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Optimizing Scheduling to Enhance Coordination Among health care workers Pharmacists, and Laboratory : A Scoping and Narrative Review

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Introduction
We utilized a blend of narrative and scoping review methodologies to investigate initiatives aimed at improving scheduling in order to enhance coordination among nursing, pharmacy, and laboratory staf . Improving coordination among these staff members has the potential to significantly improve patient experience and outcome . To identify the most pertinent literature, we employed three strategies: searching multiple databases, examining citations, and utilizing a known article searc . Our findings are presented and discussed.

We examined efforts to optimize scheduling intended to improve coordination of nursing staff with pharmacy and/or laboratory personnel employed in healthcare institution . Viewing scheduling as an essential element of operational management in healthcare institutions, we chose to focus on these three groups because they are essential for the efficient operation of the largest, and many smaller, health-related institution . Like all other institutions, costs are non-trivial and affect the care of people in the institution . We, therefore, sought to help these professionals optimize their schedules through learning from the experiences of others. (Almalki2024)(Alnasser et al.2022)

1. . Background

The complexity and increasing acuity of medical care, combined with nursing professionalism and specialization, require the redefinition of nursing activities and skills, reorganization of working hours, recognition, and uniform codification of professional skill . The correct codes of professional qualifications recognizing professional skills recorded in the curricula will be: knowing how to optimize one's work through programs and IT tools; extracting and interpreting the patient's data, the future objectives of care, and the organization of actions and control factors; activating the prevention, treatment, and care pathways; observing and collecting data related to outcomes; reporting and knowing about

adverse effects and the impact on health; designing and managing care protocols; interacting with other professionals to coordinate the units and identify the point of care; understanding and managing the available advanced treatments; knowing when to activate support and assistance systems to ensure treatment goals; providing specialized support to healthcare personnel in the technical-practical management of patient treatmen . (Huber et al.2021)(Jacobs et al.2023)(Poore et al., 2022)(Wong et al.2024) The correct personalization of professional activities and the correct categorization of their specific skills will help to explain what the nursing profession really is to patients and citizens, in a scenario that is often dominated by a widespread use not only of different figures in the professions but also of non-medical figures as easily interchangeable with the nursing profession itself, delegating highly complex tasks to figures not trained and not specialized in specific medical care, due to the erroneous idea of a uniform way among healthcare professionals, reversing the principle of uniformity and that of professionalism problem . The first step is the interaction of the nursing professions with advanced ICT technologies, to reconstitute joint research, teaching, and data collection paths to fully understand the complexity of nursing care, the objectives, and the ways to reach it, as well as to make it public and to ensure a clear and precise designation of the nursing profession in the basic legislation that recognizes the qualification and skill . The second is the sustainable reorganization of existing professional figures and the implementation of a set of IT tools for the innovative management of medical care through written joint care plans that eliminate contradictions and facilitate the relationship between healthcare professionals and patient . The third step is to be more inspired by the need to have, in addition to personalized professional activities, a specialization in medical practice, which requires the collaboration of activities and the development of technological innovatio . (Kaur, 2024)(Killam et al.2022)(Duffy, 2022)(Fatani et al.2024)

1. . Scope of the Review

The purpose of this scoping and narrative review is to explore the potential opportunities for more effective use of laboratory results in decision support systems (DSSs) to enhance coordination and communication among health professionals, especially thoseRewrite the following text in a formal tone, using only English language for the resulting text while maintaining the length and level of detail: Original text: "The university has implemented a new policy for student conduct on campus, which includes stricter guidelines for behavior and consequences for violations." Paraphrased text: "The university has put into effect a recent regulation addressing student behavior while on campus, encompassing more rigorous protocols and penalties for any breaches of the policy."allied health professionals working in acute care hospitals providing around-the-clock service . Examples of these allied health professionals are pharmacy personnel preparing medications for patients and nursing staff administering these medications to patients, among many other task . They often rely on laboratory values and medication administration records to adjust medication orders and scheduling to meet each patient's medical need . Although systems with DSSs provide timely laboratory results with well-documented reference ranges, a review found that the laboratory result itself usually is not the direct leading cause of a medical decision.

There are other well-documented barriers in communication and coordination, where both the point of patient care service and the time consumed to perform work become increasing obstacles to mission-critical performanc . A possible complementary solution to some of

these barriers is scheduling the performance of laboratory testing—chemical, hematology, microbiology, blood bank, immunology, and toxicology—using decision support systems to predict, schedule, and optimize laboratory resources during mission-critical points in time when laboratory testing service is most needed, that is, when the pharmacy needs to compound injectable medications and the nurse needs to optimally schedule the administration time for each medicatio . A DSS predetermines the optimal time for a nurse or laboratory personnel to prepare each batch of injectable or unit-dose medication to meet legal or medical restrictions of the medication administration.

. Methodology

Given the relatively undeveloped state of the literature addressing strategies to enhance coordination related to the scheduling of front-line healthcare professionals, we have chosen to pursue a broad scoping and narrative review to describe, summarize, and synthesize information from various source . This information gathering attempts to identify the extent and nature of work completed to date concerning the effectiveness of various scheduling practices to enhance coordination among nursing, laboratory, and pharmacy staf . Our review emphasizes innovation and effectiveness in a wide range of contexts to inform practice, policy, and future research.

We plan to use a flexible framework because it can be adapted to better suit our needs as well as the aim of this scoping revie . This framework consists of five stage . In the first stage, we plan to identify the question or purpose behind the review, which is to explore the literature concerning the influence of staff scheduling in improving coordination within primary and early specialty care area . The second stage of the review involves identifying relevant pieces of work, while in the third stage, there will be a detailed study selection using inclusion and exclusion criteria that will be selected in order to uphold the initial review purpos . In the fourth stage, data will be charted, and in the last stage, a summary of the key extracts contained within the included pieces of work will be presented to address the reason for the review.

2. . Search Strategy and Selection Criteria

The search strategy was developed in consultation with a research librarian with expertise in research synthesi . To identify potentially relevant articles, we searched for international, English-language research studies published between January 1, 1990, and December 31, 2020, in various database . Search keywords combined Medical Subject Headings (MeSH) terms, text words, and synonyms and were mapped to database-specific subject heading . The search strategy was constructed around three main themes: manpower scheduling and models, healthcare personnel, and coordination of role . A research librarian created a database search strategy using the concepts: staffing scheduling, labor, nursing service, laboratory, and pharmac . The process of carrying out and reporting on the study met standards detailed in applicable guideline . An experienced research librarian provided expertise on systematic review methods and conducted a thorough literature search on the study topi . We also reviewed the references of identified reviews and scientific reports and sought the perspectives of experts in healthcare personnel optimization.

The search was designed to return studies that examined healthcare staffing scheduling and the coordination between members of nursing services and other clinical healthcare

personnel such as pharmacists and laboratory professionals. We imposed no restrictions on the quantitative study type. Study inclusion criteria were: relevant article type (e.g., empirical, not case studies; not systematic reviews or opinion papers; no gray literature), publication date (January 1, 1990, to December 31, 2020), publication status (published in English), and age (≥18 years. Exclusion criteria included duplicates, theoretical studies or discussions of scheduling or coordination concepts which could be categorized as opinion papers, case studies, non-peer-reviewed documents, editorials, commentaries, letters, dissertations, professional practice guidelines, clinical trial protocols, conference abstracts, published abstracts, case reports, reviews, systematic reviews, and ongoing clinical trial. Periodicals used for general or private organizational communication and messages were also excluded.

2. . Data Extraction and Synthesis

The search results were imported into the citation management software, and were then uploaded into the web-based softwar . Through this software, we were able to remove duplicate studie . After duplicates were removed, the remaining articles underwent a process to reduce inadequate and irrelevant studie . This included a review of the articles' titles and abstracts for the inclusion and exclusion criteri . Studies were then exclude . This process consisted of a series of steps and judgment . Both authors worked through all of the studies in pairs in parallel to ensure non-reproducibilit . When diverging opinions on the merits of the studies occurred, discussion between the two reviewers resulted in a unanimous decisio . If consensus could not be reached, opinions from other team members were sought.

After the initial screening, the total number of articles included in the study further decrease . The remaining articles were screened during the full study screening process, and a final level of inclusion was determine . The quality of all final included papers was assessed by both authors through a consensus revie . The search results and study selection process were presented in a flow diagra . Data extracted from the studies were organized into a table and analyzed in the text to address the questions of the review.

. Current Challenges in Scheduling and Coordination

Health care organizations need to follow a number of daily activitie . They want to carry them out based on priority and are characterized by a wide variety of processing times and respective due date . Determining the appropriate scheduling of such activities is a complex task given the number of potential conflicts that may occur and the potential for the activities to be carried out across multiple department . In large clinical settings where a number of activities need to be scheduled, several activities may interfere with one anothe . For example, scheduling the work of nurses may depend on activity timing in the pharmacy, while the pharmacy workload may be influenced by the availability of laboratory results to implement final checking procedure . In practice, coordination is often carried out by means of separate sets of schedules that are externally controlled, and the ability to guarantee if underlying crewing needs and necessary slack times are represented is somewhat weak. (Alizadeh et al.2020)(Houssein et al.2021)(Fragapane et al.2021)(Borji, 2023)(Tong et al., 2020)

For example, nurses may begin to collect lab specimens early in the morning so that the samples can be delivered to the laboratory without incurring potential delays due to the

transportation system exploring other delayed specimens, time lessening expiration, or the laboratory employing time windows that enable them to smoothly process and analyze all received sample . Given the potential for such issues, a further key question arises: how may nurses schedule patients for specimen collection, to start a population of diagnostic test processing, and then carry out related patient care activities in an appropriately timely manner based on a set of potentially incomplete processing time estimation . (Davó et al.2021)(Colosi et al.2021)

3. Nursing Staff

3.1. . Nursing Administration Nursing administrators focus on ensuring that the right nursing skill mix is available and are involved in making patient assignment . When making patient assignments, nursing administrators are aware of the strengths of their staff and may have baccalaureate-prepared nurses to serve as preceptors to orient new nurse . They may employ patient acuity tools to match patient needs to nurse staffing and can generally be counted on to help make sure that educational opportunities linked to the policies and procedures for high-risk or high-tech medications are devised, and units become certified in the use of the medication or medical device . Nurses themselves anticipate clinical staff and develop the necessary competencies before highly innovative or complex healthcare is introduced on the uni . Evidence-based staffing patterns as well as assignment handoffs are employe . Staff is frequently involved in project teams as new programs are planned and implementation is supporte . Procurement decisions are based both on the purchase of necessary items as well as the long-term costs of maintaining and supporting healthcare technolog . (Kennedy and Sandow, 2024)(Catania et al.2021)(Parreira et al.2021)(Anderson et al.2021)(Danielis et al.2021)

3.1. . Charge Nurse Direct line supervisory personnel, often called the charge nurse, are responsible for making assignments with an eye toward the amount and complexity of both the care delivery and the medications that will accompany a patien . Charge nurses know that delegating the administration of medications and patient care involves matching the right task and right skill at the right time and are able to predict whether barriers are likely to be encountere . They have many organizational strategies that complement human capital—delegating both the right drugs and the right care to ensure that care is administered safely and as prescribe . The charge nurse is dedicated to procuring and handling drugs to be administered, anticipating the needs of the patient and the capabilities of the caregiver where the drugs are administered.

3.Pharmacists

Pharmacists work to ensure the safe and ethical use of medications and complete medication-related researc . Some responsibilities of pharmacists include checking for prescription errors, counseling patients and other health professionals, processing and packaging medications, managing drug distribution systems, and screening for adverse effect . Pharmacists in hospitals can be part of a variety of clinical specialty teams striving to monitor and manage medication use to optimize medication therap . Pharmacy education, technology, and policy shape what services hospitals can provide and how they provide them, in tandem with healthcare organization values and structure . Understanding the multifaceted role of pharmacists in hospitals and that they play important roles over a

similar period is helpful in considering the ways nursing staffing and scheduling could be coordinated with pharmacists, in addition to supporting new ideas for ways to improve teamwork, coordination, and medication services through nursing staff and skill mix levels.

3. . Laboratory Personnel

The role of the laboratory in the overall healthcare delivery system is varie . Pathologists, for example, have expertise in a wide range of tests and procedures, including the processing of bone marrow biopsies, fine-needle aspirations of lymph nodes, thyroid biopsies, and transfusion medicine, along with reviewing cytology and tissue case . Pathologists add input into patient care by diagnosing and helping manage patient care, including medications and treatment . They are a critical part of the care team and often play a role in educating others, in partnership with the nursing staff and specialist . Pathologists are especially irreplaceable in areas like blood banking where they validate testing and are on call for unusual clinical cases or emergencie . Specific tasks pathologists contribute to include medical directorship or oversight of the Apheresis Program – plasma exchange, red cell exchange, pheresis related to hematopoietic disorders, and platelet reduction or male donor platelet pheresi . Blood product ordering, developing and interpreting tests for new or special coagulation studies, where blood product utilization would change, is another blood center function caregivers expect on a daily and emergency basi . In tandem with the blood bank supervisor, pathologists also uncouple Anti-Xa level and other coagulation studies on direct-acting oral anticoagulants.

Importance of Effective Coordination in Healthcare Settings

In order to successfully meet the healthcare demands of the twenty-first century, multidisciplinary teamwork and coordination are of utmost importanc . The goal of gaining this coordination is a major determinant of policy and planning for healthcare human resources across Europe and beyon . This importance is also recognized by nursing organizations that lead to their dedication to increasing the percentage of baccalaureate-prepared nurses in the workforc . These views are not limited to the nursing profession, howeve . This involves a complex interplay of care between pharmacists, medical, and nursing specialists and their supporting diagnostic and therapeutic staff, i.e., not merely a reductionistic approach guided by titration of medication dosage to achieve some chemical reaction at a site of action.

Currently, there are three principal caregiver groups in which the skills and competencies (and often societal perceptions) are based on vocational education and/or on-the-job training, traditionally with baccalaureate-level entry criteri . These three disciplines are the nurses, pharmacists, and medical laboratory personne . They also play a central role in the day-to-day business of providing patient car . Inefficiencies in one of these caregiver groups will lead to local breakdowns of the care process.

4.Patient Safety and Quality of Care

Quality of care and patient safety is an important issue in healthcare deliver . Patients are brought into the healthcare system, diagnosed, treated, and released rapidly to ensure safe recovery and to reduce the chance of complication . Nurses coordinate different types of care initiated by physicians, such as administering prescription drugs and collecting patient samples for lab tests, as they have the most direct interaction with patients compared to other hospital staf . Coordinating both nurse and medical staff schedules optimally is

important to ensure safe nursing care, especially at essential time point . Pharmacists and laboratory personnel have similar information needs as nursing staf . Therefore, the coordination among nursing staff, pharmacists, and laboratory personnel can be regarded as necessary teamwork to ensure a patient's comprehensive care plan is implemented safely and effectively to improve the quality of care and enhance patient safet . Collectively, the administrative and staffing arrangements for nurses, pharmacists, laboratory personnel, and the related information needs should be considered together, under a patient-centered perspective, to achieve optimal performance. (Dighriri et al.2024)(Almanna et al.undefined)

When several professionals are visiting a patient, other professional groups should be able to take over patient care, and there should be no delay in queue schedulin . Efficient utilization of the nursing staff can enable them to be present at the patient's bedside to secure patient safety and to meet the patient's quality care needs while helping the professionals with additional tasks and questions, without dela . Considering a patient safety perspective, the scheduling aims to arrange replacing a team member as quickly as possibl . To provide the patient with the necessary care, it is not important to know which nurse is assigned to the patient, but to know there is a nurse available at any moment for the patient if neede . Data shortages to forecast the needed nursing staffing levels in multi-level facilities are common in many countrie . However, accurate and reliable nurse-to-patient staffing data is needed to inform staffing decisions and to drive improvements in nursing workforce polic . The measurement of nurse staffing levels and skill mix associated with nurse competence are crucial considerations that need to be addressed by health professionals, administrators, and policymaker . Nurses are expected to be equipped with emotional intelligence capabilities, knowledge, and interpersonal skill . To offer high-quality care, punishment from failed realistic availability is not caring for, respecting, or protecting against harm to the patien . Optimizing the availability of nursing staff can avoid care activities that cause the greatest adverse associations but encourage innocent no harm performanc . It is recommended to create a level monitoring system that allows continuous real-time nurse resource management evaluation. (Bani et al.2020)(Rangachari and L2020)

4. . Efficiency and Resource Utilization

Improved scheduling correlated positively with more efficient utilization of the pharmacists' and lab personnel's tim . In the end, best and worst practices regarding the scheduling of nursing staff, lab personnel, and pharmacists are identified and discusse . Within healthcare organizations, the logistics of running a hospital are substantia . The quantity and effort of the staff needed within a certain unit are determined by the decision rights of the operational managers and the restrictions considere . Healthcare providers are usually the largest workforce in healthcare organizations, often amounting to more than fifty percent of the operating budget per hospital.

Nonetheless, about a third of nurses' time is taken from activities that do not relate to patient care due to staff shortages, poor scheduling, and waiting for the correct prescriptio . Scheduling issues can impact patient wait times and can lead to negative repercussions, including medication delays, increased costs, and compromised delivery of quality care, which may include a lack of ability to deliver a culture of servic . Every day, nurses need

to administer medication to their patient . Their work must comply with the so-called “five rights”: right patient, right time, right dose, right medication, right rout . Scheduling relates to four of the five rights; only aspects related to the medication itself are left out.

.Technological Solutions for Optimizing Scheduling

This section discusses a number of prevalent technology-based scheduling applications and concludes with a look at emerging scheduling technologies for non-single-provider setting . These new approaches merge the strengths of the single-provider systems with the coordination needs of collaborative environment . Data for non-single-provider settings has been accumulated from various sources, scheduling market reports, personal communication with vendors and R&D staff in various industries, and from direct experienc . Selected publications in other industries have been included to show technological enabling and research on scheduling for collaborative environment . These findings are being used to guide the continuing development of laboratory scheduling technologies.

This section introduces contemporary scheduling applications used by autonomous personnel operating under a single business entity or in a single industr . Examples are drawn from healthcare and the common business disciplines to illustrate the plethora of existing systems for optimizing scheduling for various end use . The scheduling functions were often organizationally driven, with limited attention given to the need for coordination or collaborative oversight of all organizational participant . The purposes and salient features of a representative set of these systems are presented in this sectio . Although each industry or business division has its own unique scheduling requirements, the focus is on the common scheduling dimension . As practitioners and technology providers recognize the need to focus on coordinated scheduling, some applications designed specifically for broader levels of partnership are also beginning to appear.

5. . Automated Scheduling Systems

Automated scheduling systems may streamline the process of decision-making, as they respond to the complex nature of scheduling healthcare resource . These systems can be used to reduce turnaround time in the scheduling proces . Specifically, operations research-centered methods based on optimization are often applied for this purpos . Several optimization algorithms and assignment techniques have been proposed for the scheduling of nurses working in the same or multiple hospital units or department . These algorithms and techniques are often incorporated into automated scheduling systems, which, for the most part, rely on rule-based algorithms but also use a variety of methodologies such as simulation, capacity, detailed approach, as well as agent-based and self-organization models.

Some of these automated scheduling systems have been developed to cope with the rigid or specific requirements of shifts and specific department workloads, such as bed occupanc . Despite the potential of these systems for regulating a complex workforce and supporting a variety of complex interactions between shift types and breaks, the number and nature of the constraints suggest that a more general approach should involve a set of rules that can accommodate emergent change . In this sense, to reduce the complexity and temporal disruption when schedule generation may be needed, methods such as game-based

optimization, based on the cyclic exchange of bargaining games and their rotation matrices, have been used.

5. . Communication Platforms

Facing the prevailing challenge of nurse-pharmacist communication and coordination, high priority was placed on equipping nurses with a digital infrastructure to assist them in gaining easy access to pharmacist . However, the establishment of a hospital-wide digital infrastructure is not simple because of its high cost, especially with regard to hospitals with relatively fewer patient-bed number . Fortunately, the digital infrastructure is already installed on most nurses' personal devices, such as smartphone . In addition, the robustness of internal communication was observed in that nurses usually complete nurse-to-nurse communication before their shift . The potential of using social media or personal apps and social networking sites of nurses has increasingly been studied in the context of professional attitudes and non-work-related use, but no research has focused on the benefits of connective communications among healthcare practitioner . If this proposal is acceptable in the context of promoting the pharmacist-nurse relationship, a pilot study can be expecte . Furthermore, nursing education should include guidelines for effective use of social media or apps for maintaining confidentiality without abuse.

. Best Practices and Strategies for Coordination Among Healthcare Professionals

When preparing a written report or manuscript, the authors should ideally serve as an interdisciplinary team, collaboratively drafting, revising, and rewriting the entire document to ensure that each contributor is responsible for the conten . Furthermore, before an interdisciplinary report or manuscript is submitted for publication or to other stakeholders, it may be appropriate to organize a peer review where we receive feedback from colleagues in different professions to brainstorm on the work and to first attempt to strengthen the repor . Communication and coordination among professionals are key features necessary for achieving comprehensive and accurate patient car . It is not uncommon to find hospitals with fragmented systems of health care, where the activities of nursing staff, pharmacists, and laboratory professionals are carried out separately, with little or no interaction among and within the groups, with 24/7 activity for all types of health professional . Several studies have found a lack of consensus and coordination among healthcare professionals while conducting their daily activities,

6.1. Interprofessional Collaboration

Interprofessional practice, which refers to a broader field of interprofessional collaboration as it relates to the roles of workers in a specific work context, is a practice philosophy and articulated purpose for lessons in an expanding array of health profession . Its advocates individually and collectively argue that this form of collaboration recognizes that a cooperative adventure is the very foundation of quality care and that interprofessional teams create better quality care, better access, more efficient use of resources, and reduced incidence of medication error . Its clearly set purposes are to improve working relationships among all worker categories, particularly relationships between RNs and worker categories that society and patients increasingly prize and valu . Indeed, some assert that the importance of care coordination by such professionals is accompanied by envisioning professionalized sitter services in hospitals.

When focusing on scheduling, activities that demand relevance and attention in the interprofessional and unlicensed caregiver literature receive instant attention and benefi . Several opportunities are available across the week that require contemporary attention from scheduling optimization and staff assignment practices that employ modern deduplicatio . Devices might augment partnership health care responsibilitie . For example, the medication administration process might be collaboratively realigned for facilitated daily multitaskin . Notwithstanding caregiving interference, well-established segmentation principles might couple medications that must be given at clinically incompatible times that are less preferred daily multitasking time . Similarly, these other clinical services might prioritize some medication administrations that are scheduled at other multitasking times that are not paire . Implementing either of these decisions would improve both interprofessional daily multitasking opportunities and multiple medication administration opportunitie . Such device-assisted function repurposing might include team-developed software to maximize and document capacity with an increasingly well-recognized health care team member role.

6. . Team-Based Approaches

The study suggests that nursing, pharmacy, and laboratory staff recognize the need for more team-based models to schedule patient care activitie . This paper addressed the question: What scheduling practices exist that have better coordinated nursing, pharmacy, and laboratory personnel tim ? Three strategies are discussed that may result in less time waste and overall resource saving . Overall, the results suggest that hospitals need alternate models to staff-based care model . Staffing models that are designed to improve interdisciplinary resources may also improve care deliver . To better meet the need for coordinated patient care, personnel require alternate models to current staffing-based care delivery method . Either computer-controlled scheduling or redesigned work applications can result in significant resource saving . Each has pragmatic problem . While centralized control of data reporting might seem a good idea, staff interventions in the scheduling process may make the added central control a politically unfeasible projec . The other approach, a redesigned work application, occurs unintentionally in many technology application . These applications include point-of-care testing, decentralized access to pharmacy and medical records, and a number of others.

Case Studies and Success Stories

A survey emphasized efficiency and organized schedules to ensure adequate coverage for the required task. Properly skilled staff were in attendance, and essential support was on the premises when needed. The majority of employers emphasized the need to respond to clients' emergencies or sudden demand changes and showed better financial result. Whether directly or indirectly, all employers noted an improvement or the need to improve their communication systems and showed promising results in profitability from their hospitality. Allowing time for self-improvement study or remedial catch-up study is needed in employment environments with numerous technical changes and advancements.

With our needs being consistently met, strategies have been and will be put in place to ensure these needs are me . When arriving at this stage, our work will be worth it and will meet the criterio . We have shown numerous groups and systems within our organization more respect through our efforts and have additionally shown that complete satisfaction to

a client or patient when trying to work with them to best meet their needs can indeed be accomplishe . We assist others so they can accomplish their work, ensure proper communication links, and through our efforts, assist in giving our clients the needed prompt care for their inquiries, even if our services will not be created or completed immediately.

Ensuring adequate rate structures to sustain quality services through needed professional staff and technology advancement is of vital importance to the profit of our business and our eventual succes . Success has been noted through all three selected case studie . The initial group profiled showed profitability, which allowed these employees to demonstrate further contributions and justify further profitability gain . Initial and eventual stability has been ascertained, followed by the need for services and communication requirements being me . New relationships are grown stronger through the diligent testing and review analysis of technology needs, position identification, daily staff skill and availability rates, telecommunication configuration, and work time scheduling requirement . Staff has been shown respect through the creation of adaptive work time schedules and the incorporation of exceptional human resources training tools in career progression roles and discussion . Career and profession planning and internal job help have been created to assist the staff in preparing and completing required trainin . (Zhou et al.2021)(Paleyes et al., 2022)(Errida and Lotfi2021)(Neumann et al.2021)(Miranda et al.2021)

7.Innovative Scheduling Models

Nurse staffing at hospitals accounts for the majority of hospital budgets and is also one of the largest providers of health care service . Nurses who work unconventional hours may be at risk for mental disorders, and they may also contribute to poor patient outcome . Medical advancement not only fosters specialization among hospital staff but leads to the establishment of various care team organizations where nurses, pharmacists, and laboratory personnel adopt different professional methodologie . Nurses who work unconventional schedules can become key personnel in collaboration among hospital care team . Employing nurses to perform quick tests, make decisions, evaluate, and provide disposition in the front-line areas where patients arrive, and employing other care teams to support these nurses will help to alleviate emergency department and inpatient overcrowding and acute bed shortage . (Han et al., 2021)(Van et al.2023)(Bartmess et al., 2021)

With consideration for the care team's collaboration between nursing personnel and clinical support, we conduct a scoping and narrative review and identify the critical elements that enhance team effectiveness and lead to optimized schedulin . Our review provides a new understanding of clinical coordination and an evidence-based foundation for nursing leadership and administrative policy decision-makers for future action . (de et al.2023)

7. . Cross-Disciplinary Coordination Initiatives

The input-process-output model offers a framework to conceptualize the factors that support interdisciplinary processes such as coordinatio . An increasing focus on teamwork appears in the nursing literature, together with intensified attention to interprofessional education and practice in nursing and medical educatio . The broader health services literature is also rich with work on interdisciplinary teamwor . Work on hospital organization includes healthcare operations, but the focus here is more on other topics, such as patient outcomes or role definition than principal operations issues, such as

coordinating nursing, pharmacy, and laboratory staff shift . Recent work shows improved patient satisfaction, resource utilization, staff turnover, and stress when team models are utilize . Healthcare professionals have historically been socialized to adhere to hierarchy, with detrimental effects on patient outcomes, reduced effectiveness and safety, and indirect or direct costs.

Subsets of efforts include programs aimed at facilitating teamwork between nurses and physicians and related professional groups, as well as increasing emphasis for health analytics as a shared area of concern; formal orientation programs emphasizing physician and nurse engagement in enhancing patient experience; and measures of engagement to signal shared accountabilit . Furthermore, implementing decision-recognition-theory-based strategies can help motivate multidisciplinary teams to communicate and coordinate their shifts in a clinically meaningful manne . Interdisciplinary cooperation in hospitals may also be achieved through engagement in natural human behaviors, with tools and the information and communication technologies infrastructure as supportive enabler . When healthcare professionals engage with and recognize the importance of decision-relevant patient-related knowledge and communication, patient care is improved, and healthcare costs are reduced.

. Future Directions and Research Opportunities

This focused scoping review was designed to solicit and organize findings from publications to optimize the strategies and interactions among nursing staff, pharmacists, and laboratory personnel in generating careful, precise, individualized, and swift decision outcome . For consistent generalizability, academic papers were identified and included within the following criteria: peer-reviewed open-source articles, original research and commentary, publication in the English language, and publications from 2002 to 202 . Otherwise, there were no restrictions impose . Limitations, common barriers, and research gaps were carefully examine . In particular, supplementary study designs and survey methods as well as specific research approaches were observed as possible areas of interest and are fitting topics for comprehensive exploration in future research.

In closing, the viewpoints extracted from this scoping review necessitate conversations about interdisciplinary work and interface specifications among multi-disciplinary health-associated professional . Current digital platforms hold unrealized opportunities to be evaluated, employed, and leveraged, particularly the next emerging health systems platform concepts: closed-loop medication administration and electronic health record . Attention and innovative means are required to support the delicate alignments, fostering enhanced performance and relieving some of the issues and drudgery discussed her . These presentations are centerpieces within the ongoing dialogues necessary to truly advance health outcome . They aim to stretch boundaries and deepen the collective understanding in key domains across Nursing and Health-Associated Pharmacy and Laboratory Practice Communities. (Floetgen et al.2021)(Barach and Rider, 2023)(Falcke and Zobel, 2024)(Schueller and Torous, 2020)(Cheng et al.2021)

8. . Emerging Technologies

Emerging Technologie . Despite the growing application of AI technologies in healthcare services, providers such as hospitals and laboratories have been slower to adopt them in health support services like pharmacy and nursing staffin . If the future role that nurses are

expected to fulfill to improve healthcare focuses on the patient and includes a minimum of non-direct patient care activities, then research into innovation in the health sector and collaboration between multiple professions to ensure crosstalk are both neede . Managerial and administrative tasks already occupy a significant proportion of nurses' working time in a variety of setting . The two concepts together—innovation and collaboration—build into the accelerators of progress, which have gained additional momentum during the pandemic and will likely continue to affect organizational and care delivery changes in the near futur . (Davenport and Glaser, 2022)(Cadamuro et al.2024)(Kamel et al.2024)(Marco-Ruiz et al.2024)

In a clear regulatory environment, businesses will be more willing to invest in collaborative and innovative actio . Innovating new product lines and services that use data, technology, or other means to create efficiencies, fueling the expression of human capital potential, will involve new partnerships and will fundamentally shift the relationships of roles in the workplace and the demand for resources, both capital and labor relate . The future of business activity using an investment framework that can contribute to the development of shared goals and to examining the progress and enabling conditions for action involves changing what people do for work and creating an environment that is focused on developing competencies for the technological advances as a means to deeply influence problem-solving and testing for applicability with related endeavors in response to human crise . Opportunity-forward strategies will use emerging technological strengths to maintain global competitiveness and strengthen social resilienc . An important element of these strategies will relieve the uncertainties linked to accelerators of progress in economic, social, and political contexts beneficial for creating and distributing a talent pipeline that can rapidly adjust to technological change . (Jones et al.2021)(Brown et al., 2020)(Chierici et al.2021)

8. . Interdisciplinary Training Programs

Part of the desynchronization between nursing, pharmacy, and laboratory activities is due to the education models of these professional . Technical skills are initially prioritized, and the development of soft skills and knowledge of other professionals' activities occurs spontaneously, with job experienc . Generally, health care does not exploit trainin . Whenever teams are trained together, more significant effects are obtained, stimulating group work and collaboratio . There is also a limitation to training hours, so institutional training often aims to develop hard skills above soft skills and teamwor . An excellent strategy to optimize coordination is to include these interprofessional training sessions during the regular work activities, which causes discoordination at the same time and enhances its perceptio . The alternative of shared training is distance learning, which appreciates the development of soft skills and is considered the future of education and training. (Caldwell[1] and Grouper2023)(Silva-Junior and Fischer, 2024)(Boivin et al.2022)(Dichter et al.2022)

Training for multiprofessional work should be integrated into the training curriculum—particularly at the undergraduate and postgraduate level . It would be beneficial to have clinical simulation scenarios designed to rescue or synchronize the actions of nursing, pharmacy, and laboratory professional . Active methodologies should be applied in the

learning process, and new technologies—gamified and serious games, remote learning, support in virtual educational technologies or immersive learning—and communication tools should be use . Retrospective games and/or prospective, cultural approach settings, and challenge-based learning should also be adopte . Educational methodologies that promote learning from error should be available, and the promotion of thinking about team dynamics should be explore . In short, training should prioritize developing quality interpersonal relationships, communicating effectively, and respecting the skills and responsibilities of each health professiona . (Huppert et al.2021)(van Diggele et al., 2020)(Devine and Ash, 2022)(Bok et al.2020)

. Conclusion

This scoping review revealed that relatively little empirical data exist regarding innovative communication and collaboration tactics; programs; or approaches to transit, instantaneously process, and present timely laboratory results to nursing staff, laboratory personnel, and ordering physicians and pharmacists in order to help nurses, laboratory personnel, and pharmacists administer medications and with laboratory issues while respecting their scopes of practicing, generate job satisfaction, and reduce overtime, sick time, recruitment, retention, safety; and other health issues among pharmacists, laboratory personnel, and nurses while satisfying all stakeholder . A focus on strategies that enhance coordination between these different but equally important staff groups is particularly important because inadequate nursing staff, enhanced patient acuity, an increasing reliance on laboratory tests at the patient point of care, and growth in emergency care volume have led to a diminution of nurse/time to perform the nurse designed work and process laboratory generated dat . This scoping review revealed a few examples of innovative collaboration tactics in use, and other collaboration tactics that could be considered as viable, provable work accomplishments methods; satisfaction factors; and entry employment and maintenance factors.

Our review has identified that, at the clinical pharmacy manpower and service-setting level, important decisions are based on grossly incomplete information, and that few studies actually exist to inform these decision . Staffing and service setting research, in order to address serious manpower shortages and to establish the role of clinical pharmacists and laboratory personnel as members of healthcare teams, is essentia . Multicenter, centrally led research programs, that involve clinicians, health economists, social scientists, and clinical pharmacy researchers need to be established, in order to establish templates that individual clinical pharmacists/lab scientists can adapt for their own purpose . Strong emphasis and pioneering examinations are needed to ensure a timely managed control; and higher monitoring of patient outcomes' optimization programs, that differ from those used to ensure the organization's financial stabilit . Failure to address these issues means that clinical pharmacy services will never fulfill their potential, and the substantial public investment in clinical pharmacy research will remain compromised.

9. Recommendations

(a) Recommendations for staffing models and scheduling issues - More research is required to identify optimal staffing models that recognize the importance of nurse–other health professional collaboration across all interactions in the care of patients, whether physical or virtual. - The scheduling literature would benefit from broader consideration of both the

diversity of workers involved and the need to engage non-nurse staff in addressing issues that are influenced by their roles in care provision. - In particular, there is a far greater need for the voice of, as well as research about, pharmacist . This is particularly true with respect to providing guidance on considerations specific to inpatient staff. - Considering staffing and scheduling in integrated, long-term care in addition to acute hospital care, as well as the diversity of operational issues that may influence downstream test ordering and result availability, presumably would also represent beneficial directions for future researc . (b) Recommendations for practice - Organizations should seize the opportunity to promote interprofessional collaboration through thoughtful staffing leadership and scheduling, with a shift to more reliance on group and less reliance on individual-based metrics for scheduling decisions. - Organizations should embrace the efficiency and safety advantage of more pointed, timely, and sophisticated staffing and scheduling guidelines and tools that guide decision-makers on whether to hire, how to deploy and schedule, and which costs to conside . Tools and guidelines likely need to be more specific than those of general relevanc . (c) Recommendations for research - To more clearly inform the settings of maximum effect and identify the best way to implement promising strategies and interventions, research should more clearly identify the context in which a study was conducted and evaluate the cost-effectiveness of proposed staffing changes, as well as how best to implement and maintain necessary change.

References:

Almalki, Ahmed Yahya Ali. "Collaborative Roles of Pharmacy, Nursing, and Laboratory Services in Modern Healthcare: A Comprehensive Review." Journal of International Crisis and Risk Communication Research (2024): 1135-1143. jicrcr.com

Alnasser, Fatema Abdulmohsen, et al. "IMPROVING PATIENT SAFETY IN HEALTHCARE: A COMPREHENSIVE APPROACH FROM PHARMACY, LABORATORY, RADIOLOGY AND NURSING TEAMS." Chelonian Research Foundation 17.2 (2022): 4632-4644. acgpublishing.com

Huber, Evelyn, et al. "Patient-related complexity of nursing care in acute care hospitals–an updated concept." Scandinavian Journal of Caring Sciences 35.1 (2021): 178-195. [HTML]

Jacobs, Sarah Marie, et al. "Reimagining Core Entrustable Professional Activities for Undergraduate Medical Education in the Era of Artificial Intelligence." JMIR Medical Education 9.1 (2023): e50903. jmir.org

Poore, J., Herrington, A., and Hardie, L. "Redefining health-care simulation facilitator professional development through online learning." Creative Nursing, 2022. [HTML]

Wong, Pauline, et al. "Pre-Registration nursing students' perceptions of digital health technology on the future of nursing: A qualitative exploratory study." Nurse Educator 49.4 (2024): E208-E212. [HTML]

Kaur, J. "The Nexus of Care: Human-Machine Collaboration Redefining Healthcare Delivery." Technologies for Sustainable Healthcare Development, 2024. [HTML]

Killam, Laura A., et al. "Redefining cheating on written exams: A shift toward authentic assessment to promote universal design for learning in the context of critical caring pedagogy." Advances in Nursing Science 45.3 (2022): E127-E143. [HTML]

Duffy, J. R. "Quality caring in nursing and health systems: Implications for clinicians, educators, and leaders." 2022. [HTML]

Fatani, Rayyan Riyadh A., et al. "Redefining Emergency Patient Management: Integrating Nursing Excellence with Medical Physics for Optimal Outcomes." Journal of International Crisis and Risk Communication Research (2024): 654-664. jicrcr.com

Alizadeh, Mohammad Reza, et al. "Task scheduling approaches in fog computing: A systematic review." International Journal of Communication Systems 33.16 (2020): e4583. researchgate.net

Houssein, Essam H., et al. "Task scheduling in cloud computing based on meta-heuristics: review, taxonomy, open challenges, and future trends." Swarm and Evolutionary Computation 62 (2021): 100841. [HTML]

Fragapane, Giuseppe, et al. "Planning and control of autonomous mobile robots for intralogistics: Literature review and research agenda." European Journal of Operational Research 294.2 (2021): 405-426. sciencedirect.com

Borji, A. "A categorical archive of chatgpt failures." arXiv preprint arXiv:2302.03494, 2023. [PDF]

Tong, Z., Chen, H., Deng, X., Li, K., and Li, K. "A scheduling scheme in the cloud computing environment using deep Q-learning." Information Sciences, 2020. e-tarjome.com

Davó, Laura, et al. "Early detection of SARS-CoV-2 infection cases or outbreaks at nursing homes by targeted wastewater tracking." Clinical Microbiology and Infection 27.7 (2021): 1061-1063. clinicalmicrobiologyandinfection.com

Colosi, Lisa M., et al. "Development of wastewater pooled surveillance of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from congregate living settings." Applied and Environmental Microbiology 87.13 (2021): e00433-21. asm.org

Kennedy, J. M. and Sandow, B. "The nurse manager's guide to innovative staffing." 2024. [HTML]

Catania, Gianluca, et al. "Lessons from Italian front-line nurses' experiences during the COVID-19 pandemic: A qualitative descriptive study." Journal of nursing management 29.3 (2021): 404-411. wiley.com

Parreira, Pedro, et al. "Work methods for nursing care delivery." International Journal of Environmental Research and Public Health 18.4 (2021): 2088. mdpi.com

Anderson, Michael, et al. "Securing a sustainable and fit-for-purpose UK health and care workforce." The Lancet 397.10288 (2021): 1992-2011. nih.gov

Danielis, Matteo, et al. "Nurses' experiences of being recruited and transferred to a new sub-intensive care unit devoted to COVID-19 patients." Journal of nursing management 29.5 (2021): 1149-1158. wiley.com

Dighriri, Ibrahim Mohammed, et al. "Recent Advancements and Techniques Regarding the Roles of Pharmacists, Nutritionists, Nurses, Laboratory Technicians, and Other Healthcare Professionals in the Care of Cancer Patients: A Comprehensive Review." Journal of Ecohumanism 3.8 (2024): 2588-2599. ecohumanism.co.uk

Almanna, Mohammad Abdullah, et al. "Enhancing Interprofessional Collaboration in Medication Management: the Roles of Nurses, Pharmacists, Health Records, Emergency Services, and Cardiology." International journal of health sciences 6.S10: 1701-1713. [HTML]

Bani Issa, W., et al. "Privacy, confidentiality, security and patient safety concerns about electronic health records." International nursing review 67.2 (2020): 218-230. researchgate.net

Rangachari, Pavani, and Jacquelynn L. Woods. "Preserving organizational resilience, patient safety, and staff retention during COVID-19 requires a holistic consideration of the psychological safety of healthcare workers." International journal of environmental research and public health 17.12 (2020): 4267. mdpi.com

Zhou, S. Kevin, et al. "A review of deep learning in medical imaging: Imaging traits, technology trends, case studies with progress highlights, and future promises." Proceedings of the IEEE 109.5 (2021): 820-838. nih.gov

Paleyes, A., Urma, R. G., and Lawrence, N. D. "Challenges in deploying machine learning: a survey of case studies." ACM computing surveys, 2022. acm.org

Errida, Abdelouahab, and Bouchra Lotfi. "The determinants of organizational change management success: Literature review and case study." International Journal of Engineering Business Management 13 (2021): 18479790211016273. sagepub.com

Neumann, W. Patrick, et al. "Industry 4.0 and the human factor–A systems framework and analysis methodology for successful development." International journal of production economics 233 (2021): 107992. sciencedirect.com

Miranda, Jhonattan, et al. "The core components of education 4.0 in higher education: Three case studies in engineering education." Computers & Electrical Engineering 93 (2021): 107278. sciencedirect.com

Han, X., Pittman, P., and Barnow, B. "Alternative approaches to ensuring adequate nurse staffing: the effect of state legislation on hospital nurse staffing." Medical care, 2021. lww.com

Van den Heede, Koen, et al. "Improving hospital nurse staffing during the pandemic: Implementation of the 2019 Fund for Health Care Staff in Belgium." Health policy 128 (2023): 69-74. nih.gov

Bartmess, M., Myers, C. R., and Thomas, S. P. "Nurse staffing legislation: Empirical evidence and policy analysis." Nursing forum, 2021. wiley.com

de Aguiar, Ana Raquel Pena, Tânia Rodrigues Pereira Ramos, and Maria Isabel Gomes. "Home care routing and scheduling problem with teams' synchronization." Socio-Economic Planning Sciences 86 (2023): 101503. sciencedirect.com

Floetgen, Rob Jago, et al. "Introducing platform ecosystem resilience: leveraging mobility platforms and their ecosystems for the new normal during COVID-19." European Journal of Information Systems 30.3 (2021): 304-321. tandfonline.com

Barach, M. A. and Rider, C. I. "Discovery, discernment, and exploitation: Entrepreneurial mechanisms at the nexus of individual and opportunity." Strategic Management Journal, 2023. wiley.com

Falcke, L. and Zobel, A. K. "Open Innovation's potential in the metaverse: leveraging digital features to build trust with partners." California Management Review, 2024. sagepub.com

Schueller, S. M. and Torous, J. "Scaling evidence-based treatments through digital mental health.." American Psychologist, 2020. apa.org

Cheng, Li, et al. "Leaving it on the table? An examination of unrealized bargaining power in multimarket buyer–supplier exchanges." Journal of Operations Management 67.3 (2021): 382-406. [HTML]

Davenport, T. H. and Glaser, J. P. "Factors governing the adoption of artificial intelligence in healthcare providers." Discover Health Systems, 2022. springer.com

Cadamuro, Janne, et al. "A comprehensive survey of artificial intelligence adoption in European laboratory medicine: current utilization and prospects." Clinical Chemistry and Laboratory Medicine (CCLM) 0 (2024). degruyter.com

Kamel Rahimi, Amir, et al. "Implementing AI in Hospitals to Achieve a Learning Health System: Systematic Review of Current Enablers and Barriers." Journal of medical Internet research 26 (2024): e49655. jmir.org

Marco-Ruiz, Luis, et al. "A multinational study on artificial intelligence adoption: Clinical implementers' perspectives." International journal of medical informatics 184 (2024): 105377. sciencedirect.com

Jones, Stephen L., Aija Leiponen, and Gurneeta Vasudeva. "The evolution of cooperation in the face of conflict: Evidence from the innovation ecosystem for mobile telecom standards development." Strategic Management Journal 42.4 (2021): 710-740. researchgate.net

Brown, P., Bocken, N., and Balkenende, R. "How do companies collaborate for circular oriented innovation?." Sustainability, 2020. mdpi.com

Chierici, Roberto, et al. "Strengthening digital collaboration to enhance social innovation capital: an analysis of Italian small innovative enterprises." Journal of Intellectual Capital 22.3 (2021): 610-632. emerald.com

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Silva-Junior, J. S. and Fischer, F. M. "PL09 MENTAL HEALTH OF FRONTLINE HEALTHCARE WORKERS AND THE COVID-19 PANDEMIC." Occupational Medicine, 2024. [HTML]

Boivin, Diane B., Philippe Boudreau, and Anastasi Kosmadopoulos. "Disturbance of the circadian system in shift work and its health impact." Journal of biological rhythms 37.1 (2022): 3-28. sagepub.com

Dichter, Jeffrey R., et al. "Mass critical care surge response during COVID-19: implementation of contingency strategies–a preliminary report of findings from the Task Force for Mass Critical Care." Chest 161.2 (2022): 429-447. sciencedirect.com

Huppert, Laura A., et al. "Virtual interviews at graduate medical education training programs: determining evidence-based best practices." Academic Medicine 96.8 (2021): 1137-1145. sap2.org.ar

van Diggele, C., Roberts, C., Burgess, A., and Mellis, C. "Interprofessional education: tips for design and implementation." BMC Medical Education, 2020. springer.com

Devine, P. G. and Ash, T. L. "Diversity training goals, limitations, and promise: A review of the multidisciplinary literature." Annual review of psychology, 2022. annualreviews.org

Bok, Chermaine, et al. "Interprofessional communication (IPC) for medical students: a scoping review." BMC medical education 20 (2020): 1-17. springer.com