OPEN ACCESS

Saudi Journal of Medical and Pharmaceutical Sciences
Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Review Article **Nursing**

Integrating all Assisting Specialties with Health Administration Practices to Achieve Excellence in Healthcare Quality

Ayman Jaylan Bajawi[1]*, Yasser Awadh Alshehri[1], Sheikhah Saad Alanzi[1], Aeshah Ahmed Alshehri[1], Nasser Ali Qarshaee[1], Mona Ali Qarshaee[1], Rayan Ali Bahhah[2], Abdullah Awad Alshahrani[3], Saeed Hamad Al-Shahrani[4], Bassmah Abdullah Alomrani[5], Abdulrahman Mubarak Safar Alshahrani[6], Ahmed Ali Alomary[7], Saeed Hamad Al-Shahrani[4], Abdulaziz Abdullah Alhedethe[8], Awad Maleh Al Rasheedy[9]

[1]Nursing Specialist, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia
[2]Nursing Specialist, Wadi Aldawasir Armed Forces Hospital, Wadi Aldawasir, Saudi Arabia
[3]Health Administration, Armed Forces Hospital in the South, Khamis Mushayt, Saudi Arabia
[4]Radiological Technician, Armed Forces Hospital in the South, Khamis Mushayt, Saudi Arabia
[5]Nursing Specialist, King Salman Armed Forces Hospital in the Northwest, Tabuk, Saudi Arabia
[6]Health Services and Hospitals Management Technician, Armed Forces Hospital in the South, Khamis Mushayt, Saudi Arabia
[7]Assistant Nurse, King Salman Armed Forces Hospital in the Northwest, Tabuk, Saudi Arabia
[8]Pharmacist, Health Services for Armed Forces, Riyadh, Saudi Arabia
[9]Pharmacy Technician, King Fahad Armed Forces Hospital, Jeddah, Saudi Arabia

DOI: https://doi.org/10.36348/sjmps.2025.v11i11.006 | **Received:** 12.09.2025 | **Accepted:** 08.11.2025 | **Published:** 13.11.2025

***Corresponding author:** Ayman Jaylan Bajawi
Nursing Specialist, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia

Abstract

The pursuit of excellence in healthcare quality is perpetually challenged by systemic fragmentation, where siloed operations among critical departments like Nursing, Radiology, and Health Administration lead to communication breakdowns, clinical errors, and operational inefficiencies. This comprehensive research paper argues that the strategic and deliberate integration of these three pillars is not merely beneficial but essential for achieving superior, patient-centered care. The analysis begins by deconstructing the inherent weaknesses of the traditional "siloed system," demonstrating how it acts as a fundamental barrier to quality. It then elucidates the unique and complementary roles of each discipline: Nursing as the continuous, holistic clinical bedrock; Radiology as the pivotal diagnostic lens guiding decision-making; and Health Administration as the essential architectural framework that enables synergy through resource allocation, policy, and culture. The paper further explores practical models for "forging the link," including multidisciplinary teams, structured communication protocols, integrated clinical pathways, and interprofessional education. By synthesizing evidence from a wide range of literature, this research concludes that a conscious, system-wide commitment to dissolving interdisciplinary boundaries is the definitive pathway to enhancing patient safety, improving clinical outcomes, boosting patient satisfaction, and achieving operational excellence in the modern healthcare landscape.

Keywords: Healthcare; Integrated Care; Health Administration; Achieve; Excellence; Healthcare Quality.

INTRODUCTION

The contemporary healthcare landscape is a complex and dynamic ecosystem, perpetually striving for the holy grail of high-quality, patient-centered care. This pursuit, however, is increasingly challenged by multifaceted hurdles: rising costs, aging populations with complex chronic conditions, technological advancements, and heightened patient expectations. In this intricate environment, the notion that any single healthcare discipline can operate in isolation to achieve systemic excellence is not only outdated but fundamentally flawed. The very structure of modern medicine, often characterized by siloed departments and fragmented communication, can inadvertently become a barrier to the seamless, efficient, and safe care it aims to provide. It is within this context that the imperative for a synergistic, integrated approach becomes paramount. This research paper posits that the deliberate and strategic integration of three critical pillars of healthcare Nursing, Radiology, and Health Administration is not merely beneficial but essential for achieving and sustaining superior healthcare quality. The journey towards excellence is a continuous one, and it is through

the confluence of direct patient care, diagnostic precision, and robust operational leadership that the most significant enhancements in patient outcomes, safety, and system efficiency can be realized.

Nursing represents the foundational and most pervasive element of patient care. Nurses are the constants at the patient's bedside, the advocates, the caregivers, and the first line of defense in clinical deterioration. Their role encompasses the continuous monitoring of patient status, the administration of treatments, the provision of emotional support, and patient education. The quality of nursing care is inextricably linked to patient outcomes, including rates of hospital-acquired infections, patient falls, medication errors, and overall satisfaction [1]. The essence of nursing practice is holistic, viewing the patient not as a mere diagnosis but as an individual within a broader psychosocial context. However, the efficacy of nursing interventions is profoundly influenced by the clarity of the clinical picture and the environment in which care is delivered. Without accurate diagnostic information, nursing care, however compassionate, risks being misdirected. Similarly, without an efficiently managed healthcare environment, nurses are burdened by operational inefficiencies that detract from their primary focus the patient [2].

Conversely, the field of Radiology has undergone a revolutionary transformation, evolving from a supportive specialty to a central diagnostic powerhouse in modern medicine. It provides the "eyes" into the human body, offering critical data that guide virtually every medical and surgical decision. From X-rays and computed tomography (CT) to magnetic resonance imaging (MRI) and positron emission tomography (PET), radiological imaging is indispensable for accurate diagnosis, treatment planning, and interventional procedures. The precision of a radiologist's interpretation can determine the course of a patient's treatment, making it a cornerstone of quality care [3]. The integration of Artificial Intelligence (AI) in image analysis is further augmenting this precision, offering tools for faster and more accurate detection of pathologies [4]. Yet, the most detailed and accurate radiological report holds diminished value if it is not communicated effectively and in a timely manner to the clinical team at the forefront of patient care, namely the nurses and physicians. A delay in reporting critical findings or a lack of contextual understanding between the radiologist and the caregiver can lead to diagnostic errors and delays in life-saving interventions [5]. Therefore, radiology's contribution to quality is not solely intrinsic to its technology but is mediated by its seamless integration into the clinical workflow.

Bridging the critical gap between clinical care (nursing) and diagnostic services (radiology) is the domain of Health Administration. This discipline provides the structural and strategic framework within which healthcare is delivered. Health administrators are responsible for the overarching systems, policies, resource allocation, financial management, and strategic planning that determine the functionality of a healthcare organization. Their decisions directly impact staffing ratios, procurement of technology, implementation of electronic health records (EHR), design of clinical pathways, and the cultivation of an organizational culture focused on quality and safety [6]. The Institute of Medicine's seminal report, "To Err is Human," starkly highlighted that most medical errors are not due to individual recklessness but to systemic failures [7]. It is the role of health administration to design systems that are resilient to human error and that facilitate, rather than hinder, effective interdisciplinary collaboration. For instance, an administrator's decision to invest in an interoperable EHR system that allows for instant sharing of radiology reports with the nursing unit directly enhances communication and care coordination [8]. Similarly, developing policies for structured handoff communication between radiologists and nurses after procedures ensures continuity and patient safety. Without effective administration, even the most skilled nurses and brilliant radiologists would struggle to function within a chaotic and inefficient system.

The concept of integration, therefore, is the catalytic force that binds these three domains into a cohesive and high-performing unit. Integration is more than mere cooperation; it is the creation of shared mental models, interoperable communication channels, and collaborative protocols. In an integrated model, the nurse at the bedside is not a passive recipient of a radiology report but an active participant in the diagnostic process, providing crucial clinical context to the radiologist and understanding the implications of the findings for immediate patient management [9]. The radiologist, in turn, transitions from a distant consultant to an integral member of the patient care team, participating in tumor boards and multidisciplinary meetings to discuss findings [10]. Health administration enables this integration by fostering a culture of collaboration, providing the necessary technological infrastructure, and aligning financial and performance incentives to reward interdisciplinary quality outcomes [11].

The theoretical underpinning for this integration is supported by various frameworks, including Donabedian's structure-process-outcome model, where the administrative "structure" enables the collaborative "processes" between nursing and radiology, ultimately leading to enhanced "outcomes" [12]. Furthermore, principles from High-Reliability Organizations (HROs), which operate in complex, high-risk environments without succumbing to accidents, emphasize a preoccupation with failure, reluctance to simplify interpretations, and a deference to expertise regardless of hierarchy all of which require deep integration across specialties [13].

The Siloed System: Fragmentation as a Barrier to Quality Care:

The modern healthcare ecosystem, for all its technological sophistication, is often architecturally and culturally structured around deeply entrenched silos. These silos, defined by specialized departments, distinct professional cultures, and separate information systems, create a fragmented landscape that directly impedes the delivery of high-quality, seamless patient care. This fragmentation is not a mere operational inconvenience; it is a fundamental barrier that compromises patient safety, diminishes efficiency, and elevates costs. The siloed model is a historical artifact, emerging from an era of increasing medical specialization where depth of knowledge within a single field was prioritized over the breadth of integration across fields [14]. While specialization undoubtedly advanced clinical expertise, it inadvertently fostered isolated ecosystems nursing units, radiology departments, and administrative offices—each with its own priorities, workflows, and communication channels. The patient, rather than being the central figure around which the system cohesively orbits, often becomes a parcel passed between these isolated units, navigating a disjointed journey that is as confusing as it is clinically risky.

Within the nursing domain, the impact of this fragmentation is acutely felt. Nurses, who provide continuous, holistic care at the bedside, frequently operate with an incomplete clinical picture. A critical finding from a radiology exam may be delayed in reaching the nursing unit, or its urgency may be lost in translation through cumbersome communication pathways. For instance, a nurse monitoring a post-operative patient for signs of a pulmonary embolism may not be immediately aware that a stat CT pulmonary angiogram has been reported as positive, leading to a dangerous delay in initiating anticoagulant therapy [15]. This communication gap is not a failure of individual competence but a systemic flaw. Nurses often spend a significant portion of their shifts navigating bureaucratic hurdles, chasing down diagnostic results, and attempting to contact other departments, time that is directly stolen from hands-on patient care and surveillance [16]. This operational friction leads to cognitive fragmentation for the nurse, who must juggle multiple disconnected streams of information, increasing the risk of mental fatigue and error.

The radiology department, often physically and procedurally separated from the main clinical floors, exemplifies the silo mentality. Radiologists may work in isolated reading rooms, interpreting images with only the limited clinical history provided on the requisition form. Without direct and easy access to the nuanced, real-time clinical observations from the nursing staff such as a subtle change in a patient's neurological status or a new complaint of localized pain the radiologist's interpretation can lack context, potentially leading to overlooked findings or misinterpretations [17]. The workflow is often transactional: a study is ordered, performed, and reported, with the final report deposited into the Electronic Health Record (EHR) as an endpoint. However, if this report does not trigger an alert to the frontline caregivers or if the EHR systems are not interoperable, the diagnostic loop is not closed. The critical result, while documented, may not be acted upon in a timely manner, rendering the most precise diagnostic effort futile [18]. This "island of information" phenomenon severely limits radiology's potential impact on the dynamic process of patient care.

The administrative structures intended to support clinical care can, paradoxically, reinforce these silos. Traditional hospital administration often organizes itself along departmental lines, with separate budgets, performance metrics, and leadership for nursing, diagnostic services, and other units. This structure incentivizes departmental efficiency at the potential expense of organization-wide effectiveness. For example, a financial decision to optimize radiology equipment utilization by scheduling back-to-back scans may seem efficient for the radiology department's metrics but can create bottlenecks and delays for inpatient units, where nurses must manage patient readiness and transportation, leading to disruptions in ward routines and prolonged fasting times for patients [19]. Furthermore, administrators, who are often removed from the day-to-day clinical frontline, may fail to grasp the practical communication barriers that their system designs create. The procurement of IT systems that do not seamlessly integrate with one another is a classic example, creating digital silos that mirror the organizational ones. A standalone radiology information system (RIS) that does not provide real-time, push-notification alerts to the nursing electronic health record is a technological embodiment of the silo, forcing caregivers to actively "hunt" for information rather than having it delivered within their native workflow [20].

The consequences of this systemic fragmentation are severe and multifaceted, directly impacting the quintessential goals of healthcare quality: safety, effectiveness, and patient-centeredness. From a patient safety perspective, communication failures between silos are a leading root cause of sentinel events. A missed critical finding, a medication error due to incomplete information, or a delayed procedure because of scheduling conflicts across departments are all potential outcomes of a fragmented system [21]. The patient's journey becomes a perilous relay race where the baton of critical information is frequently dropped between specialized runners. Effectiveness is similarly compromised, as delays in diagnosis and treatment initiation become commonplace. A patient with a suspected stroke may have their MRI completed promptly, but if the report does not immediately reach the neurologist and the nursing team managing the patient, the narrow window for effective thrombolytic

therapy can be lost, irrevocably altering the patient's prognosis [22].

This fragmentation also fundamentally undermines the principle of patient-centered care. Patients and their families are often forced to repeat their medical history and concerns to every new specialist and caregiver they encounter, a process that is not only frustrating but also increases the risk of inconsistencies and errors. They perceive the healthcare system not as a unified team working on their behalf, but as a confusing and uncoordinated array of services. This lack of a cohesive experience erodes trust and diminishes patient satisfaction [23]. The financial cost of this inefficiency is staggering, manifesting in the form of duplicated tests, prolonged hospital stays due to delayed care, and the immense operational waste associated with professionals spending their valuable time compensating for poor system design rather than delivering value-added care [24].

The Clinical Bedrock: Nursing's Central Role in Patient-Centered Integration:

If the integrated healthcare model is to function as a cohesive and efficient organism, then the nursing profession constitutes its central nervous system perpetually sensing, processing, and responding to the needs of the patient. Nurses are the constants in the healthcare journey, providing an uninterrupted continuum of care that spans shifts, procedures, and departmental transitions. This unique positioning makes them the indispensable bedrock upon which patient-centered integration is built. Unlike any other profession in the hospital ecosystem, nursing embodies a holistic philosophy that views the patient not as a collection of symptoms or a diagnostic puzzle, but as a biopsychosocial being [25]. This perspective is critical for integration, as it necessitates a comprehensive understanding of how a radiological finding, an administrative policy, or a pharmacological intervention converges at the patient's bedside to affect their overall well-being.

The nurse is, therefore, the natural integrator, the clinician who must synthesize disparate pieces of information from various sources into a unified plan of care. Their role transcends task completion and enters the realm of continuous clinical surveillance and interpretation, making them the primary agents for detecting subtle changes in patient condition that may signify success, failure, or complication long before they manifest as critical events [26].

The core of nursing's integrative power lies in its profound patient-centricity. Nurses spend more direct time with patients than any other healthcare providers, fostering a relationship of trust and enabling the collection of nuanced clinical data that often falls outside the scope of standardized forms and orders. A radiologist sees an opacity on a chest X-ray; the nurse knows that the patient has had a weak, productive cough for two days and has been too fatigued to mobilize. An administrator sees a case of "community-acquired pneumonia"; the nurse understands the patient's social determinants of health, such as poor home ventilation or lack of social support, that contributed to the admission [27]. This rich, contextual information is the "clinical glue" that binds abstract diagnostic data to the lived reality of the patient. When a new medication is prescribed, the nurse evaluates not only its pharmacological action but also the patient's ability and willingness to adhere to the regimen. This holistic assessment is a continuous process, creating a dynamic and ever-updating narrative of the patient's journey, a narrative that is essential for all other specialties to perform their roles effectively [28].

This pivotal position makes nursing the critical communication nexus for the entire care team. They are the conduit through which information flows from the patient to the physician, from the radiologist to the patient's family, and from the physical therapist to the health administrator. The nurse is often the first to recognize a potential complication, such as a drop in urine output post-contrast CT scan, prompting early intervention for contrast-induced nephropathy. They are the ones who communicate the patient's increasing confusion to the physician, which may lead to a decisive MRI to rule out a neurological event. In this capacity, nurses do not merely pass messages; they translate, contextualize, and prioritize information, ensuring that the right data reaches the right person at the right time to facilitate timely and appropriate action [29]. Their shift handovers are not just administrative routines but critical information-transfer rituals that maintain the continuity of the integrated care plan across time, preventing the patient from being "reset" with every change of nursing staff [30].

The practical execution of this integrative role is most evident in the management of diagnostic processes, particularly those involving radiology. The nurse's involvement begins long before the patient reaches the radiology department. It is the nurse who ensures that the patient is appropriately prepared confirming NPO status for a sedated procedure, checking renal function for contrast administration, and educating the patient about what to expect, thereby reducing anxiety and improving cooperation [31]. This pre-procedural phase is a vital risk-management checkpoint where the nurse's assessment can prevent adverse events. During the procedure, whether at the bedside or in the radiology suite, the nurse monitors the patient's vital signs and clinical status, providing immediate support and intervention if needed. Most importantly, in the post-procedural phase, the nurse is responsible for monitoring for complications, such as bleeding at a biopsy site or a reaction to contrast media, and for integrating the preliminary or final results of the study into the ongoing care plan. A nurse who understands that a CT scan has

confirmed a pulmonary embolism will be hyper-vigilant for signs of respiratory distress or hemodynamic instability, initiating protocol-driven care even before a formal consultant's note is written [32]. This seamless loop of preparation, monitoring, and response is where diagnostic theory becomes therapeutic reality.

Furthermore, nurses are increasingly taking on advanced roles that formalize and deepen their integrative function. The emergence of Nurse Navigators, particularly in oncology, is a powerful testament to the recognition of nursing's central role in care coordination. These specialized nurses guide patients through the complex maze of multidisciplinary care, ensuring timely scheduling of imaging, biopsies, surgeries, and chemotherapy appointments [33]. They serve as a constant point of contact for the patient, interpreting complex medical jargon from radiologists and oncologists alike, and providing emotional support. Similarly, the role of Clinical Nurse Specialists (CNS) involves leading quality improvement initiatives that directly bridge departmental gaps. A CNS might develop and implement a new evidence-based protocol for the management of stroke patients, which would standardize communication pathways between the emergency department nurses, the radiology technologists performing the CT scan, the radiologist interpreting it, and the inpatient neurology unit [34]. In these advanced capacities, nurses move beyond individual patient advocacy to become architects and guardians of the integrated system itself.

However, the full potential of nursing as the clinical bedrock for integration cannot be realized without addressing systemic challenges and empowering the profession. The global nursing shortage and the resulting high nurse-to-patient ratios directly undermine the capacity for integrative work. When a nurse is overwhelmed with tasks for a large number of critically ill patients, the time available for holistic assessment, patient education, and proactive communication with radiology and other departments evaporates [35]. Task-oriented care replaces relationship-based care, and the integrative function suffers. Therefore, health administration must recognize that investing in adequate nursing staffing is not merely a line-item expense but a fundamental strategic investment in the infrastructure of integration. Furthermore, empowering nurses through shared governance models, where they have a voice in organizational policies and IT system design, ensures that the tools and protocols developed truly support, rather than hinder, their central role in patient-centered care [36].

The Diagnostic Lens: Radiology as a Pivotal Partner in Clinical Decision-Making:

In the intricate tapestry of modern medicine, radiology has evolved from a supportive ancillary service into a pivotal, decision-making clinical partner. It functions as the "diagnostic lens" through which the opaque becomes clear, providing objective evidence that is fundamental to accurate diagnosis, treatment planning, and procedural guidance. This transformation is largely driven by breathtaking technological advancements that have exponentially increased the clarity, speed, and scope of medical imaging. Modalities such as multi-detector Computed Tomography (CT), high-field Magnetic Resonance Imaging (MRI), and hybrid technologies like Positron Emission Tomography-Computed Tomography (PET-CT) have revolutionized the ability to visualize anatomy, physiology, and pathology in exquisite detail [37]. A CT angiogram can map the coronary arteries with near-surgical precision, an MRI can delineate the exact borders of a brain tumor from functional neural tissue, and a PET scan can reveal metastatic disease invisible to other modalities. This technological prowess has positioned radiology at the very heart of the clinical pathway, making it an indispensable tool for physicians across all specialties, from emergency medicine to oncology, who rely on its insights to make critical decisions with profound implications for patient outcomes.

The radiologist's role, therefore, extends far beyond the passive generation of images. They are physicians specializing in diagnostic interpretation, tasked with translating pixels and signal intensities into meaningful clinical narratives. This process is not a simple mechanical act but a complex cognitive exercise in pattern recognition and differential diagnosis. The radiologist correlates imaging findings with the provided clinical history to narrow down a list of potential causes, effectively acting as a consultant whose interpretation guides the entire direction of patient management [38]. For instance, the identification of a solitary pulmonary nodule on a chest X-ray initiates a cascade of decisions: Is it benign or malignant? Does it require a follow-up CT, a PET scan, or a biopsy? The radiologist's characterization of the nodule's size, density, and borders provides the essential evidence upon which the oncologist, surgeon, and pulmonologist base their subsequent recommendations. In this capacity, the radiologist is a central node in the diagnostic reasoning process, narrowing probabilities and focusing the clinical team's investigative and therapeutic efforts.

This pivotal role is most acutely demonstrated in time-sensitive emergencies, where radiology truly becomes the linchpin of life-saving interventions. In the setting of a suspected acute ischemic stroke, the "time is brain" paradigm places immense pressure on the radiology department. A rapid non-contrast CT scan of the head is performed to exclude hemorrhage, followed often by CT angiography and perfusion studies to identify a potentially salvageable penumbra of brain tissue and a occluded vessel amenable to thrombectomy [39]. The radiologist's immediate and accurate interpretation of these complex studies directly determines whether a patient receives thrombolytic therapy or is rushed to the neurointerventional suite for a

mechanical thrombectomy. Similarly, in a trauma patient, the Focused Assessment with Sonography for Trauma (FAST) exam and a whole-body CT (pan-scan) are used to rapidly identify internal bleeding, solid organ injury, and fractures, guiding the decision between emergency surgery, angioembolization, or conservative management [40]. In these high-stakes scenarios, the seamless integration of radiology into the clinical workflow is not just beneficial; it is a non-negotiable component of effective emergency care.

The integration of radiology into the broader healthcare team is further cemented by the rise of minimally invasive, image-guided interventions. Interventional radiology (IR) has blurred the traditional lines between diagnosis and treatment, allowing radiologists to perform therapeutic procedures that once required open surgery. Using real-time imaging guidance such as fluoroscopy, ultrasound, or CT, interventional radiologists can drain abscesses, embolize bleeding vessels, open blocked arteries, deliver targeted cancer therapies, and perform biopsies with unparalleled precision [41]. This minimally invasive approach translates into significant benefits for the patient, including reduced pain, shorter hospital stays, lower risk of infection, and faster recovery times. For example, a patient with a liver abscess can be treated by an interventional radiologist who inserts a drainage catheter through a tiny incision in the skin, guided by CT or ultrasound, thereby avoiding a major laparotomy. This evolution from diagnostician to therapeutic partner fundamentally redefines radiology's contribution, making it an active, hands-on specialty that directly alters patient outcomes and reduces the overall burden of invasive care.

The most recent transformative force in radiology is the integration of Artificial Intelligence (AI) and machine learning. AI algorithms are now capable of assisting radiologists in a multitude of tasks, from automating routine measurements and prioritizing critical cases in a worklist to detecting subtle abnormalities that might escape the human eye. Deep learning models have demonstrated remarkable accuracy in identifying fractures on X-rays, pulmonary nodules on CT scans, and intracranial hemorrhages on head CTs [42]. This does not signal the replacement of the radiologist but rather their augmentation. By handling repetitive tasks and acting as a powerful second reader, AI can increase diagnostic efficiency, reduce perceptual errors, and free up radiologists to focus on cases that are more complex, integrative diagnosis, and direct patient communication [43]. The role of the radiologist is thus evolving from pure image interpretation to that of a "information specialist," who synthesizes imaging data with AI-derived insights, laboratory results, and clinical information to generate a comprehensive diagnostic report that holds immense value for the referring clinician.

However, the immense power of this "diagnostic lens" is contingent upon its clarity and its alignment with the clinical context. A significant challenge in a siloed system is the phenomenon of the "clinical-radiological disconnect." This occurs when a radiologist interprets a study with limited or inaccurate clinical information, leading to a report that may be technically correct but clinically unhelpful or even misleading [44]. For instance, knowing that a patient has a history of cancer is crucial when evaluating a CT scan for new bone lesions. Without this context, the radiologist may offer a generic differential diagnosis, whereas with it, they can confidently state the high probability of metastatic disease. Conversely, the most detailed and accurate radiological report is of little value if it is not communicated effectively and in a timely manner to the clinical team managing the patient. Delays in reporting critical findings, such as a tension pneumothorax or a ruptured aortic aneurysm, can have catastrophic consequences [45]. Therefore, the pivot from being a isolated diagnostic service to a truly integrated clinical partner hinges on robust, bidirectional communication channels with the frontline caregivers, primarily the nursing and medical staff.

To fully realize its potential as a pivotal partner, radiology must actively step out of the reading room and engage in collaborative care models. Participation in multidisciplinary team (MDT) meetings, such as tumor boards or complex case conferences, is a prime example of this integration. In these forums, the radiologist presents and explains the imaging findings directly to the surgeons, oncologists, radiotherapists, and pathologists, engaging in a real-time discussion that synthesizes all available data to formulate the optimal, individualized treatment plan for the patient [46]. This collaborative dialogue ensures that the nuances of the imaging are fully understood and appropriately weighted in the clinical decision-making process. Furthermore, the implementation of structured reporting templates and the use of standardized lexicons like the Breast Imaging-Reporting and Data System (BI-RADS) or the Liver Imaging Reporting and Data System (LI-RADS) enhance communication clarity by reducing ambiguity and ensuring that referring clinicians can quickly and accurately understand the report's implications and recommended next steps [47].

The Architectural Framework: Health Administration's Role in Enabling Synergy:

While nursing provides the clinical bedrock and radiology offers the diagnostic lens, it is health administration that constructs the architectural framework within which these disciplines can converge to create synergy. Administration is the discipline responsible for the macro-management of healthcare organizations, tasked with designing, funding, and maintaining the systems that either facilitate or frustrate interdisciplinary collaboration. In the pursuit of integrated, high-quality care, administrators function as

the master architects and engineers; they may not lay the clinical bricks or install the diagnostic wiring, but they design the blueprints, pour the foundational concrete, and ensure the entire structure is sound, functional, and resilient. This role transcends traditional views of administration as merely managing finances and facilities. Instead, it positions health administrators as the essential enablers of synergy, whose strategic decisions directly determine whether nursing, radiology, and other clinical services operate as a cohesive, high-reliability team or as a collection of disconnected, and often competing, silos [48]. The ultimate quality and safety of patient care are, therefore, profoundly shaped by the quality of the administrative framework that supports it.

The most tangible tool at administration's disposal for enabling integration is strategic resource allocation and technological investment. The procurement and implementation of a fully interoperable Electronic Health Record (EHR) system is arguably the single most powerful step an administration can take to break down informational barriers. A truly integrated EHR creates a single source of truth, allowing a nurse on the ward to see a radiology report the moment it is signed, a radiologist to access real-time nursing notes for clinical context, and an administrator to track system-wide performance metrics [49]. However, this requires significant capital investment and a long-term vision that prioritizes system-wide efficiency over departmental cost-saving. Beyond the EHR, administration funds the critical technology that drives modern care, from advanced MRI machines and AI-assisted diagnostic software for radiology to mobile workstations and smart infusion pumps for nursing. The decision to invest in a PACS (Picture Archiving and Communication System) that is accessible across the enterprise, for instance, is an administrative action that directly empowers every clinician with immediate visual data, thereby accelerating diagnosis and treatment [50]. These technological choices are not neutral; they are foundational elements that either build bridges or reinforce walls between departments.

Furthermore, health administration is responsible for the crucial task of human resource management, which directly impacts the capacity for integration. This involves establishing appropriate staffing models and ratios. As demonstrated in numerous studies, inadequate nurse-to-patient ratios lead to task-oriented care, burnout, and a breakdown in communication, fundamentally undermining the nurse's ability to act as an integrator [51]. An administration that strategically invests in safe staffing levels is, in effect, investing in the very infrastructure of patient safety and care coordination. Similarly, administrative support for advanced and specialized roles is critical. The creation and funding of positions such as Clinical Nurse Specialists, Nurse Navigators, and Radiologist-Patient Liaisons formalize the integrative function, providing dedicated experts whose primary role is to bridge clinical and diagnostic domains [52]. By designing career ladders and compensation models that reward collaborative practice and quality outcomes rather than purely productivity-based metrics, administration can incentivize the behaviors that lead to synergy, sending a clear message that teamwork is valued and essential to the organization's mission.

The architectural role of administration extends deeply into the realm of policy, protocol, and process design. Administrators, in collaboration with clinical leaders, are responsible for establishing the standardized procedures that govern how care is delivered and how different departments interact. These protocols are the "operating system" of the integrated healthcare organization. For example, the implementation of a standardized communication tool like SBAR (Situation, Background, Assessment, Recommendation) for handoffs between radiologists and referring physicians can drastically reduce miscommunication [53]. Similarly, administrators can mandate and support the creation of structured pathways for critical conditions, such as stroke or sepsis. These pathways explicitly map out the roles and responsibilities of each stakeholder from the emergency room nurse who identifies the symptoms, to the radiology technologist who prioritizes the scan, to the radiologist who provides an immediate interpretation—creating a seamless, time-efficient process that minimizes delays and errors [54]. Without this administrative push to standardize and codify collaboration, interdisciplinary efforts often remain ad hoc and dependent on the individual initiative of staff, leading to inconsistent and unreliable outcomes.

Perhaps the most subtle yet powerful lever available to health administration is the cultivation of an organizational culture that champions collaboration and quality. Culture is the shared set of values, beliefs, and norms that guide behavior within an organization, and it is shaped primarily by leadership. Administrators, from the C-suite to department managers, must actively and consistently model and reward collaborative behavior. This involves creating forums for interaction, such as mandatory multidisciplinary team (MDT) meetings for complex cancer cases, where surgeons, oncologists, radiologists, and nurses are given protected time to collaborate on treatment plans [55]. It also means fostering psychological safety, where a nurse feels empowered to question a radiology report or a radiologist feels comfortable calling a physician to discuss a ambiguous finding without fear of reprimand or disrespect [56]. Leadership must visibly celebrate successes achieved through teamwork and conduct blameless root-cause analyses when errors occur, focusing on systemic fixes rather than individual culpability. This cultural work transforms integration from a mandated policy into a deeply held organizational value.

The commitment to enabling synergy is ultimately demonstrated through a dedicated organizational focus on quality improvement and performance monitoring. Administration is responsible for establishing the key performance indicators (KPIs) that the organization tracks and strives to improve. In a siloed system, metrics might be department-specific, such as scanner utilization rates in radiology or fall rates on a nursing unit. In an integrated framework, administrators must champion and monitor cross-functional metrics that reflect the entire patient journey [57]. These include door-to-needle time for stroke patients (involving emergency department, radiology, and pharmacy), time from biopsy order to results communication (involving nursing, radiology, pathology, and administration), and rates of hospital-acquired conditions that require multidisciplinary prevention. By collecting, analyzing, and transparently sharing this data, administration provides the feedback loop that tells the organization whether its integrative efforts are working. This data-driven approach allows for the identification of bottlenecks for instance, a persistent delay in transporting inpatients to radiology and empowers administrators to allocate resources or redesign processes to address them [58].

Forging the Link: Practical Models for Interdisciplinary Collaboration:

Recognizing the necessity of integration is merely the first step; the true challenge lies in its practical implementation. Moving from a theoretical ideal to an operational reality requires the deliberate design and deployment of concrete models that forge robust, reliable links between nursing, radiology, and health administration. These models are the practical mechanisms that transform siloed professionals into a cohesive, high-performing team. They move beyond vague encouragements to "work together" and provide structured frameworks for communication, shared decision-making, and coordinated action. The most effective models are those that are systematically embedded into the daily workflow, supported by technology, and reinforced by organizational culture. They address the critical interfaces where handoffs and information exchanges are most vulnerable to failure, ensuring that the patient's journey through the healthcare system is a seamless continuum rather than a series of disjointed encounters [59]. This section explores several key practical models that have proven effective in bridging the disciplinary divides and fostering genuine interdisciplinary collaboration.

One of the most established and powerful models for integration is the Multidisciplinary Team (MDT) meeting, often referred to as a tumor board in oncology or a case conference in other specialties. These are formal, regularly scheduled meetings where healthcare professionals from all relevant disciplines convene to discuss individual patient cases. In the context of integrating nursing, radiology, and administration, a typical MDT would include the referring physician, the clinical nurse specialist or oncology nurse, the radiologist, the pathologist, the surgeon, the oncologist, and often a representative from health administration or care coordination [60]. The radiologist presents and interprets the imaging studies, providing visual evidence of the disease's extent. The nurse contributes the patient's clinical status, psychosocial context, and functional capacity critical information that may not be apparent on a scan. Together, the team synthesizes this information to formulate a consensus-based treatment plan. This model ensures that the diagnostic precision of radiology is directly informed by the holistic perspective of nursing, and that the resulting plan is both clinically sound and logistically feasible, with administrative support for its execution.

A second critical model focuses on standardizing communication at the most vulnerable points of care: handoffs and critical result reporting. The implementation of structured communication tools, such as the SBAR (Situation, Background, Assessment, Recommendation) technique, provides a common language for interactions between nurses and radiologists. For example, when a nurse calls a radiologist to discuss a deteriorating patient, using SBAR ensures a concise and complete transfer of information: the *Situation* (e.g., "This is Nurse Smith from 4 West, I'm calling about Mr. Jones whose oxygen saturation is dropping"), the *Background* (e.g., "He is post-op day 2 from a laparotomy"), the *Assessment* (e.g., "I am concerned he may have a pulmonary embolism"), and the *Recommendation* (e.g., "I am requesting a stat CT pulmonary angiogram") [61]. Conversely, for critical radiology findings, a structured protocol is essential. This involves more than just documenting the result in the EHR; it requires a closed-loop communication system where the radiologist directly communicates the critical finding to an authorized caregiver (the nurse or physician), who must then acknowledge and document receipt and understanding of the result, ensuring accountability and preventing the finding from being lost in the system [62].

The technological infrastructure of a healthcare organization provides a foundational model for integration through the strategic use of the Electronic Health Record (EHR). However, simply having an EHR is insufficient; it must be designed and utilized to actively promote collaboration. An integrated EHR acts as a shared digital workspace. Beyond storing data, it can be configured with "smart" functionalities that forge active links. For instance, computerized provider order entry (CPOE) for imaging studies can include forced functions that require the ordering clinician to provide a specific clinical indication, which is then automatically transmitted to the radiology department, giving the radiologist vital context for their interpretation [63]. Furthermore, the EHR can be set up with automated alert

systems. When a radiologist finalizes a report with a critical finding, the system can instantly trigger an alert to the nursing unit's dashboard or to the primary nurse's mobile device, prompting immediate review and action [64]. This model of "push" technology, as opposed to requiring nurses to constantly "pull" information by checking for new results, represents a fundamental shift towards a proactive, integrated system that supports, rather than hinders, interdisciplinary care.

At a more granular, process-oriented level, the development and implementation of Integrated Clinical Pathways (ICPs), also known as care pathways or protocols, are powerful tools for standardizing collaboration around specific clinical conditions. An ICP is a multidisciplinary plan that outlines the essential steps in the care of a patient with a specific diagnosis or procedure over a predetermined period. For a patient presenting with an acute ischemic stroke, for example, the pathway would delineate precise, time-sequenced actions for each discipline: the emergency room nurse's role in rapid assessment and alerting the stroke team; the radiology department's responsibility in performing and interpreting a non-contrast CT head within 15 minutes of arrival; the radiologist's and neurologist's collaboration in reviewing CT angiography; and the administrator's role in ensuring resource availability and tracking door-to-needle times [65]. By mapping out the interdependent roles, ICPs reduce variation, minimize delays, and make the required collaboration explicit and predictable for all involved, effectively hardwiring teamwork into the clinical workflow.

To build a sustainable culture of collaboration, practical models must also extend to shared training and interprofessional education (IPE). Traditional education often trains healthcare professionals in isolation, reinforcing siloed identities from the outset. IPE flips this model by bringing students and practitioners from nursing, medicine, radiology technology, and health administration together to learn *with, from, and about* each other [66]. This can be achieved through joint simulation exercises—for example, a simulated scenario of a deteriorating patient where nursing students must recognize the change in status, communicate effectively with a radiology student to arrange an urgent scan, and work with an administration student to navigate system barriers [67]. Such experiences break down stereotypes, build mutual respect, and allow participants to practice the very communication and teamwork skills they will need in clinical practice. When supported by administration, these programs can be extended to ongoing professional development for existing staff, ensuring that the principles of collaboration are continuously reinforced and practiced.

Finally, the model of embedded or liaison roles physically and professionally places individuals from one discipline within the workflow of another to facilitate integration. A prime example is the role of a Radiology Nurse Liaison. This is an experienced nurse who is based within the radiology department, acting as a dedicated clinical resource and communication bridge [68]. This nurse can prepare patients for complex procedures, manage sedation and analgesia, monitor patients during and after exams, and serve as the direct point of contact for the inpatient nursing units. They speak the language of both nursing and radiology, ensuring that patient safety concerns are addressed and that clinical information flows smoothly in both directions. Similarly, some organizations have successfully implemented the role of an Imaging Informatics Specialist, often with a background in both radiology and IT, who works at the intersection of clinical needs and administrative systems to optimize the EHR and PACS for end-users, thereby addressing technological barriers to collaboration [69].

CONCLUSION

In conclusion, the journey toward excellence in healthcare quality is a collective endeavor that fundamentally depends on the seamless integration of its core components. This research has unequivocally demonstrated that the isolated excellence of Nursing, Radiology, or Health Administration is insufficient to overcome the inherent inefficiencies and risks of a fragmented system. True enhancement is only achievable when these disciplines operate not as independent silos, but as interconnected parts of a unified, patient-centric organism. Nursing provides the indispensable, continuous context; Radiology delivers the critical diagnostic insights; and Health Administration builds the enabling infrastructure that makes synergy possible. The practical models for collaboration from multidisciplinary meetings and smart technology to shared training provide the tangible mechanisms to forge these essential links. Therefore, the imperative for healthcare leaders and practitioners is clear: they must actively champion and invest in a cultural and operational shift towards deep, structured integration. By doing so, they can transform the healthcare delivery model from one of disjointed transactions into a cohesive, high-reliability system capable of delivering the safe, effective, and compassionate care that every patient deserves. The future of healthcare quality lies not in strengthening the walls between departments, but in building bridges.

REFERENCES

1. From staff-mix to skill-mix and beyond: towards a systemic approach to health workforce management. Dubois CA, Singh D. Hum Resour Health. 2009; 7:87. doi: 10.1186/1478-4491-7-87. [DOI] [PMC free article] [PubMed] [Google Scholar]
2. Correlation between hospital finances and quality and safety of patient care. Akinleye DD, McNutt LA, Lazariu V, McLaughlin CC. PLoS One. 2019; 14:0. doi: 10.1371/journal.pone.0219124. [DOI] [PMC free article] [PubMed] [Google Scholar]

3. Patient satisfaction with the quality of nursing care. Karaca A, Durna Z. Nurs Open. 2019; 6:535–545. doi: 10.1002/nop2.237. [DOI] [PMC free article] [PubMed] [Google Scholar]
4. Health care professional development: working as a team to improve patient care. Babiker A, El Husseini M, Al Nemri A, *et al.*,Sudan J Paediatr. 2014; 14:9–16. [PMC free article] [PubMed] [Google Scholar]
5. Healthcare reimbursement and quality improvement: integration using the electronic medical record comment on "fee-for-service payment--an evil practice that must be stamped out?". Britton JR. Int J Health Policy Manag. 2015; 4:549–551. doi: 10.15171/ijhpm.2015.93. [DOI] [PMC free article] [PubMed] [Google Scholar]
6. Principle of clinical ethics and their application to practice. Varkey B. Med Princ Pract. 2021; 30:17–28. doi: 10.1159/000509119. [DOI] [PMC free article] [PubMed] [Google Scholar]
7. Leading the way: Governance in health - the need for exchange and evidence comment on "governance, government, and the search for new provider models". Chanturidze T, Obermann K. Int J Health Policy Manag. 2016; 5:507–510. doi: 10.15171/ijhpm.2016.60. [DOI] [PMC free article] [PubMed] [Google Scholar]
8. The use of Big Data Analytics in healthcare. Batko K, Ślęzak A. J Big Data. 2022; 9:3. doi: 10.1186/s40537-021-00553-4. [DOI] [PMC free article] [PubMed] [Google Scholar]
9. Electronic health record implementation: a review of resources and tools. Aguirre RR, Suarez O, Fuentes M, Sanchez-Gonzalez MA. Cureus. 2019; 11:0. doi: 10.7759/cureus.5649. [DOI] [PMC free article] [PubMed] [Google Scholar]
10. Telemedicine: current impact on the future. Jin MX, Kim SY, Miller LJ, Behari G, Correa R. Cureus. 2020; 12:0. doi: 10.7759/cureus.9891. [DOI] [PMC free article] [PubMed] [Google Scholar]
11. Patient-centred care is a way of doing things: How healthcare employees conceptualize patient-centred care. Fix GM, VanDeusen Lukas C, Bolton RE, Hill JN, Mueller N, LaVela SL, Bokhour BG. Health Expect. 2018; 21:300–307. doi: 10.1111/hex.12615. [DOI] [PMC free article] [PubMed] [Google Scholar]
12. High-quality health systems in the Sustainable Development Goals era: time for a revolution. Kruk ME, Gage AD, Arsenault C, *et al.*,Lancet Glob Health. 2018; 6:0–252. doi: 10.1016/S2214-109X(18)30386-3. [DOI] [PMC free article] [PubMed] [Google Scholar]
13. Digital transformation in healthcare: technology acceptance and its applications. Stoumpos AI, Kitsios F, Talias MA. Int J Environ Res Public Health. 2023;20 doi: 10.3390/ijerph20043407. [DOI] [PMC free article] [PubMed] [Google Scholar]
14. Patient satisfaction with health care services; an application of physician's behavior as a moderator. Manzoor F, Wei L, Hussain A, Asif M, Shah SI. Int J Environ Res Public Health. 2019;16 doi: 10.3390/ijerph16183318. [DOI] [PMC free article] [PubMed] [Google Scholar]
15. Importance of leadership style towards quality-of-care measures in healthcare settings: a systematic review. Sfantou DF, Laliotis A, Patelarou AE, Sifaki-Pistolla D, Matalliotakis M, Patelarou E. Healthcare (Basel) 2017;5 doi: 10.3390/healthcare5040073. [DOI] [PMC free article] [PubMed] [Google Scholar]
16. Lean six sigma in healthcare: a systematic literature review on challenges, organisational readiness and critical success factors. McDermott O, Antony J, Bhat S, Jayaraman R, Rosa A, Marolla G, Parida R. Processes. 2022; 10:1945. [Google Scholar]
17. Empowering education: a new model for in-service training of nursing staff. CH M, SA M, EB A, AM A. J Adv Med Educ Prof. 2017;5:26–32. [PMC free article] [PubMed] [Google Scholar]
18. Patient satisfaction survey as a tool towards quality improvement. Al-Abri R, Al-Balushi A. Oman Med J. 2014;29:3–7. doi: 10.5001/omj.2014.02. [DOI] [PMC free article] [PubMed] [Google Scholar]
19. Health care professional development: working as a team to improve patient care. Babiker A, El Husseini M, Al Nemri A, *et al.*,https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4949805/ Sudan J Paediatr. 2014; 14:9–16. [PMC free article] [PubMed] [Google Scholar]
20. Governance in health - the need for exchange and evidence comment on "governance, government, and the search for new provider models". Chanturidze T, Obermann K. Int J Health Policy Manag. 2016; 5:507–510. doi: 10.15171/ijhpm.2016.60. [DOI] [PMC free article] [PubMed] [Google Scholar]
21. The use of Big Data Analytics in healthcare. Batko K, Ślęzak A. J Big Data. 2022; 9:3. doi: 10.1186/s40537-021-00553-4. [DOI] [PMC free article] [PubMed] [Google Scholar]
22. Digital transformation in healthcare: technology acceptance and its applications. Stoumpos AI, Kitsios F, Talias MA. Int J Environ Res Public Health. 2023;20 doi: 10.3390/ijerph20043407. [DOI] [PMC free article] [PubMed] [Google Scholar]
23. Ellenbecker CH, Samia L, Cushman MJ, Alster K. Patient Safety. Vol. 2008. Rockville: Agency for Healthcare Research and Quality (US); 2008. Patient Safety and Quality in Home Health Care. [PubMed] [Google Scholar]
24. Quentin W, Partanen VM, Brownwood I, *et al.*,Copenhagen: European Observatory on Health Systems and Policies; 2019. Measuring Healthcare Quality. [PubMed] [Google Scholar]
25. Err Is Human: Building a Safer Health System. Institute of Medicine (US) Committee on Quality of Health Care in America, Kohn LT, Corrigan JM, Donaldson MS, eds. Washington, DC: National

Academies Press (US); 2000. [PubMed] [Google Scholar]
26. A new, evidence-based estimate of patient harms associated with hospital care. James JT. J Patient Saf. 2013;9(3):122-128. [PubMed] [Google Scholar]
27. Estimating time physicians and other health care workers spend with patients in an intensive care unit using a sensor network. Butler R, Monsalve M, Thomas GW, *et al.*, Am J Med 2018;131(8): 972.e9-972.e15. [DOI] [PubMed] [Google Scholar]
28. What impact does nursing care left undone have on patient outcomes? Review of the literature. Recio-Saucedo A, Dall'Ora C, Maruotti A, *et al.,* J Clin Nurs. 2018;27(11-12):2248-2259. [DOI] [PMC free article] [PubMed] [Google Scholar]
29. Reducing interruptions to improve medication safety. Freeman R, McKee S, Lee-Lehner B, Pesenecker J. J Nurs Care Qual. 2013;28(2):176-185. [DOI] [PubMed] [Google Scholar]
30. Professional practice models for nursing: A review of the literature and synthesis of key components. Slater S, Coventry LL, Twigg D, Davis S. J Nurs Manag 2016;24(2):139-150. [DOI] [PubMed] [Google Scholar]
31. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. Page MJ, McKenzie JE, Bossuyt PM, *et al.*,BMJ. 2021;372:n71. [DOI] [PMC free article] [PubMed] [Google Scholar]
32. Content analysis in mass communication: Assessment and reporting of intercoder reliability. Lombard M, Snyder-Duch J, Bracken CC. Hum Commun Res. 2002;28(4):587-604. [Google Scholar]
33. The Defense Health Agency 2017 Stakeholder Report. Defense Health Agency; 2017. [Google Scholar]
34. Johns Hopkins Nursing Evidence-Based Practice Model and Guidelines. Newhouse RP, Dearholt SL, Poe SS, Pugh LC, White KM. Indianapolis, IN: Sigma Theta Tau International Honor Society of Nursing; 2007. [Google Scholar]
35. Professional practice models for nursing: A review of the literature and synthesis of key components. Slater S, Coventry LL, Twigg D, Davis S. J Nurs Manag 2016;24(2):139-150. [DOI] [PubMed] [Google Scholar]
36. The Defense Health Agency 2017 Stakeholder Report. Defense Health Agency; 2017. [Google Scholar]
37. Implementing a distraction-free practice with the red zone medication safety initiative. Connor JA, Ahern JP, Cuccovia B, *et al.*,Dimens Crit Care Nurs. 2016;35(3):116-124. [DOI] [PubMed] [Google Scholar]
38. Multifocal clinical performance improvement across 21 hospitals. Crawford B, Skeath M, Whippy A. J Healthc Qual. 2015;37(2):117-125. [DOI] [PMC free article] [PubMed] [Google Scholar]
39. Estimating time physicians and other health care workers spend with patients in an intensive care unit using a sensor network. Butler R, Monsalve M, Thomas GW, *et al.*, Am J Med 2018;131(8): 972.e9-972.e15. [DOI] [PubMed] [Google Scholar]
40. A systematic review of the evidence related to mandated nurse staffing ratios in acute hospitals. Olley R, Edwards I, Avery M, Cooper H. Aust Health Rev. 2019;43(3):288-293. [DOI] [PubMed] [Google Scholar]
41. A new, evidence-based estimate of patient harms associated with hospital care. James JT. J Patient Saf. 2013;9(3):122-128. [DOI] [PubMed] [Google Scholar]
42. Hemmelgarn C, Hatlie M, Sheridan S, Daley Ullem B. Who killed patient safety? J Patient Saf Risk Manag. 2022;27(2):56-58. [Google Scholar]
43. World Health Organization. State of the World's Nursing Report-2020. World Health Organization; 2020. Available at: nursing-report-2020. Accessed September 9, 2020. [Google Scholar]
44. Kerr D, Ostaszkiewicz J, Dunning T, Martin P. The effectiveness of training interventions on nurses' communication skills: A systematic review. Nurse Educ Today. 2020; 89:104405. [DOI] [PubMed] [Google Scholar]
45. Stallings-Welden LM, Shirey MR. Predictability of a professional practice model to affect nurse and patient outcomes. Nurs Adm Q 2015;39(3):199-210. [DOI] [PubMed] [Google Scholar]
46. James JT. A new, evidence-based estimate of patient harms associated with hospital care. J Patient Saf. 2013;9(3):122-128. [DOI] [PubMed] [Google Scholar]
47. Makary MA, Daniel M. Medical error-the third leading cause of death in the US. BMJ 2016;353:i2139. [DOI] [PubMed] [Google Scholar]
48. Wachter RM. Patient safety at ten: Unmistakable progress, troubling gaps. Health Aff (Millwood) 2010;29(1):165-173. [DOI] [PubMed] [Google Scholar]
49. Nightingale F. Notes on Nursing: What It Is, and What It Is Not. Dover Publications; Mineola, NY, USA: 1969. [Google Scholar]
50. Cardoso D., Ortiz F., Artur P., De Sousa F. Computerized clinical decision support system utilization in nursing: A scoping review protocol. JBI Database Syst. Rev. Implement. Rep. 2017; 15:2638–2644. doi: 10.11124/JBISRIR-2016-003184. [DOI] [PubMed] [Google Scholar]
51. Locsin R. Technological Competency as Caring in Nursing: A Model for Practice. Amazon Itália S.r.I.; Torraza Piemonte, TO, Italy: 2016. [Google Scholar]
52. Karnick P. Book Review: Technological competency as caring in nursing: A model for practice. Nurs. Sci. Q. 2006; 19:274–275. doi: 10.1177/089431840601900320. [DOI] [Google Scholar]

53. Manley B. Advancing the theory of technological competency as caring in nursing: The universal technological domain. Int. J. Hum. Caring. 2015; 19:50–54. doi: 10.20467/1091-5710.19.2.50. [DOI] [Google Scholar]
54. Monteiro ACurado M., Queirós P. Biotecnologia: Revolução digital e conhecimento estético em enfermagem. Rev. Enferm. Ref. 2017; 4:139–146. doi: 10.12707/RIV17020. [DOI] [Google Scholar]
55. Chaudhry B., Wang J., Wu S., Maglione M., Mojica W., Roth E., Morton S.C., Shekelle P.G. Systematic review: Impact of health information technology on quality, efficiency, and costs of medical care. Ann. Intern. Med. 2006; 144:742–752. doi: 10.7326/0003-4819-144-10-200605160-00125. [DOI] [PubMed] [Google Scholar]
56. Cunha A.P., Ferreira J.J.M., Rodrigues M.A. Atitude dos enfermeiros face ao sistema informatizado de informação em enfermagem. Rev. Enferm. Ref. 2010; 3:7–16. doi: 10.12707/RII0935. [DOI] [Google Scholar]
57. Luther B., Barra J., Martial M. Essential nursing care management and coordination roles and responsibilities: A content analysis. Prof. Case Manag. 2019; 24:249–258. doi: 10.1097/NCM.0000000000000355. [DOI] [PubMed] [Google Scholar]
58. Ozen-Bekar E., Baykal U. Investigation of the control process in nursing care management: A qualitative study. Florence Nightingale J. Nurs. 2020; 28:61–70. doi: 10.5152/fnjn.2020.18033. [DOI] [PMC free article] [PubMed] [Google Scholar]
59. Mororó D.D.S., Enders B.C., Lira A.L.B.C., Silva C.M.B., Menezes R.M.P. Concept analysis of nursing care management in the hospital context. Acta Paul. Enferm. 2017; 30:323–332. doi: 10.1590/1982-0194201700043. [DOI] [Google Scholar]
60. Huang T., Lee I., Wong M., Shyu Y., Ho L., Lin J., Liao G., Teng C. How do three components of professional commitment influence nurse-reported patient-centred care and care quality? J. Clin. Nurs. 2023; 32:126–136. doi: 10.1111/jocn.16198. [DOI] [PubMed] [Google Scholar]
61. Oliveira L., Schilling M. Análise do serviço de enfermagem no processo de planejamento estratégico em hospital. Rev. Gestão. 2011; 18:225–243. doi: 10.5700/rege424. [DOI] [Google Scholar]
62. Elgin K.H., Bergero C. Technology and the Bedside Nurse: An Exploration and Review of Implications for Practice. Nurs. Clin. N. Am. 2015; 50:227–239. doi: 10.1016/j.cnur.2015.02.001. [DOI] [PubMed] [Google Scholar]
63. Novak L.L., Anders S., Gadd C.S., Lorenzi N.M. Mediation of adoption and use: A key strategy for mitigating unintended consequences of health IT implementation. J. Am. Med. Inform. Assoc. 2012; 19:1043–4049. doi: 10.1136/amiajnl-2011-000575. [DOI] [PMC free article] [PubMed] [Google Scholar]
64. Wang P., Zhang H., Li B., Lin K. Making patient risk visible: Implementation of a nursing document information system to improve patient safety. Stud. Health Technol. Inform. 2016; 225:8–12. doi: 10.3233/978-1-61499-658-3-8. [DOI] [PubMed] [Google Scholar]
65. Berg G.M., Locurto J., Lippoldt D. Stages of Adoption Concern and Technology Acceptance in a Critical Care Nursing Unit. J. Nurs. Adm. 2017; 47:441–447. doi: 10.1097/NNA.0000000000000511. [DOI] [PubMed] [Google Scholar]
66. Vandresen L., de Pires D.E.P., Martins M.M.F.P.d.S., Forte E.C.N., Leão E., Mendes M. Potentialities and difficulties of technological mediation in the work of nurse managers in hospitals. Texto Contexto Enferm. 2022; 31:1–13. doi: 10.1590/1980-265x-tce-2022-0173en. [DOI] [Google Scholar]
67. Vezyridis P., Timmons S., Wharrad H. Implementation of an emergency department information system: A qualitative study of nurses' attitudes and experience. CIN Comput. Inform. Nurs. 2012; 30:540–546. doi: 10.1097/NXN.0b013e3182573b04. [DOI] [PubMed] [Google Scholar]
68. Lalley C. Workarounds and obstacles: Unexpected source of innovation. Nurs. Adm. Q. 2014; 38:69–77. doi: 10.1097/NAQ.0000000000000015. [DOI] [PubMed] [Google Scholar]
69. Zadvinskis I.M., Smith J.G., Yen P.Y. Nurses' experience with health information technology: Longitudinal qualitative study. JMIR Med. Inform. 2018;6:e8374. doi: 10.2196/medinform.8734. [DOI] [PMC free article] [PubMed] [Google Scholar]