



# NAP

**National Academies of** **ractice**

**STATE OF THE SCIENCE:  
A SYNTHESIS OF INTERPROFESSIONAL  
COLLABORATIVE PRACTICE RESEARCH**

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## Introduction

Interprofessional team-based health care is not new as both interprofessional education (IPE) and interprofessional collaborative practice (ICP) have fallen in and out of popularity since the 1970s (Brandt, Lutfiyya, King & Chioresol, 2014). The recent upswing in focus and momentum stems from recognition by the Institute of Medicine (IOM) that interprofessional teams may be best to deliver safe and effective patient-centered care (IOM, 2003). The World Health Organization Framework for Action on Interprofessional Education and Collaborative Practice (WHO, 2010) suggested interprofessional education as the avenue for health professionals to learn how to improve collaboration with each other and ultimately improve quality of care for individuals, families, and communities. Interprofessional practice was defined as the practice that occurs when health care workers from different professional backgrounds work together to deliver the highest quality of care (WHO, 2010). In addition, the National Center for Interprofessional Practice and Education (NEXUS) was established in 2012 to lead, coordinate, and study the advancement of collaborative, team-based education and practice, and their work highlighted the need for team-based care while underscoring the value of IPE and ICP. Others have discussed the value of IPE (Speakman & Arenson, 2015; Institute of Medicine [IOM], 1972; 2003; Thibault, 2013; Lutfiyya et al., 2016).

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**The purpose of this paper is two-fold. The first purpose is to review the extant research on interprofessional practice and identify current knowledge of the relationships of education to interprofessional practice and interprofessional team-based practice processes. In addition, the relationships between interprofessional practices and patient and health care system outcomes, such as length of stay, hospital readmissions, patient satisfaction, patient safety measured by falls, health care quality with provider adherence to clinical practice guidelines and health care costs are explored. The second purpose of this paper is to identify gaps in knowledge as a first step toward suggesting a research agenda to bolster interprofessional collaborative practice knowledge.**

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As a national organization comprised of 14 different health care professionals, the National Academies of Practice's (NAP's) vision is to lead and exemplify interprofessional healthcare that promotes and preserves health and well-being.

### **Methods: Search Strategy**

An exploratory search was conducted using 16 terms related to interdisciplinary teams in CINAHL Plus with Full Text, Business Source Premier, Human Resource Abstracts, ERIC, MEDLINE PsycINFO, Cochrane Central Register of Controlled

Trials, Cochrane Database of Systematic Reviews while limiting the dates to 2014-2017 and applying filters for research in Medline and CINAHL. A total of 2,137 articles were initially retrieved. Search terms were refined, and 53 articles were retrieved following the paper's committee's review of more than 119 articles.

A separate search was conducted for research articles published in the *Journal of Interprofessional Education and Practice (JIEP)*, the National Academy of Practice's professional online journal published between December 2015 (journal's first issue) and March 2018. Of 90 original articles published in that time frame, 19 research articles are included in this paper.

NAP Policy Committee members were each assigned between 7 to 9 articles to read and used a Literature Review Template to critique each article in the areas of design, methods such as sample/setting, data collection, protocol and findings. Finally, the review included statements about interprofessional practice/education/research implications. The evidence tables informed this paper.

In addition, grey literature was reviewed from the following national and international organizations that promote evaluation of interprofessional practice and education: World Health Organization (WHO), Institute of Medicine of the National Academies, Interprofessional Education Collaborate (IPEC), Agency for Healthcare Research and Quality (AHRQ), Institute for Health Care Improvement (IHI), Center for Medicaid and Medicare Innovation, Josiah Macy Jr. Foundation, NEXUS, Robert Wood Johnson Foundation, US Department of Health and Human Services and Texas Tech University HS Center Quality Enhancement Plan. Synthesis of the organizational data was used in the development of the introduction to the paper to set the stage through discussions of current frameworks around interprofessional practice/education/research.

## **Relationship of Interprofessional Education to Collaborative Practice**

Speakman and Arenson (2015) wrote a commentary suggesting our current acute care-based, technology-driven specialized health care system is fragmented and focused on system and provider needs rather than those of patients and families. It has been suggested comprehensive care is best provided by health care teams rather than individual providers. Further, the interprofessional teams must be patient-centered with focus on safety and care quality (Reeves, Tassone, Parker, Wagner and Simmons, 2012). Team training in educational programs lags the actual practice of functioning in teams (National League for Nursing Board of Governors, 2015) in practice settings. Yet, several authors and organizations suggest healthcare professional educators must teach and model collaborative practice and team-based approaches to stimulate interprofessional team building in practice settings and better prepare providers of today and tomorrow to engage in interprofessional collaboration (National League for Nursing Board of Governors, 2015; Speakman & Arenson, 2015; WHO, 2010; Thibault, 2013).

West and colleagues (2015) described a large-scale simulation training exercise suggesting interprofessional healthcare teams have direct impact on patient safety and

quality of care and that team evaluation is critical. The IOM (2015) reported the need for measuring the impact of IPE on collaborative practice and patient outcomes and published *The Interprofessional Learning Continuum* (IPLC) Model to understand the relationships of education to practice plus a broad array of learning, health, and system outcomes. The overarching concepts in the model (learning continuum, outcomes, and enabling and interfering factors) provide a framework for research that could continue building on current knowledge and allow researchers, scientists, and educators to collate data more efficiently.

Recently, interprofessional collaboration and team-based care are considered a high priority (Pilon, Ketel, & Davidson, 2015). A review to identify the best evidence of effective educational university-based interventions concluded that students' attitudes and perceptions toward interprofessional collaborative education were enhanced by educational interventions (Schwindt et al., 2017; Wietholter et al., 2017). Inconclusive evidence was found to determine if positive perceptions were sustained over time or led to interprofessional collaboration in practice (Lapkin, Levett-Jones, & Gilligan, 2011).

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**It appears the relationship between interprofessional education and collaborative practice needs further exploration. Yet there is an underlying assumption that educational interventions are logically a first step toward expanding actual collaboration in practice settings.**

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IPE in practice settings has gained interest by providing exposure to actual interprofessional practice in clinical placements. Findings from a qualitative study in Australia using focus groups with health sciences' students during their interprofessional community placements reported they gained increased understanding of interprofessional practice, enhanced professional skills and attitudes, and a broadened knowledge of professional practice (Brewer, Flavell & Jordon, 2017).

Furthermore, recent research has been published highlighting the benefits of interprofessional collaboration among students in a variety of disciplines using participatory instruction, including medicine, nursing, social work, nutrition, speech-language pathology, physical therapy, audiology and music therapy (Ekpe, McCarthy & DiGiovanni, 2017). For instance, Reising et al. (2017) evaluated a longitudinal simulated program to enhance communication and team development for nursing and medical students. This targeted training simulation was found to improve interprofessional communication and team skills among students. Another recent article developed a conceptual framework for interprofessional collaborative communication based on the literature, tested it with medical student communications and validated the findings utilizing feedback from nurses (Oza, Wamsley, Boscardin, Batt & Hauer, 2017). Relevant findings indicate information exchange and collaborative decision-making could enhance interprofessional collaborative communication. Finally, Clay and

colleagues (2018) analyzed the overall state of IPE in the US via a cross-sectional survey and found that between 2010 and 2015, there was a significant increase growth in IPE. Faculty development and dedicated resources toward IPE may be necessary to continue this promising trend.

## **Interprofessional Teams**

Interprofessional teams in practice settings are the focus of a body of knowledge that has been approached in multiple ways including team development, team training, team function and management, team meetings and team decision-making. There is evidence (IPECC, 2016) that examines the processes of teams and identifies barriers and facilitators of collaboration on health care teams, as well as core competencies for interprofessional collaborative practice. Together these topics suggest scholarly perspectives on interprofessional health care teams and may be the interim step between IPE endeavors and actual collaborative practice and patient outcomes. Each of the team topics mentioned will be explored in this paper with a view of current evidence on the topic.

In some studies, the composition of the team studied was described (Pilon, Ketel, & Davidson, 2015; Styron, Dearman, Whitworth, & Brown, 2014; Baldwin, Wittenberg-Lyles, Oliver, & Demiris, 2011; Gilardi, Guglielmetti & Pravettoni, 2013). Missing from the existing literature is an exposition of recommended interprofessional team composition. This may be because team composition is likely dependent upon context and patient condition, as not all settings and situations have every health care profession represented. One exception is the mention of the need for patient and/or family representation on the health care team (Swallow, et al., 2013) plus inclusion of community health workers, lay health workers and public health professionals in social work (Speakman & Arenson, 2014).

Team Development and Team Training. The US Department of Health and Human Services has placed an emphasis on the development of nurse-led interprofessional teams, and one such team development is described in detail by Pilon, Ketel, & Davidson (2015) guided by the Toronto framework. The University of Toronto framework for the development of IPE values and core competencies outlines steps needed to develop collaborative practice. Under this framework, groups evolve into effective healthcare teams in three phases: exposure, immersion, and competency (Centre for Interprofessional Education, 2008). The process began with identifying and clarifying goals and articulating individual uniqueness and moved to demonstrating shared team values, effective communication and measuring collaborative work. Team training included the use of communication techniques that encourage succinct description with a focus on the situation, background, assessment, and recommendation (SBAR); this format is intended to keep focus during discussions between interprofessional colleagues or when talking with patients (Pilon et al., 2015). Complex case reviews held regularly afford valuable teaching opportunities for all



members of the team and for any students who might accompany team members (Pilon et al., 2015).

The Team Development Measure (TDM) (Stock, Mahoney and Carney, 2013) is a 31-item tool that measures stages of team development and provides feedback about the team's stage of development on cohesiveness, communication, role clarity, goals and means clarity. Madigosky, McNulty and Hanson (2017) surveyed over 150 teams of more than 1,000 individuals using the TDM at the University of Colorado Anschutz Center for Interprofessional Practice and Education. The instrument was tested in teams of 3-4 persons as well as teams of >40 persons who were health professional students. In a sample of 1,195 people from 145 different teams, Cronbach's alpha was .97 for the 31 items. TDM was created for clinical teams; however, team development assessments are needed in the IPE setting. Content, response process, internal structure and consequential validity data builds a strong case that using the TDM in an interprofessional classroom setting is valid and helpful. Examining data using an assessment tool developed in clinical settings provided insight about how to build teamwork skills in a classroom setting for interprofessional healthcare professions students. Practice-based training is required to realize an interprofessional working team with deep understanding of team cognition (Gilardi, Guglielmetti & Pravettoni, 2014).

Team Function/Management. An examination of several publications devoted to interprofessional team function and management revealed important elements (Sims, Hewitt, & Harris, 2015a; Regan, Mills & Ristevski, 2012; Gilardi, Guglielmetti & Pravettoni, 2014; Sims, Hewitt & Harris, 2015b; Stocker, Pilgrim, Allen, & Gijssels, 2016; IPEC, 2016; Lamb et al., 2012; Lee, Hillier & Weston, 2014). All studies found that teamwork and team's success, which is highly variable and context dependent, depends on processes, participants and context of the work in various situations (Sims, Hewitt, & Harris, 2015b). A study explored the impact of interprofessional teamwork on patient/caregiver experience and outcomes in a stroke population. Several mechanisms were identified including: collaboration and coordination; pooling of resources; individual learning; and role blurring in the team. It is clear from the study that team members must know each other's roles and responsibilities as a first step toward effective collaboration and to avoid duplication or omission of services (Sims, Hewitt, & Harris, 2015b). It is unclear how many health professional schools focus their curricula on this content. This was confirmed by 47 papers in a literature synthesis (Sims, Hewitt, & Harris, 2015a) that revealed contexts triggering collaboration and coordination included the physical proximity of team members, formal settings for collaborations, such as interprofessional team meetings, and opportunity for team members to pool their diverse knowledge and skills (Robson & Kitchen, 2007). Pooling of resources includes sharing diverse knowledge, skills, experience, influence, resources, and networks. Qualitative studies conducted in a variety of international settings such as intensive care to rehabilitation and primary care in the community supported the idea that pooling resources improved team problem-solving and integrated treatment plans (Sims, Hewitt,

& Harris, 2015a). Finally, role blurring, defined as a shared body of knowledge and skill between team members, indicates that some elements of the other professionals' roles can be taken on by others, if needed (Sims et al., 2015a). This study identified a key context of role blurring - role clarity with teams. Many positive outcomes of role blurring were uncovered including skills and knowledge acquisition. However, the reviewed literature on role blurring failed to provide evidence of the impact of role blurring and its link to patient outcomes (Sims et al., 2015a).

Another review of 24 qualitative studies by Stocker et al. (2016) and guided by the UK Centre for Advancement of Interprofessional Education (CAIPE) Framework, revealed research foci on relational factors (n=38), processual factors (n=32) and organizational contextual factors (n=37) that may impact effective interprofessional team management. They found that barriers between autonomous nurses and doctors within their silos of specialization, failure of shared mental models, and the lack of empowering parents as team members interfered with interprofessional team management and patient safety in a pediatric intensive care unit.

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**A mindset of individual responsibility and accountability embedded in a network of equivalent partners (to include patients and their families) is required to achieve optimal interprofessional care.**

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The authors concluded that bottom-up patient safety initiatives assist all care providers to learn effective interprofessional team management and must occur to foster patient safety. Additionally, Farmanova and researchers (2017) observed the development of collaboration between psychologists and physicians in family practice using focus groups and direct observation. Findings reported the use of life-cycle models, and although physicians and psychologists had differing perspectives about collaboration, both identified 2-way communication, access to and comfort in working with each other, confidence in each other's competence and mutual respect as essential for supportive and continuous collaboration.

Team Meetings. A significant body of knowledge is dedicated to team meetings, as collaborative practice communication can be challenging (Wittenberg, Goldsmith, & Neiman, (2015), and interprofessional team meetings afford opportunities to improve communication as well as learning (Nisbet, Dunn & Lincoln, 2015). Wittenberg, Goldsmith and Neiman (2015) surveyed advanced practice registered nurses (RNs) and Doctor of Nursing Practice (DNP) nurses (n=193) attending End-of-Life Nursing Education Consortium (ELNEC) programs held in 2014 in North Carolina, Oregon, California, and Washington DC. Respondents were surveyed related to communication difficulties and team composition (number of people on the team, meeting duration and frequency, discipline representation, percentage of team collaboration during team meetings and role during bad news or prognosis disclosures). The study's overall

findings about team collaboration skills suggested that the most common communication role for nurses was reminding others about outcomes and the patient's preferences during care planning. Nurses were overwhelmingly present for bad news delivery and prognostic information sharing with patients, and therefore play an essential communication role across health care settings on interprofessional teams.

Suboptimal clinical decision making may be the result of inconsistent decision-making in the context of team meetings (Lamb, Sevdalis, Vincent, & Green, 2012). An evidence-based checklist to aid the quality of multidisciplinary decision-making during team meetings was developed and validated by surgeons, oncologists, specialist nurses, and interprofessional coordinators. While team members devoted time attending meetings, efficiencies can result regarding team decisions. In fact, team members will then have immediate access to results, plans, and discussions with colleagues, which will smooth decision pathways (Lamb, Jalil, Sevdalis, Vincent, & Green, 2014). Nisbet, Dunn & Lincoln (2015) found team meetings provided practical, time-efficient, and relevant means for interprofessional learning thus bolstering perceived benefits to individuals, teams, and patients.

There is an assumption that representation from a greater number of professionals can lead to better or more informed decision-making. Raine et al. (2014) however, found that greater levels of multidisciplinary decision-making and clarity of purpose and agreed team processes provided more cohesive care implementation. Shared objectives guided and structured communication. Focused team meeting composition and conduct had important implications for team success at clinical decision-making and implementation. Moreover, administrative support for team meetings clearly has importance, because under-resourced teams may be challenged to function effectively. Finally, the role of the patient in team meetings varied (Raine et al, 2014). Cancer patients were routinely included in team meetings or were informed of the interprofessional team processes. This was not true in other specialties such as mental health care, memory clinics, or heart failure management. It is quite possible that mandates by cancer policy to provide cancer patients with written description of the interprofessional team meetings related to their specific care is the reason for cancer patients' inclusion (Raine et al., 2014). Similar inclusion of patients in team meetings is not evident for other health conditions.

#### Barriers and Facilitators to Interprofessional Collaboration on Health Care Teams

Key factors can help influence or deter successful interprofessional collaboration. Four core competency domains for interprofessional collaborative team-based practice include 1) adopting value/ethics for interprofessional practice; 2) understanding interprofessional roles/responsibilities; 3) enhancing interprofessional communication; and 4) facilitating teams and teamwork (IPEC, 2011). Additional factors that support interprofessional team collaboration include organizational structure, professional identity, scope of practice, and understanding and confronting problematic power

differentials (Belanger & Rodriguez, 2008; Goldman, Meuser, Rogers, Lawrie, L. & Reeves, S. (2010).

Ambrose-Miller and Ashcroft (2016) conducted an exploratory focus group of social workers to determine barriers and facilitators of interprofessional collaboration in health environments. Findings were similar to the IPEC interprofessional competencies (2011) and included 1) collaborative culture, 2) self-identity, 3) role clarification, 4) decision making, 5) power dynamics, and 6) communication. Participants expressed the view that decision-making in collaborative teams requires members to have a strong sense of the unique perspective they bring to the team as well as experience with IPE, which can strengthen teamwork (Nisbet, Lincoln, & Dunn, 2013). Moreover, old power dynamics may arise in which professions that have traditionally held the most power in decision-making expect to continue in that role. This phenomenon challenges processes within interprofessional teams and may disrupt collaborative care decision-making.

Jalil and colleagues (2013) studied factors influencing decision-making and decision implementation in cancer interprofessional teams. Twenty-two participants, members of interprofessional teams, were interviewed. Barriers to clinical decision-making included inadequate clinical information, lack of investigation results, non-attendance of key members, and teleconferencing failures. Barriers to implementation of team recommendations included non-consideration of patients' choices or co-morbidities and disease progression at the time of implementation. Proposed interventions to reduce these barriers included improving the information available for the discussion, improving video-conference, reducing the team caseload, and including patients more in the decision process. Of note, one of the suggested strategies was to bolster effective leadership and chairing of meetings. These interventions need further study.

Despite the recent focus on IPE and research, there is mixed evidence on whether perceptions and stereotypes among various health professions have changed to encourage and promote interprofessional practice (Michalec, Giordano, Dallas, & Arenson, 2017). Negative perceptions and attitudes toward interprofessional practice can be a barrier that hinders collaboration and potentially negatively affects patient care. A recent study examined the attitudes of hospital employees, including nurses, physicians, respiratory therapists, nurse assistants and others, toward interprofessional practice (Everett-Thomas et al., 2017). A team training course intervention was conducted and surveys were conducted pre- and post-intervention. Attitude scores toward interprofessional collaborative practice (ICP) improved among all clinical groups, but only associate degree nurses and physicians had significant improvements in scores between pre- and post-screening (Everett-Thomas et al., 2017). Likewise, Fisher and colleagues (2017) conducted a descriptive study at a pediatric academic hospital to assess clinician perception of ICP, as well as patient satisfaction. Results indicated

providers had a moderately high perception of ICP, but no relationship existed between ICP and patient satisfaction.

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**Overall, these studies indicate the need for further research and interventions to understand how attitude and perception toward interprofessional practice impacts collaboration and patient care.**

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Since the majority of the evidence on interprofessional collaboration has focused on team function and successful decision-making, it must be acknowledged that team success is closely aligned with what occurs in team meetings and how successful teams are in their processes. Likewise, the outcomes of team collaboration are best measured by patient outcomes, and less is known about the impact of teams on these measures. Therefore, the following is a discussion of literature findings on the impact of interprofessional collaboration on patient outcomes.

### **Patient Outcomes**

Interprofessional collaboration has been shown to effect patient outcomes including health measures of glycosylated hemoglobin (HgA1C), blood pressure and triglycerides. Hutchison (2014) reported outcomes measured at one-year intervals for a total of three years after initiation of interprofessional care improved diabetic patients' HgA1c by 10%, improved blood pressure (9% improvement in systolic and 5% improvement in diastolic blood pressure), and decreased triglycerides levels by 62.6%. Englehard and colleagues (2018) assessed the efficacy of a unique, interprofessional collaborative team in educating diabetic patients in self-management strategies. Utilizing a pre-post survey design, this study evaluated patients after 8 classes using the Living Well with Diabetes Program. Most patients self-reported meeting a minimum of two goals and there were reductions in BMI, weight and blood pressure. However, these improvements were not sustained at 6 months, indicating a potential need for follow-up after interprofessional interventions.

Richardson and colleagues (2016) studied mandatory interprofessional team participation related to surgical treatment of colorectal cancer patients. There was significant improvement in completeness of total mesorectal excision (2013, 0%; 2014, 76%), and in percentage of patients discussed at a team conference (2013, 41%; 2014, 53%). Patient outcomes of tumor recurrence are currently being analyzed, though it is hypothesized patients will show improvements during the total follow-up period. In this study, all three indicators significantly improved or were predicted to improve. A heart failure clinic disease management interprofessional model adapted for use in primary care settings in Oregon demonstrated improvements of quality of life and high patient satisfaction. The team consisted of internists and nurses and all medical care and pharmacotherapy were based on national guidelines (Price, Baker, Krause, & Keen,



2014). Management of certain chronic health conditions in primary care based on the integration of primary care providers and specialists into interprofessional teams demonstrates cost-effectiveness, health care outcomes, and patient preferences (Price et al., 2014). Similarly, DeLucenay and colleagues (2017) examined the impact of a nurse and pharmacist led clinic for blood pressure control. The intervention group receiving interprofessional care at the clinic had 59.4% of the patients reaching target blood pressure control, while only 33.3% of the control group reached their goal.

Results of research examining the effects of interprofessional team-based care on hospital readmission, 30-day readmission rates, and mortality rates in comparison to usual care or other models of care were inconsistent. A study that compared hospital readmission rates across 140 patient visits found the interprofessional team had a 30-day readmission rate of 14.3% compared to the 34.3% readmission rate from the physician-only team (Cavanaugh, Lindsey, Shilliday & Ratner, 2015). Interprofessional case management alone does not reduce readmission or death for high risk patients (Low et al., 2017). Patients who received an intervention that included pre-discharge planning, medication reconciliation, coaching on self-management of chronic diseases using standardized action plans and individualized care plans with written discharge instructions, appointments schedule, medication changes and contact information of the outpatient virtual ward nurse before discharge and an outpatient virtual ward team had significantly reduced 30-day readmissions compared to usual discharge care by interprofessional case management (Low et al., 2017).

Arana and colleagues (2017) found that 30-day readmission rates were not significantly increased when a manager-led interprofessional team intervention reduced length of hospital stay (0.4-day reduction for hip arthroplasty and 0.6-day reduction for total knee arthroplasty) in a quality improvement project. Alternatively, Pannick and colleagues (2015) conducted a systematic review of 6,934 articles about interdisciplinary team care interventions. Of the 23 interventions studied, 70% had no effect on length of hospital stay, 80% did not reduce readmissions, and 93% did not affect mortality. Fifty percent of the interventions reviewed did reduce complications of care, but further analysis indicated the interventions did not consistently reduce the relative risk of early readmission or early mortality. Additionally, results of the systematic review suggested interprofessional care teams had no measurable effect on health care quality measures. In that same vein, Stokes, Kristensen, Checkland, and Bower (2016) evaluated an interprofessional team case management intervention in 2,049 intervention patients compared to control patients. A small, but not significant, increase in inpatient non-elective admissions was found and there was no indication that highest risk patients benefitted more from the intervention.

In a study to evaluate adherence to orthogeriatric inpatient clinical practice guidelines after implementation of an innovative hub and spoke interprofessional team, there was an increase in adherence to guidelines for handover (transfers of patient care), nutrition support, falls prevention, and bladder management (Drabsch, 2015). In

contrast, Diop and colleagues (2017) investigated whether interprofessional team-based care practice improved adherence to process of care guidelines in primary care settings. They found no evidence that interprofessional team-based care increased adherence to the clinical practice guidelines.

A study conducted by Rotz and colleagues (2018) examined the impact of IPP experience by comparing medication histories of dental patients receiving IPP care to those receiving standardized care. A retrospective chart review was conducted on 121 patients receiving IPP vs 131 receiving usual care. Results indicate that patients receiving ICP had significantly more medication discrepancies clarified when compared to those receiving usual care. Cost outcomes of interprofessional collaborative care have been examined. In Hutchison's study of the outcomes from an interprofessional care team (2014) in diabetes care, cost savings from improved diabetic goals and outcomes was \$256,035. Similarly, Arana and colleagues (2017) determined the direct cost result of decreased length of stay for total hip arthroplasty and total knee arthroplasty patients from manager-led interprofessional team care was \$1,020 per case (total hip arthroplasty) and \$539 per case (total knee arthroplasty). In addition, Hardin and colleagues (2017) analyzed interprofessional collaborations among competing providers treating high-frequency, high-need patents (n=19) in two health care systems. Findings suggest a 54% decrease in direct expenses (\$211,129) and operating margins improved by 71% (\$84,744), indicating a need for interprofessional collaboration. In contrast, Gray and his colleagues (2010) conducted a randomized trial to examine the cost-effectiveness of the Anticipatory and Preventive Team Care [APTCare] intervention. The APTCare team consisted of physicians, nurses and support staff and targeted participants 50 years and older with chronic conditions such as Diabetes, congestive heart failure, chronic obstructive pulmonary disease and coronary artery disease. Quality of care outcomes were significantly higher in the intervention group who received APTCare when compared to the control group. The APTCare was more costly than traditional care but also more effective in improving participant outcomes. As far as team-based care, the caveat was that working in newly established teams, there was an adjustment time for development of collaborations.

### **Vulnerable Populations with Special Needs**

Given the overall benefits of interprofessional team practice, there is a need to understand how interventions may impact vulnerable populations with special needs, including those in rural areas, elderly, chronic disease, children, and others. Gougeon and colleagues (2017) searched the literature and discovered interprofessional teams had a positive impact on patient-reported health when compared to direct measures of health among community-dwellers greater than 65 years of age receiving home care. However, the study only included 6 articles which lacked overall national representation. Another recent study compared interprofessional faculty approaches within an academic health care center and in a rural community. Using a qualitative matched pair design, a total of 26 physicians (13 from each site) and 24 pharmacists (12 from each

site) were sampled. Findings indicated although there is shared interest in IPE, the groups differed significantly in their methods of teaching IPE and there is some evidence that a lack of preparation for teaching IPE is greater among the rural community (Woltenberg, Ballard, Norton, & Riddle, 2017). As a result, there may be opportunities for focused faculty development in rural areas to improve overall patient treatment.

Strunk and colleagues (2017) conducted a broad review of the literature related to interdisciplinary teams and children with autism and concluded that interdisciplinary teams are necessary for these special populations. These findings are consistent with a program evaluation study by Perron and colleagues (2017) using interprofessional collaborations to reduce childhood obesity and Type II diabetes. They found collaboration between the elementary school, university nursing students and exercise science students, a school nursing supervisor and a PE coordinator could help to improve nutrition, healthy choices and physical activity levels. Finally, Bares et al. (2018) tested an interprofessional model for nursing, medical, and pharmacy students using a HIV-clinic based educational curriculum to improve patient care and identify unmet needs of the patient population. Each of these examples demonstrates the continued need for future research and interventions in interprofessional practice among vulnerable and special needs populations.

### **Conclusion: The Way Forward**

The first purpose of this work was to review the extant research on interprofessional practice and identify current knowledge of the relations of education to interprofessional practice and interprofessional team practice processes. As the National Academies of Practice (NAP), composed of 14 professional academies that are collaborating to advance interprofessional care, we hope the current literature review and critical analysis will serve each discipline and interprofessional teams across the nation.

The second purpose of this work was to identify gaps in knowledge as a first step toward suggesting a research agenda to bolster interprofessional practice knowledge. This will serve practitioners and researchers to help prioritize research in key areas, as well as inform IPE on areas to explore practice partnerships with an eye on collaborative practice research outcomes.

More work is needed. This paper suggests that investigators need to further explore:

- ✓ The relationship between IPE and ICP.
- ✓ Inclusion of patient and/or family members on the interprofessional care team and the role of these members on interprofessional teams.
- ✓ Examining the effects of practice-based training on team cognition.



- ✓ Lack of shared mental models when professionals practice across professional boundaries.
- ✓ Empowering patients and family members on patient safety initiatives.
- ✓ Care delivery by equivalent team partners with individual responsibility and accountability.
- ✓ The relatively short length of interprofessional interventions does not always allow for examining gains or benefits derived over longer time horizons.
- ✓ Research and interventions should target vulnerable and special needs populations, as there is a paucity of evidence on this topic.

The opportunity for healthcare leaders committed to interprofessional care is to prioritize and advance the knowledge required for sustainable improvements in the patient and clinician experience. This paper and its identified gaps in knowledge provide a roadmap on future research towards closing those gaps.

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