


Accelerated competency-based education in primary care (ACE-PC): a 3-year UC Davis and Kaiser permanente partnership to meet California's primary care physician workforce needs

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ABSTRACT

Problem: Our nation faces an urgent need for more primary care (PC) physicians, yet interest in PC careers is dwindling. Students from underrepresented in medicine (UIM) backgrounds are more likely to choose PC and practice in underserved areas yet their representation has declined. Accelerated PC programs have the potential to address workforce needs, lower educational debt, and diversify the physician workforce to advance health equity.

Approach: With support from Kaiser Permanente Northern California (KPNC) and the American Medical Association's Accelerating Change in Medical Education initiative, University of California School of Medicine (UC Davis) implemented the Accelerated Competency-based Education in Primary Care (ACE-PC) program – a six-year pathway from medical school to residency for students committed to health equity and careers in family medicine or PC-internal medicine. ACE-PC accepts 6–10 students per year using the same holistic admissions process as the 4-year MD program with an additional panel interview that includes affiliated residency program faculty from UC Davis and KPNC. The undergraduate curriculum features: PC continuity clinic with a single preceptor throughout medical school; a 9-month longitudinal integrated clerkship; supportive PC faculty and culture; markedly reduced student debt with full-tuition scholarships; weekly PC didactics; and clinical rotations in affiliated residency programs with the opportunity to match into specific ACE-PC residency tracks.

Outcomes: Since 2014, 70 students have matriculated to ACE-PC, 71% from UIM groups, 64% are first-generation college students. Of the graduates, 48% have entered residency in family medicine and 52% in PC-internal medicine. In 2020, the first graduates entered the PC workforce; all are practicing in California, including 66% at federally qualified health centers, key providers of underserved care.

ARTICLE HISTORY

Received 13 November 2023
Revised 21 June 2024
Accepted 24 July 2024

KEYWORDS

Primary care; competency-based education; workforce diversity; health equity; accelerated program

Problem

Despite an urgent need for more primary care (PC) physicians [1], student interest in PC continues to decline [2–4], medical education debt grows [5,6], and the culture of academic medicine discourages students from choosing PC [7]. The presence of PC physicians in a community is associated with an improved life expectancy [8–10]. Physicians from underrepresented in medicine (UIM) backgrounds (defined as American Indian or Alaska Natives, blacks, and Hispanics or Latinos) provide a disproportionate share of care to medically underserved populations helping to advance health equity [11,12]. Patient-physician racial concordance is associated with better health outcomes including lower costs [13] and improved communication [14]. However,

UIM student representation in medical schools is declining [15] due to financial and educational barriers and longstanding structural inequities [16,17]. Accelerated training allows graduates to enter the workforce sooner, increasing their years in PC practice and addressing the shortage of UIM physicians [18].

In 2014, University of California Davis School of Medicine (UC Davis) implemented the Accelerated Competency-based Education in Primary Care (ACE-PC) program with Kaiser Permanente Northern California (KPNC) and the American Medical Association's Accelerating Change in Medical Education initiative [19]. We describe this six-year undergraduate medical education (UME) to graduate medical education (GME) pathway for students

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committed to careers in Family Medicine (FM) or PC-Internal Medicine (PC-IM).

Approach to innovation

ACE-PC was designed with broad stakeholder input to address workforce needs, reduce medical school debt, and embed a competency-based pathway within the traditional medical school curriculum.

ACE-PC accepts 6–10 students per year using the same holistic admissions process [20] as the 4-year MD (4YMD) program with an additional panel interview prior to matriculation that includes an affiliated GME program faculty. Additional selection criteria include a demonstrated commitment to PC and underserved care. Factors that have attracted UIM students include the school’s commitment to diversity, program mission, and local media coverage. Students receive full tuition scholarships (from

KPNC and UC Davis), graduating with less than one-third the debt of 4YMD students [21]. Students receive extensive longitudinal program faculty support, early clinical exposure, and GME mentoring. The small cohort and high faculty to student ratio contributes to student success and is difficult to replicate within a traditional curriculum.

ACE-PC core curriculum (Figure 1)

The program emphasizes authentic PC experiences, mentoring relationships with PC physicians role models, and intentional professional identity development. Students complete the same educational objectives and assessments as 4YMD students on a modified timeline. Affiliated GME programs provide clinical training sites, exposing students to their faculty and institutional culture. Students

| | June | July | Aug | Sept | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May |
|------|---|--|-------------------------------|------|-----|-----|-----|------------------------|--|-----------------------|-----|---------------------|
| YR 1 | Clinical Skills Summer Immersion | | Traditional year 1 Coursework | | | | | | | | | PC Clinic Immersion |
| | Biweekly longitudinal PC Clinic Biweekly PC didactics | | | | | | | | | | | |
| YR 2 | PC Clinic Immersion | Traditional year 2 Coursework | | | | | | | Step 1 Exam | LIC: Inpatient Blocks | | |
| | | Biweekly longitudinal PC Clinic Biweekly PC didactics | | | | | | Longitudinal PC Clinic | | | | |
| YR 3 | Longitudinal Integrated Clerkship: Outpatient Ob/Gyn, Peds, Psych, Surg | | | | | | | Step 2 Exams | Post-Clerkship: Inpatient AI Specialty-Specific AI EM Advanced Clerkship 2-week Neurology 2-week Transition to Residency 2-Week Elective | | | |
| | Longitudinal weekly PC Clinic | | | | | | | | | | | |
| 4-6 | Residency: PC Internal Medicine or Family Medicine | | | | | | | | | | | |

Figure 1. Structure of the 3-year MD curriculum.

Table 1. Example didactic topics with learning objectives. And change 'The learning objectives for each session, if anchored to a UCD43 concern, are as follows' to 'The learning objectives for each session are as follows: The UCD43 is very specific to UCD and might not make much sense to a larger audience.'

| Didactic | Discipline/Topic specific Learning Objective(s) |
|---|---|
| Format: – Case discussion focused on the symptom/scenario with emphasis on clinical reasoning – Presentation by faculty or by students on an approach to the symptom/concern – Discussion of specific high-yield diseases related to the symptom or concern | The learning objectives for each session, if anchored to a UCD43 concern, are as follows: For each topic – Using a case, practice a diagnostic framework that addresses the common and life-threatening causes of the chief concern – Discuss the key elements of the history, physical exam, and diagnostic testing that are likely to lead to a diagnosis For specific disease states – Define the disease and pertinent terminology – Construct and illness script for the disease state, including prevalence, risk factors, symptoms, signs, test data, and complications if relevant – Discuss criteria for diagnosis, including the value of specific symptoms, signs, or diagnostic data in terms of likelihood ratios, if relevant – Discuss basic management |
| Chest pain | 1. Using a case, practice a diagnostic framework that addresses the common and life-threatening causes of CHEST PAIN 2. Discuss the key elements of the history, physical exam, and diagnostic testing most likely to exclude life threatening disease 3. List the common causes of CHEST PAIN |
| Edema | 1. Using a case, practice a diagnostic framework that addresses the common and life-threatening causes of EDEMA 2. Discuss the key elements of the history, physical exam, and diagnostic testing most likely to exclude life threatening disease 3. List the common causes of EDEMA |
| Dyspnea | 1. Using a case, practice a diagnostic framework that addresses the common and life-threatening causes of DYSPNEA 2. Discuss the key elements of the history, physical exam, and diagnostic testing most likely to exclude life threatening disease 3. List the common causes of DYSPNEA |
| Sleep disturbance | 1. Using a case, practice a diagnostic framework that addresses the common causes of SLEEP DISTURBANCE 2. Discuss the key elements of the history, physical exam, and diagnostic testing most likely to identify the underlying cause 3. List the common causes of SLEEP DISTURBANCE |
| Substance Use | 1. Define Substance Use Disorder 2. List DSM-V diagnostic criteria for SUD, in the context of the '4C' framework 3. Review evidence-based treatment of Alcohol use disorder 4. Review evidence-based treatment of OUD |

participate in biweekly primary care didacts (Table 1) led by master clinician educators.

Pre-clerkship

Students arrive 6 weeks before 4YMD students to complete an intensive summer clinical immersion that replaces the traditional **Year 1** longitudinal clinical skills curriculum, including the **same** final Objective Structured Clinical Examination. Students attend PC continuity clinic (PCCC) three half days a week during summer immersion and every other week during Years 1 and 2 with the same preceptor that supervises them for 3 years. Between Years 1 and 2, each student completes a four-week PC clinical at an affiliated FM or PC-IM GME program.

Clerkship

After an abbreviated study period, students take USMLE Step 1 and begin a longitudinal integrated

clerkship (LIC) with 4 weeks of inpatient IM and two-week inpatient rotations in Obstetrics and Gynecology, Pediatrics, Psychiatry, and Surgery; followed by six ambulatory months with weekly PCCC and clinics in each core discipline.

Post-clerkship

In January of Year 3, after an abbreviated USMLE Step 2 study period, students complete the required advanced clinical rotations for 4YMD students (IM, Emergency Medicine, and ICU); and either a pediatrics sub-internship (for FM applicants) or second IM sub-internship (for PC-IM applicants).

Residency match

During the LIC, students apply through the Electronic Residency Application Service and National Resident Matching Program (NRMP). Two FM programs and one PC-IM program have unique NRMP tracks for ACE-PC students only (unfilled

spots revert to the parent categorical program). GME program directors meet with ACE-PC leadership twice yearly to discuss each student's progress, facilitating a warm handoff from UME to GME.

Outcomes

Since 2014, 70 students have matriculated into ACE-PC, 71% from UIM backgrounds and 84% self-identifying as disadvantaged. MCAT scores, undergraduate GPA, and USMLE Step 1 and Step 2 scores are comparable between ACE-PC and 4YMD students. Only 10% have transitioned to the 4YMD program, compared to approximately 16% nationally for accelerated programs [22]. Of the first 40 graduates, 48% matched in FM and 52% matched in PC-IM: 42% at UC Davis, 18% at KP, and 40% at non-affiliated GME programs. All graduates progressed normally through GME; one resident in each of the first four graduating cohorts was selected to be chief resident. The first GME graduates entered the workforce in 2020; of the first 12 in PC practice, 8 work at a Federally Qualified Health Center, 2 at an academic medical center, and 2 at KP. Two PC-IM graduates completed geriatrics fellowship and one FM graduate is completing an addiction medicine fellowship.

Limitations

Accelerated programs are not advisable for all students, particularly those who need time to explore other specialties or who struggle to reach out for help. Disadvantaged students may experience personal hardships that affect performance [23–25], underscoring the need for flexibility and options for transitioning to the 4YMD curriculum. The program requires significant investment in scholarships, academic support, mentoring [26], consistent faculty development [27,28], and protected faculty time, which some institutions may be unwilling or unable to provide.

Lessons learned

ACE-PC is a successful 3-year MD pathway for diverse students committed to PC and health equity. The program leverages holistic admissions, robust scholarships, authentic PC experiences, and direct linkages to GME programs. Early PCCC cultivates professional identity development and mentoring relationships with supportive PC role models. Frequent faculty development helps develop preceptor assessment and feedback skills. The LIC cultivates long-term preceptor-student relationships while meeting the requirements of multiple core clerkships. Student success is enhanced by weekly didactics with master educators, coaching from diverse faculty

mentors, and a supportive environment in which students can learn and grow with like-minded peers.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

Drs. Fancher, Henderson and Gonzalez-Flores effort on this project was supported by a grant from the American Medical Associations ChangeMedEd grant.

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