

# Interprofessional Education for Primary Care Teams

Policy Considerations for California

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## Executive summary

### Background

Care delivered by interprofessional primary care teams — groups of health professionals and allied health workers that collaborate and share responsibilities for the care of a patient — has been shown to improve patient outcomes and to decrease burnout among primary care clinicians and staff compared to traditional models of care that place most responsibilities on the physician (Willard-Grace et al. 2014; Reiss-Brennan et al. 2016; Pany et al. 2021). The members of interprofessional primary care teams vary across practices to meet the needs of their patients and the greater community, but generally include a *core health team* in which a clinician (such as a doctor or advanced practice professional) works closely with nurses, medical assistants, and/or office staff to care for a patient. Depending on the patient's needs, the core health team may collaborate with an *extended health team* comprised of social workers, community health workers, behavioral health specialists, dentists, care managers, and pharmacists, as well as an *extended team of community providers*, such as home health aides and social service providers.

To prepare learners in the health professions for interprofessional team-based care, academic and training institutions are increasingly investing in interprofessional education (IPE) at the pre-licensure and resident levels. IPE is defined as training "students from two or more professions to learn about, from, and with each other to enable effective collaboration to improve health outcomes" (World Health Organization [WHO] 2010; Interprofessional Education Collaborative [IPEC] 2011). IPE aims to prepare learners in the health professions for interprofessional team-based care by teaching them about the roles and capabilities of other health professionals and allowing learners to practice communicating and problem-solving with team members who have different educational backgrounds. More than 24 accrediting bodies for health professional schools require accredited programs to include IPE that teaches learners at the pre-licensure and resident levels how to collaborate with interprofessional team members.

Drawing on a literature review and key informant interviews, this report aims to inform strategies to support primary care teams by: (1) summarizing current approaches to educating and training primary care teams, and (2) identifying ways that these approaches could be enhanced, spread, or scaled in California.

### Current approaches and factors affecting the education and training of primary care teams

Currently, training and education for primary care teams are delivered through two approaches: (1) IPE for students and residents in the health professions, and (2) on-the-job training for practicing primary care team members.

**IPE for students and residents.** Approaches to providing IPE at the pre-licensure and resident levels vary across academic and training institutions. Schools differ in the types of learners who engage in IPE, the duration of the IPE curriculum, and types of settings (e.g., in a classroom, virtually, or in a clinic) where IPE is delivered. Although IPE has become more common over the past decade, there are several factors that affect its successful implementation, including:

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- *Logistical factors*, especially challenges aligning the curricula and schedules across schools and the availability of physical space to host large numbers of interprofessional learners.
- *Ability to build and maintain partnerships with other health professional programs and schools.* Standalone programs that do not operate on a medical campus described this as a noteworthy obstacle.
- *Availability of faculty* with time or training to teach IPE.
- *Competing curricular demands*, especially topics that are included on licensing and board exams.
- *Availability of clinic-based learning opportunities.* Clinic-based IPE has been shown to help learners see teamwork modeled in a primary care setting and apply interprofessional skills, but key informants said it is challenging to implement due to supervisory structures and clinical protocols, so opportunities for clinic-based IPE are lacking.
- *Availability of funding to implement and improve IPE.* Several key informants described insufficient funding to support the time and resources needed to offer high-quality IPE to learners.
- *Open interpretation of accreditation standards*, resulting in variation in the duration, content, and style of IPE across schools.
- *Presence or lack of a champion for IPE among institutional leadership.* Key informants noted that having a champion for IPE was critical to ensuring the work was prioritized among the many competing demands placed on faculty and staff involved in education for health professionals.

**On-the-job training for practicing primary care teams.** On-the-job training for primary care teams takes many forms. One of the most common forms is *informal training provided during routine clinical activities, such as care team meetings or “huddles,”* to plan patients’ care. These activities provide a team-building platform where different professionals can learn from each other while planning for patients’ care. In addition, *external practice coaching* also can help train interprofessional care teams and optimize workflows for team-based care. Effective practice coaches can help primary care teams create and use team-based systems and workflows to take joint responsibility for caring for patients. Finally, *interprofessional training opportunities or simulations for practitioners and clinic staff* offer a formal training opportunity for members of care teams to hone their interprofessional teamwork skills.

On-the-job interprofessional training is important for improving team-based care and exposing all team members — especially medical assistants, community health workers, and others who are not required to obtain certification and may not have completed formal training before being hired — to the concept of interprofessional collaboration. Key informants described several factors that affect implementation of on-the-job training for primary care teams:

- *Presence or lack of a strong team-based culture.* Key informants highlighted that primary care has historically had a hierarchical structure with physicians as leaders. Efforts to train primary care teams go hand in hand with strengthening team-based culture.
- *Presence or lack of a clinic champion for interprofessional collaborative practice.* Clinic champions are typically leaders within their primary care team who are dedicated to interprofessional collaboration and help prioritize this work.

- *Support from an external practice coach.* Practice coaches can help train primary care teams and improve workflows and systems for interprofessional team-based care. However, lack of accreditation standards for practice coaches can lead to variations in the quality and effectiveness of coaching.
- *Sufficient funding.* Key informants noted that many practices do not have sufficient resources to take time away from patient care to improve interprofessional collaboration and train clinicians and staff on the skills needed to work on a primary care team.
- *The perceived value of on-the-job training for interprofessional collaboration among leaders in clinical and academic settings.* Key informants noted that enthusiasm around interprofessional collaboration in primary care can help prioritize training for care teams and catalyze innovation in this area.

### Recommendations for supporting education and training for primary care teams

Interprofessional primary care teams are the future of primary care. IPE and on-the-job training for primary care teams are needed to spread and enhance team-based primary care. Looking forward, it will be important for California to consider ways to do the following:

- **Fund demonstration projects** to foster innovation related to IPE and interprofessional collaborative practice and expand clinic-based IPE opportunities for learners and care teams.
- **Grant money to innovative institutions to package and disseminate IPE curricula and training materials** to increase access to evidence-based IPE for academic and training institutions.
- **Offer individual scholarships** to support faculty development for IPE and to mitigate barriers related to insufficient faculty with time and training to teach and oversee IPE.
- **Fund learning collaboratives** focused on IPE and interprofessional collaborative practice to help disseminate best practices and lessons learned and to cultivate peer-learning and innovation among academic and training institutions and primary care sites.
- **Support initiatives to train practice coaches using evidence-based approaches** to increase primary care sites' access to trained professional practice coaches who can help optimize team-based care.
- **Develop resources** to help make the business case for IPE and interprofessional collaborative practice.
- **Modify Graduate Medical Education (GME) funding mechanisms** to incentivize efforts to train a broader range of interprofessional primary care team members together at the same training sites.
- **Advocate for policy changes that affect primary care teams**, such as increasing the amount of money invested in primary care and shifting away from fee-for-service reimbursement toward payment models aligned with interprofessional team-based care delivery (e.g., prospective capitated payments).

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**Interprofessional team-based care has been praised as “the future of primary care” for its potential to achieve the quadruple aims of improving population health, patient satisfaction, and the work life of health care workers while reducing health care costs** (Wagner et al. 2012; Bodenheimer et al. 2014). The use of team-based care makes efficient use of patients’ and providers’ time and allows clinicians with more training to focus on complex aspects of patient care (Shipman and Sinsky 2013). Team-based care also leverages the skills of nonclinical workers, such as community health workers, in building relationships and trust with patients (Bipartisan Policy Center and the Commonwealth Fund, 2024). Numerous studies demonstrate the ability of interprofessional team-based care to improve patient outcomes and health care quality, use, and costs for patients with complex needs, and to decrease burnout among primary care clinicians and staff (Willard-Grace et al. 2014; Reiss-Brennan et al. 2016; Pany et al, 2021).

**A growing body of literature highlights best practices for interprofessional primary care teams to improve patient outcomes and the workplace satisfaction of team members.**

A 2021 report from the National Academies of Sciences, Engineering, and Medicine (NASEM), *Implementing High-Quality Primary Care: Rebuilding the Foundation of Health Care*, presents a summary of the literature on interprofessional primary care teams. For example, the report highlights the importance of well-structured teams with evenly distributed and clearly assigned tasks and optimized workflows and communication channels to improve patient care. The report cites a study of 23 high-performing practices that use innovative team-based practices, such as pre-visit planning, daily care team meetings to plan patient care, nonphysician standing orders, colocation of team members in the same physical space, and workflow mapping (Sinsky 2013; NASEM 2021). In addition, the NASEM report highlights the need for interprofessional teams to have a strong team culture where team members have good relationships and value each other’s contributions; in contrast, poorly

### What are interprofessional primary care teams?

Interprofessional primary care teams are **groups of health professionals and allied health workers** consisting of:

- A **core health team** of clinicians (such as medical doctors, nurse practitioners, physician assistants), nurses, medical assistants, and office staff
- An **extended health team** of social workers, behavioral health specialists, dentists, community health workers, care managers, and pharmacists
- An **extended team of community providers**, such as home health aides and social service providers

While primary care teams always include a clinician, the number and types of other team members vary across settings to meet the needs of the people and communities they serve. Primary care teams work together to provide coordinated and seamless care for patients and their families and share responsibilities for patients’ health outcomes.

**Source:** National Academies of Sciences, Engineering, and Medicine 2021.

### What is interprofessional team-based care?

A widely accepted definition of team-based care is **“the provision of health services to individuals, families, or their communities by at least two health providers who work collaboratively with patients . . . to accomplish goals across settings and achieve coordinated high-quality care”** (National Academies of Sciences, Engineering, and Medicine 2021). When this type of care is provided by a team of health providers with different professional backgrounds (for example, a doctor, medical assistant, and front desk receptionist working with a patient), it is considered interprofessional team-based care.

defined teams that lack a strong culture tend to lead to poor patient outcomes and lower workplace satisfaction among team members (Sinsky and Bodenheimer 2019; NASEM 2021).

**To help primary care teams work together to provide high-quality care (also known as “interprofessional collaborative practice”), there has been a growing emphasis on interprofessional education (IPE) for learners in the health professions.** IPE helps prepare learners in the health professions for interprofessional team-based care by teaching them about the roles and capabilities of other health professionals and allowing them to practice communicating and problem-solving with team members who have different educational backgrounds. In 2011, the Interprofessional Education Collaborative (IPEC) released a set of core competencies for the health professions, which called for shifting the educational experience of learners in the health professions from learning in silos to fostering collaboration and communication across professions. The competencies were endorsed by 24 accrediting body members of the Health Professions Accreditors Collaborative (HPAC) and subsequently embedded in their accreditation standards for the schools and programs for which they set guidelines (IPEC 2023). This also helped spawn the establishment of the National Center for Interprofessional Practice and Education in 2012, which disseminates research and tools to help advance interprofessional collaborative practice and IPE.

### What is interprofessional education (IPE)?

Interprofessional education (IPE) is defined as training “students from two or more professions to learn about, from, and with each other to enable effective collaboration to improve health outcomes” (World Health Organization [WHO] 2010; Interprofessional Education Collaborative [IPEC] 2011). IPE helps teach learners in the health professions about the roles and responsibilities of different care team members and helps them practice problem-solving and communicating as a team.

### IPE in accreditation standards for medical education

For most health professions, schools are required to include IPE in the curriculum to meet accreditation standards. For example, the Liaison Committee on Medical Education (LCME), which oversees medical school accreditation, stipulates in standard 7.9:

*“The faculty of a medical school ensure that the core curriculum of the medical education program prepares medical students to function collaboratively on health care teams that include health professionals from other disciplines as they provide coordinated services to patients. These curricular experiences include practitioners and/or students from the other health professions.”*

### What are the IPEC core competencies for interprofessional collaborative practice?

In 2023, Interprofessional Education Collaborative (IPEC) released the third version of the core competencies for interprofessional collaborative practice, which identifies 33 essential competencies for interprofessional collaboration across four areas:

1. **Values and ethics:** Work with team members to maintain a climate of shared values, ethical conduct, and mutual respect.
2. **Roles and responsibilities:** Use the knowledge of one’s own role and team members’ expertise to address individual and population health outcomes.
3. **Communication:** Communicate in a responsive, responsible, respectful, and compassionate manner with team members.
4. **Teams and teamwork:** Apply values and principles of the science of teamwork to adapt one’s own role in a variety of team settings.

Source: [IPEC 2023](#).

**Despite the recognition that interprofessional team-based care is critical to the delivery of primary care and that IPE is needed to advance team-based care, there are noteworthy roadblocks to the widespread implementation of interprofessional team-based care.** The literature describes wide-ranging barriers to delivering effective IPE and practicing interprofessional team-based care:

- *Limited efforts exist to standardize or evaluate IPE across schools or programs.* Although most education programs for health professionals at the pre-licensure level include IPE to meet accreditation standards, little is known about how this is operationalized, the extent to which it is occurring, or how it varies across programs.
- *Focusing on IPE for students in the health professions misses important members of primary care teams who may not receive formal training.* Some members of primary care teams, such as medical assistants or community health workers, are not required to obtain a license or complete training prior to employment, and therefore may not have any prior exposure to IPE or interprofessional collaboration (NASEM 2021).
- *Some primary care practitioners are resistant to change.* The literature highlights difficulties shifting the ingrained physician-centric model of primary care to one where interprofessional team members take joint responsibility for patient care (IPEC 2011).
- *Primary care team members may lack time and resources to implement and improve team-based care* (O'Malley et al. 2015; Sinky and Bodenheimer 2019; Rawlinson et al. 2021; NASEM 2021). Although organizations like National Center for Interprofessional Practice and Collaboration provide access to some resources to help practices measure and advance interprofessional collaborative practice, it is ultimately up to medical or administrative leaders to use these resources, which can be challenging given competing priorities.
- *Staffing shortages in health care professions make it challenging to staff and organize primary care teams* (Goodell et al. 2011; Leach et al. 2017). Shortages are especially pronounced in certain regions and in specific professions, such as physicians and behavioral health specialists. In shortage areas, there are increased demands on clinicians to care for large patient panels, making it harder for clinicians to find dedicated time to train future and current primary care team members on the skills needed for interprofessional collaboration.
- *Fee-for-service reimbursement incentivizes a high volume of procedures.* In contrast, team-based care emphasizes activities between visits, such as outreach and referral management, and between team members, such as care coordination and team meetings (Huber et al. 2023). While value-based payments are on the rise, this disconnect makes it harder for practices to make a business case for adopting and financing team-based care.

**To better understand current efforts to educate and train primary care teams and inform strategies to support primary care teams in the future, the California Health Care Foundation (CHCF) funded Mathematica to conduct a study to address the following questions:**

1. What education and training are currently in place for primary care teams?
2. How can education, training, and support for primary care teams be enhanced, spread, and scaled?
3. How can California advance the education and training of primary care teams?

As part of this study, Mathematica undertook two steps: (1) examining peer-reviewed and gray literature about interprofessional education, and (2) interviewing 14 key informants about their experiences with education, training, and support for primary care teams. We analyzed the interview data and summarized the findings from the literature review and interviews.

In this report, we discuss: education, training, and supports available to primary care teams to advance interprofessional collaboration (Section 2); strategies to enhance, spread, and scale education, training, and supports for primary care teams (Section 3); and recommendations for California to advance the education and training of primary care teams in California (Section 4). Appendix A contains additional details about methods, Appendix B highlights IPE offerings at a subset of California health professional schools, and Appendix C summarizes peer-reviewed literature about IPE at academic medical institutions (C.1) and medical centers operated by the U.S. Department of Veterans Affairs (VA) (C.2).

### **Key informants' perspectives on the importance of interprofessional collaboration in primary care**

During interviews, key informants shared their perceptions of the value of interprofessional collaboration. Key takeaways included the following:

- *Interprofessional primary care teams are critical for improving patient and provider outcomes and experiences:* Almost all key informants said they believed teams are critical for delivery of high-quality patient care. Several key informants mentioned the potential of interprofessional primary care teams to improve patient outcomes and access to care, especially through the integration of behavioral health specialists on care teams and nonclinical team members' help linking patients to resources to support health-related social needs. A few key informants noted that interprofessional primary care teams can reduce clinician burnout and therefore lower the number of medical errors.
- *Training and resources for interprofessional primary care teams are insufficient.* A few key informants noted that additional resources and training are needed for interprofessional primary care teams — not only for students and residents but also for practicing care teams. According to these key informants, this would help primary care practices make time to train team members who received insufficient or no formal IPE and offer an opportunity for teams to improve their interprofessional collaboration. As one key informant noted, "clinicians are skilled at being independent, but not skilled at being interdependent" — additional training for care teams could build this skill set.

**Source:** Mathematica's interviews with key informants.



## Section 2. What education, training, and supports are currently in place for primary care teams?

In this section, we describe education and training that currently exists for primary care teams as well as the roadblocks and supports that affect their implementation. We first describe IPE offerings at the pre-licensure and resident levels (Section 2.1) and then discuss on-the-job training and development for primary care teams (Section 2.2).

### 2.1. Interprofessional education (IPE)

Current efforts to train primary care teams have focused on providing IPE to learners in the health professions — especially at the pre-licensure (such as medical students, nursing students, and others) and resident levels. IPE requires learners with different professional backgrounds (for example, medical, nursing, pharmacy, and physical therapy) to convene to learn shared curricula and engage in learning activities, such as cases studies and simulations. Efforts to provide IPE took off in 2011 when the Interprofessional Education Collaborative (IPEC) released its core competencies, which were endorsed by the Health Professions Accreditors Collaborative (HPAC) and subsequently embedded in their accreditation standards. As of 2019, 97 percent of medical schools reported on their Liaison Committee on Medical Education (LCME) Annual Medical School Questionnaire that they required IPE for learners, up from 62 percent in 2010 (Association of American Medical Colleges [AAMC] n.d.).

#### 2.1.1. How is interprofessional education for primary care teams being implemented?

**The professional background of learners involved in IPE varies across programs.** On the 2017–2018 LCME Annual Medical School Questionnaire Part II, medical schools most commonly reported that their medical students engaged in IPE with students in baccalaureate programs for nursing (reported by 83 percent of medical schools), pharmacy (reported by 69 percent of medical schools), physical or occupational therapy (reported by 50 percent of medical schools), and physician assistants (48 percent) (AAMC n.d.). Less frequently, medical schools reported that medical students engaged in IPE with students of social work (38 percent), nurse practitioners (38 percent), dentistry (32 percent), public health (25 percent), and psychology (12 percent) (AAMC n.d.). Key informants involved in the implementation of IPE at health professional schools echoed this. Almost all said their institutions' medical and nursing school

#### Drivers of IPE

Key informants highlighted two factors that influenced their institutions' decisions to build interprofessional education (IPE) into the curriculum:

- *Accreditation standards:* Accreditation standards that mandate IPE drove many schools to embed IPE into their curricula. Key informants noted that the change in accreditation standards was prompted by IPEC's release of the core competencies for IPE in 2011.
- *Funding:* Financial support for IPE from funders such as Health Resources and Services Administration (HRSA) and the Veterans Administration (VA) enabled organizations to implement IPE — they said this funding helped them overcome start-up costs like identifying and establishing partnerships. One organization also reported using funding from a Song-Brown graduate medical education grant from the California Department of Health Care Access and Information (HCAI) to help implement IPE.

**Source:** Mathematica's interviews with key informants.

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students participate in IPE together, and a few said that their IPE programs engage pharmacy and physical therapy students. Less commonly, they described medical students engaging in IPE with students in social work or public health programs. Key informants noted that they identified other professional programs for IPE partnering based on curricular alignment, physical proximity or geographic location, and shared interest in IPE implementation. Appendix B describes the learners involved in select California universities' IPE programs as well as a brief description of their IPE models and programming.

### **IPE curricula generally aim to teach learners about other professions' capabilities and build competencies in collaboration,**

**communication, shared decisionmaking, and teamwork.** Many IPE curricula are designed to teach learners about the four areas outlined in the IPEC core competencies for IPE, including values and ethics for interprofessional practice, roles and responsibilities, interprofessional communication, and teams and teamwork. Some academic and training institutions described aligning their IPE curricula with institutional priorities. For example, one VA-based training program reported focusing on the four principal domains of IPE outlined by the VA's Center for Excellence in Primary Care (CEPC), which include: interprofessional collaboration, sustained relationships, shared decisionmaking, and performance improvement. To fulfill these competencies, key informants reported providing instruction in areas such as collaboration and communication by creating meaningful interactions between interprofessional students and having faculty demonstrate these competencies during case studies and simulations.

### **IPE commonly includes a combination of didactic teaching strategies and experiential learning techniques, such as simulations or case studies.**

Key informants reported using a combination of teaching strategies to teach learners the capabilities of different professions and to build competencies in collaboration, communication, shared decisionmaking, and teamwork. For example, the UCSF School of Medicine shared that their first IPE session is called "Our Own Differences Matter" and focuses on how to best leverage the skills and roles of each profession on the team. A key informant relayed that students find this content extremely helpful, with one medical student providing

### **Spotlight on the IPE curriculum of the University of California–San Francisco (UCSF)**

The UCSF IPE curriculum aims to provide learners in the health professions with "interprofessional didactic and clinical experiences that facilitate an appreciation of the diversity of knowledge and perspectives inherent in interprofessional teams that enhance patient care, public service, and research." The curriculum spans three levels:

- (1) **Level 1** provides students with early exposure and experience collaborating with other health care professional students in small groups in the classroom setting. Session topics include:
  - *What is it all about? Introducing core interprofessional concepts*
  - *Who is on my team? Understanding roles, responsibilities, and abilities of different professions*
  - *How will our work get done? Understanding communication, accountability, and task distribution*
  - *How to tackle challenges: conflict management and negotiation*
  - *How can we work together? Leadership and membership*
- (2) **Level 2**, students are expected to be able to apply their interprofessional collaboration skills to a standardized patient while working with an interprofessional team of colleagues. This experience aims to provide learners with an opportunity to:
  - *work with an interprofessional team to care for a patient*
  - *build knowledge of other professionals' roles in caring for patients with chronic illness*
  - *practice developing an interprofessional team care plan*
  - *receive feedback on their communication and collaboration skills*
- (3) **Level 3** engages learners in IPE through elective courses, clinical experiences, and volunteer opportunities.

**Source:** [UCSF's Program for Interprofessional Education and Practice.](#)

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the feedback that “I didn’t know nurses also do patient assessments. I thought that was our job.” Another key informant noted that their institution’s IPE curriculum involves a series of minilectures followed by case-based simulations where learners from different backgrounds worked together to develop diagnosis and treatment plans. They noted that many of the cases and examples that students work through take place in a primary care environment where interprofessional team-based care is especially important. Key informants also described efforts to teach IPE in patient-care settings, but noted that there were more roadblocks to developing this type of educational experience. For example, one key informant originally planned to have medical and pharmacy students practice interprofessional collaboration in a primary care clinic but found it too challenging to implement clinic-based IPE at the pre-licensure level given different supervisory structures (for example, nursing students require supervision by a lead nurse; pharmacy students require supervision by a pharmacist). As an alternative, they developed an opportunity for the medical and pharmacy students to collaborate at community health fairs.

### **Spotlight on the IPE caregiving certificate program of the University of Southern California (USC)**

USC offers an **IPE caregiving certificate program for social work and health affairs graduate students and professionals**. The certificate program combines didactic and experiential learning to prepare learners to work in health-related settings where they will provide team-based care with other health professionals *and* caregivers — especially those who assume caregiving responsibilities for vulnerable populations such as older adults, veterans, children and youth with special needs, and immigrants and refugees.

The nine-unit certificate program aims to help learners “apply the core IPEC competencies to caregiving with vulnerable populations through a social justice and intercultural competence lens.” Examples of courses include:

- Interprofessional Education, Team-based Care and Caregivers
- Critical Decisionmaking in Integrative Social Work Practice
- Social Work Practice in Integrated Care Settings

**Source:** [USC’s Interprofessional Education Caregiving Certificate website](#).

**Formal IPE is commonly delivered as a longitudinal curriculum over multiple years, although the total number of hours varies across programs.** One key informant reported that their IPE curriculum consists of four half-day meetings per year for two years. Another organization described that their IPE curriculum consists of five two-hour learning sessions per year. Some organizations also offer once-a-year IPE training opportunities. For example, one key informant reported offering one weeklong IPE training involving more than 700 learners from seven different health professions. Most organizations reported that participation in these activities is mandatory, though one informant stated that IPE is elective for learners at their institution.

**Although efforts to provide IPE tend to be concentrated at the pre-licensure level, some graduate medical education and nurse practitioner programs offer formal IPE as part of their curricula.** There are limited data on the prevalence of IPE in residency programs, but one survey highlighted that the most common approaches to IPE for residents included classroom-based learning followed by teaching team-based approaches to patient care in the clinical setting (Al Achkar et al. 2018). Consistent with the literature, two key informants involved in implementing IPE for residents noted that these programs focused on a combination of classroom- and clinic-based learning to reinforce roles and responsibilities, as well as teamwork skills. Both key informants noted that clinic-based learning focused on role modeling

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interprofessional collaboration. For example, one program incorporates medical and nurse practitioner (NP) residents in interprofessional care teams and provides training on how to effectively lead short daily meetings, or “huddles,” to plan patients’ care.

### 2.1.2. What factors affect the implementation of IPE for primary care teams?

#### Summary of factors affecting implementation of IPE

Key informants described several factors that affected implementation of IPE:

- **Logistical factors**, such as alignment of schedules across programs and availability of physical space to host large numbers of interprofessional learners
- **Ease or difficulty of building and maintaining partnerships** with other health professional programs and schools
- **Availability of time and training for faculty** to effectively prepare and teach IPE courses and sessions
- **Competing educational priorities**, especially from topics needed for licensing and board exams
- **Presence or lack of clinic-based learning opportunities** for learners in the health professions
- **Availability or lack of financial support** for IPE to support the time and resources required to implement and improve IPE offerings
- **Open interpretation of accreditation standards**, resulting in variation in the duration, content, and style of IPE across schools
- **Presence or lack of a champion for IPE** among institutional leadership

**Logistical factors, such as the extent that schedules align across programs and the availability of physical space to host large numbers of interprofessional learners, affect the implementation of IPE.** Key informants noted that scheduling posed a major barrier to implementing IPE because it involves bringing together students from schools that operate on different academic calendars and have their own curricula. This effort makes it difficult to align the schedules of learners and faculty involved in IPE, especially because curricula are often inflexible and set well in advance. In addition, organizing IPE sessions often requires the availability of classroom spaces that can accommodate a large number of students. This poses an additional logistical challenge as many organizations lack the physical space to bring a large number of students together.

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*“The challenge is always trying to match up to the medical school curriculum, which seemed to be set in stone and never changeable.”*

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**Compared to universities that have multiple professional programs on a single campus, stand-alone schools serving a single profession face additional challenges to establishing partnerships for IPE.** Key informants noted that these schools are required to go outside their institution to identify partners and that establishing and maintaining partnerships across stand-alone programs often requires extensive, ongoing discussions to ensure the partnership is mutually beneficial for all participating schools. It is also more challenging for stand-alone schools to make a business case for IPE because their potential partners may prefer collaborating with other schools within their own institutions. In addition, IPE at these schools often requires that learners go off-site to receive training, which introduces additional logistical hurdles.

**Faculty need the time and training to teach IPE.** Most key informants noted that recruiting faculty to teach IPE at both the pre-licensure and residency levels can be challenging due to lack of time and

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competing priorities. This aligns with a study of medical residency programs that identified lack of time for teachers as the main barrier to implementing IPE for residents (Al Achkar et al. 2018). In addition, several key informants relayed that faculty often lack the training and knowledge to facilitate high-quality IPE.

**Competing demands within the curriculum — including emphasis on material required for licensing and board exams — make it difficult to find time for IPE programming.** During interviews,

organizations reported that the curricula for the health professions are largely focused on teaching material for licensing and board certification exams, leaving little time for topics like IPE. This makes it tempting for schools and learners to meet only the minimum requirements for IPE required by accreditors. The literature notes that this challenge is also experienced by medical residents. One study highlighted that competing curricular demands for residents' time threatened residents' participation and engagement in IPE (Dulay et al. 2020).

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*“Every single educational institution — schools of nursing, schools of medicine, schools of pharmacy — struggles with the same thing. You have certain competencies that you must address, and you have only so much time. And you have only so many faculty.”*

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**Clinic-based IPE is critical to teach and model interprofessional collaboration, but many academic institutions find it difficult to implement.** Consistent with the literature, many key informants noted that didactic IPE curricula need to be reinforced in clinical settings to improve learning outcomes and ultimately have the greatest impact on patient care for practicing care teams (NASEM 2021). Although IPE has become more common among health professional schools in recent years, a few key informants noted that there continue to be insufficient opportunities for IPE in clinical settings. Key informants noted that this tends to be related to logistical challenges with schedules, supervisory structures, and clinical protocols. Programs that have effectively implemented clinic-based IPE, such as the VA's residency program, highlight the value for trainees and care team members, in that it helped reinforce team-based workflows.

**Financial support for IPE is critical to its successful implementation.** All key informants emphasized the importance of funding for IPE, noting that there are limited funding opportunities for schools and residency programs as they implement IPE. For example, one key informant noted that their organization had implemented IPE for students training to become physicians, nurse practitioners, physician assistants, and pharmacists, but they were forced to decrease the number of students that could be included in the training after seven years of operation due to a lack of funding. Many IPE programs also emphasized that they operate on a very small budget and are not able to allocate funds for development or enhancement of IPE activities. As one key informant stated, “[IPE] is taking on something extra and it's very hard to do without extra funding.” A couple of key informants highlighted the potential of grant funding to overcome financial barriers to implementing IPE, including federal Health Resources and Services Administration (HRSA) and California state Department of Health Care Access and Information (HCAI) Song-Brown grants.

### Resources and tools for IPE

Key informants said they used and valued the following resources, tools, and opportunities for peer learning related to IPE:

- [Nexus resources from the National Center for Interprofessional Collaboration and Practice](#)
- [University of Washington IPE tool kits, such as the interprofessional error disclosure simulation training](#)
- [Interprofessional Education Collaborative \(IPEC\) convenings](#)
- [University of Alberta IPE framework](#) ▲

**Accreditation requirements for IPE accelerated the adoption of IPE, but open interpretation of these standards has led to variation in the quality of IPE offerings across schools and programs.** While most health professional schools offer some IPE to meet accreditation standards, key informants noted that the duration, participants, and content of programming vary substantially. For example, one key informant noted that some schools are just “checking a box” and offer the minimum IPE required to meet accreditation standards, whereas others offer evidence-based programming that combines didactic and clinical

learning. A few key informants noted that resources (such as IPE instructional tools, interprofessional case studies, training templates, and research on lessons learned and best practices) make it easier for organizations to adopt and expand high-quality IPE programming.

**Having a champion for IPE among institutional leadership and faculty can support IPE’s successful implementation.** A few key informants reported that leadership support for IPE helped their organizations overcome challenges, such as scheduling and budget constraints, which otherwise would have made IPE very difficult to implement. A few key informants also shared that when there is buy-in from faculty for IPE, it helps demonstrate the importance of IPE and build engagement among students. However, a couple of key informants shared that additional resources that demonstrate the value of IPE to decisionmakers at their institutions would help them get additional buy-in and support.

## 2.2. On-the-job training for primary care teams

Another approach to enhancing interprofessional team-based care is through on-the-job training for primary care team members who are employed and practicing primary care. On-the-job training takes many forms, including: informal training provided during huddles and other routine clinical activities; support provided by a practice coach or facilitator to optimize workflows for team-based care; and interprofessional training opportunities or simulations for practitioners and clinic staff. On-the-job training is critical for translating classroom-based IPE to interprofessional collaborative practice, where it has the potential to improve patient outcomes (NASEM 2021). Furthermore, because some primary care team members such as medical assistants and nonclinical staff are not required to obtain certification or complete formal training programs before being hired by a practice, on-the-job training may be some team members' first exposure to interprofessional team-based care.

### 2.2.1 How is on-the-job training for primary care teams being implemented?

**At many practices, primary care team members receive on-the-job training during daily huddles.** In well-run clinics, frequent opportunities for team members to communicate, collaborate, and receive guidance from one another can improve teamwork and patient care (Hopkins and Sinsky 2022). The literature describes huddles — short daily meetings to review patient cases, discuss care plans, and enhance workflows — as a particularly useful instrument for enhancing interprofessional collaboration and communication between primary care team members (Center for Excellence in Primary Care n.d.[a]). Huddles also provide a key team-building platform where different professionals can learn about one another's roles and work to flatten clinic hierarchies. For example, one key informant noted that staging huddles in the NP residency room, and not the physician residency room, had an impact on team members' contributions and understanding of different roles and responsibilities. Ensuring that different team members, including medical assistants (MAs), NPs, and physicians, had a chance to lead huddles also was recommended as a helpful team-building exercise. However, key informants noted that for this on-the-job training approach to be effective, clinics must have a strong team-based culture in place and an understanding of how to facilitate collaboration. If huddles do not occur routinely or are poorly led, they are less likely to advance interprofessional collaboration.

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*"How do you run [huddles]? Is it top-down? Is it hierarchical? Is it 'sit in the back and we will ask your opinion?' There is an opportunity to figure out how to use [huddles] in a way that is truly inclusive and team-building."*

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### **Spotlight: Huddle coaching at the San Francisco Veterans Affairs Medical Center (SFVAMC)**

The SFVAMC implemented huddle training, in which practicing clinicians receive training and dedicated time to become “huddle coaches,” so they can teach medical residents and nurse practitioner students (“trainees”) how to structure huddle processes and build interpersonal relationships amongst team members. **SFVAMC implemented huddle training to ensure that primary care team members — including clinicians, staff, and trainees — develop a common understanding about the purpose of huddles and the skills necessary for effective communication and collaboration.**

As part of the program, MDs and NPs selected as coaches received instruction on how to lead huddles, including completing huddle checklists and providing feedback on team checklist items or team dynamics. Coaches typically did not see patients when they were coaching huddles so that they could better focus on their role as teachers and observers to trainees and other care team members.

Lessons learned from the SFVAMC’s huddle-coaching program included:

1. **Importance of providing clear structure and guidelines for the huddle process**
2. **Allowance of time for interprofessional care teams to build interpersonal relationships**, such as through day-long retreats or didactic sessions
3. The **value of including both trainees and practicing care team members in trainings** to promote interprofessional collaboration
4. The **importance of providing dedicated time** to huddle coaches so they can focus on trainee development

As primary care practices increasingly adopt team-based care delivery models, the SFVAMC huddle-coaching program offers a robust strategy for training current practitioners and trainees in efforts to bridge the gap between IPE and team-based practice.

**Source:** Shunk et al. 2014.

**Another way to train and improve interprofessional collaboration among primary care teams is through practice coaching.** Practice coaches, also known as practice facilitators, can collaborate with primary care practices to implement team-based interventions for improved care delivery (Center for Accelerating Care Transformation [ACT Center] n.d.). UCSF’s Center for Excellence in Primary Care, a leader in practice coaching, outlines areas where practice coaches can help improve care delivery at primary care practices, including poorly functioning teams and care team workflows (ACT Center n.d.; Center for Excellence in Primary Care n.d.[b]). Practice coaching is designed to “build a practice’s internal capacity to change” by helping primary care clinics create team-based systems using evidence-based approaches that they have been trained in or have observed in the field (Grumbach et al. 2012). Key informants noted the transformative role that practice coaches can play in primary care practices. One key informant observed improved outcomes in their family medicine teaching clinic after having embedded practice coaches for over 10 years, highlighting that practice coaches helped their team make better use of team members and improved workflows. One systematic review of studies in this area found that seven of eight randomized trials observed improved care delivery in clinics with practice coaches when compared to control groups without practice coaches (Nagykaldi et al. 2005).

**Other IPE opportunities for practicing primary care teams include continuing education opportunities, practice-led trainings, and team-building opportunities.** The literature notes that many

types of continuing education programs for licensed health professionals include content on interprofessional collaboration — especially training opportunities that focus on chronic condition management, health promotion, and population health (Fowler et al. 2020). In addition, practices may dedicate time to team-building activities and practice-led training sessions to foster teamwork across professions, with emphasis on topics related to cross-training staff, enhancing communication, and giving and receiving feedback (MacColl Center for Health Care Innovation at Kaiser Permanente Washington Health Research Institute 2020).

### 2.2.2 What factors affect the implementation of on-the-job training for primary care teams?

#### Summary of factors affecting implementation of on-the-job training for primary care teams

Key informants described several factors that affected implementation of on-the-job training for primary care teams:

- **Presence or lack of a strong team-based culture**
- **Presence or lack of a clinic champion** for interprofessional collaborative practice
- **Support from an external practice coach** to improve interprofessional team-based care workflows
- **Sufficient funding** to allow practices to dedicate time to improve interprofessional collaboration and train clinicians and staff on the skills needed to work in a team-based environment
- **The perceived value of on-the-job training for interprofessional collaboration** among leaders in clinical and academic settings

**Clinicians' resistance to change has posed a barrier to interprofessional collaborative practice and on-the-job training for primary care teams.** A few key informants noted that primary care has historically had a hierarchical structure with physicians as leaders, and some clinicians are resistant to changing that culture. One key informant noted that “cultures of and between the professions serve as facilitators and barriers to the way [teams] work together,” adding further that “this is culture change work . . . you can't flip a switch and magically change the culture.” Steps toward building interprofessional practice in primary care settings go hand-in-hand with strengthening a team-based culture. Restructuring primary care teams into more collaborative units can help “untrain the physician” and flatten team hierarchies.

**Presence of a clinic champion for interprofessional collaboration can help ensure that team members receive on-the-job training to support team-based care.** Clinic champions are typically leaders within their primary care team who are dedicated to interprofessional collaboration. As one key informant noted, “Success stories are because there is top-down commitment or a [group] of people who are very committed, and [they] create a wonderful experience for everybody. That is how change is accomplished usually.” This key informant — who is also a family physician in addition to being involved in IPE at an academic institution — noted that having a clinic champion for behavioral health integration at their primary care practice was key to successfully embedding the behavioral health specialist into their care teams.

**Practice coaching can support interprofessional team-based care at primary care practices when done effectively.** While a few key informants highlighted the valuable role that practice coaches can play

in improving interprofessional collaboration of primary care teams, one cautioned that practices sometimes encounter challenges with practice coaching, as there are no accreditation standards for practice coaches to ensure high-quality coaching. A study by The Commonwealth Fund, in affiliation with the Center for Excellence in Primary Care (n.d.), further emphasizes that practice coaches need to be integrated into practices rather than viewed as external consultants. An important aspect of this teamwork is a practice coach's regular interaction with a "'champion' staff member — generally the clinician who is most interested in spearheading quality improvement efforts."

**Adequate funding is needed for primary care practices to dedicate time and effort to improving interprofessional collaboration.**

Interprofessional services often cannot be billed to health insurance providers under traditional fee-for-service payment models. Lack of reimbursement for these services can prevent the implementation

and enhancement of team-based care. With funding, practices can hire staff and ensure clinical leaders and supervisors have designated time for training team members. For example, the Kaiser Permanente medical center in Richmond, California, was awarded an innovation fund that allowed them to redesign the roles of their personnel to better address patient and team needs. In particular, the center created the population management assistant (PMA) role by hiring and training new MAs in cardiovascular risk factors, an area of critical concern for the center's region (Bodenheimer 2007). PMAs were then able to assume additional responsibilities within the care team while aiding patient management and clinic workflow. Initial funding, from grants or other sources, is an essential stopgap for interprofessional collaborative team building; however, as noted by one key informant, it is important that primary care practices receiving funding have a financial sustainability plan in place to support integrated services and team-based care following initial investment.

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*"For the last 20 years, primary care has been working very hard on transformation and how to formulate interprofessional teams to support the broader basket of patients we serve. The level of resourcing in primary care is a challenge."*

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**The perceived importance of on-the-job training for primary care teams among leaders in clinical and academic settings can catalyze innovation in this area.**

Key informants were unanimous in their agreement that greater focus on interprofessional training within clinics is critical as "in-practice is . . . where the bulk of the work is . . . [and] people in practice have to have ongoing stimulation to keep innovating or keep improving." Given that an increasing number of primary care team members may not receive IPE as part of formal training — especially medical assistants, community health workers, and other nonclinical staff — on-the-job training is even more important for getting these team members up to speed. A few key informants noted that the widespread recognition of the importance of on-the-job training for primary care teams could help advance work in this area. While there has been increasing discussion about the importance of interprofessional collaboration in practice, greater awareness is

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*"I think there is that need to transform the way organizations operate and how people interact once they are out in the field . . . so that more of the benefits of interprofessional education are realized."*

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## Section 2. What education, training, and supports are currently in place for primary care teams?

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needed to continue fostering team-based redesign in primary care settings.

## Section 3. How can education, training, and supports for primary care teams be enhanced, spread, and scaled?

**Academic and training institutions interested in implementing IPE initiatives at the pre-licensure and resident levels should hire or assign a designated IPE champion.** A few key informants noted that having champions for IPE, such as invested faculty, a designated nonfaculty IPE coordinator, and/or a clinic leader, is essential to ensure that IPE receives attention and is not inadvertently de-prioritized due to competing demands. In academic institutions, a nonfaculty coordinator could be solely responsible for handling the logistics related to IPE and work with faculty to implement IPE and overcome challenges. Within a clinic or practice setting, having invested leaders to champion the work is also crucial.

**Academic and training institutions should consider ways to increase IPE in clinical settings at the pre-licensure and resident levels — especially in community settings — to help learners experience interprofessional team-based care.** A few respondents noted that building IPE into practice and creating a longitudinal IPE curriculum will enhance training for future primary care teams. Specifically, educational programs should both introduce IPE to learners early in their classroom education and revisit it as part of clinical training when they know and have had more exposure to the types of primary care team members they will eventually work with. Respondents also highlighted the importance of expanding community-based residency programs that allow future primary care doctors to train in primary care settings with interprofessional care team members instead of inpatient settings.

**Future IPE implementation efforts should build upon existing national and statewide initiatives.** For example, the National Center for Interprofessional Practice and Education disseminates evidence and provides resources on IPE and collaborative practice that academic institutions can use to develop or enhance IPE initiatives. IPEC recently updated the core competencies for interprofessional collaborative practice in 2023, which academic institutions can use to improve IPE offerings. In addition, state initiatives — such as the Texas IPE Consortium, which aims to “foster cross-institutional collaboration in order to expand learning opportunities and reinforce value for IPE as a critical aspect of health professions education”; the Florida IPE Consortium; and the Tennessee Interprofessional Practice and Education Consortium — can serve as a model for California (Texas Tech University Health Sciences Center n.d.; Palm Beach Atlantic University n.d.; Tennessee Interprofessional Practice and Education Consortium n.d.).

**A need exists to identify ways to elevate and prioritize IPE beyond funding opportunities.** While funding can mitigate major barriers to IPE, such as lack of money and time to implement and improve upon IPE offerings at academic and training institutions, other approaches to prioritize IPE should be explored. These may include adding content related to IPE to board certification exams, requiring IPE as part of continuing education, or other approaches that elevate the importance of IPE among the many competing demands that are faced by learners and faculty in the health professions.

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*"Nothing changes unless we have payment models that support [team-based care]. Everything in the primary care transformation literature [is] relevant to IPE. Practices without coaches don't transform the way practices with coaches do."*

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**In addition to backing efforts to enhance and spread IPE, policymakers and funders should support primary care practice and system transformation to promote interprofessional collaboration and allow graduates to apply IPE knowledge and skills.** While Mathematica’s findings primarily focus on how to improve education and training for primary care teams through increased funding and support, there is also a need to transform clinical settings so that they have the infrastructure and multidisciplinary staff to practice interprofessional team-based care. This requires increasing the overall proportion of health spending dedicated to primary care so that practices can invest in the development of primary care teams (including hiring and training team members with varied professional backgrounds) and improve infrastructure and workflows to facilitate communication and collaboration among team members. In addition, new payment models that support the involvement of multidisciplinary teams in patient care are needed to sustain interprofessional primary care teams. The NASEM report “Implementing High-Quality Primary Care” (2021) calls for shifting away from fee-for-service reimbursement, which pays for doctors to deliver services, to a hybrid payment model that includes prospective capitated payments (i.e., where insurers provide a fixed amount of money per patient paid in advance to the practice for the delivery of health care services) to enable practices to receive payment for care delivered collaboratively by interprofessional team members.

## Section 4. How can California advance the education and training of primary care teams?

Interprofessional primary care teams are the future of primary care. IPE and on-the-job training for primary care teams are needed to spread and enhance team-based primary care. To support the education and training of primary care teams, we recommend that California consider a variety of approaches:

1. **Fund demonstration projects to foster innovation related to IPE and interprofessional collaborative practice and to expand opportunities for training in community settings.**

Demonstration projects could be targeted to academic and training institutions, primary care sites (including community clinics or practices), or “dyads” of schools and sites. As part of these projects, funders could require that awardees document and disseminate lessons learned to advance best practices. Examples of potential projects include:

- *Award funding to academic institutions to support the implementation and enhancement of IPE.* Awardees could use this funding to hire staff to oversee IPE, implement new IPE programming, enhance existing IPE programming (for example, by integrating more clinic-based learning into existing IPE curricula), or train faculty on IPE.
  - *Award funding to clinical sites that train health professionals to enhance IPE in clinical settings.* Primary care sites (including training institutions, community clinics, and others) that host residents and trainees could apply for funding to enhance supervision and training related to interprofessional collaborative practice. This would help relieve pressure on practicing clinicians and staff by giving them the financial flexibility to dedicate time to supervising and training the next generation of health care workers on team-based care.
  - *Award funding to community clinics to support training for care team members on interprofessional collaboration.* To help clinics overcome barriers to interprofessional collaboration (such as competing priorities and lack of time to train staff), funders could award grants to community clinics with interprofessional teams to implement IPE training programs for their workforce and optimize team-based care. Training should include extended primary care team members, such as community health workers, who may not receive formal IPE curricula through training programs.
2. **Grant money to innovative institutions to package and disseminate IPE curricula and training materials.** To improve academic institutions’ access to evidence-based IPE curricula and reduce the start-up costs associated with developing or enhancing IPE programming, funding could be provided to academic institutions that have already done this work to enable them to package and disseminate their curricula. Several academic institutions in California spent considerable time and resources developing and testing their IPE curricula. Sharing these materials could reduce the need for other institutions to “reinvent the wheel.”
3. **Offer individual scholarships to support faculty development for IPE.** Individual scholarships for faculty to learn more about IPE would help address challenges related to the lack of faculty trained in IPE and competing priorities for faculty members’ time.

## Section 4. How can California advance the education and training of primary care teams?

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4. **Fund learning collaboratives focused on IPE and interprofessional collaborative practice.** Learning collaboratives (that is, opportunities for groups to share and learn from each other) could bring together leaders from academic and training institutions and primary care practices to share their experiences and lessons learned from implementing IPE and interprofessional collaboration, to discuss ways to advance these efforts and to spark innovation.
5. **Support initiatives to train practice coaches using evidence-based approaches.** The literature and key informants highlighted the role of practice coaches in improving interprofessional collaboration in primary care settings. However, they also noted the lack of training programs and standards for practice coaches as challenges to engaging coaches who have training and expertise in practice transformation. Potential initiatives include:
  - *Fund institutions to develop evidence-based training programs for practice coaches in California.* Training programs for practice coaches could make practice coaching more accessible to clinical sites and help them enhance interprofessional team-based care.
  - *Develop a practice coach certification program in California.* Certification programs could help standardize the training received by practice coaches.
6. **Develop resources to help make the business case for IPE and interprofessional collaborative practice.** Although there is a wide base of evidence on the benefits of IPE and training for primary care teams, several key informants described a need for resources to demonstrate this to leadership at academic and training institutions and in clinical settings. Materials that tailor the evidence-base to an audience of decisionmakers may help champions of IPE garner broader institutional support for these efforts.
7. **Modify Graduate Medical Education (GME) funding mechanisms to encourage interprofessional clinical training for residents and trainees with different professional backgrounds.** Changes to GME funding mechanisms could incentivize efforts to train a broader range of interprofessional primary care team members (including nurse practitioners, pharmacists, dental professionals, physician assistants, behavioral health specialists, and pediatricians) together at the same training sites (NASEM 2021).
8. **Advocate for policy and systems change.** To advance interprofessional collaboration for primary care teams, there is a critical need to shift primary care delivery models and payment structures to ones that are supportive of collaborative, team-based practice. Key players across the state of California should advocate for policy changes that increase primary care investment and support primary care transformation. Examples include:
  - *Initiatives that increase the overall proportion of investments directed toward primary care.* This would help practices hire multidisciplinary team members and invest in infrastructure and workflow improvements to enhance interprofessional team-based care.
  - *New payment models that align with delivery of interprofessional team-based care.* This includes prospective, capitated payments that incentivize primary care teams to care for patients collaboratively, as opposed to fee-for-service payments that pay for doctors to deliver services.



#### Section 4. How can California advance the education and training of primary care teams?

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- *Efforts to expand training for future primary care team members in community (versus inpatient) settings.*

Major strides have been made in the delivery of team-based primary care over the past decade, but there remains room for improvement, especially as health workforce shortages persist and the primary care needs of patients and communities grow. While many factors affecting primary care teams (such as payment structures for primary care and cultural barriers to team-based care at individual practices) are outside the state's control, there are opportunities to expand and improve interprofessional education and training for current and future primary care team members. Looking forward, efforts to advance interprofessional collaboration are needed to achieve the goals of high-quality, patient-centered primary care.

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### Appendix A. Methods

For this report, Mathematica conducted two tasks: (1) a targeted literature review of materials on models of interprofessional education (IPE) for primary care teams published from January 2003 through July 2023, printed in English, and focused on the United States, and (2) key informant interviews with 14 people implementing or supporting IPE.

#### Targeted literature review

Mathematica examined peer-reviewed and gray literature on models of IPE and their effectiveness. We searched PubMed and Google using search strings focused on the concepts of interprofessional, teams, primary care, and models, programs, curricula, education, training, or design. For our Google search, we reviewed websites of organizations that are leading or supporting IPE. We also screened 133 articles and identified 71 of them for full-text review. Of these, 38 articles were relevant and were included in data extraction.

#### Key informant interviews

Mathematica conducted a total of 14 half-hour key informant interviews with respondents implementing or supporting IPE across the country. Interviews took place from November 2023 through January 2024. Respondents included representatives of academic institutions, medical centers, and other organizations with vested interest in IPE and interprofessional collaboration. We identified key informants with expertise in IPE and collaborative practice based on literature review findings, through recommendations from project leadership, internet searches, and snowball sampling. Though our primary interest was key informants with knowledge of initiatives to educate primary care teams in California, we also interviewed a few individuals from national or regional organizations involved in supporting the implementation of IPE and interprofessional collaborative practice.

We identified a total of 18 individuals representing 10 different organizations. We initially contacted potential key informants via email. We received responses from all individuals contacted and were able to schedule and complete 14 interviews. Each interview was staffed by two to three Mathematica team members, with one team member leading the discussion and the others taking notes. All interviews but one were recorded and transcribed, with respondents' consent. Two of the 14 interviews were excluded from the analysis due to irrelevance of content.

#### Analysis

Mathematica extracted information from the 38 relevant articles and 12 interviews on IPE models and their effectiveness into Excel matrices. Topic areas analyzed include the importance of education and training for primary care teams, interest and motivation in educating and supporting primary care teams, description of efforts to educate and train primary care teams, challenges to and facilitators of educating and training primary care teams, and recommendations for spreading/scaling education and support for primary care teams. Data were analyzed vertically to abstract themes across key informants and articles.

## Appendix B. Examples of interprofessional education (IPE) models used by California health professional schools and training programs

Organization/university	Types of learners	Description of IPE programming
<a href="#">Education in Patient Aligned Care Teams (EdPACT)</a> (formerly San Francisco VA Center of Excellence in Primary Care Education)	Internal medicine (IM) residents, nurse practitioner (NP) students, pharmacy trainees, social work trainees, nutrition trainees, mental health trainees, and podiatry trainees	IM residents are partnered with NP students in a clinic at the VA San Francisco to care for a panel of patients. Trainees participate in huddles with a team huddle coach (i.e., a clinician trained on huddle best practices), who provides feedback to trainees.
<a href="#">Kaiser Permanente School of Medicine</a> (KPSOM)	KPSOM medical students, University of Southern California pharmacy students, and Western University of Health Sciences graduate nursing students	Learners from the three schools engage in classroom and simulation-based learning over a multiyear period.
<a href="#">Loma Linda University Center for Interprofessional Education and Practice</a>	Allied health professions, behavioral health, dentistry, medical, nursing, pharmacy, public health, and religion students	Students of each of the named schools receive either didactic, simulation, or clinical IPE, or a mix of all three. IPE offerings vary per academic track, but students collaborate in a case-based and clinical simulation laboratory.
<a href="#">University of California, Davis</a>	Nursing, medicine, and physician assistant students and residents	Interprofessional groups of students and residents engage in lectures and simulations. UC Davis also offers an interprofessional teaching scholars program for medical and nursing faculty, which aims to foster development of a collaborative and innovative interprofessional teaching and learning community.
<a href="#">University of California, San Francisco</a> (UCSF)	Dentistry, medicine, nursing, pharmacy, and physical therapy students	UCSF’s “Core Principles in Interprofessional Practice” program engages students through three levels: <b>Level one:</b> Students participate in five small-group sessions in a classroom over the course of their first two years. Topics include an overview of IPE, roles and responsibilities of each profession, communication, accountability, tasking, conflict management, and leadership. <b>Level two:</b> Students engage in an interprofessional team with a standardized patient simulation. <b>Level three:</b> Students gain experience in practicing the IPE core principles through engaging in their elective coursework, clinical practices, and volunteering.
<a href="#">University of Southern California (USC) Keck School of Medicine</a>	Medicine, physician assistant, pharmacy, occupational therapy, physical therapy, nursing, dentistry, and social work students	Students in different professional programs learn alongside each other to cover the IPE curriculum and come together for Interprofessional Education Day. Medical students engage in clinical clerkships where they are exposed to and involved in direct patient care as members of interprofessional care teams.

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[Western University of Health Sciences](#)

Medicine, nursing, pharmacy, podiatry, physical therapy, physician assistant, optometry, dental, and veterinary medicine students

Trainees from all health professional schools at Western University meet via four one-credit sequential courses to engage in modified problem-based and case-based discussions. The coursework includes such themes as human factors; health care systems improvement; systems thinking; leadership; diversity, equity, and inclusion (DEI); and anti-racism and anti-bias.

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## Appendix C. Summary tables of relevant literature

The following tables summarize peer-reviewed literature pertaining to interprofessional education (IPE) at academic medical centers (Table C.1) and IPE at Veterans Affairs (VA) clinics (Table C.2).

Appendix Table C.1. Summary of literature describing IPE models at academic medical centers

Authors	IPE model <sup>1</sup>	Learners	Description	Results and implications
Block et al. 2021	Improving Patient Access, Care, and Cost Through Training (IMPACcT)	IM residents, medical students, pharmacy students and residents, PA students, and psychology externs	Trainees work collaboratively under the guidance of faculty from each discipline. The program includes huddles and a mentorship component, where residents and faculty are paired to maintain the same schedule and practice jointly throughout training.	The evaluation found increased practice and quality indicators, improved provider continuity and arrival rates, and higher patient satisfaction in the areas of coordinated care and team functioning compared to traditional resident training. Physician learners also were more likely to continue in primary care practices compared to residents not in the program, and they reported increased perceived competence in interprofessional communication and teamwork.
Coleman et al. 2008	Sharing a Team Approach to Resource Utilization (STAR)	NPs, family medicine residents, and social work students	Learners are grouped into teams to deliver longitudinal patient care in an ambulatory primary care setting. Learners also are required to attend didactic core competency conferences.	Learners reported improved interprofessional skills, ability to resolve conflict, ability to follow through on agreements, and effective interaction with team members. Learners also believed that they provided patients with superior care through team-based care.
Lie et al. 2016	Not specified	Medical students, occupational therapy students, pharmacy students, and PA students	Overseen by licensed faculty members, learners in interprofessional care teams deliver outpatient nonemergency services to underserved individuals at a student-run clinic. Training uses simultaneous care models, sequential care models, team huddles, and learner-led presentations. Learners participated in focus groups to share their experiences at the interprofessional student-run clinic.	Students described gaining knowledge of team members' roles from working with interprofessional colleagues; understanding the value of delivering effective team-based care; appreciating that patients like and perceive higher quality care when seen by multiple professions; higher consideration of career paths with underserved populations or in primary care; developing physical examination, teaching, leadership, and collaboration skills; and gaining competencies earlier than curriculum typically allows.
Miselis et al. 2022	Interprofessional Care Clinic	Medical students, PA students, social work	Learners work under the supervision of medical preceptors to deliver	The evaluation showed increased trainee growth in interprofessional skills regarding communication, roles and



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Authors	IPE model <sup>1</sup>	Learners	Description	Results and implications
	(combines longitudinal curriculum and a patient care experience)	interns, and nutrition interns	primary care to patients with chronic medical conditions and/or health-related social needs. Training includes ongoing interactive case-based didactics and patient care sessions in which all team members visit the patient simultaneously.	responsibilities, conflict management, and team collaboration for all trainees combined as well as within each individual discipline. Measures of socialization among trainees and their readiness to function in interprofessional teams increased significantly.
Phillips & Keys 2018	Primary care course	Students in dentistry, medicine, nursing, pharmacy, PA, public health, and social work	A 12-week ungraded one-credit course that teaches fundamental concepts of primary care to students who may otherwise not receive specialized primary care training. The course consisted of class presentations, readings, discussions, small group problem-solving exercises, and a half-day visit to a primary care clinic.	Almost all students recommended the course be offered again and recommended the course for other students. Most students felt the program should be expanded. Students that completed the course reported that the course influenced their decision to pursue (or continue to pursue) a career in primary care.
Pippitt et al. 2015	IPE experience	Medical students (in Years 1 and 2) and PA students (in Year 2)	Students work collaboratively in a primary care setting, supervised by primary care preceptors.	Students and preceptors reported a positive experience with IPE; students showed increased understanding of the role of the collaborative student, views about the benefits of IPE assessed before and after the work showed no difference, and students felt that IPE training benefited their educational experience and improved patient care.
Selleck et al. 2017	Nurse-led interprofessional collaborative practice (IPCP) model	Undergraduate nursing students, graduate NP students, nursing informatics students, optometry students, dietetic interns, IM residents, and Master of Public Health students	Learners participate in morning huddles and afternoon post-conferences and deliver primary care in a collaborative practice setting.	Participants were able to define IPCP and demonstrated a deep comprehension of IPCP concepts; expressed a greater awareness of discipline-specific fields with which they had little or no prior experience; identified improved communication as a benefit of working in a collaborative team-based practice; expressed increased awareness of the importance of communication across disciplines; regarded communication between providers, staff members, and patients as appropriate; and believed that patients are included in setting health care goals.
Sicat et al. 2014	Clinical interprofessional education	Pharmacy and medical students	Learners rotate through collaborative care clinics, in which each student serves on pharmacist-led and physician-led care teams. In	Based on trainee surveys, trainees did not experience significant changes in attitudes toward interprofessional teamwork but reported relatively positive attitudes at baseline. Students reported that the interactive group discussions and clinical

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Authors	IPE model <sup>1</sup>	Learners	Description	Results and implications
			addition to clinical experience, this model includes an online module and facilitated group discussions.	experience were relatively more helpful to their learning than the online modules and orientation tools that were included in the IPE experience. Responses to open-ended survey items suggest that students valued interprofessional interaction in the direct patient care setting.
Slater et al. 2020	Peer-assisted teaching (PAL)	Pharmacy students (in Year 4), medical students (in Year 2), and nursing students (in Year 3)	Fourth-year pharmacy students hold education sessions for medical and NP students regarding the use of insulin pens, proper insulin selection and dosing, and counseling points for patients with type 2 diabetes.	Based on a pre- and post-intervention survey of learners, there were improvements in learners' knowledge and confidence with selecting, dosing, administering, and counseling on insulin products. In both the pre- and post-intervention survey, more than 90 percent of medical and nursing students reported that they agreed or strongly agreed that clinical pharmacists add value to the care team; learners reported that their willingness to reach out to pharmacists for assistance with patient care increased after participation.
Weinstein et al. 2018	Interprofessional practice model and curriculum	Medical students, NP students, pharmacy students, and Master of Public Health students	Learners receive an interprofessional curriculum that includes clinical training in a primary care setting, didactic training, leadership training, and collaborative research.	The evaluation used pre- and post-intervention surveys to assess impacts of the model. Survey responses indicated that learners had positive attitudes toward team-based care at baseline. Over the course of participation, learners reported improved attitudes toward situation monitoring, limiting of personal conflict, administration support, and communication. However, there were small but statistically significant declines in metrics for one team structure and two communication items.

<sup>1</sup> Mathematica defines an IPE model as an intervention or program implemented to advance IPE for learners.

IM = internal medicine; IPCP = interprofessional collaborative practice; IPE = interprofessional education; NP = nurse practitioner, PA = physician assistant.

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Appendix Table C.2. Summary of literature describing IPE models implemented by the U.S. Department of Veterans Affairs (VA)

Authors	IPE model <sup>1</sup>	Learners	Description	Results and implications
<b>Patient Aligned Care Team (PACT) model</b>				
Gardner et al. 2019a	PACT	NP students and senior physician (post-graduate Year 2 or 3) residents	Learners participate in a half-day of didactics, QI projects, panel management sessions, and primary care clinical sessions in dyad pairs (e.g., one physician resident and one NP student). They negotiate their respective responsibilities pre- and post-visit.	NP students reported improvements in clinical skill levels, and physician residents felt that taking on a teaching role in the dyad pair was an opportunity for them to improve their practice. Observation data showed that dyads strengthened their relationships as the model went on and demonstrated mutual respect. The success of the program relied on expert faculty facilitators who understood the needs of different learners and provided guidance to dyad teams.
Gilman et al. 2014	PACT	Physician residents, NP students, and other health professions' trainees	Curricular implementation occurs primarily in the clinical practice setting where trainees collaborate to provide team-based care. Didactic sessions vary across sites, but all support workplace learning. Learners engage in reflection and interprofessional learning through case conferences.	The study looked at implementation of the PACT model with resident and NP trainees at five VA health centers. Implementation struggles largely revolved around the operational logistics and cultural disruption of integrating educational redesign for medicine and nursing and facilitating the interface between educational and clinical activities. The authors suggest that moving forward, it will be important to strengthen the union between interprofessional learning, team-based practice, and high-value care.
Harada et al. 2019	PACT	Physician residents, NP students and residents, pharmacy residents, and psychology fellows, with some participation by other professions, such as social work interns and physical therapy residents	Curriculum includes didactic and clinical practice sessions and focuses on four principal domains: interprofessional collaboration, sustained relationships, shared decisionmaking, and performance improvement.	The study aimed to assess IPE's impact on learners' career decisions. Student retention in primary care increased and students continued to use skills in interprofessional collaboration after graduation. This suggests that improving interprofessional clinical environments and increasing the value of team-based care can increase the appeal of primary care for students.
Long et al. 2014	PACT	Medical residents, NP trainees, pharmacy trainees, and health psychology trainees	Learners are assigned to a pair of MD/NP faculty providers and spend half of their time in interactive educational sessions focusing on the core domains. The remaining time is spent providing care to an	Evaluation of performance data showed that the total clinical work hours (i.e., hours providing patient care) of faculty providers more than doubled after the model had been implemented for one year. Same-day clinic access for patients increased because they were seen by members of

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Authors	IPE model <sup>1</sup>	Learners	Description	Results and implications
			assigned panel of patients. This site also offers a one-year post-master's adult NP interprofessional clinical fellowship.	the interprofessional team of NP and MD trainees and faculty.
Newell et al. 2020	PACT	Medicine residents, nursing students, pharmacy residents, and psychology trainees	Didactic tactics across the five core CoEPCEs vary according to available resources. However, each CoEPCE shares a focus on redesign and integration of health professions' education and improved alignment between educational and clinical initiatives in primary care settings.	The study assessed staff members' perceptions of the IPE curriculum and experiences working with interprofessional trainees. Staff members had a positive perception of participating in the curriculum. Efforts to improve interprofessional collaboration among trainees and providers, such as increased shared leadership, had positive spillover effects for staff members. Nonfaculty staff viewed themselves as playing an important role in trainees' interprofessional education.
<b>Patient Aligned Care Team — Interprofessional Care Update — EFECT model (PACT ICU EFECT)</b>				
Bitton et al. 2013	PACT-ICU EFECT	Physician residents and NP students	Learners use the EFECT framework (i.e., Elicit the narrative of illness, Facilitate a group meeting, Evidence-based gap analysis, Care plan, and Track changes) to develop an integrated care plan with high-risk patients and the interprofessional team, and engage patients in shared-decisionmaking.	The study used learner survey data to assess the effects of the model. Results showed significant improvements in learners' perceptions around the various elements (e.g., biological, psychological, and social) that must be considered in a patient's care and in their understanding of the roles that each of the team members can play in patient care.
Gardner et al. 2018	PACT-ICU EFECT	NP students and residents, physician residents, pharmacy residents, psychology interns, and psychology postdoctoral fellows	The model combines didactic and workplace learning. Didactic learning occurs through formal presentations about a patient's medical issues. Workplace learning occurs as learners observe and participate in decision-making on interprofessional teams.	Trainees' clinical and teamwork skills improved. Patients had more interactions with members of the team (e.g., behavioral health, clinical pharmacists, and nurse care management) compared to a high-risk control group, and participation was associated with significantly decreased hospitalizations and ED visits for patients. Analyses suggest that there was possible improvement in glycemic and blood pressure control among patients that participated in the model.

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Authors	IPE model <sup>1</sup>	Learners	Description	Results and implications
<b>IPE models focused on panel management</b>				
Dulay et al. 2018	Interprofessional Panel Management curricula	IM residents, NP students and residents, pharmacy residents, and psychology postdoctoral fellows	Instruction varies across the five VA sites, ranging from periodic formal instructional sessions to ad hoc activities within primary care settings. Each site seeks to engage trainees in learning to collaborate with interprofessional primary care team members for panel management.	The study assessed implementation of an interprofessional panel management curriculum across five VA sites. Sites reported robust curriculum implementation for physician and NP trainees while curriculum for pharmacy and psychology trainees was in the pilot stage at most sites. Authors suggested that ongoing work is needed to integrate pharmacy and psychology trainees into IPE focused on panel management activities.
Gardner et al. 2019b	PACT Panel Management	DNP students in adult, family, and psychiatric mental health NP programs; NP residents; IM residents; postgraduate pharmacy residents; and other health professions' trainees	Learners engage in supervised patient care sessions and formal didactic activities. Didactic activities focus on panel management/quality, team building/communications, and clinical content seminars. This research focuses on training related to interprofessional panel management.	Colocating learners and faculty in the primary care clinic promoted team identity and facilitated communications with trainees from other professions. Preliminary analyses suggested that primary care clinic patient panels were increasingly within target ranges for diabetes and blood pressure measures. The VA's simultaneous adoption of the medical home or PACT model was a major factor in the program's success.
<b>IPE models focused on Quality Improvement (QI)</b>				
Dulay et al. 2020	Interprofessional QI curriculum	IM residents, adult gerontology residents, pharmacy residents, NP students, and postdoctoral psychology fellows	Curriculum involves didactic sessions that highlight QI tools and concepts. Learners also work in mentored IP teams to select, design, implement, evaluate, and present a QI project.	Learners and mentors reported positive experiences working on QI projects, including improved QI skills. Several QI projects favorably influenced care processes. Approximately one-quarter of teams reported that the professional diversity of team members was a crucial factor for their QI project's outcomes.
Hunt et al. 2018	QI-based IPE model for pharmacy trainees	Pharmacy residents, IM residents, nurses, and psychologists	The curriculum includes four didactic one-hour workshops. Learners are also assigned to interprofessional teams to complete year-long QI projects.	Pharmacy residents that completed the program felt more comfortable fulfilling strong leadership roles on interprofessional QI teams. Trainees suggested that the experience improved their knowledge of different roles of members of the health care team.
<b>Other or unspecified models</b>				
Gelberg et al. 2021	Interprofessional Academic-Homeless	Psychology fellows, psychiatry residents,	Geared toward caring for veterans experiencing homeless, the IA-	This paper estimated effects of the model on patients' utilization of health care services. The evaluation found that

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Authors	IPE model <sup>1</sup>	Learners	Description	Results and implications
	Patient Aligned Care Team (IA-HPACT)	pharmacy residents, IM residents, and NP residents and students	HPACT curriculum emphasizes team-based care, humanism, well-being, relationship-centered communication, QI, panel management, and social determinants of health. Trainees are integrated into the clinic workflow for all services, including primary care, mental health care, and pharmacy visits.	integrating inexperienced trainees into care under the IA-HPACT model had no significant or adverse effects on patients' access to care or the cost of outpatient or inpatient care. Implementation was facilitated by colocation of team members, frequent meetings, the presence of clinical pharmacy, and team members' willingness to proactively address patient care needs.
Hulen et al. 2020	Not specified	IM, advanced practice nursing, psychology, pharmacy, and social work trainees	Curriculum includes didactic and clinical practice sessions and focuses on four principal domains: interprofessional collaboration, sustained relationships, shared decisionmaking, and performance improvement.	This qualitative study assessed learners' experiences with IPE through the VA CoEPCE program. Learners reported that the training broadened their understandings of primary care clinic processes and supported their ability to collaborate. Many also said the experience shifted their career expectations and shaped what they looked for and expected in their workplaces. Faculty role modeling of interprofessional collaboration supported student learning and contributed to changed expectations for post-graduation work environments.
Molander et al. 2017	Patient Aligned Care Team: Primary Care — Mental Health Integration (PACT PC-MHI)	Psychiatry residents, pharmacy/MH residents, pharmacy/ambulatory care residents, and social work interns	The program has a strong emphasis on experiential learning with a clinical rotation combined with protected IPE weekly learning time. The program is intended to support the integration of primary care and behavioral health through building interprofessional competencies.	Trainee program evaluations were favorable, and trainee skill and confidence improved significantly. Cross-disciplinary supervision was highly valued by trainees, and case-based learning in small groups encouraged trainees to share perspectives on their disciplines. Motivational interviewing training was one of the IPE experiences most valued by trainees and staff, as it created an opportunity for a shared learning environment because most trainees started at the same skill level. Rotation schedules and academic calendars posed challenges but were mitigated by close collaboration between training directors and support staff.

<sup>1</sup>Mathematica defines an IPE model as an intervention, curriculum, or program implemented to advance IPE for learners.

CoEPCE = Center of Excellence in Primary Care Education; DNP = doctor of nursing practice; ED = emergency department; IM = internal medicine; IP = interprofessional; MD = medical doctor; MH = mental health; NP = nurse practitioner; PACT-ICU = patient aligned care team interprofessional care update; QI = quality improvement.