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The Role of Laboratory Professionals in Multidisciplinary Healthcare Teams: Advancing Patient Safety and Quality of Care

Arub Adel Mawlawi Zaini Bogis[1], Tahani Ali Salem Al Shafia[2], Mohammed Saud Abdullah Alhejaili[3], Yousef Abdullah Ayidh Almaghthawi[4], Ahmad Khalaf Khulaif Aljabri[5], Ahmed Moeed Awad Alharbi[6], Arwa Hasan Alahmadi[7], Mohammed Hulayil Helal Almutaani[8], Zain Hussain Albargi[8], Abdulrahman Atiah Ali ALthalabi[8], Saleh Saeed Alghamdi[8], Ahmed Hassan Saeed Alzubaidi[8], Awatif Abdul Moti Mohammed Aljohani[9]

[1]Laboratory Specialist, Al Laith General Hospital, Saudi Arabia.
[2]Laboratory Specialist, Turabah General Hospital, Saudi Arabia.
[3]Medical Laboratory Technician, King Fahad Hospital, Saudi Arabia.
[4]Medical Laboratory Technician, Prince Abdulmuhsin Hospital, Saudi Arabia.
[5]Laboratory technician, Nujood Medical Center, Saudi Arabia.
[6]laboratory technician, Al salam Hospital, Saudi Arabia.
[7]Laboratory Specialist, Regional Laboratory in Makkah, Saudi Arabia.
[8]laboratory technician, Al-Laith General Hospital, Saudi Arabia.
[9]Laboratory Technician,Medical Rehabilitation Hospital, Saudi Arabia.

ABSTRACT: Integrated healthcare teams consist of complementary professionals working together to improve patient care across the continuum of health services. Their common goal is to deliver safe, appropriate, and quality services to individuals. Figures on avoidable harm demonstrate a persistent need to strengthen integrated healthcare teams and efforts to mainstream quality and safety into education. An array of disciplines contribute to integrated healthcare teams, including but not limited to laboratory, nursing, radiology, physiotherapy, and public health. All health professionals have specific roles and responsibilities in the quality and safety domains, but these responsibilities differ. Common themes emerge in the application of quality and safety frameworks across the professional spectrum, and competencies are relevant to the teaching of quality and safety. One framework for concerted quality and safety efforts draws on the Plan-Do-Study-Act (PDSA) cycle, aligning with the triple aim of enhanced patient experience, improved population health, and reduced per-capita cost of care [1]. Mainstreaming quality and safety into practice requires integration into the quotidian work of every health professional.

Laboratory, nursing, radiology, physiotherapy, and public health professionals comprise key stakeholders in integrated healthcare teams, contributing uniquely to collaborative efforts that enhance safety and quality. Health professionals have a fundamental duty to protect and promote the health of communities, patients, and populations. The integration of quality and safety into practice is underpinned by an ascribed set of responsibilities and a suite of skills. Quality improvement necessitates knowledge of interdependence—within a given specialty and across all disciplines involved in a particular patient journey—among other essential competencies. The terminology associated with quality and safety varies across disciplines, and the responsibility at stake also differs. Nonetheless, the diverse

occupations share a commitment to the improvement of safety and quality in health services.

Leaders are needed to coordinate integrated healthcare teams and ensure cooperation, mutual assistance, equitable contribution, and support for the diverse activities of professionals across the various health-related occupations. Effective leadership establishes a team identity, clarifies approaches for interprofessional work, and creates a sense of shared purpose. The establishment of leadership-and-governance structures points to a widespread recognition of the paramount importance of harmonious teamwork and collaboration to patient safety and the quality of services provided to the public [2].

1. INTRODUCTION

Healthcare systems are increasingly recognising the importance of interprofessional practitioners working together toward the common goal of enhancing healthcare quality and patient safety. This recognition has led to considerable interest in understanding how integrated healthcare teams operate and how they contribute to these two critical areas. Integrated healthcare teams, consisting of at least two professionals from different clinical backgrounds [4] , are essential within modern chronic disease care. Patient-centric integrated care requires collaboration from multiple clinical professionals, prioritising patients' individual care needs, goals, and overall well-being to optimise patient care quality. Health professionals collaborating as teams can provide superior care than isolated practitioners; pooling skills, knowledge, and expertise leads to more effective service delivery and has been demonstrated to enhance both quality and safety. Quality and safety of care are inherently linked in that compromised quality frequently results in adverse events and harm, while quality improvement initiatives directly target system design and care delivery to support safety [5].

Healthcare professionals from diverse disciplines play critical roles in monitoring, assuring, and improving the quality and safety of health services and patient rights throughout the continuum of care. Although an abundant literature exists on the integrated quality and safety efforts of numerous professions, it tends to focus on just one or two specialisations and often overlooks the broader context governing the contributions of all stakeholders. A variety of roles, responsibilities, and perspectives must be considered to achieve comprehensive understanding and cohesive cooperation across the full spectrum of professionals. This comprehensive review seeks to illuminate both the unique and interconnected contributions of multiple healthcare fields to overall quality and safety improvement, ultimately enabling integrated teams to enhance health service quality holistically.

2. CONCEPTUAL FRAMEWORK FOR INTEGRATED HEALTHCARE TEAMS

Interprofessional collaboration can be illustrated using several models, but at their core are the concepts of teamwork and interdependence. Given this emphasis, a simple model that classifies interprofessional collaboration can include inputs, processes, and outcomes [6] : various individual and organizational inputs contribute to team-building processes, which in turn produce teamwork outcomes, including team function and team effectiveness. Teamwork outcomes can reflect team performance with respect to quality and safety, safety culture, or other variables of professional and organizational interest [4]. For the specific context of integrated teams of healthcare professionals working in laboratory, nursing, radiology, physiotherapy, and public health, an additional framework provides a higher-level articulation of how two important intermediate outcomes of teamwork—team functioning and patient safety—are linked [7]. Enhanced team functioning reflects the efficiency and effectiveness of input-processing-output cycles associated with teamwork and is designed to optimize the use of time and human resources invested in team-based activities. Enhanced team functioning is expected to improve patient safety by enabling clinical care processes to be conducted in a manner that safeguards patients from adverse events and error.

3. PROFESSIONAL ROLES AND RESPONSIBILITIES

To encourage patient resilience and independence in managing their health, laboratory professionals strive to empower patients to take the lead in their healthcare. The exponential growth of health-related mobile applications has fostered this patient empowerment trend. Nevertheless, patients often lack the necessary health-related knowledge to access pertinent information for their specific situations. Professional consultation is therefore essential to identify the most suitable applications for patient empowerment. Professional teams gather and curate international health-related websites and proprietary health-related applications for various patient groups. Lab professionals play a crucial role in determining the adequacy of these contents and

applications for every required context. They assess the technical, analytical, and clinical aspects in order to better match the consulting applications with patients' inquiries [2].

While departing from an investigation of the health-related information patrons seek, nursing professionals have established the Nurse-Pan and applications gathering website among many other solutions. Radiologists contribute by verifying the quality of content messages, establishing inter-professional information pools, and motivating other professionals to participate amid competing priorities. Similar databases are also founded for help desk type inquiries across different health-related teams. Nurses play a pivotal role in patient education through the delivery of health information, demonstrating the importance of interdisciplinary collaboration to support professional empowerment initiatives.

3.1. Laboratory Professionals

Laboratories play a crucial role in the healthcare system by assisting in patient diagnosis and management, conducting quality assurance, and helping medical professionals to perform their jobs more effectively. The laboratory team contributes significantly to maintaining optimal patient care through a range of interprofessional collaboration with other disciplines. Pathology and laboratory services are essential components of healthcare delivery systems. These services form part of well-organized integrated healthcare teams, which have now become accepted as providing improved quality and safety in healthcare worldwide. One of the most effective vehicles for such interprofessional collaboration is the various working groups and committees formed to address issues of mutual concern. Pathology is part of the multidisciplinary care team. Pathology professionals receive essential clinical information from other disciplines in order to optimize patient diagnosis, treatment, and health outcomes, and return carefully considered clinically-relevant information detailing diagnostic and therapeutic options back to their professional colleagues. Pathology plays a huge role in accessing the patient's specimen, be it a body fluid or biopsy from tissue, and providing adequate equipment, consumables, and materials in order to perform the necessary tests that physicians require for their patients. After initial examination and confirmation of relevant test requests by laboratory professionals, laboratory directors convene to assess the clinical information supplied with regard to specimen type received, volume required, maximum transportation time, urgency of the request, anticipated turnaround time, and whether essential background information has been supplied on the requisition. Laboratory personnel provide informative feedback to the requestor on laboratory test and analysis-related matters [8].

3.2. Nursing Professionals

Nursing professionals play a critical role in enhancing the quality and safety of healthcare services [4]. Nursing professionals are the frontline of healthcare services, possessing the largest number of human resources and having the most access and close contact within the multidisciplinary team. Professional nursing standards and regulations describe their functions distinctly, ensuring that nursing professionals are profoundly involved in the quality improvement and safety programs of each healthcare organization. Nursing professionals are connected with healthcare data (e.g., medication, laboratory tests, patient symptoms, instruments) and are skilful and able to manage these data [9]. The expanded scope of nursing practice, such as nurse practitioners and nurse anaesthetists, may enable other team members to focus on specific tasks concerning safety and quality. Furthermore, professional nursing organizations promote the integration process with the interdisciplinary health team in different healthcare environments.

3.3. Radiology Professionals

Medical imaging and interventions are vital for diagnosis, monitoring, and treatment of diseases. Radiology professionals ensure appropriateness and safety of imaging and intervention requests, advice on alternatives when relevant, appropriately interpret and report on images, collaborate with healthcare teams to integrate results in management plans and respond to queries, and educate the public and healthcare professionals about the benefits and risks of such procedures [2].

3.4. Physiotherapy Professionals

Physiotherapist involvement on multidisciplinary teams is essential for enhancing patient quality of care and safety [10]. In the case of patients with critical illnesses and/or injuries, for example, physiotherapists are viewed as vital team members because they offer highly valuable professional services pertaining to individual patients' recovery trajectories. Notably, they can apply clinical reasoning and evidence-based clinical practice to identify problems that from a safety perspective other professions may have missed on individual patients' management and care. In addition, physiotherapists can play a significant role in education of both staff and patients within the team regarding, for example, early mobility and need for patients to understand their

conditions. This underlines the relevance of physiotherapists in patients' hospitalisation periods – their involvement contributes to notable cost savings by shortening patients' length of stay, which also improves safety and accessibility for other patients in the system. Positive feedback from patients and staff alike reflects satisfaction with the physiotherapy services provided, highlighting perceived clinical benefits and quality-of-care improvements [11].

3.5. Public Health Professionals

Public health professionals play a vital role in the healthcare system and, therefore, must work in multidisciplinary teams whose members communicate and collaborate to improve outputs and outcomes. The activities of public health professionals influence population health through the delivery of health services, the enforcement of regulation, the management of public health campaigns, the conduct of epidemiology, and the specification of building standards. Public health professionals pursue interventions such as encouraging lifestyles that reduce the incidence of chronic diseases, designing and operating utility systems that prevent the spread of infective organisms, and assuring the quality of air, food, and water systems. They also engage in forecasting and prevention of emerging diseases, rigorous application of improvement methodologies such as Plan-Do-Study-Act, analytical research to identify and confirm root causes of health improvement, and supervised internships to ensure the entry of new public health professionals into the workforce. Working in integrated healthcare teams enables public health professionals to enhance their contributions to quality and safety [12] ; [13].

4. INTERPROFESSIONAL COLLABORATION AND COMMUNICATION

Effective interprofessional collaboration in healthcare, as defined by the World Health Organisation, occurs when "multiple health workers from different professional backgrounds work together with patients, families, caregivers, and communities to deliver care." Effective collaboration facilitates integrated healthcare delivery based on mutual respect, shared values, and team-based problem-solving [14] and improves relevant outcomes such as patient satisfaction, safety, quality of care and health processes [15]. Interprofessional collaboration is a major health-system priority in count3b9d9789-7745-42d5-b3e8-3bad14e583a4 including Australia, the United States, Canada and the United Kingdom where clinical services are increasingly provided by integrated multidisciplinary teams [16]. Professional discipline-specific barriers, rather than a lack of teamwork ability, are a principal hindrance to operational implementation and to reducing the hierarchical professional relationships that inhibit collaboration among team members.

Collaboration among healthcare disciplines is essential to the timely and accurate delivery of clinically relevant information. Radiologists, physiotherapists and public health experts rely on nursing professionals to liaise with patients and connect their care to existing medical histo3b9d9789-7745-42d5-b3e8-3bad14e583a4 and treatment plans. Laboratory professionals support clinical teams by collecting samples and communicating results. Public health and nursing professionals collaborate to ensure facilities comply with the appropriate health service legislation and to monitor the origin of infectious disease outbreaks. Automated alarm systems, group messaging, video conferencing and electronic health records facilitate timely communication within integrated teams by providing access to up-to-date information. Non-automated communication is enhanced by dedicated team meetings, debriefings and shift handovers.

4.1. Mechanisms for Effective Collaboration

Interprofessional collaboration fosters collective impact on patient care, quality assurance, continuous improvement, and safety culture among laboratory, nursing, radiology, physiotherapy, and public health professionals. Collaboration draws on observations, ideas, and experiences, enhancing safety and quality procedures, encouraging quality improvement participation, and increasing ownership of all patient safety climate survey dimensions [4]. Quality focus has shifted from 'what should be done' to 'what actually happened' [17]. A change mechanism promotes problem definition through reporting and discussion across professional tiers and levels. Multi-level team approach benefits from broadened discussions, diversified views, and direct access to discipline-specific quality standards, while designated discipline champions facilitate group reporting, convergence, and data-oriented quality pursuit [18].

4.2. Communication Barriers and Facilitators

Effective interprofessional communication can help avoid misunderstandings or forgotten patient issues between nurses, physicians, radiologists, aesthetics and clinical engineers, thus preserving patient safety and healthcare quality. Studies showed that nurse participants advocating for the Radiology department have fostered communication centered on patient safety. Besides mandated meetings, their contact was limited. External factors fostered better cooperation between hospital staff—

major radiological developments benefitted from collaborating with engineers, who in turn relied on consultations with nurses. Radiologists and engineers established new protocols to streamline information exchange, while technicians aided in sharing technical details, benefitting both professional communities. However, some barriers still hinder activities, such as time constraints, surgical stress impacting socialization among colleagues, or turf protection hindering interaction [19].

4.3. Information Technology and Shared Health Records

The roles of health professionals have expanded over the years in response to evolving patient needs and skills within health care teams. Laboratory, nursing, radiology, physiotherapy, and public health professionals collaborate within health planning to improve healthcare quality and ensure patient safety across health clinics. Laboratory professionals design sample collection and management systems to limit contamination, construct laboratory-based risks to enhance patient safety, and develop information systems to track samples and results. Nursing professionals recognize beneficial advice from other professionals if this happens to provide advice to patients in medication or health surveys. Radiology professionals promote better communication, contribute to roundtable discussions to prevent unnecessary imaging, and develop or adopt new imaging technologies to address quality and safety concerns. Physiotherapy professionals share information about vital signs during discharge, collaborate with nurses for future health assessments, and provide preventive health service advice to patients. Public health professionals incorporate health equity frameworks to the clinical setting for better healthcare planning, promote awareness of locally important social determinants of health, and contribute to health education and preventive health campaigns.

Health data are popularly shared via information technology in the era of digitalization. Health professionals provide specific health planning while also considering quality of evidence shared between them. The expected quality of health evidence indicates the necessity of checking for isolated files received by personal email through careful tracking of health data, laboratory results, and pre-clinic health surveys [20]. Time-series analysis and prediction remain healthy in enriching the knowledge outcome toward future health planning inspection. Reaching shared health records not only provides other health supports but facilitates safer tracing on the quality of health shared.

5. QUALITY IMPROVEMENT AND PATIENT SAFETY

In the pursuit of quality improvement, medical professionals must tackle challenges such as structural uncertainty, evolutionary technologies, workforce issues, and patient safety. The goal is to provide diagnostics, treatments, and other services that produce results aligned with established norms while ensuring that performance meets regulatory requirements. The multidimensional nature of health-system quality requires integrated teams in which radiologists collaborate to improve quality across diagnostic imaging, image-guided therapy, interventional radiology, and multi-institutional networks [2].

Quality represents a broad concept encompassing safety, timeliness, efficiency, effectiveness, equitability, and patient-centeredness. The establishment of a safety culture and the reduction of incidents requiring investigation form an integral consideration, with additional focus on monitoring the perception of safety culture through local instruments complemented by participation in external safety surveys. Safety reporting is one avenue for objectively quantifying safety but must comply with legal agreements concerning privileged communication and restricted use of reporting systems for research [21]. Further, radiologists manage and mitigate multiple sources of potential incidents, yet the exchange of lessons learned from adverse events remains an underutilized and critical element for organizations to limit recurrence of similar incidents.

5.1. Quality Assurance Across Disciplines

Laboratory professionals' responsibilities encompass a wide scope, from obtaining and processing specimens for diagnostic evaluation to interpreting results and approving reports. Tasks can differ based on the type of specimen collected, the clinical question to be answered, and the examination methods employed. Laser focus on laboratory quality assurance begins while pre-analytical activities are still taking place. Anything that happens before the specimen arrives at the laboratory is regarded as pre-analytical, and it accounts for almost 70% of the errors in the laboratory testing cycle [2].

Nursing professionals play a critical role in delivering safe, high-quality patient care. Their engagement is essential as they frequently serve as the first point of contact for patients across a broad spectrum of health concerns. Encouraging them to participate actively in quality assurance activities enhances teamwork and promotes broader engagement, particularly in large organizations where obtaining buy-in from all staff can pose a challenge.

To maintain quality systems and stimulate continuous quality improvement, the involvement of radiology professionals is paramount. The responsibility to establish, implement, and manage radiology quality programs often lies with the radiologist. Quality programs address multiple aspects, including individual practitioner profile and performance, group practice quality, departmental performance, system-level radiology safety and quality, national needs in safety and quality, and international safety and quality concerns [21]. The commitment to healthcare quality spans several decades and is ever-expanding. Education on the subject, supported by international organizations, is instrumental in promoting sustainability, particularly in low-resource environments.

Quality practices should cover the entire spectrum of a clinical laboratory activity, from specimen acquisition, collection, transportation, and handling up to pre-analytical, analytical, and post-analytical phases, with the pre-analytical phase constituting the most critical period for error prevention. Due to the broad scope of clinical laboratory profession, only a small aspect of quality assurance is performed in high-income countries laboratories; external quality assurance programs have also been established to assure even greater quality and patient safety.

5.2. Safety Culture and Reporting Systems

Patient care is inherently risky, which necessitates patient safety initiatives and practices. Safety culture is fundamental to many of these initiatives, and an effective safety culture is strongly linked to the reporting of adverse events and near misses. Healthcare professionals need to openly acknowledge, explore, and share their mistakes or occurrences, which require strong, effective safety reporting systems. Safety reporting systems are usually developed at a national level after a thorough consideration of the specific conditions within the healthcare system. Accordingly, there is no universal template for effective safety reporting systems, but the WHO has taken the initiative to provide specific support to member countries wishing to prioritize safety culture and safety reporting [22].

Safety culture–related interventions can create the conditions necessary for better, deeper, and wider adverse-event reporting. When elements of safety culture are acknowledged, the definition of patient safety subsequently evolves to encompass the systematic exploration and sharing of any shortcomings that adversely affect one or many patients. This expanded emphasis remains squarely within the patient safety paradigm; it simply interfaces with the physical, psychological, organizational, environmental, or care-system conditions that, in turn, interface with the patient [23].

5.3. Error Prevention and Learning from Adverse Events

For quality improvement initiatives to become embedded in the daily work of healthcare professions, the integrated team must adopt a systems approach to safety. A framework for analyzing serious adverse events includes six steps: identification of the event, preparation, identification of root causes, selection of appropriate recommendations, implementation of recommendations, and reassessment of the organization. By addressing the underlying systems errors that led to adverse events, organizations can prevent similar events from recurring [24]. These principles align with the concept of a just culture, which recognizes that humans working in complex systems will make mistakes and that the larger goal is to improve systems and outcomes [25].

6. EDUCATION, TRAINING, AND CONTINUING PROFESSIONAL DEVELOPMENT

Advances in health and medicine are demanding that medical professionals continuously maintain and enhance their knowledge and skills. A review of these continuing professional development (CPD) needs is therefore essential in guiding the design of relevant programs [26]. CPD is a lifelong process through which health practitioners develop and maintain competence and improve professional practice. Activities may be face-to-face, e-learning or a mixture of both, and their aim is to create a competent workforce capable of meeting the population's needs. Successful CPD in turn improves the quality of care, health outcomes and the motivation, satisfaction, retention and performance of health workers. The implementation of structured CPD systems that fulfil workers' and patients' needs maximizes the benefits of the process. Factors that enhance the effects of CPD include self-directed learning, relevance to practice, preferences for workplace learning, leadership support and the overall culture of the workplace. Participation increases when health workers perceive activities as meaningful and pertinent to their specific field of practice.

Continuing education, training, and professional development interventions also have positive effects on health professions practice and, consequently, health care outcomes in primary care settings. Development and implementation of continuing medical education programs have been shown to improve clinical performance using evidence-based guidelines [27]. However,

enhancing the impact of CPD on practice and on the contribution of the nursing and midwifery workforce to primary health care remains challenging. Users' expectations and perceptions regarding CPD activities are crucial to improving their effectiveness and gaining broader recognition of their value. An integrative framework has been proposed to support community engagement in health promotion by translating health-promotion theory into practice.

6.1. Interprofessional Education Approaches

Interprofessional education fosters collaboration among health care students and professionals to enhance patient safety and care quality. Key elements include selecting suitable learners, educators, and contexts, and focusing on teamwork, professionalism, and collaboration. Models and frameworks support sustainable implementation, prioritising integration into curricula and practice. Interprofessional education promotes shared understanding, communication, and cooperation essential for effective team-based care [28].

Interprofessional education involves collaborative learning among health professions students to improve teamwork, communication, and patient outcomes. Approaches include service-learning projects addressing community health issues, such as childhood obesity, and programmes promoting health careers. Best practices emphasise interdisciplinary student interest groups, community-based participatory research, and health disparities curricula. These methods foster collaboration, understanding of diverse roles, and address social determinants of health. Interprofessional education prepares students for team-based care, enhances healthcare quality, and meets societal health needs [29].

6.2. Credentialing and Competency Frameworks

Credentialing denotes the process of recognizing and granting approval for an individual or organization, reflecting standards such as competency, skills, qualifications, and suitability for the position. Developing a credentialing and competency framework can be useful for healthcare professionals to undergo continuous assessment of their skills and competencies.

All healthcare professionals are expected to maintain competency development; however, the strategies used in this regard differ from one profession to another [30]. In laboratory medicine, there is a concern that focusing on CanMEDS competencies directs attention away from optional roles essential for maintaining competence in core laboratory skills [31]. Credentialing under CanMEDS is considered a formative assessment where evidence of these competencies is collected in a portfolio. Credentialing is not mandatory for laboratory specialists in Canada; therefore, a CanMEDS-oriented portfolio framework is being developed to modify practice in accordance with these competencies.

6.3. Simulation and Skills-Based Training

Simulation, including simulation programs and techniques based on the use of instructional tools or devices that reflect real-world situations with high fidelity or realism, is a valuable and widely recognized methodological reference for effective educational practices, enabling learning that can be transferred to real life [32]. Interprofessional simulation training exercises, in particular, actively engage students in a realistic clinical scenario incorporating multiple health professions, allowing participants to apply knowledge and skills and covering a range of disciplines and specialties. Such interprofessional education has the potential to develop competency in collaborative practice and improve learning outcomes. Complementary to both simulation programs and instructional programmes designed for specific target audiences, "serious games" that target health professionals' competencies in quality improvement (QI) and patient safety are also used as a training alternative [33]. These games engage teams of health trainees at any educational level and discipline in the investigation of a fictional psychiatric patient who elopes from a simulated hospital through data collection, process mapping and intervention design, and they have been widely implemented with positive results. Simulation has become a standard educational methodology in health-profession training, and the high-fidelity interprofessional simulation programme and the quality-improvement QI serious game are two pertinent applications for health-track students and trainees.

7. HEALTH EQUITY, POPULATION HEALTH, AND PUBLIC HEALTH SCOPE

The responsibility of meeting the health needs and aspirations of individuals and communities rests on multiple disciplines working together. Factors outside the health sector—so-called social determinants of health (SDoH)—greatly affect health outcomes, which has motivated a focus on integrated health using a systems approach. Integrated care requires collaboration among the various professionals in the health sector as well as linkages to other sectors.

Public health surveillance and response constitute an essential aspect of integrated patient care and are intrinsic to the scope of health professionals across multiple disciplines. Surveillance encompasses systematic collection and analysis of a range of clinical data and other information necessary for both outbreak detection and planning of facilities and services such as mass vaccination clinics. Likewise, at patient interfaces, a range of data from health care interactions is collected. Adverse trends, previously undiagnosed infections, and social and economic problems may be detected on this basis. Ministries of health routinely use health services data from both public and private providers, for which linkages to information technology from the health sector, physicians, and the community are vital. Community engagement is crucial for many services such as vaccination campaigns, targeted health promotion, preventive programs, distribution of medications, interpersonal counseling, and food monitoring [13].

7.1. Social Determinants of Health in Integrated Care

The interconnected trajectories of human and planetary health call for a paradigm shift in how health and social care systems, workforces, and professions respond to social determinants of health and promote health equity, environmental sustainability, and climate justice [34]. The World Health Organisation proposes that strengthening education and training on social determinants and equity will enhance the capacity of the health workforce and sectors to address structural environmental and socio-economic challenges upstream of health. Nonetheless, the extent of implementation remains insufficient, as many countries experience deteriorating planetary health (including climate-related shocks and biological crises) alongside widening health inequities and stagnation or decline of life expectancy. Furthermore, the urgency for action increases along with the interconnections among rising health inequities, growing planetary health deterioration, and worsening climate change, which further exacerbate health and social inequities across multiple populations. Consequently, the sector has a moral obligation to accelerate, expand, and publicly advocate for reforms in education and training that fill the identified health and social inequities gap in curricula, thereby enabling health professionals to enact a universal social, economic, and environmental determinants of health agenda.

Reflecting on the specific context of such transformations, Tadeu and Geelhoed emphasised the significance of integrated care in global health strategies [35]. For example, in Mozambique, many child, maternal, and infectious diseases remain highly prevalent. Promoting rapid access to timely, reliable, and accurate laboratory services could therefore contribute significantly to integrated primary healthcare and help improve clinical and health service management in the country. Integrated care delivers health services to people with complex, chronic conditions while engaging — in addition to governmental authorities — intersectoral stakeholders outside the health system, such as those in education, agriculture and rural development, and community-based organisations.

7.2. Public Health Surveillance and Response Within Clinical Teams

Public health surveillance (PHS) involves systematic data collection, analysis, interpretation, and dissemination to improve population health [12]. It was traditionally performed by local public health authorities, but now clinical teams take over significant tasks. Such team-based PHS incorporates laboratory, nursing, radiology, physiotherapy, and other professionals, whose roles are increasingly vital to global surveillance activities.

Collaboration during the COVID-19 pandemic prompted integrated PHS in the UK. Guidance from Public Health England, now the UK Health Security Agency, required healthcare users to report positive SARS-CoV-2 results. In growth scenarios of emerging pathogens or antimicrobial-resistant organisms, teams from environmental health, virology, and antimicrobial stewardship were deployed with further advice from national institutions [36].

7.3. Community Engagement and Preventive Health

Integrated healthcare teams aim to strengthen preventive health initiatives, which improves community well-being. These teams participate in community outreach, mass awareness, and awareness campaigns during emergencies. They also screen and manage non-communicable diseases, such as high blood pressure and diabetes, by conducting screening camps and promoting healthy lifestyles to achieve the targets set by the World Health Organization. In collaboration with the community, integrated teams also organize the management of waste disposal and sterilize drinking water to prevent health issues.

Community-based health and awareness initiatives encourage preventive healthcare and promote healthy lifestyles. Integrated healthcare teams identify community health needs, counsel patients, and promote healthy practices. Collaboration with multiple departments is critical for integrated outreach, which includes blood donation drives, plastic waste management, and child

immunization awareness, as well as promoting screening for high blood pressure and diabetes to mitigate complications caused by these non-communicable diseases. Scheduling follow-ups with patients for diabetes and high blood pressure is important for controlled management. [5]

8. POLICY, GOVERNANCE, AND LEADERSHIP IN INTEGRATED CARE

Governance structures for multidisciplinary teams need to cater to the interacting settings of independent professions, organizations, and government policies that affect delivery systems, while at the same time avoiding one-size-fits-all regulations. Situated at the interface of operational practices and system-wide policies, many decisions need to be made jointly across levels and sectors [37] , and the representatives or facilitators for integrated-care teams therefore have important contributions to make in every institutional context. Professional, policy, and administrative leaders thus require new skills to not only collaborate better with one another but also to build a climate of flexible cooperation through the adaptation of governance structures. Collaborative initiatives need to be maintained during periods of instability, since their very emergence is usually a response to tensions in the environment. Changes in interaction among stakeholders can also propagate easily across the system, and several interactions should be monitored together to spot problems early on. Policy and administrative leaders are further encouraged to provide separate governance structures for activities related to, on the one hand, legislation and regulation of the system, and on the other hand, the ongoing evolution of delivery methodologies. Such measures allow integrated teams to remain in intermittent operation even when major reforms are being implemented.

Collaboration across independent disciplines raises issues of accountability, and measures are required to define clear lines of responsibility and generate information on accountability, quality, and incentives needed for interprofessional cooperation [2]. Domain-specific standards still apply, only these become a benchmark—not the objective—when professionals interact across disciplines. Governance also comprises defining metrics for the quality of joint outputs from individual practitioners: for multidimensional interventions, there are many ways in which care can fail in a systemic manner, and devising systematic ways of capturing these becomes critical when a task proceeds across multiple organizations. Integrated interprofessional practice introduces new ethical challenges in delineating responsibilities, prioritizing interventions, and reconciling divergent values. Multidisciplinary teams typically address one kind of care jointly, while respect for the autonomy of each profession has sometimes led to functional segregation and the marginalization of some professions in non–clinical contexts; care has often revolved around medication, fees for medicines have been prohibited, and free information has been given instead.

8.1. Governance Structures for Multidisciplinary Teams

Effective healthcare teams can enhance quality delivery and patient safety but they require supporting policy structures.

Formal governance structures should underpin multidisciplinary teams working to deliver healthcare quality and safety. Governance is defined as the establishment of principles, assigning responsibilities, managing relations, and setting rules and strategic directions [4]. Within the healthcare setting, governance structures are critical to enabling effective leadership and organizing joint efforts of both specialized practitioners and multidisciplinary teams in the pursuit of patient safety. It is vital that such arrangements build systemic capacity for team-based approaches to patient quality and safety by addressing team accountability and work coordination across sectors for a clearer understanding of overall healthcare system performance when multiple proportional interventions are employed [38].

8.2. Accountability, Quality Metrics, and Incentives

One form of collaborative governance involves the interdependence among individual practitioners, teams, and organizations responsible for improvement [39]. A shared understanding of accountability is essential for collaboration, yet a single definition is elusive. For educators, accountability involves responsibility for student outcomes; for leaders, it encompasses stewardship and support for frontline practitioners; and for practitioners, it might include service, contribution to improvement, and equity. Each professional has unique responsibilities that vary by profession and discipline [40].

Progress toward health-equity goals necessitates the establishment of a systematic equity-accountability framework and supporting infrastructure. The practice model described in this framework necessarily connects with and enhances the capacity already present in the health sector. Quality improvement and accountability systems that are already used can be integrated into the policy, governance, and leadership framework. Fulfilling practices of governance, stewardship, and system-wide engagement advances every aspect of quality and is needed to enable the nation's full response to any current or future challenge.

8.3. Ethical Considerations in Interprofessional Practice

The ethical requirements associated with collaborative practice across disciplines are broadly similar to those of individual members, yet the dynamic differs in significant ways. Whereas individual professionals are mainly concerned with identifying, weighing, and addressing situations in which their own ethical responsibilities may conflict with those of others, interprofessional situations additionally involve two or more sets of responsibilities and the indirect imposition of one professional's ethics upon another. For instance, if a laboratory professional discovers a safety hazard in the operation of a piece of imaging, physiotherapy, or otherwise equipment, they may be obliged to report it. If there is the potential for misinterpretation of the data to influence patient diagnosis or treatment, an imaging professional must then weigh the imperative to communicate the finding against the duty to respect the explicit request for confidentiality from the other discipline. Through integrated patient-centred teams, therefore, professionals experience the ethical responsibility of contributing to the work of the team while remaining accountable to the ethical obligations of their primary discipline [41]. Credentialing to indicate qualification to participate and supervision to indicate partial oversight along with opportunity for individual practice at the pre-interprofessional and professional education stage may help to develop team-competencies while still respecting discipline competencies and professional autonomy.

9. RESEARCH GAPS AND FUTURE DIRECTIONS

Health systems globally address how to enhance healthcare quality and patient safety. Limited research exists concerning the integrated role of healthcare professionals. An integrated approach encompasses the roles of laboratory, nursing, radiology, physiotherapy, and public health professionals in ensuring healthcare quality and patient safety. Filling identified knowledge gaps provides a research agenda to explore the integrated role of healthcare professionals within health systems.

Research concerning the integrated role of laboratory, nursing, radiology, physiotherapy, and public health healthcare professionals remains limited. Health systems still struggle to enhance healthcare quality and patient safety, evidenced by high-profile patient safety events and expensive malpractice premiums. Moreover, quality assurance efforts frequently neglect substantial and essential micro -> meso-level care delivery processes. Therefore, healthcare systems must emphasize quality assurance and patient safety systematically and fundamentally to foster sustainable health improvement.

Health quality and patient safety merit comprehensive examination, yet relevant literature focuses narrowly on safety culture and improvement. Investigation of integrated perspectives on laboratory, nursing, radiology, physiotherapy, and public health professionals represents an additional priority. The interdependence among these professionals significantly influences care quality and safety. Engagement from professionals across disciplines can shield health systems from degradation of quality and safety.

Countless studies have analyzed topics such as top-down leadership, the unified advancement of quality and safety, deterioration of safety, adverse events, patient-centeredness, and the safeguarding of health systems against safety regression. While applicable in isolation, the perspectives of individual disciplines remain prevalent in various scholarly works. Further understanding of these isolated perspectives proves necessary. Conversely, investigation into the integrated roles of these professionals remains entirely unexamined. Such an integrated account is crucial for enabling systems to re-elevate the profile of quality and safety alongside access, efficiency, and equity to enhance whole-system quality and safety [1].

10. CONCLUSION

Integrated quality assurance programs require the participation of all stakeholders in patient management. The focus on accreditation and standards has led to quality-oriented programmes in health care. Laboratories, nursing, radiology, physiotherapy, and public health professionals are integral to quality assurance, yet their roles are not always formally defined. Quality assurance should take priority over quality improvement, in order to build a quality pyramid towards the ultimate goal of continuous quality improvement [2].

Healthcare plays an essential role in social and economic development. Evidently, poor quality of healthcare hampers development. The role of healthcare as an enabler of development has prompted governments to invest in healthcare to improve its quality. Quality is defined as the ability of a healthcare delivery system to meet user requirements, and the focus has shifted from the services offered to the users' perspective. Quality assurance is thus an important consideration. Quality assurance also increases opportunities for heightening professional status through leadership, implementation of appropriate systems, total interdependency, shared accountability, commitment, and fearing God.

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