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Integrated Healthcare Administration, Administrative Coordination, and Daily Workflow Management in Health Centers: A Multidisciplinary Review of Best Practices in Nursing, Radiological Technology, and Medical Laboratories

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Abstract

The increasing complexity of modern healthcare delivery, driven by multimorbidity, specialization, and rising patient expectations, has exposed the limitations of fragmented, siloed operational models in health centers. This narrative review synthesizes contemporary evidence on integrated healthcare administration, administrative coordination, and daily workflow management, with a focused examination of best practices across three critical disciplines: nursing, radiological technology, and medical laboratories. A comprehensive literature search of PubMed, CINAHL, Scopus, and Google Scholar was conducted for publications between 2017 and 2026. The review identifies that strategic integration of administrative coordination functions—including master scheduling, referral loop management, and health information management—is essential for achieving the Quintuple Aim of healthcare. Key findings indicate that automation, Lean methodologies, and interoperability-driven workflow engines significantly reduce administrative burden, turnaround times, and error rates. Nursing workflow optimization through virtual care models and command centers enhances care delivery and reduces burnout. Radiology workflow improvements, including decision support and dashboard systems, reduce scan overscan and turnaround times. Laboratory automation and auto-verification systems substantially decrease turnaround times and manual errors. The review concludes that a conscious, system-wide commitment to dissolving interdisciplinary boundaries, supported by structured communication protocols, integrated health information technology, and interprofessional education, is the definitive pathway to operational excellence and patient-centered care.

Keywords: Integrated care, administrative coordination, workflow management, interprofessional collaboration, healthcare quality.

Introduction

Contemporary healthcare systems confront a fundamental paradox: unparalleled therapeutic capabilities coexist with profound systemic fragmentation (Bajawi, 2025). Patients with complex, chronic conditions no longer experience linear care pathways but rather navigate labyrinthine journeys across specialized providers, departments, and care settings (Kerrissey et al., 2022; Song et al., 2022). A single episode of care for a patient with diabetic complications may involve sequential or concurrent interactions with primary care, endocrinology, radiology for imaging, nursing for wound care, physiotherapy for mobility, and potentially emergency or dental services for acute issues (Bajawi, 2025). This necessary specialization creates significant risks for care delays, communication failures, and adverse events, with traditional clinical coordination models often overlooking the pivotal administrative and informational backbone of care continuity (Dillon et al., 2024).

The pursuit of excellence in healthcare quality is perpetually challenged by systemic fragmentation, where siloed operations among critical departments—including nursing, radiology, and health administration—lead to communication breakdowns, clinical errors, and operational inefficiencies (Bajawi, 2025). The traditional, siloed biomedical model is increasingly inadequate for managing complex patient needs that extend beyond

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isolated biological pathology to encompass psychological, social, and environmental dimensions (Aljabri et al., 2025). This recognition has driven a paradigm shift toward integrated care models that prioritize patient-centered holism and multidisciplinary collaboration (Struckmann et al., 2024).

Integrated healthcare administration represents a strategic approach to dissolving these interdisciplinary boundaries. As defined by the World Health Organization's European Observatory on Health Systems and Policies, integrated care provides a shift from a reactive approach to a proactive approach focused on prevention and integration between healthcare, long-term care, and social care (Struckmann et al., 2024). The operational realization of this vision depends fundamentally on administrative coordination systems that orchestrate complex patient journeys across specialties and settings (Dillon et al., 2024).

Administrative coordination, as a determinant of healthcare quality, has emerged as a critical yet understudied domain. Research indicates that effective navigation of multi-specialty care is fundamentally dependent on seamless administrative and informational orchestration, including master scheduling, proactive management of referral loops, and timely sharing of complete health records. The quality, safety, and efficiency of complex patient care are inextricably linked to the performance of these administrative coordination systems (Dillon et al., 2024).

Daily workflow management in health centers encompasses the operational processes through which clinical and administrative tasks are organized, sequenced, and completed. In nursing, workflow optimization directly impacts patient safety, care quality, and staff well-being (Al Moteri et al., 2024). In radiological technology, workflow efficiency determines diagnostic timeliness and resource utilization (Ranschaert et al., 2021). In medical laboratories, workflow management affects turnaround times, error rates, and clinical decision-making (Liu et al., 2025).

This narrative review aims to synthesize existing evidence on integrated healthcare administration, administrative coordination, and daily workflow management, with a focused examination of best practices across three critical disciplines: nursing, radiological technology, and medical laboratories. The review addresses the following objectives: first, to examine theoretical frameworks and models underpinning integrated healthcare administration; second, to identify evidence-based best practices in workflow management within each of the three focal disciplines; third, to analyze mechanisms for cross-disciplinary coordination and integration; and fourth, to propose recommendations for health center administrators and policymakers.

Theoretical Frameworks for Integrated Healthcare Administration

The Quintuple Aim and Patient-Centered Holism

The theoretical foundation for integrated healthcare administration rests on the evolution from biomedical reductionism to patient-centered holism (Aljabri et al., 2025). The Quintuple Aim framework—encompassing population health, patient experience, cost reduction, clinician well-being, and health equity—provides the strategic orientation for integration efforts (Aljabri et al., 2025). Achieving these aims requires a deeply integrated, multidisciplinary approach that examines the indispensable and synergistic roles of core pillars including nursing, laboratory services, radiology, and administrative support (Aljabri et al., 2025).

The theoretical case for integration is compelling. Fragmented care delivery produces redundant testing, delayed diagnoses, medication errors, and patient dissatisfaction (Bajawi, 2025). In contrast, integrated care models have demonstrated improvements in clinical outcomes, operational efficiency, and patient satisfaction (Bajawi, 2025). The shift from reactive to proactive care is enabled through shared expertise, real-time data exchange, and integrated clinical workflows (Hasirah et al., 2025).

Implementation Science Frameworks

The transition toward integrated care is complex and understudied (Desmet et al., 2025). Implementation science frameworks provide structured approaches for navigating this complexity. The Consolidated Framework for Implementation Research (CFIR) has been applied to identify barriers, facilitators, and strategies supporting interprofessional care transitions (Desmet et al., 2025). Key findings from CFIR-guided research indicate that clear task allocation and communication structures within protocols improve care coordination, while external factors such as financial constraints and high workloads pose challenges (Desmet et al., 2025). Internal practice dynamics—including shared vision, mutual trust, and structured team meetings—are crucial enablers (Desmet et al., 2025).

A framework developed by the World Health Organization's European Observatory identifies twelve overall strategies to transform care delivery toward integrated models (Struckmann et al., 2024). These strategies emphasize the importance of supportive infrastructure, including interorganizational arrangements and information systems, to enable new models of care that integrate health and social care provision around the patient (Struckmann et al., 2024). Emerging healthcare paradigms seek to address fragmentation challenges by implementing integrated care models that prioritize patient-centered approaches (Elizondo et al., 2024).

The Socio-Technical Systems Perspective

Integrated healthcare administration is fundamentally a socio-technical challenge. ICU Command Centers exemplify this perspective, functioning as centralized spaces—physical or virtual—for real-time monitoring and management that integrate clinical and operational data to support timely decisions on bed availability, staff allocation, and resource coordination (Muñoz et al., 2026). These centers enhance early detection of deterioration, streamline team communication, and reduce errors by fostering coordinated, multidisciplinary care. Importantly, their impact depends on alignment with clinical workflows, especially those of nurses, and on trust-building strategies that promote adoption and sustained use (Muñoz et al., 2026).

The socio-technical perspective recognizes that technology alone cannot solve fragmentation. The human element remains the most critical factor in making coordination mechanisms work (Hasirah et al., 2025). Interprofessional collaboration, supported by practice-tailored protocols, offers a promising approach to optimizing task shifting and enhancing care coordination (Desmet et al., 2025). However, the transition toward protocol-based interprofessional care requires structured implementation strategy, effective practice management, and team alignment (Desmet et al., 2025).

Table 1. Theoretical Frameworks and Their Application to Integrated Healthcare Administration

Framework	Core Principles	Application to Health Center Integration	Key References
Quintuple Aim	Population health, patient experience, cost, clinician well-being, equity	Strategic orientation for multidisciplinary integration across nursing, radiology, laboratory	Aljabri et al. (2025); Bajawi (2025)
CFIR	Intervention characteristics, outer setting, inner setting, characteristics of individuals, process	Identifying barriers and facilitators for interprofessional protocol adoption	Desmet et al. (2025)
WHO Integrated Care Framework	Twelve strategies for care delivery transformation	Policy and infrastructure guidance for integrated care systems	Struckmann et al. (2024)
Socio-Technical Systems	Joint optimization of social and technical subsystems	Design of command centers, workflow engines, and coordination technologies	Muñoz et al. (2026); Hasirah et al. (2025)
Lean Management	Value specification, value stream mapping, flow, pull, perfection	Process improvement in laboratory, radiology, and administrative workflows	Franco-Alucano et al. (2025); Harsvardhan et al. (2026)

Best Practices in Nursing Workflow Management

Virtual Nursing Models and Task Reallocation

Nursing workflow management has undergone significant transformation through the emergence of virtual nursing models. Virtual nursing has emerged as an approach to support bedside nurses and enhance patient care delivery, evolving from mentorship-focused models to comprehensive workflow integration (Roberson et al., 2025). Research examining an advanced virtual nursing model demonstrated that shifting tasks from bedside nurses to virtual nurses increased admission and discharge completion rates by reducing administrative burdens for bedside nurses and improving resource allocation (Roberson et al., 2025).

The operational benefits of virtual nursing are substantial. Following implementation of an advanced virtual nursing model, findings revealed reductions in overtime and length of stay, along with improved discharge planning and patient education (Fleming et al., 2025). Overtime hours decreased by 26%, and the length of stay index was reduced by 11.6%, suggesting more effective patient flow and resource utilization. Readmissions and falls with injury decreased by 2.21% (Fleming et al., 2025). A key consideration when developing virtual nursing models is implementing a design that meets the unique needs of the practice, including those of the patient population and the nursing staff (Roberson et al., 2025).

ICU Command Centers and Data-Driven Coordination

ICU Command Centers represent a scalable, data-driven infrastructure for high-acuity care coordination (Muñoz et al., 2026). These centers integrate clinical and operational data to support timely decisions on bed availability, staff allocation, and resource coordination. Authoritative ICU Command Center models are associated with improved adherence to best practices, reduced ICU mortality and length of stay, and enhanced operational efficiency. Platforms integrating predictive dashboards and remote expert support improve staff responsiveness and reduce documentation burden (Muñoz et al., 2026).

For nurses specifically, Command Centers may reduce alarm fatigue, streamline workflows, and enhance team communication—especially when systems are tailored to frontline needs (Muñoz et al.,

2026). When integrated effectively, ICU Command Centers can reduce cognitive overload and optimize nursing care by supporting prioritization, protocol adherence, and interdisciplinary coordination. Involving nurses in the design and implementation phases is key to ensuring usability and clinical relevance (Muñoz et al., 2026).

Artificial Intelligence and Closed-Loop Nursing Information Management

The application of artificial intelligence to nursing workflow management has demonstrated significant improvements in both efficiency and quality. Research on AI-assisted closed-loop mobile nursing information management found that the nursing workflow completion rate rose from 73.17% pre-implementation to 94.89% post-implementation (Yuan et al., 2025). Overall patient satisfaction increased from 83.3% before implementation to 97.65% after implementation (Yuan et al., 2025). An AI-powered solution directed 35.4% of patient requests, effectively reducing the nursing team's workload by nearly three out of five patient requests and resulting in considerable time savings for nurses (Gentil et al., 2025).

Addressing Bottlenecks in Nursing Workflow

Despite technological advances, nursing workflow bottlenecks remain a significant concern. Research designed to pinpoint and analyze the principal factors contributing to bottleneck issues in nursing workflow identified nurse staffing as a primary variable contributing to extended shift times (Al Moteri et al., 2024). Effective delegation between nurses and secretarial staff has been shown to significantly improve physician and staff burnout, team satisfaction, and functional effectiveness, including reduced wait times and better panel management (Alzahrani et al., 2025). Appropriately delegated work can maintain or even improve quality measures for chronic disease and preventive care (Alzahrani et al., 2025). Significant obstacles include preservation of professional role, regulatory constraints, and inadequate training, while effective leadership, co-designed workflows, and effective communication are key facilitators (Alzahrani et al., 2025).

Best Practices in Radiological Technology Workflow Optimization

Protocol Standardization and Decision Support Systems

Radiological technology workflow optimization begins with protocol standardization. A multi-cycle audit of urinary tract CT imaging demonstrated that targeted, pragmatic interventions in departmental workflow can substantially improve adherence to national scan-range standards (Ullah et al., 2025). The implementation of a pre-populated vetting template specifying cranial scan limits, coupled with dedicated educational sessions for radiography staff and strategically positioned visual aids within CT control rooms, reduced the proportion of scans exceeding the 10% overscan threshold from 64.0% to 29.4%, a statistically significant 34.6% reduction (Ullah et al., 2025).

The selection of the T11 vertebra midpoint as the upper scan limit was evidence-based rather than arbitrary, drawing from established anatomical principles and prior optimization studies (Ullah et al., 2025). By specifying the midpoint of T11 rather than simply "T11," radiographers were provided with precise, actionable guidance that reduced interpretive variability and enhanced protocol adherence. The pre-populated vetting template functioned as a form of clinical decision support system, ensuring that appropriate scan parameters remained consistently visible to operators during protocol selection (Ullah et al., 2025). Such decision support tools have been shown to reduce cognitive burden in high-acuity clinical environments, thereby enhancing protocol compliance and patient safety (Ullah et al., 2025).

Dashboard Systems and Real-Time Communication

The development of emergency department-radiology dashboards has improved communication and transparency of radiologic imaging and report status (Dhanaliwala et al., 2024). An algorithm based on historical trends was developed for predicting expected turnaround times, with most examinations having turnaround times better than the estimated time and fewer than 1% having turnaround times greater than 2 hours from the estimated time (Dhanaliwala et al., 2024). This real-time visibility enables clinical teams to make informed decisions about patient disposition and resource allocation.

Radiology workflow optimization with advanced platforms enables zero-footprint access, real-time analytics, and automation that lower operational costs (Ranschaert et al., 2021). Enhanced communication with physician portals, streamlined appointment processes with drag-and-drop functionality, and automated appointment reminders keep patients informed and engaged in their care. Streamlined end-to-end radiology workflow with embedded tools automating image processing, analysis, and reporting simplifies workflow complexity, improves clinical communication, and enhances reporting accuracy (Ranschaert et al., 2021).

AI-Based Triage and Workload Optimization

Artificial intelligence is increasingly applied to radiological workflow optimization through AI-based triage systems that prioritize urgent radiological examinations (Alimiri Dehbaghi & Khoshgard, 2025). These systems enable workload optimization by ensuring that critical findings are identified and communicated rapidly, while routine studies are appropriately queued (Alimiri Dehbaghi & Khoshgard, 2025). Digital twin applications in radiology enable optimizing CT room utilization by predicting examination durations based on clinical indications and patient factors, balancing radiologist

workloads by distributing studies according to complexity and subspecialty expertise, and predicting staffing requirements for varying patient volumes throughout days and weeks (Olawade et al., 2026).

Research on MRI efficiency demonstrated that optimized facility design and workflow optimization efforts resulted in a decrease of the mean total process cycle by 5.0-6.8 minutes (16.4-18.9%) compared to traditional room configurations, primarily attributed to reduced turnaround times (Herold et al., 2025). These findings underscore the importance of physical environment design in workflow efficiency.

Table 2. Comparative Best Practices Across Nursing, Radiological Technology, and Medical Laboratory Workflows

Domain	Best Practice	Reported Outcome	Enabling Mechanism	Key References
Nursing	Virtual nursing task reallocation	26% reduction in overtime; 11.6% LOS index reduction	EHR optimization; task standardization	Roberson et al. (2025); Fleming et al. (2025)
	AI-assisted closed-loop information management	Workflow completion ↑ from 73.17% to 94.89%	AI-directed request routing	Yuan et al. (2025)
adiology	Protocol standardization with decision support	34.6% reduction in overscan; excess DLP halved	Pre-populated vetting templates; education	Ullah et al. (2025)
	ED-Radiology dashboard	<1% of exams exceeded estimated TAT by >2 hours	Predictive algorithms; real-time visualization	Dhanaliwala et al. (2024)
Laboratory	Dual-autoline + auto-verification	Outpatient TAT ↓ 16.78%; inpatient TAT ↓ 33.06%	Intelligent auto-verification rules; dual automation	Liu et al. (2025)
	Lean Six Sigma + digital shadow	Significant intra-lab TAT reduction	Real-time monitoring; waste elimination	Cai et al. (2025)
Administrative	Centralized referral workqueues	91% increase in completed visits; referral-to-appointment ↓ from 31 to 25 days	EHR workqueue redesign; geo-tagging	Nelson et al. (2025)
	Role delegation (nurse-secretarial)	Reduced wait times; improved panel management	Protocol-based task redistribution	Alzahrani et al. (2025)

Best Practices in Medical Laboratory Workflow Management

Automation and Auto-Verification Systems

Medical laboratory workflow management has been revolutionized by automation and intelligent verification systems. A study evaluating the implementation of a fully automated coagulation testing system integrating dual-coagulation-autoline and auto-verification protocols demonstrated that the dual-autoline system reduced outpatient turnaround time by 16.78% (from 49.77 min to 41.42 min) and inpatient turnaround time by 33.06% (from 110.3 min to 73.83 min) (Liu et al., 2025). Optimized auto-verification rules achieved a 62.48% pass rate, 100% sensitivity, 93.50% specificity, and 0% false negatives (Liu et al., 2025). Auto-verification further reduced outpatient and inpatient turnaround time by 8.29% and 16.21%, respectively, while sample volume increased by 2.8% (Liu et al., 2025).

The integration of dual-coagulation-autoline and refined auto-verification significantly improved turnaround time, reduced manual errors, and standardized workflows in a high-volume setting (Liu et al., 2025). Personalized system optimization, including dynamic testing allocation and real-time tracking, enhanced clinical efficiency, and the validated auto-verification framework demonstrated robust generalizability for large-scale laboratories (Liu et al., 2025).

Lean Methodologies and Digital Shadow Integration

The application of Lean principles to laboratory workflow management has produced substantial efficiency gains. Lean Healthcare 4.0, integrating AI, Lean principles, and simulation, addresses inefficiencies and errors in clinical laboratories, particularly in the pre-analytical phase, which is vulnerable to inefficiencies and human error that directly affect diagnostic quality and patient safety (Franco-Alucano et al., 2025). Laboratory automation in microbiology has been shown to improve productivity and reduce sample turnaround times, with automation alone responsible for 37.2% and 75.8% of turnaround time reduction in different laboratory sections (Trigueiro et al., 2024).

The integration of digital shadow technology with Lean Six Sigma methodology for optimizing clinical laboratory efficiency demonstrated how digital shadow architectures can enhance process monitoring and reduce intra-laboratory turnaround time (Cai et al., 2025). This real-time monitoring approach enables laboratory managers to identify bottlenecks as they occur and implement corrective actions immediately, rather than retrospectively.

Quality Management and Occurrence Management

Quality management in medical laboratories extends beyond efficiency to encompass error reduction and patient safety. Strategies for effective occurrence management in resource-limited clinical laboratories, aligned with ISO 15189:2022, include implementing non-punitive "just culture" reporting policies, using cost-effective in-house pooled patient sera for quality control, and deploying offline-capable systems (Myke-Mbata et al., 2026). These practical, low-cost interventions bridge the gap with international quality standards while acknowledging resource constraints (Myke-Mbata et al., 2026).

Laboratory consolidation, total lab automation, and process design have been shown to significantly improve workflow efficiency and quality of care by minimizing errors and allowing laboratory technologists to focus on complex tasks (Wu et al., 2018). The shift from manual to automated processes enables laboratory professionals to apply their expertise to higher-value activities, including result interpretation, quality assurance, and clinical consultation.

Administrative Coordination as the Backbone of Integration

Master Scheduling and Referral Loop Management

Administrative coordination functions as the essential backbone of integrated care delivery. Effective navigation of multi-specialty care is fundamentally dependent on seamless administrative and informational orchestration. Key navigator functions identified in the literature include master scheduling and appointment synchronization, proactive management of referral loops and insurance pre-authorizations, and the curation and timely sharing of complete health records (Dillon et al., 2024).

The novel application of "patient journey mapping" as an administrative tool has been highlighted as a method to visualize and preemptively address systemic bottlenecks (Dillon et al., 2024). The quality, safety, and efficiency of complex patient care are inextricably linked to the performance of administrative coordination systems. Elevating the interdisciplinary role of medical secretarial and health information management professionals through formalized navigation frameworks, integrated health IT, and interprofessional education is a critical and undervalued strategy for achieving truly patient-centered, continuous care (Dillon et al., 2024).

Technology-Based Closed-Loop Referral Systems

Technology-based closed-loop referral systems represent a significant advancement in administrative coordination. A framework for closed-loop referral between healthcare and social service agencies leverages existing care coordination technology infrastructure to facilitate seamless communication and follow-up (Sharma et al., 2024). Digital information ecosystems in modern care coordination and patient care pathways present both challenges and opportunities for AI solutions (Chen et al., 2024).

The implementation of an enhanced ambulatory referral tool integrating EHR enhancements with streamlined operational processes demonstrated significant improvements in care coordination (Nelson et al., 2025). Centralized, separate Epic workqueues for Medical Oncology and Hematology that included all referrals placed, along with geo-tagging to match referring providers' zip codes to the closest treatment location, resulted in a 29% increase in referrals placed and a 91% increase in completed visits (Nelson et al., 2025). Median days from referral placed to appointment date decreased from 31 days to 25 days (Nelson et al., 2025). These findings demonstrate that collaboration between EHR enhancements and centralized operational processes significantly improves the efficiency of referrals (Nelson et al., 2025).

Discharge Coordination and Care Transitions

Discharge coordination is a critical administrative function that directly impacts patient outcomes and operational efficiency. A dedicated discharge coordinator—a nurse, nurse practitioner, or case manager—tasked solely with tracking and resolving same-day discharge barriers in real time has been shown to reduce length of stay by 0.5 to 1 day, improve patient throughput, decrease readmission rates, and enhance communication between care teams (Bechir & Bechir, 2025). Various coordination models, ranging from unit-based facilitators to EHR-integrated tracking tools, have demonstrated effectiveness (Bechir & Bechir, 2025). Effective discharge planning involving nursing, physicians, pharmacy, rehabilitation, and social services reduces readmission rates and frees hospital beds more rapidly. When departments jointly manage care transitions, paperwork is streamlined, delays are minimized, and patient placement is better aligned with clinical needs (Hasirah et al., 2025).

Enabling Technologies and Interoperability

Interoperability-Driven Workflow Engines

Health information technology serves as the enabling infrastructure for integrated healthcare administration. Interoperability-driven workflow engines in healthcare IT enhance care coordination through standards-based automation, automating

intricate clinical and administrative workflows across discharge planning, medication reconciliation, and referral management (Gagalova et al., 2020). A decade of data shows that 70% of hospitals now engage in all four domains of electronic data exchange—electronically finding, sending, receiving, and integrating patient health information—up from just 23% in 2014 (Barker et al., 2024). This has enhanced care coordination and patient outcomes and is helping to support seamless information sharing across healthcare systems (Barker et al., 2024).

Collaborative communication supported by Electronic Health Records prevents redundant laboratory tests, repeated imaging studies, and unnecessary referrals (Hasirah et al., 2025). By eliminating duplicated services, hospitals improve efficiency and reduce patient burden while ensuring faster treatment progression. Integrated communication systems—such as shared dashboards, automated alerts, and joint handover tools—minimize miscommunication that could lead to scheduling errors, documentation mistakes, or delayed interventions (Hasirah et al., 2025).

Automation of Administrative Workflows

Administrative tasks remain a leading contributor to physician burnout in primary care and hospital settings (Farrukh et al., 2026). Recent advancements in informatics infrastructure, including continued development and adoption of standards and interoperability, are helping enable greater workflow automation (Farrukh et al., 2026). Many clinical workflows can benefit from automation to improve efficiency—from prior authorizations and inbox management to scheduling, billing, and report generation (Farrukh et al., 2026). However, automating a workflow to gain value requires leveraging a strategic implementation strategy (Farrukh et al., 2026). As the artificial intelligence landscape rapidly expands, additional workflows become amenable to automation (Farrukh et al., 2026).

An advanced In-Basket Management System in primary care clinics reduced provider workload burden and self-reported burnout (Smith et al., 2024). The electronic health record has been associated with provider burnout, exacerbated by increasing In-Basket burden, and systematic redesign of In-Basket management can mitigate this burden (Smith et al., 2024). In 2024, 43.2% of physicians reported experiencing at least one symptom of burnout, down from 48.2% in 2023 and 53% in 2022, suggesting that workflow improvements may be having a positive impact (Berg, 2025).

Digital Care Coordination Platforms

Digital care coordination platforms facilitate multidisciplinary collaboration and patient management. The Multidisciplinary e-Care Coordination system represents an evidence-based, co-designed digital care component for pressure injury management focusing on protocol development, stakeholder engagement, and initial digital configuration across seven evidence-based care domains (Al-Moteri et al., 2025). EHR-integrated patient navigation dashboards streamline patient barrier management and care coordination through real-time patient tracking and standardized barrier identification. Successful implementation requires interdisciplinary collaboration and engagement, IT partnership, standardized metrics, and data validation (Fromm et al., 2025). Figure 1 presents a conceptual model illustrating the integration of administrative coordination functions across nursing, radiological technology, and medical laboratory workflows.

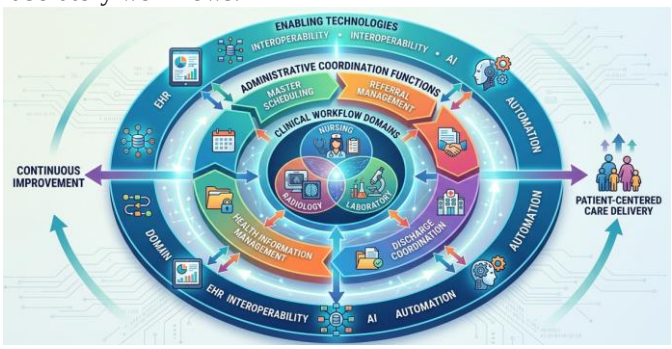


Figure 1. Integrated Healthcare Administration Framework: Conceptual Model

Arrows indicate bidirectional information flow and feedback loops that enable continuous improvement and patient-centered care delivery.

Challenges, Barriers, and Implementation Considerations

Professional Boundaries and Role Identity

The transition toward integrated care and optimized workflow management faces significant barriers related to professional boundaries and role identity. Significant obstacles include preservation of professional role, regulatory constraints, and inadequate training (Alzahrani et al., 2025). At the individual level, motivation to adopt protocols varies, with some physicians expressing reluctance due to concerns about shifting patient relationships and increasing complexity in their caseloads (Desmet et al., 2025). Addressing challenges such as gaining trust and provider resistance is critical for successful implementation (Desmet et al., 2025).

The implementation process benefits from a stepwise approach guided by a team leader, clear goal setting, continuous evaluation, and peer learning (Desmet et al., 2025). While practice-tailored protocols can enhance efficiency and collaboration, their success depends on structured implementation strategy, effective practice management, and team alignment (Desmet et al., 2025).

Resource Constraints and Infrastructure Limitations

Resource constraints pose significant challenges to workflow optimization, particularly in

resource-limited settings. External factors such as financial constraints and high workloads pose challenges to interprofessional teamwork (Desmet et al., 2025). Collaborations with external healthcare providers facilitate interprofessional teamwork when internal resources are insufficient (Desmet et al., 2025).

In laboratory settings, strategies for effective occurrence management in resource-limited clinical laboratories include practical, low-cost interventions such as implementing non-punitive "just culture" reporting policies, using cost-effective in-house pooled patient sera for quality control, and deploying offline-capable systems (Myke-Mbata et al., 2026). These approaches bridge the gap with international quality standards (ISO 15189:2022) while acknowledging resource constraints (Myke-Mbata et al., 2026).

Change Management and Adoption

The adoption of new workflows and technologies requires careful change management. The advanced virtual nursing model showed varying levels of acceptance among patients and nurses, highlighting the importance of addressing stakeholder concerns during implementation (Roberson et al., 2025). Future efforts should focus on expanding virtual nursing, investing in technology, and applying change management strategies (Roberson et al., 2025). In the context of ICU Command Centers, their impact depends on alignment with clinical workflows, especially those of nurses, and on trust-building strategies that promote adoption and sustained use (Muñoz et al., 2026).

Future Directions and Recommendations

Artificial Intelligence and Predictive Analytics

The integration of artificial intelligence into healthcare workflow management represents a frontier with substantial potential. Predictive analytics, including AI and machine learning, have gained traction in critical care, enabling early warnings for sepsis, shock, and cardiopulmonary arrest (Muñoz et al., 2026). These models are most effective when embedded into real-time dashboards and alert systems. The expansion of hospital-at-home models suggests that command centers could facilitate safer transitions from ICU to home (Muñoz et al., 2026).

Digital twin applications in radiology and radiotherapy offer patient-focused tracking of cumulative radiation exposure across all imaging studies throughout patient lifetimes (Olawade et al., 2026). Applications include optimizing CT room utilization by predicting examination durations, balancing radiologist workloads by distributing studies according to complexity and subspecialty expertise, and predicting staffing requirements for varying patient volumes (Olawade et al., 2026).

Interprofessional Education and Team-Based Care

Making multidisciplinary team-based care a success in primary care requires sustained investment in interprofessional education and team development. Patient-centered care is the foundation for safe and high-quality care that enhances patient health outcomes, with multidisciplinary team-based care being a key enabling factor (Liang et al., 2025). Sharing of expertise and niche knowledge across teams increases referrals to wellbeing and therapy services, shares patient stories and clinical details not captured in the patient record, and strengthens inter-professional reflection and support around complex and challenging clinical scenarios (Strawson et al., 2025).

Policy and Governance Implications

Policy adaptations are needed to facilitate widespread adoption of interprofessional care models in primary care settings (Desmet et al., 2025). Future research should explore scalable support mechanisms and policy adaptations (Desmet et al., 2025). The newly created integrated care systems in England aim to improve quality of care by achieving the best outcomes for individuals and populations through the provision of evidence-based services (Lalani et al., 2024). These system-level reforms provide natural experiments for evaluating the impact of integrated governance on workflow efficiency and patient outcomes. Figure 2 provides a comparative visualization of workflow optimization outcomes reported in the literature across nursing, radiological technology, and medical laboratory domains. Nursing metrics include workflow completion rate improvement (73.17% to 94.89%), patient satisfaction increase (83.3% to 97.65%), and overtime reduction (26%). Radiology metrics include overscan reduction (34.6%) and process cycle time reduction (16.4-18.9%). Laboratory metrics include outpatient TAT reduction (16.78-24.07%) and inpatient TAT reduction (33.06-49.27%). Administrative metrics include completed visit increase (91%) and referral-to-appointment time reduction (31 to 25 days).

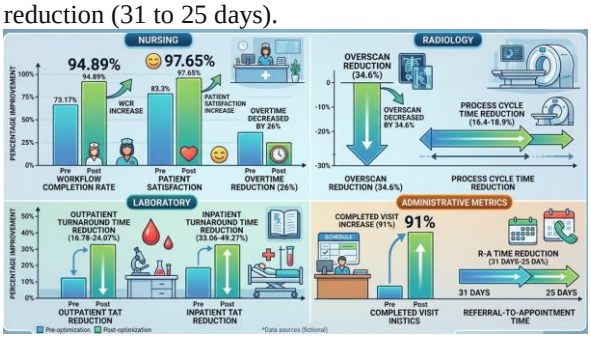


Figure 2. Workflow Optimization Outcomes Across Disciplines: A Comparative Synthesis

Conclusion

This narrative review synthesizes evidence on integrated healthcare administration, coordination, and workflow management in nursing, radiological technology, and medical laboratories. It identifies fragmentation as a key barrier to quality and

efficiency but highlights evidence-based strategies for overcoming these challenges. The review underscores the importance of frameworks like the Quintuple Aim and socio-technical systems in achieving successful integration through social processes and technical infrastructure. Best practices in nursing include virtual nursing models, ICU Command Centers, and AI-assisted information management, which enhance care delivery and reduce administrative burdens. In radiology, protocol standardization, decision support systems, and AI-based triage improve workflow and reduce turnarounds. For medical laboratories, automation and quality management systems aligned with ISO standards are crucial for minimizing errors and turnaround times. Administrative coordination—through scheduling, referral management, and closed-loop systems—is vital for integrated care delivery, significantly enhancing continuity and patient access.

References

1. Alimiri Dehbaghi, H., & Khoshgard, K. (2025). Revolutionizing emergency care: an overview of the transformative role of artificial intelligence in diagnosis, triage, and patient management. *International Journal of Emergency Medicine*, *18*(1), 242. https://doi.org/10.1186/s12245-025-01049-1
2. Aljabri, N. K. B., Alrashidi, B. A. H., Alhasiri, A. D., Alrashidi, I. A., Alharbi, S. R., Almatrafi, A. A. O., ... & Alarawi, N. A. M. (2025). A Qualitative Theoretical Framework for Integrated Clinical, Technical, and Administrative Roles in Healthcare Systems: Bridging Dentistry, Anesthesia Technology, Nursing Specialists and Nursing Technicians, General Medicine, Pharmacy Technology, Radiolog. *Vascular and Endovascular Review*, *8*(20s), 225-237. https://verjournal.com/index.php/ver/article/view/1528
3. Al Moteri, M., Aljuaid, J., Alsufyani, B., Alghamdi, A., Althobiti, E. S., & Althagafi, A. (2024). Bottleneck factors impacting nurses' workflow and the opportunity to prioritize improvement efforts: factor analysis. *BMC nursing*, *23*(1), 640. https://doi.org/10.1186/s12912-024-02311-2
4. Al-Moteri, M., Sahrah, A. Z., Althobiti, E. S., Alotaibi, A. S., Alshamari, S., HabibUllah, A. A., ... & Alzaidi, S. (2025). The development of a Multidisciplinary e-Care Coordination (MDeCC) prototype to facilitate effective care of pressure injuries. *BMC Health Services Research*, *25*(1), 1434. https://doi.org/10.1186/s12913-025-13587-8
5. Alzahrani, A. A. M., Mashnafi, A. M., Badwi, M. H. Y., Algammdi, T. M., Al Otaibi, R. S., Alotaibi, A. M., ... & Alanazi, R. M. (2025). Optimizing the Healthcare Team: A Systematic Review of Role Delegation and Task Sharing Between Nurses and Secretarial Staff in General Medicine Practices. *Saudi Journal of Medicine and Public Health*, *2*(2), 679-687. https://doi.org/10.64483/20252260
6. Bajawi, A. J. (2025). Integrating all Assisting Specialties with Health Administration Practices to Achieve Excellence in Healthcare Quality. *Saudi J Med Pharm Sci*, *11*(11), 1062-1073. https://doi.org/10.36348/sjmps.2025.v11i11.006
7. Barker, W., Gabriel, M., & Patel, V. (2024). A decad e of data: progressing patient-centric care through health IT. *Health IT Buzz*.
8. Bechir, G., & Bechir, A. (2025). Reducing delays, improving flow: the importance of a dedicated discharge coordinator in hospital discharge planning. *Cureus*, *17*(6). DOI: 10.7759/cureus.85879
9. Berg, S. (2025). Doctors work fewer hours, but the EHR still follows them home. *American Medical Association, August*.
10. Cai, X., Lin, Y., Zhan, L., Lu, Q., Wu, Z., & Lin, X. (2025). Optimizing clinical laboratory efficiency through digital shadow and lean six sigma integration: A real-time monitoring approach to reduce intra-laboratory turnaround time. *Digital Health*, *11*, 20552076251375939. https://doi.org/10.1177/20552076251375939
11. Chen, Y., Lehmann, C. U., & Malin, B. (2024). Digital information ecosystems in modern care coordination and patient care pathways and the challenges and opportunities for AI solutions. *Journal of medical Internet research*, *26*, e60258. https://doi.org/10.2196/60258
12. Desmet, L., Goossens, E., Van Bogaert, P., & Danhieux, K. (2025). Adopting tailored interprofessional protocols in general practice: barriers, strategies, and lessons learned from a CFIR-guided qualitative study. *BMC Health Services Research*, *25*(1), 1341. https://doi.org/10.1186/s12913-025-13424-y
13. Dhanaliwala, A. H., Deutsch, A. J., Moon, J., Lalevic, D., Chambers, C., & Cook, T. S. (2025). Development and deployment of an emergency department radiology dashboard to improve communication and transparency of radiologic imaging and report status. *Journal of the American College of Radiology*, *22*(2), 191-199. https://doi.org/10.1016/j.jacr.2024.11.024

14. Dillon, E. C., Martinez, M. C., Li, M., Mann-Grewal, A. K., Luft, H. S., Liang, S. Y., ... & Patel, M. (2024). “It is not the fault of the health care team-it is the way the system works”: a mixed-methods quality improvement study of patients with advanced cancer and family members reveals challenges navigating a fragmented healthcare system and the administrative and financial burdens of care. *BMC Health Services Research*, *24*(1), 1378. https://doi.org/10.1186/s12913-024-11744-z
15. Elizondo, A., Williams, R., Anderson, S., & Cresswell, K. (2024). Implementing integrated care infrastructure: A longitudinal study on the interplay of policies, interorganizational arrangements and interoperability in NHS England. *Health Policy*, 105237. https://doi.org/10.1016/j.healthpol.2024.105237
16. Farrukh, N. Q., Chandawarkar, A., Vundavalli, S., & Taxter, A. J. (2026). Automation and workflow efficiency in clinical settings: implementing automation to reduce administrative burdens. *Medical Clinics*, *110*(2), 259-271. https://doi.org/10.1016/j.mcna.2025.07.001
17. Fleming, K., Foley-Daneker, M., Walsh, L., Martin, K., Berner, V., & Egnatovich, P. (2025). Enhancing patient care through virtual nursing: Strategies for effective implementation and communication. *Nurse leader*, 102436. https://doi.org/10.1016/j.mnl.2025.05.002
18. Franco-Alucano, I., Tortorella, G., Aguilar-Duque, J., Flores, D. L., Limón-Romero, J., Báez-López, Y., & Tlapa, D. (2025). Lean Healthcare 4.0: Integrating AI, Lean Principles, and Simulation for Laboratory Process Improvement. *IEEE Access*, *13*, 207762-207775. https://doi.org/10.1109/ACCESS.2025.3640970
19. Fromm, K., Aryeh, B., Snow, A., Liu, M., Pappalardo, R., Mazor, M., ... & Bhardwaj, A. S. (2025). Implementation of an EHR integrated oncology patient navigation dashboard: A system for streamlining patient barrier management and care coordination. *JCO Oncol Pract 21(*10), 590. DOI: 10.1200/OP.2025.21.10_suppl.590
20. Gagalova, K. K., Leon Elizalde, M. A., Portales-Casamar, E., & Görges, M. (2020). What you need to know before implementing a clinical research data warehouse: comparative review of integrated data repositories in health care institutions. *JMIR formative research*, *4*(8), e17687. https://doi.org/10.2196/17687
21. Gentil, L. L. S., Pires, V. A. L., Andrade-Silva, J., Almeida, Y. E., Pinheiro, P. G., Pinheiro, C. G., & Laselva, C. R. (2025). Using an AI-powered solution to transform nursing workflow and improve inpatient care: a retrospective observational study. *AJN The American Journal of Nursing*, *125*(5), 38-43. DOI: 10.1097/AJN.0000000000000070
22. Hasirah, A. S. M. A., Al Rashah, M. M. R., Al Ishaq, R. N. M., Al Rashah, S. M. R., Alsarimi, M. R. M., Ishaq, Y. I. A. I., & Alrasahah, M. A. S. (2025). Transforming Patient Outcomes Through Multi-Departmental Collaboration in Healthcare Settings: A Comprehensive Review of Clinical, Operational, and Patient-Centered Impacts. *The Review of Diabetic Studies*, 387-397. https://doi.org/10.70082/8pcy5n39
23. Harsvardhan, R., Jain, A., Singh, S., Suhaib, M., & Bose, S. (2026). Improving Administrative Processes in a Trauma Centre: Lean and Pareto Approach. *Journal of Healthcare Quality Research*, *41*(1), 101172. https://doi.org/10.1016/j.jhqr.2025.101172
24. Herold, A., Lo, W. C., Sharp, A., Wichtmann, B. D., Hartmann, S. P., Gupta-Rastogi, A., ... & Husseini, J. S. (2025). Enhancing MRI efficiency in musculoskeletal examinations: Impact of optimized facility design and workflow optimization efforts. *European Journal of Radiology*, *190*, 112263. https://doi.org/10.1016/j.ejrad.2025.112263
25. Kerrissey, M. J., Hayirli, T. C., Bhanja, A., Stark, N., Hardy, J., & Peabody, C. R. (2022). How psychological safety and feeling heard relate to burnout and adaptation amid uncertainty. *Health care management review*, *47*(4), 308. https://doi.org/10.1097/HMR.0000000000000338
26. Lalani, M., Sugavanam, P., Caiels, J., Crocker, H., Gunn, S., Hay, H., ... & Fitzpatrick, R. (2024). Assessing progress in managing and improving quality in nascent integrated care systems in England. *Journal of health services research & policy*, *29*(2), 122-131. https://doi.org/10.1177/13558196231209940
27. Liang, Z., Montgomery, J., Dingelstad, C., Koschel, A., & Redford, M. (2025). Making Multidisciplinary Team-Based Care (MTBC) a Success in Primary Care: A Scoping Review Care: A Scoping Review. *Journal of healthcare leadership*, 681-695. https://doi.org/10.2147/JHL.S560629
28. Liu, C., Huang, X., Ling, L., Meng, Q., Liao, J., & Zhou, J. (2025). Implementation

and validation of an intelligent auto-verification system in a coagulation testing automatic line. *Clinical Biochemistry*, *139*, 110969. https://doi.org/10.1016/j.clinbiochem.2025.110969

29. Muñoz, J., Muñoz-Visedo, L., Moreno-Ortega, E., Ribón-Liberal, R., & Muñoz-Visedo, J. (2026). ICU command centres in critical care: Nursing workflows, organizational models, and implementation challenges. A narrative review. *Intensive and Critical Care Nursing*, *92*, 104245. https://doi.org/10.1016/j.iccn.2025.104245
30. Myke-Mbata, B. K., Basil, B., & Mba, I. N. (2026). Strategies for effective occurrence Management in Resource-Limited Clinical Laboratories: Challenges and practical solutions. *Clinica Chimica Acta*, 121211. https://doi.org/10.1016/j.cca.2026.121211
31. Nelson, R., Tulkop, L., Bayol, J., Duffy Fray, K. C., Schwartz, S., Wells, M., ... & Bond, K. (2025). Implementation of an enhanced ambulatory referral tool to improve access to cancer care. *JCO Oncology Practice*, 21, 587. https://doi.org/10.1200/OP.2025.21.10_suppl.587
32. Olawade, D. B., Akinro, O., Oisakede, E. O., Bello, O. J., Analikwu, C. C., & Egbon, E. (2026). Digital twin applications in radiology and radiotherapy: applications, challenges, and future perspectives. *European journal of radiology*, 112865. https://doi.org/10.1016/j.ejrad.2026.112865
33. Ranschaert, E., Topff, L., & Pianykh, O. (2021). Optimization of radiology workflow with artificial intelligence. *Radiologic Clinics*, *59*(6), 955-966. https://doi.org/10.1016/j.rcl.2021.06.006
34. Roberson, A. E., Martinez, H. R., Holligan, S. A., & Carlson, M. (2025). An evolving virtual nursing model: enhancing care delivery through advanced workflow integration. *Nursing Outlook*, *73*(3), 102421. https://doi.org/10.1016/j.outlook.2025.102421
35. Sharma, S. V., McPherson, H., Sandoval, M., Goodman, D., Paret, C., Mahata, K., ... & Boerwinkle, E. (2024). Design and framework of a technology-based closed-loop referral project for care coordination of social determinants of health. *Population Health Management*, *27*(6), 390-396. https://doi.org/10.1089/pop.2024.0129
36. Smith, L., Kirk, W., Bennett, M. M., Youens, K., & Ramm, J. (2024). From headache to handled: advanced in-basket management system in primary care clinics reduces provider workload burden and self-reported burnout. *Applied Clinical Informatics*, *15*(05), 869-876. DOI: 10.1055/s-0044-1789575
37. Song, Z., Hu, Y., Ren, Z., Wang, G., Liu, S., Zheng, S., ... & Zhao, R. (2022). Optimal management of the public and patients by pharmacists in the era of COVID-19: an evidence-based review and practical recommendations. *Frontiers in Public Health*, *9*, 758325. https://doi.org/10.3389/fpubh.2021.758325
38. Strawson, J., Stracey, T., Noori, A., Noon, K., Doyle, K., & Fellows, H. (2025). P-121 'Together everyone achieves more': crossing the hospice workforce divide, the power of joint community and inpatient multidisciplinary team and mortality meetings. *BMJ Supportive & Palliative Care,* *15*, A56. https://doi.org/10.1136/spcare-2025-HUK.138
39. Struckmann, V., Shuftan, N., Scarpetti, G., Looman, W., Bal, R., Rutten-van Mölken, M., & van Ginneken, E. (2024). How to implement integrated care? A framework with 12 overall strategies to transform care delivery. Copenhagen: European Observatory on Health Systems and Policies, WHO Regional Office for Europe; 2024. Licence: CC BY-NC-SA 3.0 IGO.
40. Trigueiro, G., Oliveira, C., Rodrigues, A., Seabra, S., Pinto, R., Bala, Y., ... & Cardoso, C. (2024). Conversion of a classical microbiology laboratory to a total automation laboratory enhanced by the application of lean principles. *Microbiology spectrum*, *12*(2), e02153-23. https://doi.org/10.1128/spectrum.02153-23
41. Ullah, S., Noofel, Z. M., Khoja, A. K., Bashir, A., Shoaib, H., Hussain, S., & Chaudhary, H. (2025). Optimising Urinary Tract CT Scans for Renal Colic: Enhancing Efficiency and Reducing Radiation. *Cureus*, *17*(11). DOI: 10.7759/cureus.97305
42. Wu, A. H., Christenson, R. H., Greene, D. N., Jaffe, A. S., Kavsak, P. A., Ordonez-Llanos, J., & Apple, F. S. (2018). Clinical laboratory practice recommendations for the use of cardiac troponin in acute coronary syndrome: expert opinion from the Academy of the American Association for Clinical Chemistry and the Task Force on Clinical Applications of Cardiac Bio-Markers of the International Federation of Clinical Chemistry and Laboratory Medicine. *Clinical chemistry*, *64*(4), 645-655. https://doi.org/10.1373/clinchem.2017.277186

Yuan, X., Zhu, L., Jiang, K., & Chen, J. (2025). Impact of Artificial Intelligence-Assisted Closed-Loop Mobile Nursing Information Management on Nursing Quality Indicators and Work Efficiency. *Risk Management and Healthcare Policy*, 3581-3591. https://doi.org/10.2147/RMHP.S548275.