CBC), comprehensive metabolic panels (CMP), arterial blood gases (ABGs), lipid profiles, and coagulation studies (NursingCE, 2023). Nurses must be proficient in recognizing normal and abnormal reference ranges, understanding the physiological and pathological implications of these findings, and anticipating potential clinical interventions. A low hemoglobin level (e.g., <12 g/dL in females or <13.5 g/dL in males) identified in a CBC may indicate anemia, prompting nurses to conduct a thorough clinical assessment for symptoms such as fatigue, pallor, or shortness of breath (NurseBuff, 2021). This assessment involves correlating laboratory data with the patient's medical history and physical findings, such as recent blood loss or chronic disease, to determine the underlying cause and urgency of intervention.

Similarly, interpreting a CMP requires nurses to evaluate multiple parameters, such as serum electrolytes (e.g., sodium, potassium), glucose, and liver function tests (e.g., aspartate aminotransferase [AST], alanine aminotransferase [ALT]). An elevated potassium level (>5.0 mmol/L), for instance, may signal hyperkalemia, necessitating immediate action to prevent cardiac arrhythmias (Shrimanker & Bhattarai, 2023). Nurses must also interpret ABGs to assess acid-base balance, recognizing that a pH below 7.35 may indicate acidosis, which could stem from respiratory or metabolic causes requiring distinct interventions (NursingCE, 2023). This process demands not only technical knowledge but also clinical judgment, as articulated in Tanner's Model of Clinical Judgment, which emphasizes noticing relevant data, interpreting its significance, responding appropriately, and reflecting on outcomes (Steinberg, 2023; Table 1). By integrating laboratory results with clinical observations, nurses contribute to timely diagnoses and effective treatment plans, ensuring that critical findings are escalated to physicians or specialists as needed.

Nurses must also correlate laboratory data with clinical presentations. For example, elevated liver enzymes (AST/ALT) in a patient with acetaminophen overdose require immediate reporting and intervention to prevent hepatic failure (Studocu, 2023). This process demands both technical knowledge and clinical judgment, as outlined by Tanner's Model of Clinical Judgement (Steinberg, 2023).

_____

Table 1. Common Laboratory Tests and Normal Ranges

Test	Normal Range (Adults)	Clinical Significance
Hemoglobin (CBC)	Male: 13.5–17.5 g/dL; Female: 12.0–15.5 g/dL	Indicates oxygen-carrying capacity; low levels suggest anemia
Sodium (CMP)	135–145 mmol/L	Reflects fluid balance; abnormal levels may indicate dehydration or hyponatremia
pH (ABG)	7.35–7.45	Measures acid-base balance; deviations may signal respiratory or metabolic issues
Prothrombin Time (PT)	11–13.5 seconds	Assesses clotting ability; prolonged times may indicate bleeding risk

Source: Adapted from NursingCE (2023) and NurseLabs (2024)

Communication with Patients

Effective communication is central to translating laboratory results into meaningful information for patients. Nurses must convey results in a clear, empathetic, and culturally sensitive manner, ensuring patients understand their implications without causing undue alarm (Mastors, 2021). For instance, explaining a high fasting blood glucose level to a diabetic patient involves not only stating the result but also discussing its impact on their condition, lifestyle modifications, and treatment options (Shrimanker & Bhattarai, 2023).

The "readback" protocol, where nurses verify critical results by repeating them to laboratory personnel, ensures accuracy before communicating with patients or providers (TJC, 2023). This process underscores nurses' legal and ethical obligations to report critical results promptly and accurately (NursingCE, 2023). Moreover, nurses often act as patient advocates, ensuring that results are discussed in a way that respects patients' emotional and cultural needs (Foronda et al., 2016).

Patient Education and Health Literacy

Nurses play a critical role in enhancing health literacy by educating patients about their laboratory results. Health literacy, defined as the ability to understand and act on health information, is a determinant of care outcomes (Kosteniuk et al., 2019). Low health literacy can lead to misunderstandings about test results, reducing adherence to treatment plans (Kumaran & Chipanshi, 2015). Nurses address this by using plain language, visual aids, and teach-back methods to confirm patient understanding (Pelzang, 2010).

When discussing a lipid panel, nurses might explain cholesterol levels using analogies (e.g., "Think of cholesterol as fat in your blood that can clog arteries") and provide actionable advice, such as dietary changes (NursingCE, 2023). This approach empowers patients to participate in shared decision-making, a cornerstone of person-centered care (Hochman, 2017).

Care Coordination

Nurses coordinate care by communicating laboratory results to other healthcare providers, ensuring seamless transitions between care settings. The Transitional Care Model by Mary Naylor emphasizes nurses' role in facilitating communication during hospital discharges, which includes relaying laboratory findings to outpatient providers (Storfjell et al., 2017). Effective coordination reduces errors, prevents duplicative testing, and improves patient outcomes (McDonald et al., 2007).

Competencies Required for Nurses

To effectively interpret and report laboratory test results, nurses must possess a wide set of abilities that encompass technical skills, interpersonal skills, and cultural competence. A clinical knowledge foundation is needed, which will enable nurses to interpret the purposes, reference ranges, and clinical uses of tests such as complete blood counts, comprehensive metabolic panels, and arterial blood gases (ABIM, 2023). This knowledge allows nurses to identify abnormalities and anticipate their impact on patient care. Additionally, important is to be critical thinkers, which means questioning laboratory results in the context of a patient's clinical presentation, history, and current symptoms to inform care decisions (Peet et al., 2019). Effective communication skills are necessary because nurses need to present complex medical information in the simplest, sensitive, and patient-centered manner to deliver results to patients without causing unnecessary distress (USAHS, 2024). Cultural competence is also crucial, requiring nurses to cross language and cultural barriers to meet the diverse needs of patients, establish trust, and provide fair care (Foronda et al., 2016). In addition, technological proficiency is more necessary than ever, as nurses use electronic health records (EHRs) and patient portals to access, document, and communicate lab results promptly, enhancing care coordination and documentation quality (Brown et al., 2020). Overall, these skills help nurses close the loop between laboratory data and patient knowledge, optimizing health outcomes (Table 2).

Barriers to Effective Communication

Nurses encounter a complex array of barriers when interpreting and communicating laboratory results, which can impede their ability to deliver patient-centered care. These barriers are multifaceted, encompassing institutional constraints, linguistic and cultural challenges, patient-related factors such as health literacy, and environmental disruptions. Each of these obstacles presents unique challenges that require tailored strategies to ensure effective communication and optimal patient outcomes.

_____

Table 2. Key Nursing Competencies for Laboratory Result Communication

Competency	Description	Example Application
Clinical Knowledge	Understanding test purposes and ranges	Recognizing abnormal CBC results and their implications
Critical Thinking	Correlating results with clinical symptoms	Linking elevated potassium to arrhythmia risks
Communication Skills	Using clear, empathetic language	Explaining cholesterol results using patient-friendly terms
Cultural Competence	Addressing language and cultural barriers	Using interpreters for non-English-speaking patients
Technological Proficiency	Navigating EHRs for result access and documentation	Documenting critical results in real-time

Source: Adapted from AACN (2023) and Brown et al. (2020)

Institutional Barriers

Institutional factors significantly hinder nurses' ability to engage in thorough and meaningful communication of laboratory results. High patient-to-nurse ratios, coupled with demanding workloads and staffing shortages, often limit the time nurses can dedicate to patient education and result discussions (Ddumba-Nyanzia et al., 2020). In busy clinical settings, nurses may be responsible for multiple patients simultaneously, leaving insufficient time to explain complex laboratory findings or address patient questions comprehensively. Additionally, institutional policies governing the reporting of critical laboratory results can lack clarity or vary across healthcare facilities, leading to inconsistencies in practice (TJC, 2023). For instance, some hospitals mandate that nurses notify physicians of critical values—such as a potassium level exceeding 6.0 mmol/L—within a strict timeframe, a task that becomes challenging under time constraints or when staffing is inadequate (NursingCE, 2023). The absence of standardized protocols for result communication further exacerbates these issues, potentially leading to errors or delays in care delivery.

Language and Cultural Barriers

In diverse healthcare settings, language barriers pose a significant obstacle to effective communication of laboratory results. Nurses frequently care for patients with limited proficiency in the primary language of the healthcare facility, necessitating the use of interpreters to ensure accurate information exchange. However, a scoping review highlights that access to trained, professional interpreters is often inconsistent, forcing nurses to rely on untrained individuals, such as family members, which can compromise accuracy and patient confidentiality (LG et al., 2020). Cultural misunderstandings further complicate communication, as patients from different cultural backgrounds may hold unique health beliefs or practices that influence their interpretation of laboratory results. For example, some patients may attribute abnormal results to spiritual or traditional causes rather than medical conditions, requiring nurses to approach discussions with cultural sensitivity (Foronda et al., 2016). Without adequate training in cultural humility or access to language-assistance resources, nurses may struggle to bridge these gaps, potentially undermining patient trust and engagement.

Health Literacy and Patient Factors

Patients' varying levels of health literacy significantly impact their ability to understand laboratory results, posing a critical challenge for nurses. Health literacy, defined as the capacity to obtain, process, and act on health information, is a key determinant of patient outcomes (Kosteniuk et al., 2019). Patients with low health literacy may find it difficult to comprehend medical terminology or the implications of results, such as an elevated creatinine level indicating potential kidney dysfunction, leading to confusion or non-adherence to treatment plans. Emotional factors, including anxiety, fear, or denial, can further complicate communication, as patients may struggle to process information about serious diagnoses or abnormal results (Pelzang, 2010). For instance, a patient receiving news of an abnormal lipid panel may experience anxiety that hinders their ability to engage in discussions about lifestyle changes. Nurses must therefore tailor their communication strategies, employing techniques such as plain language, visual aids, or the teach-back method, to address these individual needs and ensure comprehension.

Environmental Barriers

The physical and environmental context of healthcare settings can also disrupt effective communication of laboratory results. Noisy or chaotic environments, such as busy hospital wards or emergency departments, can make it difficult for patients to focus on or fully absorb explanations of their results (Mastors, 2021). For example, background noise from medical equipment or conversations may distract a patient during a discussion about critical blood glucose levels, reducing their understanding and retention of information. Additionally, poorly designed clinical spaces, such as wards lacking private consultation areas, can limit nurses' ability to engage in confidential and focused discussions with patients

(BMC Health Services Research, 2014). These environmental constraints necessitate creative solutions, such as finding quieter spaces or scheduling dedicated time for result discussions, to ensure patients receive clear and uninterrupted communication.

Strategies to Optimize Nurses' Role

To address the multifaceted barriers to effective communication of laboratory results and enhance nurses' effectiveness in this critical role, a range of evidence-based strategies can be implemented. These strategies encompass standardized communication protocols, continuing professional development (CPD), leveraging technology, fostering interdisciplinary collaboration, and promoting cultural competence and language support. By integrating these approaches, healthcare systems can empower nurses to deliver accurate, patient-centered, and culturally sensitive communication, ultimately improving patient outcomes and satisfaction.

Standardized Communication Protocols

The adoption of standardized protocols for communicating laboratory results is essential to ensure consistency, reduce errors, and enhance clarity in both patient and provider interactions. The Joint Commission (TJC) advocates for structured communication tools such as SBAR (Situation, Background, Assessment, Recommendation), which provides a systematic framework for conveying critical information succinctly and accurately (TJC, 2023). For example, when reporting a critical result like an elevated potassium level (>6.0 mmol/L), nurses can use SBAR to articulate the situation (e.g., the abnormal result), provide background (e.g., patient history), offer an assessment (e.g., potential for cardiac complications), and recommend immediate actions (e.g., physician consultation). This approach minimizes miscommunication and ensures timely escalation of urgent findings. For patient interactions, SBAR can be adapted to structure explanations, ensuring that nurses present results in a clear, concise, and patient-friendly manner, such as explaining the implications of a low hemoglobin level in the context of anemia management. Implementing such protocols across healthcare facilities promotes uniformity and enhances patient safety by reducing variability in communication practices.

Continuing Professional Development (CPD)

Ongoing education through CPD programs is critical for equipping nurses with the knowledge and skills necessary to interpret and communicate laboratory results effectively. CPD initiatives should focus on three key areas: laboratory diagnostics, communication skills, and cultural competence (BMC Nursing, 2021). Specialized training in laboratory diagnostics, such as workshops on interpreting arterial blood gases (ABGs) or comprehensive metabolic panels (CMPs), enhances nurses' ability to understand complex results and their clinical implications, such as recognizing acid-base imbalances or electrolyte disturbances (McEwen & Wills, 2023). Communication-focused CPD programs can strengthen nurses' therapeutic communication skills, teaching techniques like the teach-back method, where patients restate information to confirm understanding, or the use of plain language to explain results like lipid panels to patients with limited health literacy. Additionally, training in cultural competence equips nurses to address diverse patient needs, fostering confidence in navigating sensitive discussions about laboratory findings. By investing in CPD, healthcare institutions can enhance nurses' confidence, competence, and ability to deliver patient-centered care, ultimately improving communication outcomes.

Use of Technology

Advancements in healthcare technology, such as electronic health records (EHRs) and patient portals, offer powerful tools to facilitate the communication of laboratory results. EHRs enable nurses to access real-time laboratory data, verify results, and document findings efficiently, ensuring accuracy and continuity of care (Brown et al., 2020). For example, when a nurse identifies an abnormal glucose level in the EHR, they can promptly discuss it with the patient and coordinate with the healthcare team. Patient portals further empower patients by providing direct access to their results, accompanied by nurse-led explanations or educational resources, which can enhance understanding and engagement. Additionally, telehealth platforms and mobile health applications can support remote communication, allowing nurses to explain results to patients in non-traditional settings, such as during virtual follow-up visits for chronic disease management (Kitson, 2008). These technologies are particularly beneficial for patients in rural or underserved areas, where access to in-person care may be limited, ensuring that nurses can maintain consistent communication and education regardless of geographical constraints.

Interdisciplinary Collaboration

Effective communication of laboratory results relies on robust collaboration among nurses, laboratory personnel, physicians, pharmacists, and other healthcare providers. Interdisciplinary collaboration ensures that laboratory findings are accurately interpreted and integrated into comprehensive care plans. Nurses can participate in interdisciplinary rounds, where they discuss laboratory results, correlate them with clinical symptoms, and align treatment strategies with the healthcare team (McDonald et al., 2007). For instance, during rounds, a nurse might highlight an elevated prothrombin time (PT) in a patient on anticoagulant therapy, prompting a collaborative decision to adjust the medication dosage. This team-based approach fosters a shared understanding of patient needs, reduces the risk of miscommunication Justine, and

enhances care coordination. By creating a collaborative environment, interdisciplinary rounds minimize communication errors and ensure that laboratory results are acted upon promptly and appropriately, improving patient safety and outcomes.

Cultural Competence and Language Support

Cultural and linguistic barriers significantly impede effective communication, particularly in diverse healthcare settings. To address these challenges, healthcare institutions should prioritize cultural competence and language support. Training in cultural humility, as advocated by Foronda et al. (2016), enables nurses to build respectful and empathetic partnerships with patients from diverse backgrounds, ensuring that communication about laboratory results is sensitive to cultural beliefs and practices. For example, a nurse discussing a cancer screening result with a patient from a culture that stigmatizes certain diagnoses must approach the conversation with sensitivity to avoid misunderstanding or distress. Additionally, hiring bilingual nurses or providing access to professional interpreters can overcome language barriers, ensuring accurate and confidential communication (LG et al., 2020). Technology-assisted language tools, such as real-time translation apps, can further support nurses in communicating with non-English-speaking patients. These strategies enhance patient trust and engagement, enabling nurses to deliver culturally appropriate explanations of laboratory results, such as cholesterol levels or blood glucose readings, in a manner that resonates with patients' cultural and linguistic contexts (Table 3).

Table 3. Strategies to Enhance Nurses' Communication of Laboratory Results

Strategy	Description	Expected Outcome
Standardized Protocols	Use of structured tools like SBAR	Improved consistency and reduced errors
CPD Programs	Training in diagnostics and communication	Enhanced clinical and interpersonal skills
Technology Use	Leveraging EHRs and patient portals	Increased accessibility and patient engagement
Interdisciplinary Collaboration	Team-based discussions of results	Better care coordination and reduced miscommunication
Cultural Competence	Training in cultural humility and interpreter use	Improved communication with diverse patients

Source: Adapted from TJC (2023) and Foronda et al. (2016)

Impact on Patient Outcomes

Effective communication of laboratory results by nurses has a direct impact on patient outcomes. Studies show that clear explanations improve adherence to treatment plans, reduce hospital readmissions, and enhance patient satisfaction (Hochman, 2017). For example, patients who understand their laboratory results are more likely to follow medication regimens, as seen in studies of diabetic patients managing blood glucose levels (Shrimanker & Bhattarai, 2023).

Moreover, nurses' ability to address emotional and cultural needs during result discussions reduces patient anxiety and fosters trust. Person-centered care, facilitated by effective communication, has been linked to improved quality of life in patients with chronic conditions like dementia (Kim & Park, 2017). Conversely, poor communication can lead to misunderstandings, non-adherence, and adverse events, underscoring the importance of nurses' role (Ddumba-Nyanzia et al., 2020).

Recent Advances and Future Directions

Current 2023 studies highlight the evolving nurse role of conveying lab results. Advancements in digital health, such as AI-driven tools to interpret results, are being integrated into nursing practice, increasing efficiency and accuracy (CMS, 2023). There is also growing emphasis on patient empowerment, with nurses encouraged to involve patients in decision-making using their results (McEwen & Wills, 2023). Future research should deal with the development of standardized training modules for nurses, determining the communication impact of technology, and bridging gaps in access to interpreters. Longitudinal research would also be useful in examining the long-term consequences of nurse-initiated communication on patient outcomes, especially focusing on marginalized populations (Narayan, 2019).

Conclusion

Nurses cannot be replaced when it comes to interpreting and communicating laboratory test results, serving as educators, advocates, and coordinators in the healthcare system. Their ability to translate vast data into understandable information enhances patient understanding, concordance, and satisfaction. Despite barriers such as workload, language differences, and health literacy deficits, interventions such as standard procedures, CPD, and technology can optimize their effectiveness. Through the advancement of interdisciplinary practice and cultural competence, nurses can eliminate the gap between laboratory data and patient care, which manifests in better health outcomes. Ongoing investment in training and resources will keep nurses at the forefront of patient-focused care.

References

1. AACN. (2023). The impact of education on nursing practice. www.aacnnursing.org

2. ABIM. (2023). Laboratory reference ranges. American Board of Internal Medicine.

3. BMC Health Services Research. (2014). How nurses and their work environment affect patient experiences of the quality of care: A qualitative study. bmchealthservres.biomedcentral.com

4. BMC Nursing. (2021). Lifelong learning and nurses' continuing professional development, a metasynthesis of the literature. bmcnurs.biomedcentral.com

5. Brown, J., et al. (2020). Nurses' ability to use digital technology in their work. Journal of Nursing Scholarship, 52(3), 245–253.

6. CMS. (2023). Advancements in digital health for nursing practice. www.cms.gov[](https://www.cms.gov/files/document/nursing-home-staffing-study-final-report-appendix-june-2023.pdf)

7. Ddumba-Nyanzia, E., et al. (2020). Communication between HIV care providers and patients. Journal of Global Health, 10(1), 010345.

8. Foronda, C., et al. (2016). Cultural humility in nursing practice. Journal of Transcultural Nursing, 27(2), 115–123.

9. Grant, A., & Booth, S. (2021). Critical reviews in evidence-based practice. Nursing Research, 70(4), 289–297.

10. Hochman, O. (2017). Patient-centered care and communication. Health Affairs, 36(6), 1032–1039.

11. Kim, S. K., & Park, M. (2017). Person-centered care for dementia patients. Journal of Gerontological Nursing, 43(5), 32–39.

12. Kitson, A. (2008). Knowledge translation in nursing practice. Nursing Inquiry, 15(4), 279–287.

13. Kosteniuk, J., et al. (2019). Communication tools and sources of education and information. Journal of the Medical Library Association, 107(4), 538–554.

14. Kumaran, M., & Chipanshi, M. (2015). Information-seeking behaviour of internationally educated nurses. Journal of the Canadian Health Libraries Association, 36(2), 45–53.

15. Kwekkeboom, K., & Frese, A. (2009). Information sources used by oncology nurses. Journal of Hospital Librarianship, 9(1), 73–80.

16. LG, L., et al. (2020). Language barriers between nurses and patients: A scoping review. PMC, pmc.ncbi.nlm.nih.gov

17. Mastors, P. (2021). The impact of care environment on patient communication. Nursing Outlook, 69(3), 412–420.

18. McDonald, K. M., et al. (2007). Care coordination in healthcare. Agency for Healthcare Research and Quality.

19. McEwen, M., & Wills, E. M. (2023). Theoretical basis for nursing. Wolters Kluwer.

20. Narayan, M. (2019). Addressing implicit bias in nursing. Nursing Outlook, 67(5), 558–565.

21. NurseBuff. (2021). Laboratory values and interpretation. (https://www.physio-pedia.com/Lab_Value_Interpretation)

22. NurseLabs. (2024). Normal laboratory values guide. nurseslabs.com

23. NursingCE. (2023). Basic laboratory values nursing CE course. https://www.nursingce.com/ceu-courses/basic-laboratory-values-nursing-ce-course-for-rns-and-lpns)

24. Peet, J., et al. (2019). Strengthening nursing surveillance in general wards. Journal of Clinical Nursing, 28(15-16), 2924–2933.

25. Pelzang, R. (2010). Person-centered care in nursing. Journal of Nursing Care Quality, 25(3), 189–196.

26. Pirhonen, L., et al. (2017). Person-centered care in acute coronary syndrome. European Journal of Cardiovascular Nursing, 16(4), 295–302.

27. Prins, M., et al. (2010). Nurse-patient communication and safety. Journal of Patient Safety, 6(2), 85–90.

28. Saunders, H., & Vehviläinen-Julkunen, K. (2016). Evidence-based practice in nursing. Nursing Research, 65(3), 215–223.

29. Scherger, J. (2009). Patient engagement in care. Family Medicine, 41(8), 573–579.

30. Shiparski, L. (2005). Nurse-patient communication and outcomes. Journal of Nursing Administration, 35(6), 283–289.

31. Shrimanker, I., & Bhattarai, S. (2023). Electrolyte imbalances in clinical practice. StatPearls Publishing.

32. Steinberg, J. (2023). Clinical reflection in nursing practice. Studocu, www.studocu.com[](https://www.studocu.com/en-us/document/post-university/nursing-assessment/final-reflection-paperlast/67821458)

33. Stewart, R., et al. (2018). The three-legged stool of evidence-based practice. Journal of Nursing Education, 57(4), 201–207.

34. Storfjell, J., et al. (2017). Transitional care models in nursing. Journal of Nursing Management, 25(6), 456–463.

35. Studocu. (2023). Nursing review questions collection. https://www.studocu.com/row/document/jamaa%25D8%25A9-alaalom-oaltknolojya-

alardny%25D8%25A9/nursing/nursing-review/31467136)

36. Thomas, K. (2022). White blood cell differential. www.testing.com
37. TJC. (2023). Critical result reporting guidelines. The Joint Commission.
38. Tingen, M. S., et al. (2007). Nursing research and patient outcomes. Nursing Research, 56(4), 245–252.
39. USAHS. (2024). The importance of effective communication in nursing. https://www.usa.edu/blog/communication-in-nursing/)
40. Wuchner, S. (2014). Translating research into clinical practice. Journal of Nursing Scholarship, 46(5), 321–329.
41. Yoo, J., et al. (2021). Safety climate and organizational communication. Journal of Perianesthesia Nursing, 36(1), 24–29.
42. Doo, E. Y., & Kim, M. (2020). Effects of hospital nurses' internalized values. Research in Nursing & Health, 43(5), 499–510.
43. Jantzen, D. (2021). Organizational support for CPD in nursing. Nursing Management, 28(2), 34–40