Journal of Population Therapeutics & Clinical Pharmacology

Exploring The Impact of Inter Professional Education on Team Dynamics and Patient Outcomes: Nursing, Radiology, Laboratory, Dental and Medical Secretary Integration

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Abstract:

Effective interprofessional collaboration is vital for delivering high-quality patient care**.** However, health professions have trditionally been educated in silos, with little exposure to other disciplines during training.

While research supports interprofessional education's IPE benefits, few studies have evaluated programs integrating nursing, radiology, laboratory, dental and medical secretary students. IPE is

increasingly recognized as important for training a healthcare workforce capable of delivering high-quality, team-based patient-centered care.

The overarching goal of IPE is to prepare a collaboration ready workforce by developing interprofessional values and education. Specific objectives include improving understanding of roles, fostering mutual respect and trust, enhancing effective communication skills and promoting team-based problem solving. IPE aims to transfer these skills and attitudes into clinical practice to benefit clients, populations and systems of care.

A longitudinal mixed-methods study was conducted involving nursing (n=30), radiology (n=15), laboratory (n=10), dental (n=5) and medical secretary (n=10) students who participated in a mandatory final-year interprofessional education program between 2015-2017. The program consisted of four half-day workshops incorporating simulated patient scenarios and team-based learning activities.

To address the research questions, we collected both quantitative and qualitative data. Team dynamics were measured at 6, 12, 24 and 36 months post-graduation using a validated tool incorporating Likert-scale questions on vision, participation safety, support for innovation and task orientation. Patient outcomes were assessed by retrospective chart review of 100 patients seen by each graduate in their current roles over the past year.

Both quantitative and qualitative data were analyzed using descriptive statistics and thematic analysis respectively.

Results showed significantly higher ratings of vision, participation safety, support for innovation and task orientation in graduate teams who had been exposed to interprofessional education compared to those without. Chart reviews found reduced length of stay and readmission rates for patients seen by interprofessional education-exposed graduates versus others. Patient satisfaction scores were also higher in this group.

Our results suggest interprofessional education can positively impact subsequent team dynamics and collaboration between nursing, radiology, laboratory, dental and medical secretary graduates. Improved relationships and understanding of roles may enhance coordination and efficiency of care, leading to benefits such as reduced length of stay and readmissions. These findings are consistent with other studies demonstrating interprofessional education's influence on collaborative practice.

However, our study was conducted in a single institution, and team compositions may vary in different contexts. Future research with larger, multi-site samples controlling for more factors is still needed. This review's findings indicate that an interprofessional education program integrating nursing, radiology, laboratory, dental and medical secretary students can positively impact subsequent team dynamics and patient outcomes after graduation.

1. Introduction:

Effective interprofessional collaboration is vital for delivering high-quality patient care **(World Health Organization, 2010)**. However, health professions have traditionally been educated in silos, with little exposure to other disciplines during training **(Frenk *et al.,* 2010)**. This can negatively impact later teamwork and patient outcomes **(Reeves *et al.,* 2016).** Interprofessional education aims to address this by providing opportunities for interactive learning between future members of collaborative practice teams **(World Health Organization, 2010).** While research supports interprofessional education's benefits, few studies have evaluated programs integrating nursing, radiology, laboratory, dental and medical secretary students **(Brandt, 2014; Reeves *et al.,* 2016).**

2. Literature review:

Interprofessional education (IPE) involves students from two or more professions learning about, from and with each other to enable effective collaboration and improve health outcomes **(World Health Organization, 2010).** IPE is increasingly recognized as important for training a healthcare workforce capable of delivering high-quality, team-based patient-centered care.

IPE occurs when two or more professions actively learn interactively with, from and about each other to improve collaboration and quality of care **(Centre for the Advancement of Interprofessional Education, 2002)**. Silos in professional education have traditionally promoted interdisciplinary rivalries rather than collaboration **(Frenk *et al.,* 2010).** However, health challenges like chronic disease demand coordinated, team-based solutions **(World Health Organization, 2010).** IPE helps counteract these negative effects by exposing students to other perspectives during training **(Reeves *et al.,* 2016).** This can positively influence later collaborative competence and patient outcomes **(Brandt, 2014).**

Goals and objectives of IPE

The overarching goal of IPE is to prepare a "collaboration-ready" workforce by developing interprofessional values and education **(Interprofessional Education Collaborative, 2016).**

Specific objectives include improving understanding of roles, fostering mutual respect and trust, enhancing effective communication skills and promoting team-based problem solving **(Canadian Interprofessional Health Collaborative, 2010).** IPE aims to transfer these skills and attitudes into clinical practice to benefit clients, populations and systems of care **(Interprofessional Education Collaborative, 2016).**

Models and approaches to IPE

Several models exist for structuring IPE experiences. These include:

1. Interprofessional lectures/seminars where students from different professions learn together in a classroom setting.
2. Problem-based/case-based learning involving interactive small groups addressing client scenarios.
3. Clinical simulation and skills-based training using simulated clients and procedures.
4. Community/population health promotion activities as an interprofessional team.
5. Interprofessional student-led clinics providing direct client care.

The most effective IPE combines several approaches like didactic and experiential components **(Reeves *et al.,* 2016).** Timing, context and outcomes should also be considered when designing programs **(Brandt, 2014).**

In summary , IPE is an important approach for developing collaborative practice-ready graduates and high functioning healthcare teams. Ongoing research and refinement of IPE models continues to strengthen this evolving field. When thoughtfully implemented, IPE shows promise for transforming professional education and benefitting clients.

Effective teamwork is essential for delivering safe, high-quality healthcare **(Körner *et al.,* 2016).** Team dynamics refer to the behaviors and relationships within a group that influence how effectively they work together **(Salas *et al.,* 2005).** In healthcare, teams are comprised of various professionals who must coordinate to provide unified patient care **(Xyrichis & Ream, 2008).** Dynamics shape how members interact, communicate, and leverage their collective skills **(Körner *et al.,* 2016).** Positive dynamics foster collaboration, while poor dynamics hinder coordination and efficiency **(Manser, 2009).**

Importance of Collaboration for Patient Outcomes:

A substantial body of research links effective teamwork to improved clinical outcomes **(Manser, 2009; Xyrichis & Ream, 2008).** Coordinated teams can more accurately diagnose conditions,

provide higher-quality treatment plans, prevent medical errors, and reduce readmission rates **(Manser, 2009).** For complex cases or vulnerable populations, team-based care has demonstrated particular benefits such as decreased mortality and length of hospital stay **(Mitchell *et al.*, 2012).** Collaboration also enhances job satisfaction and retention of healthcare professionals **(Baggs *et al.*, 1999).**

Factors Influencing Team Dynamics

Communication is a core determinant of team functioning, with open exchange of information vital for coordination **(Mitchell *et al.*, 2012).** Leadership style also shapes dynamics, as supportive leaders who value input foster greater participation **(Baggs *et al.*, 1999).** Role clarity is similarly important - unclear or overlapping roles can breed tension and inefficiency **(Xyrichis & Ream, 2008).** Additional influences include mutual respect, psychological safety to speak up, and a shared mental model of patient-centered goals **(Körner *et al.*, 2016).**

In healthcare, positive team dynamics are linked to improved collaboration, process of care and clinical outcomes. Understanding factors like communication, leadership and role clarity is key for building and maintaining high-functioning teams. Further research can provide additional insights into optimizing dynamics for enhanced patient safety and quality of care.

As the largest healthcare profession, nurses play a central role in interprofessional collaboration **(WHO, 2010).**

The Role of Nurses in Teams

Nurses spend the most time with patients and have holistic views of their needs **(Xyrichis & Lowton, 2008).** As patient advocates, they coordinate care across settings and specialties **(Baggs *et al.*, 1999).** However, traditional hierarchical structures sidelined nursing's leadership **(Reeves *et al.*, 2018).** Empowering nurses as equal team members leverages their expertise and improves outcomes **(Körner *et al.*, 2016).**

Preparing Nurses through Education

Nursing curricula increasingly incorporate interprofessional education (IPE), with positive effects on collaboration competencies **(Cuff *et al.*, 2020).** IPE exposes future nurses to other roles through shared learning activities **(Reeves *et al.*, 2016).** This improves understanding of differing perspectives and fosters mutual respect that carries into practice **(Xyrichis & Lowton, 2008)**. Clinical placements with interprofessional preceptors further prepare nurses to coordinate as team members **(Cuff *et al.*, 2020).**

Impact of Nursing Integration

Research links greater nursing integration to enhanced teamwork, safety culture and patient satisfaction **(Manser, 2009; Mitchell *et al*., 2013).** When empowered partners, nurses facilitate communication and coordinate complex care **(Baggs *et al.*, 1999).** Qualitative studies find nurses help balance task-orientation with humanistic concerns **(Xyrichis & Lowton, 2008).** Their central involvement may also reduce length of stay and mortality **(Mitchell *et al.*, 2013).**

As the largest healthcare profession, empowering nursing's leadership through IPE and collaborative practices strengthens outcomes. Their holistic perspectives and emphasis on coordination benefit patients and teams. With education fostering collaboration skills, nurses are well-positioned to improve dynamics and quality of care as equal partners.

Radiology plays a pivotal yet often overlooked role in healthcare delivery. This paper examines radiology's part in interprofessional teams and the impacts of their integration.

The Role of Radiology in Teams

Radiologists and technologists utilize medical imaging to non-invasively diagnose and guide treatment **(Ferrer *et al.*, 2018)**. However, radiology's consultative nature historically separated it from direct patient care teams **(Hall *et al.*, 2019).** Growing evidence shows benefits when radiology is proactively engaged in multidisciplinary settings **(Gunderman & Brown, 2015).**

Importance of Radiology Integration

Imaging interpretation directly influences up to 30% of medical decisions, yet communication gaps with referrers previously hindered optimization **(Hall *et al.*, 2019)**. Integrating radiology earlier allows correcting misdiagnoses and tailoring treatment plans **(Gunderman & Brown, 2015).** For complex oncology, radiology now helps coordinate multimodal management **(Ferrer *et al.*, 2018).** Timely collaboration spares patients from repeat tests or invasive procedures **(Hall *et al.*, 2019).**

Impact of Radiology Integration on Teams and Outcomes

Qualitative research finds radiologist presence at tumor boards enhances diagnostic confidence and decision-making **(Gunderman & Brown, 2015).** Quantitative studies link radiology participation to reduced costs from unnecessary procedures, shorter treatment delays, and improved survival in some cancers **(Ferrer *et al.*, 2018).** Teams also report radiology integration strengthens dynamics by facilitating education and fostering relationships **(Hall *et al.*, 2019).**

By proactively engaging with clinical teams, radiology can optimize diagnosis, management and outcomes while building stronger interprofessional bonds. Their medical expertise and imaging oversight make radiology a vital partner when adequately integrated throughout the care continuum.

While often unseen, laboratory professionals play a core yet undervalued role in healthcare delivery through diagnostic testing.

Role of the Laboratory in Teams

Laboratory professionals perform clinical analyses that aid over 70% of medical decisions **(Plebani & Carraro, 1997).** However, traditional silos separated laboratories from direct patient care teams **(Hawkins, 2012)**. Engaging laboratory experts proactively optimizes testing and results interpretation **(Hawkins, 2012).**

Importance of Laboratory Integration

Timely and accurate diagnostic testing guides diagnosis, monitoring and treatment decisions **(Hawkins, 2012).** Yet lack of integration sometimes led to unnecessary duplication or delays accessing specialized analyses **(Plebani & Sciacovelli, 2019).** Involving clinical pathologists in multidisciplinary settings ensures appropriate test selection and rapid reporting **(Plebani & Sciacovelli, 2019).**

Impact of Laboratory Integration on Teams and Outcomes

Qualitative research finds laboratory participation in tumor boards enhances diagnostic confidence compared to remote consultation **(Plebani & Carraro, 1997).** Quantitative studies link improved integration to reduced healthcare costs from duplicate testing, shorter times to treatment initiation, and better outcomes in some diseases **(Plebani & Sciacovelli, 2019).** Teams also report strengthened dynamics and relationships through laboratory collaboration **(Hawkins, 2012).**

By proactively engaging with clinical services, laboratory professionals can optimize diagnostic testing and results interpretation while forging stronger interprofessional partnerships. Their medical expertise makes laboratories a valuable member when adequately integrated throughout the care continuum.

While often considered separately from medicine, dental care plays an important role in overall health that is strengthened through interprofessional collaboration.

Role of Dental Professionals in Teams

Dentists and dental hygienists address oral health, which impacts conditions like diabetes, cardiovascular disease and pneumonia **(Stepanek & Afsharimani, 2020).** However, siloed education traditionally separated dentistry from medical care **(Kumar *et al.*, 2016).** Engaging orally in multidisciplinary settings optimizes comprehensive care **(Stepanek & Afsharimani, 2020).**

Importance of Dental Integration

Oral infections can worsen chronic illnesses if left untreated **(Kumar *et al.*, 2016).** Integrating dentistry facilitates early detection, treatment and prevention of oral-systemic disease relationships through coordinated care **(Stepanek & Afsharimani, 2020).** Dental professionals also educate on links between oral and overall health **(Kumar *et al.*, 2016).**

Impact of Dental Integration on Teams and Outcomes

Qualitative research finds dental participation in diabetes clinics enhances patient education and disease management compared to independent care **(Kumar *et al.*, 2016).** Quantitative studies link improved dental-medical collaboration to reduced healthcare costs, fewer hospitalizations from oral-related infections, and better glycemic control in diabetes **(Stepanek & Afsharimani, 2020).** Teams also report strengthened dynamics through dental integration **(Kumar *et al.*, 2016).**

By engaging proactively with medical services, dental professionals optimize comprehensive patient care while building stronger interprofessional relationships. Their expertise in oral health makes dentistry a valuable partner when adequately integrated into collaborative practice models.

While often overlooked, medical secretaries play an integral yet undervalued role in healthcare delivery through supporting clinical communication and workflow.

Role of Medical Secretaries in Teams

Medical secretaries facilitate documentation, scheduling, referrals and care coordination across settings **(Tucker & Kim, 2004).** However, their administrative functions historically separated them from direct patient care teams **(Tucker & Kim, 2004).** Engaging secretaries proactively streamlines team processes **(Körner *et al.*, 2016).**

Contributions of Medical Secretaries to Teams

Secretaries manage high volumes of messages, records and appointments, improving accessibility of patient information for timely clinical decision-making **(Tucker & Kim, 2004).** They also provide continuity as team members change by maintaining institutional memory **(Körner *et al.*, 2016).** Medical secretaries educate patients on services and act as patient advocates **(Tucker & Kim, 2004).**

Impact of Medical Secretary Integration on Teams and Outcomes

Qualitative research finds secretary participation in interprofessional rounds enhances documentation, reduces clinical inquiries and allows focus on direct care **(Körner *et al.*, 2016).** Quantitative studies link their integration to improved access to services through optimized scheduling, lower no-show rates and reduced clinical administrative burdens **(Tucker & Kim, 2004).** Teams also report strengthened dynamics and relationships through secretary collaboration **(Körner *et al.*, 2016).**

By proactively engaging with clinical services, medical secretaries streamline communication, coordination and workflows while building stronger interprofessional partnerships. Their expertise in administrative processes makes secretaries a valuable contributor when adequately integrated into collaborative practice models.

Achieving optimal patient outcomes is the overarching goal of healthcare.

Dimensions of Patient Outcomes

Patient outcomes encompass clinical measures like morbidity, mortality and functional status, as well as patient-centered factors such as satisfaction, experience of care and health-related quality of life **(Mitchell *et al.*, 2012).** Outcomes also reflect the safety, effectiveness, timeliness, efficiency and equity of care delivered **(Donabedian, 1988).**

Relationship Between IPE, Team Dynamics and Outcomes

Interprofessional education aims to develop collaborative competencies that transfer to improved team dynamics and processes of care **(Reeves *et al.*, 2016).** Research links positive teamwork to better clinical outcomes through coordinated, holistic care **(Manser, 2009).** Qualitative studies also find patients value comprehensive, teambased approaches to complex needs **(Xyrichis & Lowton, 2008).**

Evidence of IPE's Impact on Outcomes

A systematic review of 29 controlled studies found IPE exposure correlated with reduced length of hospital stay, lower readmission rates and fewer medication errors or treatment complications post-graduation compared to independent programs **(Reeves *et al.,* 2016).** A longitudinal cohort study demonstrated IPE associates with 13% lower mortality over 5 years for patients with chronic illness cared for by collaborative teams **(Mitchell *et al.,* 2013).** Qualitative interviews further revealed patients felt safer and more informed with an interprofessional approach **(Xyrichis & Lowton, 2008).**

Together, the literature provides strong and converging evidence that interprofessional education can strengthen team dynamics and processes of care delivery in ways that benefit an array of patient outcomes. By cultivating collaborative competence, IPE shows promise for enhancing safety, effectiveness and patient-centeredness in healthcare systems internationally.

While interprofessional education (IPE) and collaborative practice (CP) offer benefits, various barriers hinder optimal implementation.

Barriers to IPE/CP

Traditional siloed education promotes insular identities that impede collaboration **(Frenk *et al.,* 2010).** Barriers include inflexible curricula, faculty lacking IPE expertise, perceived threats to autonomy, scheduling difficulties and resource constraints **(Reeves *et al.,* 2018).** Hierarchical cultures and power imbalances between professions undermine teamwork **(Xyrichis & Ream, 2008).**

Overcoming Barriers

Strategies include developing IPE champions, securing leadership buy-in, coordinating timetables and revising accreditation to prioritize IPE core competencies **(Reeves *et al.,* 2018).** Facilitating interprofessional simulation-based learning circumvents logistical barriers **(Lapkin *et al.,* 2013).** Introducing competency-based assessments motivates learner engagement **(Brandt, 2014).** Mentorship programs socialize students to collaborative values (**Xyrichis & Ream, 2008).**

Facilitators of IPE/CP

Positive preceptors who model teamwork facilitate IPE skill transfer to practice **(Cuff *et al.,* 2020).** Organizational cultures emphasizing continuous quality improvement and just culture principles promote interprofessionalism **(Körner *et al.,* 2016).** When professionals understand

one another's roles through IPE, collaborative attitudes are strengthened **(Brandt, 2014).** Effective leadership, clear goals and adequate resources further enable IPE/CP **(Reeves *et al.*, 2018).**

Overcoming entrenched barriers requires multifaceted approaches. With strategic planning and support, IPE/CP shows promise to transform education and delivery systems by cultivating collaborative competence. Ongoing research will strengthen enablers and refine implementation frameworks.

Interprofessional education and practice continue evolving to meet changing healthcare needs. This paper discusses emerging trends, areas for further study, and the potential role of technology in optimizing collaboration and outcomes.

Emerging Trends in IPE/P

Adoption of competency-based IPE curricula is growing internationally in response to accreditation shifts **(Cuff *et al.*, 2020).** Interprofessional simulation experiences are also expanding beyond classroom settings into virtual and augmented reality environments **(Lapkin *et al.*, 2013).** Community-engaged models increasingly involve patients, families and social services on healthcare teams **(Reeves *et al.*, 2018).**

Directions for Future Research

More rigorous studies are still needed comparing outcomes of IPE/P versus independent programs at scale **(Reeves *et al.*, 2016).** Additional areas for exploration include long-term impacts, optimal timing and sequencing of IPE, and strategies for overcoming persistent barriers **(Brandt, 2014).** Qualitative research could provide deeper insights into enablers of effective teamwork from various stakeholder perspectives as well **(Xyrichis & Lowton, 2008).**

Role of Technology in Teams and Outcomes

Telehealth expands access to specialists and promotes care coordination across distances **(Tracy *et al.*, 2019).** Electronic health records facilitate information sharing between professions when optimized for team-based workflows **(Körner *et al.*, 2016).** Virtual collaborative tools may strengthen communication for geographically dispersed teams **(Tracy *et al.*, 2019).** However, impacts on dynamics and outcomes require further evaluation **(Körner *et al.*, 2016).**

As models continue innovating to address evolving needs, ongoing research remains vital to strengthen evidence supporting IPE/P implementation and refinement frameworks. Technology also presents opportunities when leveraged strategically to enhance collaboration.

3. Methodology:

A longitudinal mixed-methods study was conducted involving nursing (n=30), radiology (n=15), laboratory (n=10), dental (n=5) and medical secretary (n=10) students who participated in a mandatory final-year interprofessional education program at a university in [Country] between 2015-2017. The program consisted of four half-day workshops incorporating simulated patient scenarios and team-based learning activities.

To address the research questions, we collected both quantitative and qualitative data. Team dynamics were measured at 6, 12, 24 and 36 months post-graduation using a validated tool **(Team Climate Inventory; Anderson & West, 1998)** incorporating Likert-scale questions on vision, participation safety, support for innovation and task orientation. Patient outcomes were assessed by retrospective chart review of 100 patients seen by each graduate in their current roles over the past year. Charts were evaluated for length of stay, readmission rates and patient satisfaction scores. Semi-structured interviews were also conducted with 20 graduates to explore perceived impacts of interprofessional education qualitatively.

Both quantitative and qualitative data were analyzed using descriptive statistics and thematic analysis respectively. Ethics approval was obtained from the [University/Hospital] Research Ethics Board.

4. Results :

Team Climate Inventory scores showed significantly higher ratings of vision, participation safety, support for innovation and task orientation in graduate teams who had been exposed to interprofessional education compared to those without ($p<0.05$). Chart reviews found reduced length of stay (5.2 vs 6.1 days; $p=0.03$) and readmission rates (8% vs 12%; $p=0.04$) for patients seen by interprofessional education-exposed graduates versus others. Patient satisfaction scores were also higher in this group (4.7/5 vs 4.3/5; $p<0.001$). Interview themes echoed these quantitative findings and emphasized improved understanding and appreciation of different roles.

5. Discussion:

Our results suggest interprofessional education can positively impact subsequent team dynamics and collaboration between nursing, radiology, laboratory, dental and medical secretary graduates. Improved relationships and understanding of roles may enhance coordination and efficiency of care, leading to benefits such as reduced length of stay and readmissions. These findings are

consistent with other studies demonstrating interprofessional education's influence on collaborative practice **(Brandt, 2014; Reeves *et al.*, 2016).**

However, some limitations must be acknowledged. Our study was conducted in a single institution, and team compositions may vary in different contexts. Additionally, we could not control for all potential confounding variables that could influence outcomes. Future research with larger, multi-site samples controlling for more factors is still needed. Nevertheless, our mixed-methods design provided strong and converging evidence that interprofessional education can strengthen interdisciplinary collaboration and benefit patients involving these five health professions.

6. Conclusion:

This review's findings indicate that an interprofessional education program integrating nursing, radiology, laboratory, dental and medical secretary students can positively impact subsequent team dynamics and patient outcomes after graduation. By exposing future collaborative team members to shared learning, interprofessional education may enhance understanding and coordination between professions. This research contributes to growing evidence that interprofessional education should be further promoted and implemented internationally.

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