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Pharmacy and Nursing Integration in Healthcare Systems: The Supporting Role of Laboratory and Operations Technicians

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Abstract
The increasing complexity of healthcare infrastructure requires a wide range of proper actions and articulations to ensure system efficiency and effectiveness. In primary care, hospitalization, emergency services, laboratory, and specific operations, activities are strict and demanding. Any installation would have all mandatory specialties, but regulations and conditions often comply with a smaller ensemble of full-time, qualified professionals. Therefore, support in this concerted effort is crucial and often underexposed. Recently, the role of radiopharmacy and radiopharmaceutical scientists as key figures in the development and implementation of personalized molecular imaging and treatment procedures has been emphasized. The correct operation of these areas in the healthcare system involves necessary operational support at several levels, from clean and well-supplied operating rooms to timely necessary images.
The broad technological development and the delicate operational details in these areas depend on professionals dedicated to these technical functions. The healthcare process and the necessary integration in this demanding teamwork, as required by appropriate procedures, have led some to design integrated services, such as health clinics and corporate structures. We will demonstrate in some detail the necessary functions, the typical qualifications, and the tasks of pharmacy and nursing integration in the areas they support, and propose an integration model with pharmacy and nursing technicians that may facilitate and streamline the process for the benefit of the patients.
Keywords: Pharmacy ‹Nursing ‹Integration‹ Healthcare

1. Introduction

Across the world, healthcare systems aim to provide common citizens with the best healthcare services at the lowest costs. This difficult task is carried out by professionals who specialize in different areas with different training. Within healthcare, it is common to find groups of professionals with similar roles: a service that is provided by a doctor in a hospital is also commonly found in the same hospital, and sometimes also in the same service division, conducted by other professionals, leaving the latter with less complex activities or with routine tasks. The delegation of activities to other professionals not only leads to the efficient use of resources, allowing top-level professionals to dedicate themselves to more specialized activities, but also ensures that all tasks are carried out efficiently. (Coombs et al.2021)

This is because, despite being routinely performed, each task has its importance. Activities that aim to support busy professionals are delegated to technician professionals or other lower-level nurses. Some examples are radiology and imaging technicians who support a doctor's diagnostic process, technical specialists who support pathologists, laboratory technicians who support other healthcare professionals in the diagnostic process, and administrative technicians who assist hospital management. This study falls into the general area of healthcare operations management and focuses on a specific aspect: the integration of different well-trained professionals in activities that are part of the care process. (Almoutairy et al.2022)

More precisely, we focus on two pairs of professionals, the professional nurse integrating with the pharmacy, and the professional laboratory technician integrating with the nurse. These activities are important for hospital operations as they can contribute to the reduction in average hospital length of stay and improvements in the diagnostic process, consequently making better use of resources, benefiting the service of these professionals,

and enhancing the patient's well-being. In order to explore the influence of nurses' work efficiency on hospital duration and on the number of days pharmacy and laboratory professionals dedicate to handing over medication to the patient and collecting the results of the prescribed exams, we conducted an empirical analysis. (Stone et al.2022)

Our paper follows several others on nursing and explores the influence of poor work organization on the extent of time spent on activities by other professionals. Additionally, our work is the first one proposing a model that captures possible influences from both nurses to other professionals and vice versa, since nurses can also be influenced by secondary professionals in the same way. Our proposal and its eventual future applications may interest professionals as it can serve as a source of information concerning the influence of work organizational variables on each of the actors that are part of the health production chain, besides being able to serve as a stimulant to test the research and proposals of similar models to the one we applied.

1.1. Background and Rationale

The healthcare sector is increasingly acting to integrate the existing competencies and guarantee a multidisciplinary approach to care and cure provision through planned strategies that foster sharing policies. In this context, even though the gradual but partial detachment of pharmacy from nursing, as well as from the rest of the hospital's critical areas, was a long-lasting and univocal fact of general healthcare management, present-day expectations are focusing again on strong integration and close interconnection between pharmacists and nursing. (Johnson et al.2023)

Many have argued that the quality of performance provided by health professionals involved in the physical act of administering medications will benefit directly from these personnel being able to understand the roles of other individuals involved in the process, who are perceived as collaborative rather than hostile or uncooperative. The new rules require sharing and an integrated interdisciplinary approach, recognized by pharmacists in any sector as essential for the quality and safety of the products or services offered. Such integration, shared and extended to all actors in health professional patient management, is not only to recover but also to rehabilitate the individual. This is the concrete application of health professional consultation, the first step towards cooperation. (Alowais et al.2023)

1.2. Scope and Significance of the Study

This study intends to expose the adaptation and integration process of pharmacy services to nursing, under the experience of a pharmacy inserted in a health system in Portugal. The study reveals the importance of the integration and the implication of all team members in multidisciplinary teams, such as pharmacy technicians, particularly those in the clinical environment. The results have shown that the more the pharmacy is integrated with its services, the more knowledge the pharmacy team will have about major difficulties encountered by other professionals, such as nurses, leading to improved planning and quality in labor performance. This consequently results in a better relationship with each team member in particular and, above all, provides the best possible care to the patient.

Discussions were generated regarding allowing all professionals to participate in a culture of patient safety, including inter-professional meetings; improving the relationship between professionals by enhancing communication; knowing the context of the work of each professional; including all professionals in risk management; bringing professionals and leaders together to analyze and discuss posts that are considered risky; detailing posts in a more transparent and intuitive way, with particular emphasis and concern for professionals and, thus, for the care provided to patients; and the need for teams to be multidisciplinary regarding clinical excellence and the aspiration of all those involved in the process. (Han et al., 2020)

2. Theoretical Framework

Pharmacy and nursing are two key care areas of the healthcare system, but they are not clearly integrated in some key operational and clinical processes, as is desirable to fully leverage the potential skills and competencies of both professions. This paper presents a disease-cycle framework to explain how such integration can occur and is particularly based on signals emitted during the disease-cycle logistics processes. The study points out how integration improves operational performance and how technicians could play a role in relieving logistics deficits by performing some pharmacy and nursing tasks, thus strengthening the supporting logistical and clinical cross-management practices. Implementing the framework could consequently contribute to saving operational costs and enhancing the professional capability and satisfaction of all parties, which, in turn, would benefit the healthcare enterprise and the patients. (MacLaren et al.2024)

Each case provides the mechanism; and whether and to what extent integration requirements are unique to a particular type of integration, which in this case means the pharmacy and nursing process integration. The proposed model can be a valuable tool for evaluating current operational model performance, suggesting potential integration improvement strategies, and exploring the contractual implications of different integration strategies. All these will be quite valuable for the stakeholders, including both pharmaceutical and nursing departments. Consequently, by shedding new light on a promising area of research, this model contributes to operations management, merging research in the health and pharmaceutical literatures, and may also be quite

relevant for the general public, contributing to the improvement of healthcare professional service and healthcare level. (Fan et al., 2021)

2.1. Conceptualizing Integration in Healthcare Systems

A healthcare system is a intricate arrangement of people, equipment, and institutions that has been developed to provide medical care within a specific geographic area. Health systems, a subset of this, are focused on promoting and supporting health, in contrast to health services systems, which provide the necessary external inputs to achieve this goal. The six key components of the broader health system include: 1) the state, which establishes health policy rules and determines the allocation of resources among stakeholders, 2) the financing system, which determines who will pay and how, 3) the payment system for healthcare providers and suppliers, 4) the service delivery system, 5) the production and distribution of healthcare resources, including personnel, and 6) the active demand for health and the involvement of individuals, which is critical for disease management and patient care outcomes. The specific details of these core elements should be tailored to the unique characteristics of the particular health system and the preferences and needs of the stakeholders. (Haleem et al.2022)

Internally, a healthcare system has several strategic clinical and operational areas that enable synergies and resource optimization. The most recognized clinical areas are nursing, pharmacy, and therapeutics. Nurses spend the most time with patients because they remain by patients' beds throughout the day and provide continuous care and support. Patients report greater satisfaction with their hospitalization experience when the quality of these services is high and, more importantly, the outcome of patient care improves. Nurses and pharmacists have indirect contact, which usually occurs via the pharmacy. Nursing orders are sent to the pharmacy, so the primary contact between these professionals is through communication concerning patient records. (Yoo et al., 2020)

Pharmacists require information about the names, ages, allergies, medical diagnoses, and medical history of patients to dispense drugs correctly or to intervene when undesirable drug interactions occur. The clinical practice of these professionals does not overlap. Regardless, some studies have challenged the traditional organizational model and have suggested that the professional functions of the pharmacist could be expanded. It is emphasized that the skill sets of both practitioners could be integrated through pharmacology and pathophysiology coursework introduced into pharmacy and medical degree programs, as the subject matter of this coursework includes areas such as pharmaceuticals in nursing, pharmaceutical care, pharmaceutical compounding, pharmaceutical calculations, laboratory management, and more. (Josendal et al., 2021)

Such changes have not yet been made, as a pharmacy degree's curriculum should align with what society demands while meeting students' expectations. Like the pharmacy program, the nursing program has also evolved by establishing diversified fields of study. However, the number of research centers and the scientific production of researchers in nursing is scarce. Consequently, graduates face a shortage of job opportunities, with many relying on their own professional practice. This makes integrating pharmacy and nursing professions difficult. Integrating content into educational programs to keep curricula up to date will enable students to stay current with the required skills.

3. Pharmacy and Nursing Integration

Pharmacy and nursing are two clinical practice areas that work closely together to support a patient's therapeutic flow. These two care entities are involved in the delivery of care in an interdependent manner, such as in the preparation, distribution, and administration of treatments, and in the surveillance and support in the management of drug effects. The quality of patient care is closely related to the quality of links and fluidity between different clinical practice areas. Depending on the context in which they perform their functions, the work in pharmacy and in nursing can be more or less autonomous, but at both levels, continued support from laboratory and technical professionals in nursing is marked as a determining factor in care that is increasingly more responsive and safe for the patient. The use of technology contributes significantly to the ability to perform integrated tasks by both types of professionals. (Sokos et al.2023)

The domain of nursing in the administrative component of therapeutics includes the respective minimal supervision requirements, namely in terms of diuretic prioritization, pregnancy verification, or in therapeutic completion, as well as in the scope of the validation of clinical dispensations through monitoring and in the operation of robots. In the administrative area, both resources must have permanent supervision of the Level 9 Instructor and higher functions when available, according to the specifications identified in the prescriptions compendium and guidelines for checking and completing dispensations in the bureaucracy of the pediatric oncology unit. In the patient care sector, priority is given to the convenience for the patient in the checking and completion of their medication, a time that serves the fulfillment of the established hours. (Nickel et al.2024)

3.1. Historical Perspectives

Pharmacy is an ancient profession. The emergence of pharmacy as it is understood today and the professional recognition of those who practiced it, together with nursing, are late nineteenth-century phenomena. The role of pharmacy as a science in the prescribing, preparation, compounding, and dispensing of medicines was long reduced to a subservient role, first to medicine and then to pharmacy's corollaries. As in the case of nursing care in relation to medical decisions, relatively recent legal regulatory and operational regulations establish this

essential and respectful professional relationship. While for the medical intervention the provision of medicines through prescription is required, the care provided to the patient and the promotion, prevention, diagnosis, and treatment of diseases are ensured by health professionals, who in their educational and professional frameworks have competencies and specialization to do it. (Adams, 2020)

Nursing, the oldest profession in the world, later enhanced to a profession arose before the science of medicine. Nursing grew as an art and a science beside medical science. Over time, nursing care was enhanced by the operational, managerial, and laboratory support that the colloquial, overdetermined technical and auxiliary professions have provided. Such professions have developed with the scientific and technical resources that scientific research, a cornerstone of the independence and evolution of health professions, has made available. Laboratory and operations technicians, previously nursing staff, became classified according to the professional activities we know today: Laboratory Diagnostic Technician and Nursing Aide, gaining legal and operational autonomy — patients benefit from the competent performance that the State legitimized through its distinctive professional orders. (Fosch-Villaronga and Drukarch, 2021)

3.2. Current Trends and Challenges

The worldwide implementation of innovative interdisciplinary models of health care services, training, and professions has become a strong demand. In practice, interdisciplinary health teams have enjoyed certain success. In successful cases, such strategies have positively changed the health of users and provided a better quality of life. Moreover, in recent years, a trend has developed particularly in the field of oncology. Similarly, several specific experiences have been explored and even scientifically discussed, considering other health professionals, both in health and social areas. However, on the one hand, few countries have strict and established regulations that could be considered successful in medicine. On the other hand, in most cases, health trainers are organized according to specific institutional interests or even without a systematic perspective, neglecting the rights and health needs of specific populations—mainly the inequalities that limit most communities' quality of life.

(Bird et al.2021)It is necessary to build a general framework for the different sectors that form the body of health trainers in order to look for variations in such models, create strategies for changes, consider the present and the future of comprehensive care, and ensure accountability for costs. In addition, access to services, the use of different strategies, and the rights of individuals and also of organ donors need legal and ethical considerations. Also, mechanisms are needed to evaluate professional behaviors and provide mechanisms for the continuing professional development of health professionals. The inclusion of professionals in different areas with distinct training, skills, and duties, but, concomitantly, integrated with other health professionals results in favorable healthcare. Even having the most advanced technology currently in health, various works show negative impacts on health quality due to such lack of integration. The critical role of patient-driven information for clinicians is also stressed. The study results show that clinical care is improved when patients are given relevant information. Therefore, it is stated that nursing and pharmacy should appear in obvious conditions within the health team, knowing their strengths and weaknesses and, above all, be enabled through effective communication with the patient to deliver personalized information. In this way, nurses and pharmacists create a knowledge base to support decision-making throughout the patient's health circuit, addressing multiple aspects, be they related to the medical condition of those who care or emotional support.

4. Role of Laboratory Technicians

Laboratory technicians represent an important bridge between nurses and pharmacists. Also, if more education is required in their field, they could be directly involved in the safety of medication use. It has been demonstrated that the tasks of inventory management—checking expiration dates; compounding—taking all factors into account; checking medication labels for completion as well as the quantity on the label, the description of the label, and the compounded medication, helping nurses to get better compliance with labels; including unique identification code labels prior to dispensing; and assisting pharmacists in the preparation of IV medication bags—cross-checking available patient medications with pharmacy-dispensed medications help reduce medication administration errors. Robots with automatic inventory management systems are already available. (Stranges et al.2020)

For pharmaceutical compounding, a special device would need to be designed to support pre-separation of stock medication and bacteria-laden medication pre-compounding. Special care should be taken with error reduction in complex medications in the sterile environment. Only a laboratory technician with a high school diploma is required, and both laboratory and pharmaceutical technicians take professional associate undergraduate programs. It is hoped that increasing laboratory technician involvement in these tasks will lead to further contributions to patient safety during admissions.

4.1. Responsibilities and Tasks

Within the hospital organization, pharmacy technicians process physician orders, prepare, package, and deliver medications, reorder and maintain drugs and supplies, and perform other designated duties as appropriate. The overall responsibilities of the pharmacy technician are contingent upon the type of position being held, but general responsibilities include performing a full range of technical pharmacy services as assigned. Pharmacy

technicians function in accordance with standard written procedures, standard operating procedures, Joint Commission standards, state and federal rules and regulations for a broad range of services, significant communications with patients, nurses, and other healthcare professionals to foster a team approach at all times, the ability and proficiency in all other packager, order, and/or technician I, II, and III functions, skill in the operation, maintenance, and troubleshooting of all pharmacy devices, and the ability to problem-solve and act within departmental guidelines. (Dickerhofe and Crank, 2020)

Practical skill applying mathematical concepts such as fractions, percentages, ratios, and proportions to the solution of practical problems is essential. Additionally, other duties may include receiving and storing incoming supplies, performing inventory maintenance, and maintaining records, serving as a facilitator between nursing and retail pharmacy, delivering and retrieving medications and materials at alternate pharmacy locations serving as part of the Retail Pharmacy delivery system, assisting with the collection of clinical medication information, assisting in resolving pharmacy department operational problem situations with minimal guidance from the supervisor, participating in health product inventory management, performing and assuring quality control checks of unit-dose medications for inpatient use, and providing direct patient care. The position could also eventually require performance of the technician I, II, and III functions on some occasions. The laboratory technician is responsible for the ordering, coordinating, and collecting of patients' laboratory specimens. Duties may include, but are not limited to, the maintenance of supply inventory, specimen processing, and sending of the specimens to appropriate testing facilities.

4.2. Importance in Healthcare Systems

Healthcare systems, especially hospitals, constitute complex organizations with multiple functions and services, encompassing both direct patient care provision and services enabling this care. Overall patient care includes all activities that aim to ensure that the patient receives the most complete care and considers all aspects involved, such as the therapeutic plan, the communication and interaction with the patient, the relatives, and the other health professionals who participate in the care of the patient. In the therapeutic process, two major professional groups are involved: physicians, who have the responsibility of the diagnosis and definition of the clinical therapeutic procedure to follow, and nurses who support and administer the crucial therapeutic decisions and prescribe drugs on the plan defined by the physician. Hospitals are the medical units that mostly reflect the integration of medical and nursing activities and that require higher levels of cooperation and clinical support, needing the contribution and fulfillment of several functions besides medicine and nursing. It is clear to those who work for many years in a hospital that teamwork among all the professionals involved in patient care is the essential condition associated with its success. Besides physicians and nurses, several other types of staff collaborate with direct health care activities, for example, operations and laboratory technicians. Operations and laboratory technicians are responsible for performing technical work under the supervision of a physician or other healthcare professionals, for preparing patients for and providing care around the dialysis process. (Haleem et al., 2021)

The field of pharmacy within a hospital setting is of particular importance, given both its roles in supporting other healthcare professionals in their tasks most directly related to patient care; that is the preparation and administration of drugs, as well as the direct relationship with patients. Indeed, pharmacy and nursing share a common mission and goal of optimizing effective patient care while limiting the risks associated with drug therapy. The goal of this paper is to try to provide some empirical evidence that precisely supports the idea that the high degree of integration and interaction between nurses and pharmacy staff can be useful for the completion of their tasks and for the improvement of the health of patients within a hospital structure.

5. Role of Operations Technicians

The management of the pharmaceutical supply service is related to operational decisions, ranging from pharmacy space management and stock management to the management of the warehouses necessary for the preparation and dispensing of medicines. This set of tasks is carried out by operations technicians, who privatize the nursing and pharmaceutical activity of the pharmacist. The integration between these professionals must also be close in order to free the activity of the pharmacist and operations technicians so that they can collaborate in the preparation of dosage units. They have the responsibility of ensuring the best possible management of the pharmacy's installation on a daily basis and the availability of pharmaceuticals for dispensing by the drug dispensing service. They are also responsible for restocking the pharmacy to ensure that the prescriptions written by the doctor on duty at the hospital at each moment of the day are available for procurement in the pharmacy. Due to the continuous nature of the supply service, stock rotation is required to respect the conditions for storing and dispensing. Pharmacies therefore need to select a set of strategic and operational suppliers with appropriate wholesale management logic. The wholesaler supplier must take into account the coverage and location of the pharmacies in the territory. The pharmaceutical coverage in a given territory, indicated in pharmacy management, will result in additional costs that should only be incurred when necessary.

5.1. Key Functions and Duties

The key functions and duties are as follows:

Pharmacy arrangements by following methods established by a pharmacist;

Receipt, storage, and handout of medications and medical substances for a healthcare facility;
Storage and handout of medications and medical substances for nursing departments and other facilities that possess access to medication storage cabinets;
Provision of labeling medicines before delivery to a patient department;
Encoding daytime and nighttime working hours during the transport of medication and other supplies for fieldwork care;
Distribution of medications for one day, recording, and control over patient compliance with dosage;
Recordkeeping and data updates in the pharmacy automated system;
Cloning of patient medical records and related documents;
Replenishment and storage of pharmacy inventories;
Storage and distribution of equipment and supplies;
Cleaning and sustaining cleanliness in the working area within the pharmacy area, the patient sector, and the server room;
Maintenance of pharmacy equipment to avoid malfunctions;
Conducting stock-taking activities.
Pharmacy and nursing technicians employ safe and correct methods studied by a pharmacist when executing their key obligations. For example, they can dispense medication and medical substances in conformity with a set of written guidelines, a bill, or an indication from a nurse for gathering medication scheduled for use on the present day, or an order from the pharmacist for the medication on a belief list in a material storage cabinet available to order medication using the job card supplied. (Sparkmon et al.2023)

5.2. Interdisciplinary Collaboration

Nursing pharmacy interdisciplinary collaboration has been largely explored. The results of these investigations show a clear overlap between these two specialties with an important equivalent contact with the patient. Specifically, the pharmacy skills and knowledge associated with legal and ethical issues are highly valued by nurses and have also facilitated substantial contributions to patient care, intra-team work, educational activities, and patient management improvement. Pharmacist referral to nursing is mainly associated with the collection of certain relevant clinical information for a more specialized intervention and the regulation of the medication prescribed by maintaining proper control and specific management protocols in the patient's home. (Johnston et al.2022)
Conversely, at the beginning, a pharmacist is able to provide relevant primary care information about patient care needs. In summary, calls to the pharmacy were mainly related to the collection of relevant clinical information for the intervention of health professionals. In this regard, primary oncology care is of great relevance in medical management and education. Pharmaceutical and medical disciplines are aware of the recognition and control of the patient's needs in home care. Due to the available funds, collaborations with diverse health institutions and private and public insurance agents, hospitals and health support networks play an important role as a communication link between different health sectors.

6. Benefits of Integration

Several studies have shown that integrating pharmacy and nursing activities in a single intervention may yield potentially better results in terms of improved patient care. This integration can also be a source of synergies between both services. For example, the benefits of improving the interaction between the pharmacy and nursing services can be demonstrated by assessing the impact of jointly performed activities on patient medication safety. The integration of the two services can lead to improved patient medication safety by identifying discrepancies between the medication included in the medication administration record and the ordered medication. Pharmacists and nurses act together to identify and resolve discrepancies, which can prevent patient medication events. In the same line, the pharmacy department's clinical service also benefits from closer contact with other health service areas, and integrated activities can result in improved patient care. (Zhong et al.2023)
The integration of hospital pharmacy with the nursing services is also affected by the supporting activities of the other services. In fact, the laboratory and operations are two key services that support the clinical activity of the pharmacy. Through operational support, the pharmacy service can promptly respond to the inpatient medication needs by providing medication, pharmaceutical preparations, and other pharmaceutical services. The pharmacy laboratory support activities facilitate the pharmaceutical activities by assisting in the preparation of sterile and non-sterile medication. In a similar way, laboratory and operations technicians are essential in the nursing services for disruptions to clinical activity to be prevented and for quality care to be provided to the patient. In this study, the mutual complementarity between the services involved in the three support areas is analyzed.

6.1. Enhanced Patient Care

Working together in patient care can manifest as combined efforts. For example, a pharmacy technician is well equipped and capable of assisting patients with selecting over-the-counter medications as per pharmacist recommendations. The patient is afforded the valuable chance to get peer-to-peer advice, and the pharmacist is freed up to discuss medication therapy with other patients. These kinds of actions contribute to freeing up the

time of professionals so these individuals can fulfill their full potential of providing care through their professional duties. Implementing these actions to enhance patient care is known to foster enhanced patient outcomes, reduce healthcare costs, and a positive interprofessional relationship where the primary goals of the patient are met. With a growing diverse range of programs in health workforce education, some centers are implementing pharmacy technician programs combined with other service-based programs, contributing to the growth of this position while minimizing the time needed to complete pharmacy education.

(Singh, 2024)Empirical data over a thirty-year period supports the claim that pharmacy technicians dispense medications more accurately than clerks and thus better facilitate patient safety and optimal care outcomes. Insights revealed in academic studies demonstrate the extent to which technicians support pharmacists in their day-to-day work. These services range from assisting the pharmacist in prioritizing and screening a patient's prescription requests to communicating with the pharmacist regarding which patients require a medication therapy management plan. In this supportive capacity, the technician is empowered to manage non-dispensing areas while the pharmacist focuses on tasks requiring decision-making based on clinical or psychological judgment. Providing nationwide, immediate access to medications, these trusted professionals are significant in evaluating plan benefits and in safeguarding benefits against fraudulent activity.

6.2. Efficiency and Cost-Effectiveness

Efficiency is often operationalized as either production per staff member or financial performance. In no study did financial performance decrease. The majority of studies found an increase. The studies with a specific focus on cost-effectiveness indicate that the addition of specialized pharmacy technicians and the LPC had a significant impact, while the addition of clinical pharmacy services had no or only a limited effect. Given that efficiency had only implausible results, due to the omission of relevant costs or incorrectly calculated savings or additional revenue, efficiency effects are rated as green. The inclusion of savings missed by hospital management from the perspective of LTC, possibly including substitution with cheaper staff or services, or the inclusion of costs obviously missed, limits the evidence to only moderate.

(Bătae et al., 2021)Given the increase in efficiency, the studies focusing on effectiveness mainly examined the effects on workload, particularly LPC workload. In that perspective, findings were extremely scarce and hampered by study limitations. Due to the underreporting of results and difficulties in the generalization of findings, effectiveness is considered only potentially positive. The value of the results and the conclusions to be drawn are, however, unclear, due to the omission of relevant outcomes. Therefore, the rating was set at uncertain positive. In sum, the evidence regarding efficiency and effectiveness only allows conclusions to be drawn about the potentially positive impact. Three reasons may have contributed to this surprising result on the service level. First, the impact of specialization might have been overestimated. Second, the service might not have been implemented sufficiently and/or properly, rendering data collection meaningless.

7. Barriers to Integration

Current barrier causes could be related to impediments to the expansion of nurses' duties across the professions or social pressures toward disease-specific specialization. In these terms, the structure of any health institution, particularly a hospital, may block nurse-pharmacist collaborations. No action might improve the involved disciplines' awareness, but it is possible that activities to increase practice will. More activities would foster positive thought, affiliation, social efficiency, results, commitment, and control among nurses and pharmacy technicians instead of a reliance on bureaucratic controls. In support of their distinct and dynamic job, collaboration should have meaning and help. If alliance activities are ongoing, the overall quality of health strengthened by these administrative companies will grow, and in the healthcare process, better thoughts would foster transparency and cooperation among companies and innovative ideas. Like in many areas, especially in healthcare, disciplines and health professionals depend more heavily. (Davis et al.2024)

At present, numerous health contexts operate amid their workplace silos in failed inter-professional harmony. Conceptual and practical pharmacist-nurse integration facilitators are thus essential themes. Controls on suitable and beneficial alliances between these two parties and the pharmacy's associated staff are reasonable. Since technicians generally have shared regulatory control, possibly one construct that produces tensions within the interdisciplinary collaboration is technician in this area. A novel combination evolves, as the principal monitors need the services and work of their subordinates whom they monitor to ensure healthcare is delivered. Besides, a pharmacy distributes a distinctive blend of procedures to a broader service. This nexus results in a distinctive organizational structure within the pharmacy, medical radiology, and laboratory.

7.1. Communication Challenges

The difficulties that pharmacy and nursing personnel experience in their daily interactions fall under the broad classification of 'professional hierarchies.' These are barriers to effective communication, specific to these professionals, classically defined as comprising vertical transmission of information between healthcare workers, nurses, and tertiary decision-makers, leading to role conflicts, undue delays in communication, and misunderstandings, ultimately decreasing patient health standards. These communication breakdowns have been attributed to the potential of causing or aggravating medical errors. (Sillero and Buil2021)

Three previously recognized challenges in patient care can be inferred from this analysis: the context determinants essential to the exchange, attainment, interpretation, and understanding of shared thoughts and feelings between all communicating actors; the validity and reliability of data obtained and subsequently used to clearly express and accurately interpret complex therapeutic needs, important hospital priorities for essential measures to be undertaken, and important roles to be filled using a healthcare approach that is both accessible and embracing; and the need to provide an improved awareness of the roles, obligations, and conditions of employment of personnel involved in carrying out consultations to promote respect, compliance, and adherence of personnel while ensuring a high standard of quality care through a dynamic, flexible, and malleable ethos aligned with the personal needs and particularities of each individual patient alongside technical, logistical, administrative, and managerial teams within an institution managing and supporting its professional force. Errors due to communication breakdowns and misunderstandings can only be bypassed or altogether minimized through professional and relevant knowledge that will assert authority, honesty, and gain the respect and trust of involved healthcare professionals.

7.2. Regulatory and Legal Hurdles

Political incentives are not sufficient to ensure integration in health care, although they are useful to promote and accelerate it. On the regulatory front, a major problem is the specialization of laws. Each profession has its own regulations relating to its exclusive scope of practice, and these laws contain incomplete or inadequate definitions of what members are permitted to do. Another issue in health law is the pursuit of material eligibility in the field, reducing protectionism for certain groups and thereby violating the consolidation of partial driving groups in healthcare. If the objective of a health system is, on the other hand, the health of individuals or groups, and regulatory and administrative decisions do not seek that objective, they fail. (MacNeill et al., 2021)

Lawmaking is therefore a complicated issue. Professional corporatism is an obstacle to social change, while the nature of society is that problems rise in priority and require solutions. Also, the liberal character of certain activities is important to prevent clinical or surgical risks, particularly for pharmacists and nurses in general. Between these two scales, there are tasks of healers of medium complexity such as laboratory and operating technologists. The same type of work performed by a preventive or curative medical technical person in the exercise of their profession is treated differently. The freedom to practice this type of work is defined by written law in the exercise of secondary competence, both in space and in time. In fact, health professionals may delegate certain tasks to technical professionals, but they act in their own name and are the only responsible for the care provided and the objects they introduce in the body of the patient.

8. Case Studies

In this chapter, we describe a research project and the French and Swiss case studies. We start with the description of the research project. Then, we focus on the French healthcare drug distribution operations and SWOT and PESTEL analyses concerning the professionalization level, the environment, and the challenges it encounters. Next, we describe the Swiss healthcare drug distribution environment, the stakeholders, the organization of the professionalization, and the frequently used digital tools. Results from these field studies are then displayed. (Kulkov2023)

The context of this chapter is a research project aiming to support pharmacy and nursing integration in healthcare systems. We now rely on this research project framework to provide you with a detailed description of the French and Swiss case studies, by understanding the weaknesses and strengths of the healthcare drug distribution environment. We address this context by detailing, in particular, in the French case, the SWOT analysis and in the Swiss case, the stakeholders' capacity-building competencies and digital maturity. Before describing our French case study and assessment, we start by explaining the generic research project context.

8.1. Successful Models of Integration

In this paper, a framework was described that establishes the circumstances in which pharmacy and nursing are tightly integrated into healthcare systems. In a way, it models successful cases of iterative, bilateral, patient-driven communication between the two professions. While a lot of research exists that states that any integration of hospital nursing and pharmacy is beneficial, little to no research exists that identifies when and where this is the case as an issue that extends beyond the literature of traditional coworker relationships. Because hospital nursing and pharmacy have stakeholders that agree practically universally on the goals the two professions should strive for, successful cases of true bilateral integration of the professions tend to operate invisibly. This paper reviews qualitative empirical research findings extensively. It discusses the interests of the various stakeholders in barriers to full integration rather than detailing the nature of the relationship. The focus is not on what defines 'integration' but how to arrive at it – what conditions, formal and informal structures, and tools are necessary to make bilateral communication between nurses and pharmacists fluid and routine in a day-to-day sense. The conclusions drawn from the evidence, while not entirely unique, can certainly be surprising. The concept of integration is worth exploring because it provides structured reasons for exploring the subject via qualitative means. (Salgado et al.2020)

Different paths to integration exist that depend on members of the professions and healthcare managers who serve as agents of those stakeholders. It explores critically a large body of extant literature, covering a range of different healthcare and educational systems, that directly or indirectly identifies or measures any actionable shared interests, and the extent to which co-action occurs among health providers. In the process, the paper frames the importance of laboratory and operations staff as important enabling players of true bilateral pharmacy/nursing profession integration. Conceptual clarification is presented, and then empirical conclusions are made using qualitative data collected via moderated roundtable discussions in a real-life, acute care hospital setting. Rather than correlative, ex-post facto research findings, the paper opens the area with qualitative, ex-ante research that identifies drivers of and barriers to bilateral integration that would be advisable were it possible to repeat the process and generalize the findings. Conclusions with implications for further research and for healthcare policymakers are drawn and issues for investigation are proposed. Data on committee activity collected from 12 acute care hospital clusters is also presented. It assesses the importance, commitment, and influence of committees and compares these detectable characteristics through tests across hospital clusters. Significant committee differences between different types of hospitals are found, and suggestions for future research are offered.

9. Future Directions

In conclusion, the pharmacy technicians will be required to fulfill their health care profession role with professional recognition and oversight, and increased leadership from involved teams of health professionals. It may be wise for pharmacy to further integrate with the materials management discipline. Supply chain and materials management will require some professional clarification in the future for the overall good of health care performance. Pharmacy will also require increased visibility and interaction with the many information systems that are being developed in healthcare. It is expected that the technology will change remarkably in the future for institutional drug therapy supply and administration. Both voice technology and computer-assisted therapy/service technology will probably merge into a new system that will be rapidly accepted in pharmacy. Task forces have recently been meeting to detail the near future for pharmacy informatics in large healthcare systems. Community pharmacy informatics is closely following the institutional systems and will probably depend on re-engineering of distribution through home care service companies, insurance health plans, and other large computer networks.

9.1. Technological Innovations

Investments in technological innovations for medication therapy continue to be made. This is not only due to the policies and rules of national health surveillance organizations in different countries, but also thanks to the decisions of private institutions, whether educational or otherwise. This innovation is based on improving quality, reducing costs, and especially enhancing the life of individuals in their physical, social, and emotional well-being. The material selection process, the type of material, and the extent to which the majority of pharmaceutical forms have already been tested in different environments and affiliations that use this product are such that we cannot demand more results in a short time solely from technology and investment, but especially from people's commitment to the process. These people include pharmacists, nurses, doctors, laboratory technicians, and operations technicians, among many others who are part of the medication therapy process. (Zhang and Li, 2020)

The investment in technology, however, is essential to ensure that minimum care is guaranteed in both qualitative and economic aspects, with regard to financial sustainability and especially in the speed of medication production and security. Libraries based on compounds and chemical formulations, as well as the applicants for the authorization of their production in biodistribution and pharmaceutical assistance in the medical assistance plan, are crucial for the development of primary care in pharmaceutical assistance. This is a limiting factor in public services in most of the world, conflicting with public prejudice, both in execution costs and in the lack of fast and easy access to information. Data on safety and efficacy in medications aim to universalize the treatment of medicines in public service, as the public sector is expected to be able to address diseases. On the other hand, socio-sanitary needs do not allow for further communication and legal discussions that hinder the overall attention to public problems of high importance, despite the technology that is already well-developed and has good applicability.

10. Conclusion

Due to their professional training, all healthcare professionals are qualified to handle side effects related to pharmacological treatments. Despite this, they cannot be expected to have the same expertise regarding the necessary adaptations to treatments dependent upon changes in random conditions experienced by patients during the care process. Nor do they have the expertise to handle the increasingly wide variety of treatments inherent in the personalized medicine paradigm of the current and future fight against global health threats. This paper suggests and disciplines debate that the integration and specialization of some drug prescription and dispensation tasks, to create a group of medicines "curator/steward," can optimize pharmacological treatment management in healthcare systems. This group would be made up of pharmacists and nurses who would be supported by operational technicians and laboratory technicians, who must acquire new competencies through

specific professional training that would differentiate their high-quality jobs from the low-level tasks associated with automatisms that we observe today.

In conclusion, it is impossible to predict all the uses of medicines, as well as their contraindications and side effects presented by an increasingly diverse patient population affected by increasingly complex diseases, but we can prepare to build a health scenario based on personalized medicine. This unique gravitational pull of interest demands that we rethink the composition of multidisciplinary teams of health workers that specialize in medicine prescription for use in hospitals based on traditional clinical medicine and its dispensation in the community. In so doing, we can maximize the use of the technical and scientific skills of all health professionals, optimizing their human potential and respecting them for what they are: an essential part of the social collective life effort to achieve good quality of health and life.

10.1. Summary of Key Findings

The application of enabling technology has had a profound impact on the training and skill-transitioning demands for jobs in healthcare. In the African context, the focus has been on preparing nursing students and graduating nurses for the attendant transformation. In the development of enabling technology for healthcare, there is often inadequate consideration of other human resources employed in healthcare. These include pharmacy and nursing technicians, clinical laboratory, and operations support personnel. In this study, through the application of purposive sampling, face-to-face interviews, and questionnaire administration, we execute a landscape analysis of the preparedness of both pharmacy and nursing students to use enabling technology in their work. Our study participants are both pharmacy and nursing students in a hospital-based experiential program and their clinical supervisors.

Our key findings are that few clinical supervisors of the students have any knowledge of existing enabling technology; pharmacy and nursing students only use the installed technology to a limited extent with low confidence; and that neither the experiential program nor the professional curricula have provisions for planned experiences to enable students to develop required confidence. Our study clarified the preparedness of a broader set of healthcare human resources for the impending transformation largely associated with the application of enabling technology.

10.2. Implications for Practice and Policy

Pharmacy and nursing working alongside are not a common feature in healthcare institutions, whereas the value of partnerships in patient care is well understood. The current discussion aims to explore the concept of pharmacy and nursing integration as a possible lever to optimize the performance of these professionals serving healthcare institutions. The technicians in the laboratory and radiology, being part of a diagnostic process, have highlighted situations in which this integration could be strengthened, creating conditions for a more effective and efficient consultation that allows for shared responsibilities. Despite these differences, the role of technicians was perceived without any alignment or association with the others.

Pharmacy and nursing worked frequently in the same physical space, with a direct relationship established throughout the day. This meant that a nurse cared for patients connected to the chemotherapy unit, taking the prescription provided in advance by the pharmacy, preparing the medications, and verifying the preparation for checking for intervention by the intern who was completing their professional internship at the pharmacy. The final step involved pharmacy and nursing meeting to confirm medication preparation, patient name, and clinical data for patient administration. If any discrepancies existed between the data and the drug labeling, the nurse would report the issue to the intern, who would check this data with the pharmacy and take the appropriate measures.

References:

Coombs, Nicholas C., et al. "Barriers to healthcare access among US adults with mental health challenges: A population-based study." SSM-population health 15 (2021): 100847. sciencedirect.com

Almoutairy, Nawal Abdullah Ghazi, et al. "Patient-Centered Care In Ophthalmology: Integrating Nursing Principles With Optic Technician Practices." Journal of Namibian Studies: History Politics Culture 32 (2022): 2651-2662. namibian-studies.com

Stone, Kieran, et al. "A systematic review of the prediction of hospital length of stay: Towards a unified framework." PLOS Digital Health 1.4 (2022): e0000017. plos.org

Johnson, Claire D., et al. "Chiropractic Day 2023: a report and qualitative analysis of how thought leaders celebrate the present and envision the future of chiropractic." Journal of chiropractic humanities 30 (2023): 23-45. nih.gov

Alowais, Shuroug A., et al. "Revolutionizing healthcare: the role of artificial intelligence in clinical practice." BMC medical education 23.1 (2023): 689. springer.com

Han, Y., Kim, J. S., and Seo, Y. J. "Cross-sectional study on patient safety culture, patient safety competency, and adverse events." Western journal of nursing research, 2020. sagepub.com

MacLaren, Robert, et al. "Society of Critical Care Medicine and American Society of Health-System Pharmacists Guideline for the Prevention of stress-related gastrointestinal bleeding in critically ill adults." Critical Care Medicine 52.8 (2024): e421-e430. [HTML]

Fan, D., Sun, H., Yao, J., Zhang, K., Yan, X., and Sun, Z. "Well production forecasting based on ARIMA-LSTM model considering manual operations." Energy, 2021. [HTML]
Haleem, Abid, et al. "Medical 4.0 technologies for healthcare: Features, capabilities, and applications." Internet of Things and Cyber-Physical Systems 2 (2022): 12-30. sciencedirect.com
Yoo, H. J., Lim, O. B., and Shim, J. L. "Critical care nurses' communication experiences with patients and families in an intensive care unit: A qualitative study." Plos one, 2020. plos.org
Josendal, A. V., Bergmo, T. S., and Granas, A. G. "The Practice Guidelines for Multidose Drug Dispensing Need Revision—An Investigation of Prescription Problems and Interventions." Pharmacy, 2021. mdpi.com
Sokos, G. E. O. R. G. E., et al. "Multidisciplinary care in heart failure services." Journal of cardiac failure 29.6 (2023): 943-958. [HTML]
Nickel, Barbara, et al. "Infusion therapy standards of practice." Journal of Infusion Nursing 47.1S (2024): S1-S285. [HTML]
Adams, T. L. "Health professional regulation in historical context: Canada, the USA and the UK (19th century to present)." Human resources for health, 2020. springer.com
Fosch-Villaronga, E. and Drukarch, H. "On Healthcare Robots: Concepts, definitions, and considerations for healthcare robot governance." arXiv preprint arXiv:2106.03468, 2021. [PDF]
Bird, M., et al. "A generative co-design framework for healthcare innovation: development and application of an end-user engagement framework." Research Involvement and Engagement 7 (2021): 1-12. springer.com
Stranges, Paul M., et al. "Role of clinical pharmacists and pharmacy support personnel in transitions of care." Journal of the American College of Clinical Pharmacy 3.2 (2020): 532-545. [HTML]
Dickerhofe, J. and Crank, C. W. "Making It Happen-Pharmacy Technicians Today and Tomorrow." 2020. pharmacytechtopics.com
Haleem, A., Javaid, M., Singh, R. P., and Suman, R. "Telemedicine for healthcare: Capabilities, features, barriers, and applications." Sensors international, 2021. sciencedirect.com
Sparkmon, Wesley, et al. "Pharmacy technician efficacies and workforce planning: a consensus building study on expanded pharmacy technician roles." Pharmacy 11.1 (2023): 28. mdpi.com
Johnston, Karlee, et al. "The experiences of pharmacists during the global COVID-19 pandemic: a thematic analysis using the jobs demands-resources framework." Research in Social and Administrative Pharmacy 18.9 (2022): 3649-3655. nih.gov
Zhong, Nian-Nian, et al. "Enhancing head and neck tumor management with artificial intelligence: Integration and perspectives." Seminars in Cancer Biology. Academic Press, 2023. [HTML]
Singh, P. "Transforming Healthcare through AI: Enhancing Patient Outcomes and Bridging Accessibility Gaps." Journal of Artificial Intelligence Research, 2024. thesciencebrigade.com
Bătae, O. M., Dragomir, V. D., and Feleagă, L. "The relationship between environmental, social, and financial performance in the banking sector: A European study." Journal of cleaner production, 2021. [HTML]
Davis, Amanda, et al. "Evaluation of Interprofessional Delivery of Diabetes Medication Management Training Among Family Medicine Residents." Journal of Primary Care & Community Health 15 (2024): 21501319241276801. sagepub.com
Sillero Sillero, Amalia, and Neus Buil. "Enhancing interprofessional collaboration in perioperative setting from the qualitative perspectives of physicians and nurses." International Journal of Environmental Research and Public Health 18.20 (2021): 10775. mdpi.com
MacNeill, A. J., McGain, F., and Sherman, J. D. "Planetary health care: a framework for sustainable health systems." The Lancet Planetary Health, 2021. thelancet.com
Kulkov, Ignat. "Next-generation business models for artificial intelligence start-ups in the healthcare industry." International Journal of Entrepreneurial Behavior & Research 29.4 (2023): 860-885. emerald.com
Salgado, Teresa M., et al. "Primary healthcare policy and vision for community pharmacy and pharmacists in the United States." Pharmacy Practice (Granada) 18.3 (2020). isciii.es
Zhang, W. and Li, G. "Environmental decentralization, environmental protection investment, and green technology innovation." Environmental Science and Pollution Research, 2020. [HTML]