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Interdisciplinary Collaboration Among Nursing, Anesthesia, Pharmacy, Radiology, and Medical Laboratory Professionals in Improving Patient Care Outcomes

Introducing the SYNAPSE Framework for Integrated, Patient-Centred Team Practice within the Saudi Vision 2030 Health Transformation

¹Kholoud Ahmed Ghazwani , ²Malek Abdullah Marzoqi Al-Dowimar , ³Abdulaziz Fuhaid Farae Al-Mutairi , ⁴Mariam Mohammed Mikbash Jaafari, ⁵Read Al Harbi , ⁶Haya Ali Mubarak Alaklabi, ⁷Amal Obaed Saeed Aldobaisi , ⁸Mahmoud Kareem Althagafi , ⁹Saad Rashed Saad Alshabanat, ¹⁰Atallah Mohammed Sulbukh Alruwaili , ¹¹Abdulmohsen Raji Al-Ruwaili, ¹²Khalid Saud Alqahtani, ¹³Abdulelah Mofareh Alruwaili

¹NURSING , ALRAITH GENERAL HOSPITAL

²Pharmacy , Ministry of National Guard Health Affairs

³Pharmacy, Ministry of National Guard Health Affairs

⁴Nursing Technician, Jazan Health Cluster

⁵Health Administration , National guard health affairs

⁶Nursing, ALJABA Health Center. Asir Health Cluster

⁷Nursing, Maternity and children hospital Asir Health Cluster .

⁸Anesthesiologist, KAMC- Riyadh (NGH)

⁹Medical Assistant , Minister of National Guard

¹⁰Nursing, General Administration for Medical Services Ministry of interior

¹¹Nursing, General Directorate of Medical Services, Ministry of Interior

¹²Radiology , General Directorate of Prison Health Ministry of Interior

¹³Medical Laboratory, Employer: General Directorate of Prison Health, Ministry of Interior

ABSTRACT:

Background: Contemporary hospital care is delivered through tightly coupled chains of professional work in which a single clinical decision may depend on a nurse's assessment, an anesthesia provider's airway and haemodynamic plan, a pharmacist's medication review, a radiologist's interpretation, and a laboratory professional's validated result. When these contributions are fragmented, errors accumulate at the handoffs; when they are integrated, outcomes improve.

Aim: This paper critically examines how interdisciplinary collaboration among nursing, anesthesia, pharmacy, radiology, and medical laboratory professionals influences patient

care outcomes, identifies the barriers that impede collaboration, and proposes an original integrative model—the SYNAPSE Framework—tailored to the Saudi healthcare context.

Method: An integrative narrative review of international and regional literature, professional standards, and policy documents was undertaken, synthesised through Donabedian’s structure–process–outcome model, Reason’s Swiss cheese model, the IPEC competency domains, and TeamSTEPPS.

Findings: Evidence consistently associates structured collaboration with fewer medication errors and adverse drug events, improved diagnostic accuracy and timeliness, safer perioperative care, shorter length of stay, and greater patient and staff satisfaction. Principal barriers include professional hierarchy, role ambiguity, siloed information systems, workload pressures, and uniprofessional education.

Conclusion: Collaboration is not an interpersonal nicety but a measurable patient safety intervention. Embedding the seven SYNAPSE components—Shared goals, Yielding role clarity, Networked communication, Aligned protocols, Person-centred joint decisions, Safety culture, and Evaluation—offers Saudi institutions a practical route to realising the Vision 2030 Model of Care.

1. INTRODUCTION

Modern healthcare has become too complex for any single profession to deliver safely on its own. The expansion of diagnostic technologies, the growth of high-alert pharmacotherapy, the rising acuity of surgical and critically ill patients, and the ageing of populations with multiple chronic conditions have transformed the hospital into a system of interdependent specialists. Within this system, five professional groups occupy a particularly central position in the patient journey: **nurses**, who provide continuous bedside surveillance and coordinate care; **anesthesia professionals**, who manage patients through their most physiologically vulnerable periods; **pharmacists**, who safeguard the medication-use process; **radiology professionals**, who generate and interpret the images on which many diagnoses depend; and **medical laboratory professionals**, whose analyses inform a very large share of clinical decisions.

The landmark report *To Err Is Human* (Institute of Medicine, 2000) established that most preventable harm arises not from individual incompetence but from poorly designed systems, including failures of communication and coordination between professionals. Subsequent work has repeatedly located the greatest risks at the interfaces—the handoffs, orders, results, and transitions—where the work of one discipline becomes the input of another (Reason, 2000; Starmer et al., 2014). It follows that improving the quality of these interfaces through genuine interdisciplinary collaboration is among the most powerful levers available to healthcare leaders.

The World Health Organization (2010) defines collaborative practice as occurring when multiple health workers from different professional backgrounds work together with patients, families, carers, and communities to deliver the highest quality of care. In the Kingdom of Saudi Arabia, this vision aligns closely with the Health Sector Transformation Program under Vision 2030, which seeks to shift the system toward integrated, value-based, and patient-centred care delivered through regional health clusters. Accreditation requirements of the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) and professional regulation by the Saudi Commission for Health Specialties (SCFHS) further emphasise teamwork, communication, and patient safety as core expectations. Despite this policy momentum, collaboration among these five disciplines remains uneven. Pharmacists and laboratory scientists are often physically and organisationally distant from the bedside; radiology and laboratory results may travel through information systems without meaningful dialogue; and anesthesia and nursing teams may operate within strong professional hierarchies that inhibit speaking up. This paper therefore addresses four questions: (1) What distinctive contribution does each discipline make to patient outcomes? (2) Where and how do their roles intersect across the care pathway? (3) What does the evidence show about the outcomes of collaboration, and what barriers impede it? (4) What integrative framework can guide Saudi institutions in strengthening collaboration?

2. CONCEPTUAL AND THEORETICAL FOUNDATIONS

2.1 Defining Interdisciplinary Collaboration

The terms multidisciplinary, interdisciplinary, and interprofessional are often used interchangeably, yet they describe distinct levels of integration. In **multidisciplinary** care, professionals work in parallel, each contributing a discipline-specific component with limited interaction. **Interdisciplinary** or **interprofessional** collaboration implies a deeper integration in which professionals share goals, co-construct care plans, and hold collective responsibility for outcomes. D'Amour et al. (2005) identified five core concepts that recur in definitions of collaboration: sharing, partnership, power, interdependency, and process. Collaboration, in this sense, is not a structure that can simply be installed but a dynamic process that must be continually negotiated and sustained.

2.2 Guiding Theoretical Models

Four complementary models underpin the analysis presented in this paper:

- ◆ **Donabedian's Structure–Process–Outcome Model** (Donabedian, 1988) proposes that good structures (staffing, systems, policies) enable good processes (communication, coordination, clinical decisions), which in turn produce good outcomes. Interdisciplinary collaboration is fundamentally a process variable, but it depends on structural enablers and must be judged by its outcomes.
- ◆ **Reason's Swiss Cheese Model** (Reason, 2000) represents each professional check—the nurse's double-check, the pharmacist's verification, the laboratory's critical-value call, the radiologist's report—as a defensive layer. Harm occurs when holes in successive layers align. Collaboration narrows the holes and prevents their alignment by ensuring that each layer actively informs the next.
- ◆ **The IPEC Core Competencies** (Interprofessional Education Collaborative, 2016) define four domains required for collaborative practice: values and ethics, roles and responsibilities, interprofessional communication, and teams and teamwork. These domains provide a shared language for education and performance appraisal across professions.
- ◆ **TeamSTEPPS** (Agency for Healthcare Research and Quality [AHRQ], 2023) operationalises teamwork through trainable skills—communication, leadership, situation monitoring, and mutual support—and practical tools such as SBAR, briefs, huddles, debriefs, check-back, and the two-challenge rule.

“Each profession is a layer of defence; collaboration is what keeps the holes in those layers from lining up.”

3. METHODOLOGICAL APPROACH

This paper adopts an integrative narrative review design, suitable for synthesising heterogeneous evidence—including experimental studies, systematic reviews, observational research, professional standards, and policy documents—into a coherent conceptual account. Sources were identified through searches of PubMed/MEDLINE, CINAHL, the Cochrane Library, and Google Scholar using combinations of the terms *interprofessional collaboration*, *interdisciplinary team*, *nursing*, *anesthesia*, *clinical pharmacy*, *radiology*, *laboratory medicine*, *patient safety*, and *patient outcomes*. Policy and regulatory documents were obtained from the WHO, AHRQ, The Joint Commission, and Saudi bodies including the Ministry of Health, CBAHI, SCFHS, and the Saudi Food and Drug Authority (SFDA).

Priority was given to high-quality systematic reviews and landmark studies with direct relevance to one or more of the five disciplines. Findings were organised thematically around discipline-specific contributions, collaborative interfaces, outcome domains, and barriers and enablers, and were then synthesised to inform the proposed framework. As a narrative review, the paper does not claim the exhaustiveness of a systematic review; its aim is conceptual integration and practical guidance.

4. DISTINCTIVE CONTRIBUTIONS OF EACH DISCIPLINE

4.1 Nursing: The Continuous Link

Nurses constitute the largest professional group in hospitals and the only one present at the bedside around the clock. They perform ongoing assessment, detect clinical deterioration, administer most medications, collect many laboratory specimens, prepare patients for imaging and anesthesia, and educate patients and families. Their position makes them the natural integrators of interdisciplinary information. The strength of the relationship between nursing resources and outcomes is well documented: Aiken et al. (2002) found that each additional patient per nurse was associated with a 7% increase in the odds of patient death

within 30 days of admission. Nurses' capacity to escalate concerns, question orders, and coordinate across disciplines is therefore central to collaborative safety.

4.2 Anesthesia: Guardians of Physiological Safety

Anesthesia professionals—anesthesiologists, nurse anesthetists, and anesthesia technologists—manage airway, ventilation, haemodynamics, analgesia, and sedation across the perioperative period, in procedural suites, and increasingly in radiology and endoscopy departments. Anesthesiology was among the first specialties to adopt human-factors science: Cooper et al. (1978) demonstrated that most anesthesia mishaps were preventable and linked to human error and equipment interaction. Anesthesia practice is intensely interdependent: it relies on accurate pre-operative laboratory data (haemoglobin, coagulation, electrolytes), imaging of the airway and chest, pharmacist support for high-alert drugs and drug shortages, and nursing collaboration in pre-operative preparation and post-anesthesia recovery.

4.3 Pharmacy: Stewards of the Medication-Use Process

Pharmacists ensure that medications are appropriate, effective, safe, and affordable. Their roles now extend well beyond dispensing to include clinical rounds, medication reconciliation, therapeutic drug monitoring, antimicrobial stewardship, parenteral nutrition, and anticoagulation management. In a seminal study, Leape et al. (1999) showed that pharmacist participation in intensive care rounds reduced preventable adverse drug events caused by prescribing errors by approximately two-thirds. Pharmacist-led reconciliation at transitions of care is consistently associated with fewer medication discrepancies (Mueller et al., 2012). The WHO (2017) *Medication Without Harm* challenge identifies pharmacist–nurse–prescriber collaboration as essential to its goal of reducing severe avoidable medication-related harm.

4.4 Radiology: Seeing Inside the Patient

Radiology professionals—radiologists, radiographers, sonographers, and nuclear medicine technologists—provide images and interpretations that shape diagnosis, staging, procedural guidance, and treatment monitoring. The accuracy of imaging depends heavily on collaboration: incomplete clinical information on requests, inadequate patient preparation, undisclosed renal impairment before contrast administration, or failure to communicate critical findings can each compromise safety. Brady (2017) noted that discrepancy and error are inherent in radiological interpretation and that systems of communication, peer learning, and clinical correlation are essential mitigations. The American College of Radiology (2020) requires timely, direct communication of urgent or unexpected findings to the responsible clinical team.

4.5 Medical Laboratory: The Evidence Behind Decisions

Medical laboratory professionals perform and validate analyses in clinical chemistry, haematology, microbiology, immunology, transfusion medicine, and molecular diagnostics. The frequently cited claim that laboratory results inform around 70% of medical decisions has been questioned for its weak evidence base (Hallworth, 2011); nevertheless, the laboratory's influence on diagnosis, monitoring, and treatment is undeniable. Importantly, most laboratory errors occur outside the laboratory walls—in the pre-analytical phase of test ordering, patient identification, specimen collection, labelling, and transport—and in the post-analytical phase of result communication and interpretation (Plebani, 2010; Lippi et al., 2011). These phases are precisely where laboratory, nursing, and medical staff must work together.

Table 1. Core Contributions and Collaborative Dependencies of the Five Disciplines

Discipline	Core contribution to outcomes	Key collaborative dependencies
Nursing	Continuous assessment, early warning of deterioration, medication administration, specimen collection, patient education	Relies on pharmacy for safe dosing, lab and radiology for timely results, anesthesia for perioperative plans
Anesthesia	Airway, haemodynamic and pain management; perioperative and procedural sedation safety	Relies on lab for pre-operative values, radiology for airway/chest imaging, pharmacy for high-alert drugs, nursing for PACU care

Discipline	Core contribution to outcomes	Key collaborative dependencies
Pharmacy	Medication review, reconciliation, dosing, antimicrobial stewardship, adverse drug event prevention	Relies on lab for renal/hepatic function and drug levels, nursing for administration feedback, anesthesia for perioperative regimens
Radiology	Diagnostic imaging, image-guided procedures, critical findings communication	Relies on nursing for preparation, lab for creatinine before contrast, pharmacy for contrast reactions, anesthesia for sedation
Medical Laboratory	Accurate, timely analysis; critical value reporting; transfusion safety; microbiology for stewardship	Relies on nursing for correct collection and labelling, pharmacy for interpretation of drug levels, clinicians for clinical context

Source: Synthesised by the author from the literature reviewed.

5. COLLABORATIVE INTERFACES ACROSS THE PATIENT JOURNEY

The value of collaboration becomes clearest when the patient journey is examined as a sequence of interfaces. At each stage, outcomes depend less on the excellence of any single discipline than on the reliability of the connections between them.

5.1 The Perioperative Pathway

Pre-operatively, anesthesia assessment integrates laboratory results, imaging, and a pharmacist-reviewed medication history—particularly regarding anticoagulants, antiplatelets, hypoglycaemics, and herbal products. Nurses prepare the patient, confirm consent and fasting status, and communicate concerns. Intra-operatively, the WHO Surgical Safety Checklist provides a structured moment for the entire team to share critical information; its introduction across eight countries was associated with reductions in both mortality and complications (Haynes et al., 2009). Post-operatively, handover from anesthesia to recovery and ward nursing, supported by pharmacy guidance on analgesia and thromboprophylaxis, and by prompt laboratory monitoring, determines the trajectory of recovery. Lingard et al. (2004) observed that roughly 30% of team exchanges in the operating room were communication failures, a third of which had visible effects on the team.

5.2 Critical Care and Emergency Care

In intensive care and emergency departments, time-critical decisions demand rapid, closed-loop communication. A patient with suspected sepsis illustrates the point: nurses recognise deterioration and draw blood cultures; the laboratory processes lactate and cultures and reports critical values; radiology identifies the source of infection; pharmacy ensures that the right empirical antibiotic is given promptly at the right dose, adjusted for renal function; and anesthesia or critical care teams secure the airway and provide vasopressor support. Multidisciplinary bundles have produced striking results; Pronovost et al. (2006) reported a sustained reduction of up to 66% in catheter-related bloodstream infections through a checklist-based, team-wide intervention.

5.3 Diagnostic Pathways

The National Academies of Sciences, Engineering, and Medicine (2015) reframed diagnosis as a team activity in which radiologists, pathologists, and laboratory professionals are full members of the diagnostic team rather than peripheral service providers. Diagnostic errors are common; Singh et al. (2014) estimated that approximately one in twenty US adults experiences a diagnostic error in outpatient care each year. Radiology–laboratory correlation, multidisciplinary tumour boards, and direct clinician–diagnostician dialogue reduce the risk of missed or delayed diagnoses.

Table 2. High-Risk Interfaces and Collaborative Safeguards

Interface	Typical failure	Collaborative safeguard
Order → specimen	Wrong patient, mislabelled or haemolysed sample	Two-identifier protocols; nurse–lab training; barcode labelling at bedside
Result → clinician	Critical lab or imaging finding not acted upon	Closed-loop critical result reporting with read-back and documentation
Prescription administration →	Dosing error, allergy missed, drug interaction	Pharmacist verification; nurse double-check for high-alert drugs; CPOE with decision support
Contrast imaging	Contrast-induced kidney injury; allergic reaction	Lab creatinine/eGFR check; pharmacy premedication protocol; nurse screening
Theatre → recovery → ward	Incomplete handover of anesthesia events and drugs	Structured handover (SBAR/I-PASS); shared electronic record
Admission discharge ↔	Medication discrepancies at transitions	Pharmacist-led reconciliation with nursing patient education

CPOE = computerised provider order entry; SBAR = Situation–Background–Assessment–Recommendation.

6. EVIDENCE ON THE IMPACT OF COLLABORATION ON OUTCOMES

The evidence base linking collaboration to outcomes is broad, although heterogeneous in design and quality. A Cochrane review by Reeves et al. (2017) found that practice-based interprofessional collaboration interventions may slightly improve functional status, patient-assessed quality of care, and adherence to recommended practices, while emphasising the need for more rigorous studies. More targeted interventions involving the five disciplines examined here show clearer effects across several outcome domains.

6.1 Medication Safety

Collaborative medication management consistently reduces harm. Beyond the ICU findings of Leape et al. (1999), Bond and Raehl (2007) associated the availability of specific clinical pharmacy services with lower hospital mortality rates. Nurse–pharmacist partnership in reconciliation and in the administration of high-alert medications such as insulin, anticoagulants, opioids, and concentrated electrolytes closes the loop between prescribing intent and bedside reality.

6.2 Diagnostic Accuracy and Timeliness

Pre-analytical quality programmes that bring laboratory professionals and nurses together—for example, joint training on phlebotomy, order-of-draw, and labelling—reduce specimen rejection and repeat collections (Lippi et al., 2011). In imaging, provision of complete clinical information and direct radiologist–clinician communication improves interpretive relevance and reduces the risk that critical findings are overlooked (Brady, 2017).

6.3 Surgical and Perioperative Outcomes

Team-based interventions in the perioperative setting have among the strongest evidence. In the US Veterans Health Administration, implementation of a medical team training programme was associated with an approximately 18% reduction in annual surgical mortality compared with a 7% reduction in facilities that had not yet undergone training (Neily et al., 2010). Structured checklists and briefings achieve their effect largely by creating a psychologically safe moment in which every discipline—including nurses and technologists—is expected to speak.

6.4 Communication, Handover, and Adverse Events

Structured communication tools translate collaboration into reliable behaviour. The I-PASS handoff programme was associated with a 23% reduction in medical errors and a 30% reduction in preventable adverse events (Starmer et al., 2014), and a systematic review of SBAR found moderate evidence of improved patient safety, particularly when used to communicate between nurses and physicians by telephone (Müller et al., 2018).

Table 3. Summary of Outcome Domains Influenced by Interdisciplinary Collaboration

Outcome domain	Illustrative indicators	Disciplines most involved
Medication safety	Adverse drug events, reconciliation discrepancies, high-alert drug incidents	Pharmacy, Nursing, Anesthesia
Diagnostic quality	Specimen rejection rate, turnaround time, missed critical findings, discrepancy rate	Laboratory, Radiology, Nursing
Perioperative safety	Surgical mortality, complications, unplanned ICU admission, PACU incidents	Anesthesia, Nursing, Pharmacy, Laboratory
Infection outcomes	CLABSI, surgical site infections, appropriate antimicrobial use	Nursing, Pharmacy, Laboratory (microbiology)
Efficiency	Length of stay, readmissions, avoidable repeat tests and scans	All five disciplines
Experience	Patient satisfaction, staff satisfaction, burnout, retention	All five disciplines

“The evidence is consistent: when professions share information and responsibility at the interfaces, patients experience fewer errors, faster diagnoses, and safer recoveries.”

7. BARRIERS TO EFFECTIVE COLLABORATION

Despite compelling evidence, collaboration is often weaker in practice than in principle. Weller et al. (2014) describe healthcare professions as ‘tribes’ with distinct identities, languages, and loyalties that can impede teamwork. The barriers can be grouped into five interrelated categories.

- ◆ **Hierarchical and cultural barriers.** Steep authority gradients, particularly in anesthesia and surgical environments, discourage nurses, technologists, and junior staff from voicing concerns. In some settings, cultural norms of deference further reinforce silence.
- ◆ **Role ambiguity and professional boundaries.** Unclear responsibilities—for example, who communicates a critical laboratory value, or who confirms renal function before contrast—create gaps in which each discipline assumes another has acted.
- ◆ **Structural and organisational barriers.** Physical separation of pharmacy, laboratory, and radiology from clinical units; staffing shortages; high workloads; and shift patterns that prevent shared rounds limit opportunities for interaction.
- ◆ **Technological barriers.** Poorly interoperable information systems, alert fatigue, and results that arrive without context undermine shared situational awareness.
- ◆ **Educational barriers.** Most professionals are trained in uniprofessional programmes with little exposure to the roles, competencies, and constraints of colleagues in other disciplines.

Table 4. Barriers, Consequences, and Evidence-Informed Enablers

Barrier	Consequence for patients	Enabler
Hierarchy and fear of speaking up	Unvoiced safety concerns; unchallenged errors	TeamSTEPPS training; CUS and two-challenge rule; leadership modelling
Role ambiguity	Missed tasks at handoffs; duplicated effort	Written role charters; RACI matrices for critical processes
Physical and organisational silos	Delayed results and clarifications	Unit-based pharmacists; point-of-care testing; joint rounds and huddles
Fragmented information systems	Lost or unseen results; incomplete handovers	Integrated EHR; closed-loop result acknowledgement; interoperability standards
Uniprofessional education	Limited mutual understanding and trust	Interprofessional education and simulation; SCFHS-accredited joint CPD
Workload and burnout	Reduced vigilance and communication quality	Safe staffing; task redesign; wellbeing programmes

8. THE SYNAPSE FRAMEWORK: AN INTEGRATIVE MODEL

Drawing on the preceding synthesis, this paper proposes the **SYNAPSE Framework**. The metaphor is deliberate: in the nervous system, a synapse is the junction at which a signal passes from one neuron to another. The body functions only when these junctions transmit reliably. Likewise, a hospital functions safely only when the junctions between nursing, anesthesia, pharmacy, radiology, and laboratory medicine transmit information, intention, and responsibility without loss. The framework comprises seven mutually reinforcing components arranged around the patient (Figure 1).



Figure 1. The SYNAPSE Framework for interdisciplinary collaboration (developed by the author).

Table 5. Components of the SYNAPSE Framework

Component	Description	Practical mechanisms
S — Shared Goals & Patient Focus	All five disciplines orient around explicit, shared patient outcomes rather than departmental targets	Unit-level shared quality goals; joint dashboards; common patient safety objectives
Y — Yielding Role Clarity	Each discipline understands and respects its own and others' scope, and yields or leads as the situation requires	Role charters; RACI matrices; cross-discipline shadowing
N — Networked Communication	Information flows through structured, closed-loop channels supported by integrated technology	SBAR, I-PASS, read-back; interoperable EHR; critical-result alerts; secure messaging
A — Aligned Protocols & Pathways	Clinical pathways are co-designed so that each discipline's steps interlock	Joint sepsis, contrast, perioperative and anticoagulation protocols
P — Person-Centred Joint Decisions	Care plans are co-constructed with the patient and family across disciplines	Interdisciplinary rounds; tumour boards; shared decision-making tools
S — Safety & Learning Culture	Psychological safety enables all to speak up; errors become shared learning	Just culture; TeamSTEPPS; interprofessional morbidity and mortality reviews
E — Evaluation & Feedback Loops	Collaboration is measured and continuously improved	KPIs across Donabedian domains; audit and feedback; PDSA cycles

The framework maps onto Donabedian's model: Shared goals, Yielding role clarity, and Aligned protocols largely represent **structure**; Networked communication and Person-centred joint decisions represent **process**; Safety culture operates as the enabling environment; and Evaluation connects all components to **outcomes**. In Reason's terms, SYNAPSE strengthens each defensive layer and, crucially, the connections between them.

9. THE SAUDI ARABIAN CONTEXT AND VISION 2030

The Saudi health system is undergoing one of the most ambitious transformations in its history. The Health Sector Transformation Program (2021) introduces a new Model of Care that organises services around patient pathways—such as keeping well, planned care, urgent care, and chronic conditions—delivered through integrated regional health clusters. This model is inherently interdisciplinary: it cannot succeed if nursing, anesthesia, pharmacy, radiology, and laboratory services continue to operate as isolated departments.

Several national assets can accelerate collaboration. **CBAHI** national hospital standards require effective communication of critical results, medication management systems, and patient safety programmes, providing an accreditation lever for interdisciplinary processes. The **SCFHS** regulates professional classification and continuing professional development and is well placed to accredit interprofessional education activities. The **SFDA** supports pharmacovigilance and medical device safety, reinforcing pharmacist–nurse reporting of adverse events. National digital health initiatives, including the **Nphies** health information exchange platform and virtual care services such as the Seha Virtual Hospital, create the infrastructure for networked communication, tele-radiology, and remote pharmacist and laboratory consultation.

At the same time, the Saudi workforce context presents specific considerations. The workforce is highly diverse, with professionals educated in many different national systems and bringing varied expectations of hierarchy and communication. Saudisation programmes are expanding the national workforce in nursing and allied health, creating an opportunity to embed

interprofessional competencies from the start of professional education. Research capacity at institutions such as King Abdullah International Medical Research Center (KAIMRC) can support the local evaluation of collaborative models.

“The Vision 2030 Model of Care is, at its heart, a model of collaboration: patient pathways only work when the professions along them work as one.”

10. IMPLEMENTATION ROADMAP AND PERFORMANCE INDICATORS

Translating the SYNAPSE Framework into practice requires a phased, leadership-supported approach. The following roadmap is proposed for Saudi hospitals and health clusters.

Table 6. Phased Implementation Roadmap

Phase	Timeframe	Key actions
1. Readiness & diagnosis	Months 0–3	Leadership commitment; baseline safety culture and collaboration surveys; map high-risk interfaces; form an interdisciplinary steering group
2. Design & training	Months 3–9	Co-design aligned protocols; develop role charters; deliver TeamSTEPPS and simulation training across the five disciplines
3. Pilot & integrate	Months 9–15	Pilot interdisciplinary rounds and closed-loop result reporting in ICU and perioperative units; integrate EHR alerts and dashboards
4. Scale & sustain	Months 15–24+	Extend across the cluster; link to CBAHI accreditation and SCFHS CPD; embed audit, feedback, and recognition

Table 7. Suggested Key Performance Indicators by Donabedian Domain

Domain	Indicator	Target direction
Structure	Proportion of units with an embedded or ward-based clinical pharmacist	Increase
Structure	Proportion of staff completing interprofessional team training	Increase
Process	Critical lab/imaging results acknowledged within defined time	Increase
Process	Medication reconciliation completed within 24 hours of admission	Increase
Process	Specimen rejection rate (pre-analytical errors)	Decrease
Outcome	Preventable adverse drug events per 1,000 patient-days	Decrease
Outcome	Surgical complications and unplanned ICU admissions	Decrease
Outcome	Patient experience and staff collaboration scores	Increase

11. RECOMMENDATIONS

11.1 For Healthcare Leaders and Policymakers

- ◆ Treat interdisciplinary collaboration as a formal patient safety strategy with dedicated governance, budget, and executive sponsorship.
- ◆ Integrate collaboration metrics into cluster performance frameworks and CBAHI accreditation surveys.
- ◆ Invest in interoperable information systems that support closed-loop communication of results and medication information.

11.2 For Clinical Managers

- ◆ Establish daily interdisciplinary huddles and rounds that include pharmacists and, where relevant, laboratory and radiology representatives.
- ◆ Define clear, written responsibilities for high-risk processes such as critical results, contrast safety, and perioperative handover.
- ◆ Cultivate psychological safety through just-culture policies and visible leadership support for speaking up.

11.3 For Educators and Regulators

- ◆ Embed IPEC-aligned interprofessional education in undergraduate curricula for nursing, pharmacy, anesthesia technology, radiologic sciences, and clinical laboratory sciences.
- ◆ Encourage SCFHS accreditation of joint simulation-based CPD activities that bring the five disciplines together.

12. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

This review has limitations. As a narrative synthesis, it may be subject to selection bias, and much of the underlying evidence originates from North American and European health systems whose structures differ from those in Saudi Arabia. Studies of collaboration also face methodological challenges, including the difficulty of isolating collaboration from co-interventions and the reliance on before-and-after designs. The SYNAPSE Framework is a conceptual proposal and has not yet been empirically validated. Future research should (1) validate the SYNAPSE Framework using mixed methods in Saudi hospitals and health clusters; (2) develop and test locally adapted instruments to measure interprofessional collaboration; (3) evaluate the cost-effectiveness of interdisciplinary interventions; and (4) examine the influence of workforce diversity and cultural factors on team communication in the Gulf region.

13. CONCLUSION

Patient outcomes in modern hospitals are produced not by individual professions but by the quality of the connections between them. Nurses, anesthesia professionals, pharmacists, radiology professionals, and medical laboratory professionals each contribute indispensable expertise, yet the greatest risks—and the greatest opportunities—lie at their interfaces. The evidence reviewed in this paper demonstrates that structured collaboration reduces medication errors, strengthens diagnostic accuracy, improves perioperative safety, and enhances the experience of patients and staff alike. The SYNAPSE Framework offers a practical, theory-informed pathway for strengthening these junctions through shared goals, clear roles, networked communication, aligned protocols, person-centred joint decisions, a culture of safety, and continuous evaluation. For Saudi Arabia, where Vision 2030 is reshaping care around integrated patient pathways, investing in interdisciplinary collaboration is not optional: it is a precondition for delivering safe, high-quality, patient-centred care.

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