KL2 Abstract

The rationale and fundamental goal of the UCSF Clinical and Translational Science Institute KL2 Scholars Program is to train, mentor and equip succeeding generations of exceptional and diverse junior faculty investigators with the methodologic, analytic, leadership, and team science skills required to conduct transformative clinical and translational research. The Program’s alumni, as individuals and as members of multidisciplinary teams, have made exceptional contributions to health sciences research across the lifespan. The proposed career development program is a key resource for clinical departments and research units across the campus, and does not duplicate existing training programs at UCSF. In continuing the successful KL2 program, with core faculty expertise in clinical and methodologic research, multisite studies and trials, and vulnerable populations, the Program provides a proven and vital resource for UCSF faculty from the Schools of Medicine, Nursing, Dentistry, and Pharmacy. In the proposed funding period the Program will leverage UCSF’s unique strengths and partnerships with basic scientists, biopharmaceutical investigators, and industry innovators to position its Scholars to continue to advance the field of Clinical and Translational Science, with the following proposed Aims: **Aim 1.** To recruit a superb group of professionally and ethnically diverse UCSF junior faculty KL2 Scholars and to support them for up to 3 years as they progress toward research independence with individual NIH K and R awards; **Aim 2.** To expand and enhance training and mentoring at the frontiers of clinical and translational research, in partnership with other CTSI programs, emphasizing cutting-edge research methods; **Aim 2a.** Educate, train, and mentor KL2 Scholars to take full advantage of technology-enabled research methods; **Aim 2b.** Educate, train, and mentor KL2 Scholars to plan and conduct high-quality, efficient multisite studies and trials, and successfully disseminate and implement study results; **Aim 2c.** Promote research in traditionally understudied special populations and enhance efforts to address health inequities; **Aim 3.** Promote multidisciplinary collaboration and team science through leadership training, mentorship and the creation of KL2 Scholar “teamlets” focused on addressing a specific research problem; **Aim 4.** To share and disseminate the successful elements of the KL2 Program as a model for regional collaboration. The KL2 Scholars Program is designed around in-depth education, systematic in-person activities, bringing together Scholars from widely varied disciplines with senior faculty who facilitate development of their research and professional skills. Program experience demonstrates that a “face-to-face” structure, with a strong emphasis on interdisciplinary collaboration, peer mentorship, and team science skills, is essential for the KL2 Scholars to become successful independent clinical and translational investigators.
A. Background

A.1. Overview, Program Rationale, and Aims

The rationale and fundamental goal of the UCSF Clinical and Translational Science Institute K Scholars Program is to train, mentor, and equip succeeding generations of exceptional and diverse junior faculty investigators with the methodologic, analytic, leadership, and team science skills required to conduct transformative clinical and translational research at UCSF. The “K Scholars Program” at UCSF, which integrates the KL2 and other K and career development awardees, has become one of the largest and most successful clinical and translational research training programs in the nation. Our K Scholars Program alumni, as individuals and as members of multidisciplinary teams, have made exceptional contributions to health sciences research across the lifespan. The proposed career development program does not duplicate existing training programs at UCSF, and is a key resource for clinical departments and research units across the campus. In continuing our successful K program, with core faculty expertise in clinical and methodologic research across the lifespan, multisite clinical trials, and vulnerable populations, we provide a proven and vital resource for UCSF faculty from the Schools of Medicine, Nursing, Dentistry, and Pharmacy (see Dean’ Letters of Support; Talmadge King Letter of Support). We have long fostered a multidisciplinary team science approach, and in the next funding period we will leverage UCSF’s unique strengths and partnerships with basic scientists, biopharmaceutical investigators, and industry innovators to position our Scholars to continuously advance the field of Clinical and Translational Science. We propose the following Aims:

Aim 1. To recruit a superb group of professionally and ethnically diverse UCSF junior faculty KL2 Scholars and to support them for up to 3 years with both proven and enhanced activities to accelerate their progression toward research independence with individual K and R awards.

Aim 2. To expand and enhance training and mentoring at the frontiers of clinical and translational research, in partnership with other CTSI programs, emphasizing cutting-edge research methods.

Aim 2a. Educate, train, and mentor KL2 Scholars to take full advantage of technology-enabled research methods.

Aim 2b. Educate, train, and mentor KL2 Scholars to plan and conduct high-quality, efficient multisite studies and trials, and successfully disseminate and implement study results.

Aim 2c. Promote research in traditionally understudied special populations and enhance efforts to address health inequities.

Aim 3. To promote multidisciplinary collaboration and team science through leadership training, improved mentorship, and the creation of KL2 Scholar “teamlets” focused on addressing a specific research problem.

Aim 4. To share and disseminate the successful elements of our K Scholars Program as a model for regional collaboration.

A.2. Organization of Clinical and Translational Research Training at UCSF

The KL2 program is the crucial foundation for the broader UCSF K Scholars Program, which includes junior faculty from 6 small institutional K12 programs at UCSF, individual NIH K awardees, such as the K23, K01, and K08, and those with NIH diversity supplements. The institutional K12 programs range from the Omics of Lung Disease (PI: D Earle) to Building Interdisciplinary Research Careers in Women’s Health (PI: N Adler). Over the past 5 years 35% (12/34) of Scholars from the K12 programs have participated in our K Scholars Program. The K Scholars program receives additional institutional support, and collects fees from non-KL2 scholars. Other than the salary and research funding support provided only to KL2 Scholars, non-KL2 Scholars have equal access to and participate in the full spectrum of research training opportunities. The popularity of our “K mother ship” for these otherwise isolated early faculty is demonstrated by the fact that all of the non-KL2 funded Scholars in the 2014-15 cohort have committed to another year - a considerable time commitment - and 7 new individually-funded K Scholars entered the program in 2015, including 1 each from the Kaiser Permanente Division of Research and the San Francisco Department of Public Health. The KL2 Program greatly benefits from the incorporation of non-KL2 Scholars into the K Scholars Program: KL2 Scholars are exposed to a broader range of clinical and translational research topics and methods, and have more opportunities for multidisciplinary collaboration and team building.

The broader UCSF K Scholars Program is integrated within the CTSI Training Program (CTST; Figure 1; see U54 Part D.1). CTST is composed of didactic and degree-granting programs, and level-specific training programs ranging from undergraduates to faculty. Each integrated training component of CTST draws on the
educational offerings of the Training in Clinical Research Program (TICR), provides level-specific mentoring and research experience, and is led by senior researchers who are recognized nationally for their contributions to teaching, research methods, and mentoring.

Kirsten Bibbins-Domingo, MD PhD MAS, directs the CTST and oversees all of the education and training programs, with the assistance of an Administrative Director (Christine Ireland, MA MPH) and program directors, who compose the CTST Steering Committee. These programs are: Training in Clinical Research (TICR Director, Jeffrey Martin, MD); KL2 Scholars Program (KL2 Director, Douglas Bauer, MD); TL1 Training Program (TL1 Director, Joel Palefsky, MD); Resident Research Training Program (Director, Alison Huang, MD MCR) and Pre-health Undergraduate Program (Director, Peter Chin-Hong, MD). All programs receive UCSF institutional support; the Resident Research Training and Pre-health Undergraduate Programs are fully supported by UCSF (see Deans’ Letter of Support). Dr. Bibbins-Domingo serves on the Internal Advisory Board and Senior Leadership Group of the CTSI, and will act as Co-PI of both the KL2 and TL1 awards. She chairs the CTST Steering Committee, which meets the first Monday of the month with frequent email and personal communication between meetings. This organizational structure assures that program directors are aware of and contribute to all CTST activities, and fosters synergy, collaboration, and cross-cutting endeavors across all education and training programs.

A.3. Overview of KL2 Program

Our KL2 Program was originally funded (2005) as a Roadmap K12 Multidisciplinary Training and Career Development Program. The Program is based in ~5000 sq ft of space on the first and second floors of the new Clinical Sciences and Global Health building on the UCSF Mission Bay campus, and includes state-of-the-art large classrooms, computer laboratories, conference/seminar rooms, small group meeting rooms, study rooms, and work space for Scholars based at other UCSF campuses.

Since 2011 the program has supported a total of 44 KL2 Scholars, and traditionally accepted 5-9 new Scholars per year with a commitment of up to 4-5 years of support. Our programmatic elements are designed to prepare KL2 Scholars to conduct high quality scientific research and to reach the goal of research independence by obtaining NIH R or equivalent awards.

A.3.i. Core components of the UCSF KL2 (Table A)

- **Didactic education.** The TICR Program (Training in Clinical Research), based in the Department of Epidemiology and Biostatistics and led by Jeff Martin, MD, is the core didactic program that serves the KL2 Program, offering a Master's in Clinical Research (MCR) (see Appendix 1) and a Certificate in Advanced Training in Clinical Research (ATCR). With 44 courses (see Appendix 2 for descriptions), TICR allows Scholars to focus their education across the translational spectrum, including early translational methods, clinical trials, and implementation science. All TICR students are expected to have substantive backgrounds in a biomedical or behavioral discipline and to have developed a research interest that they will cultivate. TICR operationalizes its educational philosophy by providing theoretical methodologic instruction leading to development of tangible products such as research protocols, analysis plans, and consent forms.

<table>
<thead>
<tr>
<th>Table A. Current Core Components of UCSF KL2 Program</th>
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<tbody>
<tr>
<td>Didactic Education</td>
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<tr>
<td>Mentored Career Development</td>
</tr>
<tr>
<td>Core Faculty Advisors and Mentoring Teams</td>
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<tr>
<td>Friday Core Training Activities</td>
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</table>
KL2 Scholars are required to have or achieve Master’s level (or equivalent) education in clinical and translational research. Scholars may attain this level of education by completing the TICR Master’s in Clinical Research. Many Scholars enter the K Program with Master’s level training and use the broad range of TICR courses to focus and expand their education. TICR curricula are available in person, online, and with Web-based offerings to enhance accessibility to the broadest possible audience within UCSF and across CTSA hubs and research organizations. KL2 Scholar education is personalized, and in addition to TICR, they may choose from a wide variety of courses and Web-based training available at UCSF - from basic science, to product development and research informatics.

- Mentored career development. KL2 Scholars have traditionally received 4-5 years (depending on level of training on entry) of salary support at $85,000 per year for 75% effort to pursue multidisciplinary clinical and translational research; their remaining salary is provided by the School or Department. In addition, Scholars are immersed in a supportive environment, are provided start-up research funds, and benefit from ongoing access to core faculty who provide expertise and mentored guidance in research design, measurement and questionnaire design, study coordination, data management, biostatistical analysis, publishing and presenting research, and manuscript and grant writing. All first year K Program Scholars, in collaboration with their mentors, prepare an individual Career Development Plan (CDP) that is based on the format recommended by the NIH (see Section B.2 and Appendix 4: CDP template).

- Core Faculty/Advisors and Mentoring Teams. We have 11 Core Faculty; 6 Clinical Research Advisors and 5 Biostatisticians (see Table D, below) who attend the Friday Core Training Activities (see below). Upon admission to the Program, each KL2 Scholar is assigned 2 Core Faculty Advisors: a Clinical Research Advisor and a Biostatistics Advisor. Core Faculty are established investigators with strong mentoring experience as well as established national and international reputations in areas critical to the Program, including underserved populations and simulation modeling (Bibbins-Domingo), multisite studies and trials (Bauer), geriatrics (Walter), research informatics (Pletcher), and high dimensional data analysis (McCulloch). Five of these faculty have received UCSF Mentoring Awards. The Program also assures that each Scholar has strong relationships with a Lead Mentor, and 1 or more Co-mentors, both selected by the Scholar for relevance to their research focus, and drawn from UCSF’s great depth of clinical and translational scientists (see Sections B.1.ii, B.2; Data Tables 2 and 5B). Scholars also have a Career Mentor from their department or division, often the Division Chief. Several representative KL2 research mentors are described below (Box), with additional examples in Data Table 5B.

<table>
<thead>
<tr>
<th>Selected KL2 Scholar Mentors from across the UCSF Faculty (past 10 years; and see Data Tables 2 and 5B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary Margaret Chren, MD, Professor of Dermatology; research on skin cancer in older adults. She has mentored a dozen individuals over the past 10 years, including 4 KL2 Scholars (Tang, Arron, Linos, Abuabara). A 2014 JAMA publication first-authored by Linos on overdiagnosis of basal cell carcinoma in older patients had substantial impact on disease management.</td>
</tr>
<tr>
<td>Kenneth Covinsky, MD, Professor of Geriatrics; research focuses on determinants and outcomes of disability in older adults. He received mentorship awards from the Society for General Internal Medicine and Bay Area Clinical Research Symposium. He has mentored 24 individuals over the past 10 years, including 3 KL2 Scholars (Lee, White, Smith).</td>
</tr>
<tr>
<td>Joseph DeRisi, PhD, Professor of Biochemistry and Biophysics; his lab is dedicated to whole genome approaches to problems in human infectious disease. He is Director of the T32 Integrative Program in Complex Biological Systems. He has mentored 29 individuals over the past 10 years, including 2 KL2 Scholars (Arron, White).</td>
</tr>
<tr>
<td>Donna Ferriero, MD MS, Professor of Neurology and Pediatrics and Chair of Pediatrics; her lab has been critical in defining the role of oxidative stress during hypoxia-ischemia and the relationship of vulnerable populations of neural cells during maturation-dependent injury. She has mentored 19 individuals over the past 10 years, including 5 KL2 Scholars (Bonifacio, Glass, Gelfand, Fox, Mueller).</td>
</tr>
</tbody>
</table>

- Friday Core Training Activities. K Scholars, Core Faculty, and guests meet in person every Friday morning. The first hour is a seminar led by faculty or Senior Scholars on methodology and career development topics (see Section B.3.1 below for additional details and Appendix 3 for Friday schedule), followed by 2 hours dedicated to Scholar-led Works-in-Progress sessions (WIPs), where Scholars present their research projects and obtain expert feedback and advice from peers, Core Faculty, and periodically, their Lead and Co-Mentors. WIPs are structured in 4-5 small concurrent groups of 10-12 KL2 and non-KL2 Scholars who remain together as a cohort until they complete the program. Each weekly WIP session is facilitated by 2 Core Faculty (a clinical researcher and a biostatistician). These faculty rotate among WIP cohorts over the course of the year, so that over time they are able to meaningfully contribute to each Scholar’s research program. Finally, there is a weekly Networking Lunch (supported by institutional funds) where Scholars, Core Faculty, other scientists and guests, and UCSF academic and program leaders meet informally. Special workshops (Table E, below) are typically scheduled on Friday afternoons.

- Other existing program features include:
• Recruitment of a superb group of KL2 Scholars, diverse in discipline, race, and ethnicity. Since 2011 the program has supported a total of 44 KL2 Scholars, and traditionally accepted 5-9 new Scholars per year with a commitment of up to 4-5 years of support. The program receives 25-40 applications per year for 4-7 slots. We have been very successful in creating a new interdisciplinary paradigm at UCSF, funding KL2 Scholars drawn from all 4 UCSF Professional Schools (Dentistry, Medicine, Nursing and Pharmacy), and from 21 different departments (Table I, below). We have encouraged faculty from racial and ethnic minorities to apply (following the example set by the 2 previous Directors of the KL2 Program, an Hispanic male born in Mexico [Ralph Gonzales, MD MSPH], and an African American woman [Dr. Bibbins-Domingo]). Between 2006 and 2011, 11% of KL2 Scholars have been underrepresented minorities; we have been particularly successful in attracting women (~75% of KL2 Scholars in the past 5 years: see Section B.5. Candidates and Scholars and Table I, below).

• KL2 Scholar Success. The defining characteristic of our KL2 Scholars is the degree to which each stands out among the exceptional caliber of the junior faculty at UCSF—the cream of the crop. Our Scholars advance clinical and translational research, measured by academic rank, publications, and extramural funding. Table B presents results of a survey of 46 KL2 Scholars who entered the program from 2005-2011 and had left the program at the time the survey was conducted. Of the 42 respondents, 48% had attained the rank of Associate Professor, 60% devote >60% of their professional effort to research, 90% had served as a PI on at least 1 grant, and 71% had received NIH R03, R21, R01 or equivalent funding. In addition, 45% of Scholars reported having collaborated with another K Scholar during the Program that resulted in a funded grant (17%), and a publication (38%). Mentoring activity was robust: 83% reported having been a mentor with a median of 5 publications with their mentees. Scholars have an overall rate of 9 first or last authored publications (median range: 12 for the oldest cohort-2 newest cohort), and an overall rate of 13 total publications, (median range: 24 for the oldest cohort-4 newest cohort).

• Perhaps the most impressive indicators of our Program’s success are the prominent local and national appointments our Scholars attain after leaving our Program (see Data Table 12B and Box below).

### A.3.ii. Major achievements of the KL2 Program (see Data Table 12B)

<table>
<thead>
<tr>
<th>Table B. Outcomes of UCSF KL2 Scholars (Entered Program 2005-2011)</th>
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<tbody>
<tr>
<td><strong>Year of program entry</strong></td>
</tr>
<tr>
<td><strong>Position</strong></td>
</tr>
<tr>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Associate Professor</td>
</tr>
<tr>
<td>Professor</td>
</tr>
<tr>
<td>Non-academic/other</td>
</tr>
<tr>
<td><strong>% Effort Spent in C&amp;T Research</strong></td>
</tr>
<tr>
<td>0-19%</td>
</tr>
<tr>
<td>20-59%</td>
</tr>
<tr>
<td>≥6%</td>
</tr>
<tr>
<td><strong>No. first/last author pubs</strong></td>
</tr>
<tr>
<td><strong>No. of total publications</strong></td>
</tr>
<tr>
<td><strong>Research grants or contracts</strong></td>
</tr>
<tr>
<td>Any as PI</td>
</tr>
<tr>
<td>NIH R03 or R21</td>
</tr>
<tr>
<td>NIH RO1 or equivalent</td>
</tr>
<tr>
<td>Foundation</td>
</tr>
<tr>
<td>Industry</td>
</tr>
</tbody>
</table>

**Selected Local and National Appointments of UCSF KL2 Program Alumni (year completed)**

- **Douglas White, MD MCR (2008)**, Prof. of Medicine, Endowed Chair and Director, Program on Ethics, Center for Bioethics and Health Law, University of Pittsburgh School of Medicine. Dr. White is PI on an R01 and R21 from NIA and an R01 from NINR.
- **Kathleen Liu, MD PhD MCR (2010)**, Assoc. Professor of Medicine, UCSF. Dr. Liu is PI on a U01 and R01 from NIDDK.
- **Bradley Aouizerat, PhD MCR (2011)**, Professor of Oral and Maxillofacial Surgery and Deputy Director, Bluestone Institute for Clinical Research, NYU. Dr. Aouizerat is PI on a U01 from NIA and 2 R01s from NCI.
- **Steven DuBois, MD (2012)**, Assoc. Professor, Pediatrics, Harvard and Director of Experimental Therapeutics, Dana-Farber Cancer Institute. Dr. DuBois is PI on an R01 from NCI.
- **Carmen Peralta, MD MCR (2010)**, Assoc. Professor of Medicine, UCSF. Dr. Peralta is PI on an R01 from NIA and an R34 from NIDDK and Co-Director of the new UCSF Center for Kidney Diseases.
- **Radojka Savic, MD PhD (In training)**, Assistant Professor of Bioengineering, UCSF. Dr. Savic is PI on an R01 from NICHD, received during her second year of KL2 support. She continues to devote 50% effort to her KL2 while PI of her R01 (2015-16).
• Marked expansion of the program to include other NIH-funded K Scholars.
We have expanded the membership of our K Scholar Program beyond its KL2-funded scope through UCSF’s institutional commitment of funds. As noted, KL2 awardees and those with individual NIH K awards participate together in the program, thus broadening the collaborative team science reach. (Table C). We encourage and support our KL2 Scholars to apply for individual NIH K awards; 42% have succeeded in the past 10 years. Due to our inclusive membership, these “transitioning” Scholars are able to remain in the Program.

<table>
<thead>
<tr>
<th>Table C. UCSF K Scholars Program by Year of Entry</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>KL2 Scholars</td>
<td>10</td>
<td>8</td>
<td>13</td>
<td>8</td>
<td>5</td>
<td>44</td>
</tr>
<tr>
<td>Non-KL2 Scholars (intramural, NIH K, or diversity supplement)</td>
<td>13</td>
<td>7</td>
<td>11</td>
<td>9</td>
<td>8</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>15</td>
<td>24</td>
<td>17</td>
<td>13</td>
<td>92</td>
</tr>
</tbody>
</table>
B. PROGRAM PLAN
One of the great strengths of the K Scholars Program is that most of its leaders, administrative staff, and Core Faculty have been involved in and shaped the Program for many years. For example, Dr. Bibbins-Domingo, KL2 Co-PI, directed the program from 2012-2014 and served as Associate Director and Core Faculty from 2007-2011. The Associate Directors, Drs. Charles McCulloch and Louise Walter, have served as Core Faculty since 2008.

B.1. Program Administration

B.1.i. Leadership
The K Scholars Program will be led by Drs. Douglas Bauer and Kirsten Bibbins-Domingo. Dr. Bauer will serve as KL2 Program Director/Core Leader/Co-PI at 20% effort. He has directed the Program since 2014, and is responsible for all aspects of operations, overseeing Scholar selection, Program evaluation, Program seminars and other activities, and chairs the K Program monthly faculty meetings. He will be the NIH contact for the Program. Dr. Bibbins-Domingo, at 10% effort, will serve as KL2 Co-PI, providing guidance, and assuring integration with other CTST education and training programs, as well as alignment with the goals of the CTSI. (See also Multiple PI Plan) Both Drs. Bauer and Bibbins-Domingo will also serve as core faculty, participating fully in our educational and mentoring activities (Figure 2).

**Douglas Bauer, MD**, is Professor of Medicine and Epidemiology and Biostatistics, and is an Executive Member of the San Francisco Coordinating Center. He has been at UCSF since 1982, and developed and directed the Resident Research Training Program (a training program in the CTST) from 2006 to 2014, when he assumed the directorship of the K Scholars Program. He is an internationally recognized clinical investigator with expertise in osteoporosis, thyroid disease, and biomarkers. He has received K23, R34, RO1, and K24 awards from the NIH. Dr. Bauer is an expert in multisite studies and trials, having led or participated in such groundbreaking studies as the Fracture Intervention Trial (FIT), the FIT Longterm Extension (FLEX), and the Study of Osteoporotic Fractures (SOF). He is currently a standing member of the NIH Neurologic, Aging and Musculoskeletal Epidemiology study section (NAME). Dr. Bauer has recently been invited by the FDA to join the Bone, Reproductive and Urologic Drugs Advisory Committee. He is a member of the Editorial Board for the Journal of Bone and Mineral Research, has published over 300 peer-reviewed manuscripts, and has co-authored 130 publications with mentees. Dr. Bauer has extensive experience in faculty development and mentoring. His K24 Midcareer Award from NIAMS (2006-2016) allows him to devote significant effort to mentoring students, residents, and junior faculty. He was selected 2010 Mentor of the Year for the UCSF Department of Medicine.

**Kirsten Bibbins-Domingo, MD PhD MAS**, is the Lee Goldman, MD, Endowed Chair in Medicine and Professor of Medicine and of Epidemiology and Biostatistics. She directs the UCSF Center for Vulnerable Populations at San Francisco General Hospital, a research center dedicated to discovery, innovation, policy and advocacy, and community engagement for communities at risk for poor health and inadequate healthcare. A general internist at San Francisco General Hospital, Dr. Bibbins-Domingo has expertise in cardiovascular disease, diabetes, and chronic kidney disease. Her work focuses on racial, ethnic, and income differences in manifestations of chronic disease and effective clinical, public health, and policy interventions aimed at prevention. She leads the UCSF computer simulation modeling group using the Cardiovascular Disease Policy Model. Dr. Bibbins-Domingo is the PI or joint PI of 3 collaborative center grants from the NIH: the NIMHD P60 Center for Health And Risk in Minority youth and adults (CHARM) addressing disparities in chronic disease in
youth and young adults; Bring It Down: an NINDS U54 research center addressing stroke prevention and stroke disparities in collaboration with Kaiser Permanente Northern California; and BUILD: a NIGMS U54 infrastructure and training grant with San Francisco State University. She is an active mentor with a K24 from the NIDDK. She has been a member of the US Preventive Services Task Force (USPSTF) since 2010 and is currently its co-Vice Chair. She is an inducted member of the American Society for Clinical Investigation. Dr. Bibbins-Domingo sits on the Workforce Development Domain Task Force.

**Associate Directors.** Dr. Charles McCulloch and Dr. Louise Walter serve as KL2 Associate Directors. They participate in policy decisions, planning, and executing the Program, and also serve as core faculty, leading Works-in-Progress sessions (WIPs) and advising K Scholars. Dr. McCulloch organizes the Scholar WIPs and faculty-led seminars, and oversees the Biostatistics core faculty and statistical advising. Dr. Walter oversees and organizes the Scholar selection process and oversees the Clinical Research core faculty and career advising of Scholars.

**Charles McCulloch, PhD,** is Professor and Head of the Division of Biostatistics at UCSF and Vice Chair of the Department of Epidemiology and Biostatistics. He was previously on the faculty at Cornell University where he was the founding chair of the Department of Statistical Science. He is an expert on the development and use of statistical methods for longitudinal data analysis and mixed models. He has authored or co-authored over 300 peer-reviewed publications. Dr. McCulloch has extensive mentorship experience. While at Cornell University, he directed 9 PhD theses, 12 Master’s theses and advised over 50 graduate statistics minor students. At UCSF he regularly serves on committees for Master’s in Clinical Research Degrees. He has served as a biostatistical mentor in the K Program since 2007. He is also the training director for a Rare Diseases Clinical Research Network. This mentoring has resulted, to date, in over 140 refereed, jointly-authored publications with mentees or former mentees.

**Louise Walter, MD,** is Professor of Medicine, Chief of the Division of Geriatrics and an internationally known clinical researcher in aging. Her research focuses on how health and life expectancy affect the use and outcomes of cancer screening tests in older adults, which has transformed the approach to cancer screening in older adults. She has received a VA Career Development Award and VA Merit Review (IIR) as well as R01 and K24 awards from the NIH. She is the Director of the Career Development Core for the UCSF Claude D. Pepper Older Americans Independence Center, which allows her to devote a substantial amount of time to mentoring students, residents, fellows, and junior faculty. In 2010 she received the UCSF Academic Senate Distinction in Mentoring Award, one of the most prestigious awards at UCSF, given annually to a faculty member in recognition of “exceptional mentoring to fellows and faculty.” Dr. Walter has authored 77 peer-reviewed publications; 44 have been with current or former mentees.

**Administrative Leadership.** Christine Ireland, MA MPH, a senior Academic Coordinator at UCSF, has been Deputy Director of the K Program since 2006. She also serves as Deputy Director of the CTST and the TL1, and for the past 20 years has administered the TICR Program. She works directly with the K Program leadership to plan and execute program activities, assists in budgeting, oversees program evaluation and tracking, and manages preparation of NIH continuation applications. She assists with CTSI internal reviews, and directly supervises the Program Coordinator (C. Leiva) to handle complex scheduling of multiple WIP groups, faculty-led seminars, special workshops, as well as updating the program Web site and the Web-based platform used by Scholars and faculty for communications, information, and scheduling.

**B.1.ii. K Program Core Faculty**

Every KL2 Scholar is assigned a Clinical Research Advisor and a Biostatistics Advisor from the Program’s Core Faculty (Table D and Data Table 2). All are senior faculty; most have been at UCSF for at least 15 years; 3 have received K24 Midcareer Investigator Awards and 5 have received mentoring awards at UCSF. They represent a broad range of clinical and translational research and biostatistical areas of expertise.

The Clinical Research Advisors provide ongoing research and career advice. In addition to weekly Friday morning interactions, the Clinical Research Advisor meets formally with the Scholar twice a year in the first year, and annually thereafter to review the Scholar’s written Career Development Plan (see Appendix 4), and as needed at any time. The Scholars place a high value on advice from a senior faculty member at UCSF whose only interest is the Scholar’s career and is free from conflicts of interest that may arise with their research mentors and supervising faculty in their departments.

The Biostatistics Advisors provide expert advice and consultation on biostatistical methodology and issues particular to the Scholar’s research; they frequently become collaborators and co-authors on Scholar publications. For example, Dr. Boscardin has co-authored 46 publications with K Scholars in the past 5 years.
Vignette: Core Faculty interactions with K Scholars. During a works-in-progress, Dr. Anne Suskind, a first year K Scholar from the Department of Urology, presented her very early work on urologic procedures in nursing home residents. Her Core Faculty Advisor (L Walter, Professor of Geriatrics) advised her about key geriatrics measures to include in her study and encouraged her to apply for a UCSF Pepper Center pilot grant (which she received), helped her network with other investigators in aging research and co-mentored her on an R03 GEMSSTAR application which was recently funded.

Dr. Bauer leads a monthly faculty meeting where K Program Core Faculty provide status updates on their areas of responsibility, as well as engage in discussions of all aspects of the Program and provide suggestions for improvement. Once a year, over the course of 3 monthly meetings, faculty advisors present each K Scholar to the group, summarizing Scholar progress, raising issues in mentoring, achievement, departmental support, or personal challenges. Other faculty often provide excellent advice, with new perspectives on how to support a Scholar who may not be progressing as expected.

B.2. KL2 Mentors and Mentorship Training

Developing a successful clinical research career requires strong relationships with mentors and a research team. One of the 5 selection criteria (see Section B.5. for complete selection criteria) for the KL2 award is the quality, appropriateness, and multidisciplinary complementarity of their proposed mentors. At the time of application, each KL2 Scholar must identify a Lead Mentor and at least 1 Co-mentor from a different discipline (Data Table 2). These mentors are generally from outside of the K Program Core Faculty. The Program does not match Scholars and mentors, as we believe that mentoring is an organic relationship that cannot be imposed. However, as noted, each KL2 Scholar is assigned a Clinical Research/Career Advisor and Biostatistics Advisor from the KL2 Core Faculty. In addition, many Scholars have a Career Mentor who is frequently their Division Chief or Department Chair.

- Role of the mentoring team. Lead mentors have overall responsibility for helping Scholars develop creative and independent careers in research. In addition to being an expert in the scientific area the Scholar has chosen to pursue, a lead mentor must be familiar with faculty, resources, and databases at UCSF, and have resources and research staff to support the Scholar's research. Lead mentors provide guidance to assure that projects are moving satisfactorily on the path to presentations, publications, and grant applications, and provide advice about career directions, national networking, and academic promotion. They also help to assure that 75% of the Scholar's effort is protected from clinical and administrative duties, and fully available for training and research. Co-mentors work with the lead mentor on these responsibilities, and provide guidance in complementary areas of expertise. Career mentors ensure that the Scholar is fulfilling responsibilities to the home Division or Department, meeting academic milestones for promotion, and assure that 75% of the

<table>
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<th>Table D. K Program Core Faculty</th>
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<tbody>
<tr>
<td><strong>Clinical Research Advisors</strong></td>
</tr>
<tr>
<td>Douglas Bauer, MD, Professor of Medicine and Epidemiology, KL2 Director and Co-PI</td>
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<tr>
<td>Kirsten Bibbins-Domingo, MD PhD MAS, Professor of Medicine and Epidemiology, CTST Director, KL2 Co-PI</td>
</tr>
<tr>
<td>Louise Walter, MD, Professor of Medicine, Chief of Geriatrics, KL2 Associate Director</td>
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<tr>
<td>Catherine Chesla, PhD, Professor of Family Health Care Nursing</td>
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<tr>
<td>Mark Fletcher, MD MPH, Professor of Epidemiology and Biostatistics, Director CTSI Informatics and Research Innovation Program</td>
</tr>
<tr>
<td>Richard Grant, MD, Senior Research Scientist, Kaiser Permanente Division of Research</td>
</tr>
<tr>
<td><strong>Biostatistics Advisors</strong></td>
</tr>
<tr>
<td>Charles McCulloch, PhD, Professor and Chief of Biostatistics, KL2 Associate Director</td>
</tr>
<tr>
<td>Elaine Allen, PhD, Professor of Biostatistics</td>
</tr>
<tr>
<td>John Boscardin, PhD, Professor of Biostatistics</td>
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<tr>
<td>John Neuhaus, PhD, Professor of Biostatistics</td>
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<tr>
<td>Stephen Shiboski, PhD, Professor of Biostatistics</td>
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</table>
Scholars are required to meet at least monthly with their lead mentor, both individually and in conjunction with other members of the research team. Scholars also meet regularly with their co-mentors, and at least twice a year with all of their mentors as a group. Mentors are encouraged to participate in the Scholar's WIP sessions.

- **Career Development Plan (CDP).** All first year K Scholars begin the Program with a CDP, developed in collaboration with their mentors. The CDP is based on the format recommended by the NIH (see Appendix 4, CDP template). During a face-to-face meeting with K Core Faculty Advisors, the CDP is reviewed and revised at the start of the Program and annually thereafter. By defining goals, objectives, activities, and products, each CDP contains a structured review of progress in achieving academic milestones and includes individual written summaries of formal and informal interactions with department leaders and mentors. Any changes in research direction, key collaborators, or mentorship are noted and discussed during these reviews.

- **Program Expectations of Mentors.** All mentors of KL2 Scholars are senior faculty (virtually all at the Professor level) with active research programs, and extensive experience mentoring postdoctoral fellows and junior faculty. Their biosketches provide evidence of their success as principal investigators in clinical and translational research and in publishing their research results. KL2 mentors are required to have independent research support to cover the costs of proposed research projects that exceed the Scholar research funds provided by the KL2. The candidate's mentors complete a 1-page statement describing the specific resources that the mentor will provide to the Scholar, including access to research resources of the mentor, space, staff, clinical and laboratory resources, and research funding that they will make available to the Scholar. The selection committee considers the strength and commitment of the mentoring team, as well as the resources that mentors are willing to provide as an important indicator of the mentor's commitment to the Scholar's career. During the past 5 years, over 100 UCSF faculty have served as lead or co-mentors to KL2 Scholars. Data Table 5B includes 20 KL2 mentors to illustrate the broad range of clinical and translational research areas of the mentors, as well as their mentoring track record.

- **Mentorship Training.** In 2007, the CTSI Comprehensive Mentoring Program, led by Mitchell Feldman, MD MPhil, created the now nationally acclaimed Mentor Training Program (MTP), a year-long workshop for mid-career research faculty on effective mentoring.\(^3\)\(^4\) CTSI has since implemented the Mentoring Unit of CTSI’s Consultation Service to provide expert advice on difficult mentoring issues. To provide comprehensive mentorship training to all K Program mentors and Scholars, the Comprehensive Mentoring Program will work with the CTSI Online Education program to create a Web-based MTP (U54 proposal, Part D.1). The online MTP will be based on the very successful in-person course that has trained >100 mid-level faculty at UCSF. The modules will address mentorship responsibilities, mentoring models, goals and expectations, mentoring communication, and mentoring challenges. Of particular relevance to the K program, the MTP will also include modules on “Mentoring Across Differences” that focus on the specific mentoring needs of women and underrepresented minorities.\(^5\)

- **Training for Mentors.** For each K Scholar, identified Lead and Co-mentors will be queried about previous mentorship training and those without formal training will be strongly encouraged to complete the online program.

- **Training K Scholars to be Mentees.** To assist K Scholars to afford themselves the best possible experience as mentees, the MTP will feature several specific Web-based training modules (lectures, reading materials, videos, and exercises) aimed at working effectively with a mentoring team. The sessions will help the Scholars to clarify mentee roles and responsibilities, how to use a Career Development Plan to clarify their career and project goals and expectations with their mentors and how to play an active role in the mentoring relationship by learning to “manage up.” By the end of the sessions, the K Scholars will understand the roles of various types of mentors on a mentoring team, will have assembled their own mentoring team, and will have completed a CDP and be actively using it to align their goals with those of their mentors.

- **Training K Scholars to be Mentors.** To build successful academic careers, K Scholars need to learn to become effective mentors. Although K Scholars rarely serve as lead mentors, Senior Scholars have a very strong command of research methods and clinical expertise and should begin to act as research mentors for younger colleagues such as clinical fellows/post-docs, residents, and students. Becoming an accomplished mentor will help K Scholars develop multidisciplinary teams, increase productivity, and develop lifelong colleagues. Senior K Scholars and others with ongoing mentoring responsibilities will be encouraged to complete the Web-based Mentor Training Program.

- **Program Evaluation of Mentors.** A key role of the K Program Clinical Research Advisor for each Scholar is to monitor the mentoring relationships between Scholars and their mentors. When a K Advisor has a concern about the quality of a Scholar’s mentoring relationships, the Advisor will take one of several courses of action:
discuss the issue directly with the mentor if appropriate; bring the problem to the attention of K Program leadership, who may then intervene to help the mentor improve; or help the K Scholar to select a new mentor. The Program is especially attentive to the importance of holding the mentors, Division Chiefs, and Chairs accountable to the signed commitments they make during the application process. In our experience, Scholars have been able to resolve differences with advice, and very rarely have Scholars changed mentors except in cases where the mentor has left UCSF. We also conduct semi-annual formal mentor evaluations using a 14-item online mentor evaluation instrument developed by the CTSI Comprehensive Mentoring Program. Results of this survey are reviewed by the K Scholar’s Advisors.

B.3. Aims of the Career Development Program

The overarching goal of the UCSF KL2 Program is to train outstanding clinical and translational investigators skilled at leading multidisciplinary research teams to develop innovative approaches to diagnose and prevent disease, improve health, relieve symptoms and improve function. Our linked Aims build on our proven activities and enhance these to support Scholars in the important transition from KL2 to NIH K Awards (K-to-K) and K-to-R independence (Aim 1); expand and enhance didactic and experiential opportunities at the frontiers of scientific inquiry and methodology (Aim 2); train our Scholars to build, lead, and participate in team science endeavors (Aim 3); and outline our strategies for sharing and disseminating our key programmatic features across the CTSA California network, and beyond (Aim 4) (Table E).

To achieve our goal during the next funding period, we propose the following Aims:

**Aim 1:** To recruit a superb group of professionally and ethnically diverse UCSF junior faculty KL2 Scholars and to support them for up to 3 years with both proven and enhanced activities to accelerate their progression toward research independence with individual K and R awards.

We will build on our highly successful CTSI K Scholars Program, and greatly enhance our support for the transition to individual K and R awards. The K Scholars program is built on didactic education primarily from the TICR Master’s in Clinical Research Program, and a core set of activities that occur in person on Friday mornings at the Mission Bay campus. The face-to-face activities greatly accelerate the potential for new and transdisciplinary collaborations that can occur among junior faculty, peer mentoring that facilitates ongoing career development both during the Program and as alumni, and efficient transmission of new content (including support for K-to-R transition and other focus areas outlined in Aims 2 and 3). These in-person sessions also further enable the creation of a supportive mentored environment that is essential for the success of junior faculty researchers.

The K Scholars Program in general, and the KL2 Program in particular, attract outstanding junior faculty from all 4 professional schools at UCSF. The program is highly regarded, as evidenced by the continued institutional support from each School (See Deans’ Letter of Support) and the adaptations made by individual departments and divisions to ensure that their junior faculty may participate. The KL2 award is highly competitive and the sustained interest we have experienced ensures a rich pool of applicants.

**B.3.i. Ongoing core features and activities of the K Scholars Program (Table E)**

The key features of the K Scholar Program that will continue include:

- **Financial support.** The KL2 award will provide up to $85,000 per year for salary support to ensure 75% protected time for mentored research, plus an additional $25,000 in annual research funds for up to 3 years. Departments or other institutional funds are expected to support the gap between the $85K supplied from the award for salary support and the actual amount of the Scholar’s salary. The awards will be a maximum of 3 years in duration (which reflects a reduction in support from the prior KL2 award, see below), and a major emphasis will be placed on transitioning to individual K grants, with institutional funds allowing Scholars successful in this transition to remain in the K Scholars Program for up to 5 years.

- **Didactic training in clinical and translational science methods.** The Program supports Scholars from a broad array of research approaches (T1-T4) and a wide spectrum of academic disciplines. We require all Scholars to be well trained in clinical and translational research methods. Didactic training is essential, but is also appropriately tailored to the background and needs of the Scholar. For most Scholars with a health professional degree, we require the Master’s in Clinical Research or the equivalent; for those with PhDs, requirements may include the 1-year Certificate in Advanced Training in Clinical Research or targeted coursework in our Training in Clinical Research Program. Such training also assures that Scholars have similar methodological backgrounds, which greatly enhances the WIPs sessions, and the quality of collaboration and peer support. K Scholars also have access to a broad variety of courses and Web-based training available at UCSF – from basic science, to product development and research informatics.
• Works-in-Progress (WIPs). Each Friday morning these 2-hour sessions will serve as the core activity of the K Scholars. These WIPs sessions are structured in small groups of 10-12 Scholars, with 4-5 WIPs running concurrently, each facilitated by 2 experienced Core Faculty (a clinical researcher and a biostatistician). At each WIP, Scholars present and discuss their research in a supportive and constructive environment, considering study and grant ideas and designs, implementation issues, analytical and ethical quandaries, research results, and drafts of grant applications and manuscripts. The work of 2 Scholars is reviewed each week; the frequency of WIPs is weekly in the first year and twice monthly in subsequent years.

• Weekly methodology and career development seminars. Scheduled on Friday mornings, these seminars will be led by Core Faculty, invited guests, and advanced K Scholars. Topics include a diverse range of design and methodologic issues, such as “Adaptive Trial Design” (McCulloch), “Health IT” (R Grant), and “Missing data” (Boscardin); career development topics include, e.g., “The Writer’s Algorithm” and “Developing Your Elevator Pitch and Mission Statement” (Markowitz), “Resources for Mentoring” (Feldman), and “Working with the NIH” (Mitchell). Seminars also include panel discussions on NIH reviews, mock study sections, media skills, and an end-of-year “Lessons Learned” by Senior Scholars.

• Networking Lunch. Each Friday all K Scholars are invited to meet informally with K program faculty, guests and UCSF leadership over lunch to expand on WIP or seminar topics, or to discuss other topics of mutual interest related to research methods, career development, and work-life balance.

Program mentoring. As noted, application for a KL2 award requires that the Scholar have a strong Lead mentor and Co-mentors from a range of disciplines. In addition, K Core Program faculty also serve as research and biostatistical advisors to the Scholars. Advisors ensure the progress of Scholars with regular review of their career development plans (Section B.2).

• Teaching assistant opportunities. K Scholars teach a small group section of Epidemiology 202, Designing Clinical Research, in their first or second year. Scholars greatly value this experience teaching the foundations of clinical research to students, fellows, and residents, and often find mentees among the students.

• Annual retreat and national meeting. An overnight retreat in July will allow new K Scholars to meet other UCSF K Program participants, and all KL2 Scholars are encouraged to attend the annual Translational Science meeting in Washington, DC.

B.3.ii. Enhanced features of the K Scholars Program to promote research independence (Table E)

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<tr>
<th>Ongoing Activities</th>
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<td>Didactic Courses</td>
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<td>Works-in-Progress Sessions</td>
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<td>Methodology and Career Development Seminars</td>
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<tr>
<td>Networking Lunch</td>
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<tr>
<td>Individual K Faculty Advisor and Lead/Co-mentor interactions</td>
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<tr>
<td>Formal Career Development Plan Review 2x/year (Scholars and Faculty Advisor)</td>
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<tr>
<td>Teaching Assistant in Epidemiology 202, Designing Clinical Research 8 weeks (Summer Quarter)</td>
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<tr>
<td>Mentoring Team Meetings at least 2x/year</td>
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<td>One-on-one meetings with grant and manuscript writing coaches (ongoing)</td>
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<td>Meetings with biostatistical advisors (ongoing)</td>
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<tr>
<td>Annual Retreat (July)</td>
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<td>Translational Science Meeting (Spring)</td>
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<tr>
<th>Enhanced Career Development Training and Activities</th>
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<tr>
<td>K Grant Writing Workshop—6 sessions (Fall) (Aim 1)</td>
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<tr>
<td>R Grant Writing Workshop—6 sessions (Winter) (Aim 1)</td>
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<tr>
<td>One-on-one meetings; mock study sections with writing coaches/faculty focused on “KL2 to Individual K” (K-to-K) and “K-to-R” transitions (ongoing) (Aim 1)</td>
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<th>New Activities Supporting Career Development and Dissemination</th>
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<tr>
<td>Didactic and experiential activities related to technology-enabled research, multisite trials, Special Populations (Aims 2.a.b.c)</td>
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<td>Formation of multidisciplinary “teamlets” (Aim 3)</td>
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<td>Media Skills Workshop—1 afternoon (Winter) (Aim 3)</td>
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<tr>
<td>Leadership/Team Science Workshop—3 afternoons (Spring) (Aim 3)</td>
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<td>Mentor Training Program (Aim 3)</td>
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<td>Dissemination of K Scholar Program activities (Aim 4)</td>
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Table E. Ongoing and Enhanced Activities of the K Scholars Program
consist of 6 intensive sessions focused on writing the 3 most important and challenging sections of a mentored K award application: Career Development Plan, Mentoring Plan, and Research Plan. Each session will be held in small groups (4-6 Scholars) providing focused feedback on each grant section prepared by Scholars. One-on-one support in grant and manuscript writing will continue to be provided by Amy Markowitz, JD, a professional medical editor and experienced scientific writing instructor. We will also introduce a mock study section for reviews prior to submission, providing additional experience for our Scholars to understand the review process and the strengths and weaknesses of proposals. Institutional support for the K Scholars program allows KL2 awardees who successfully transition to an individual K award to remain in our K Scholars program for a total of 5 years; Scholars view this as highly supportive, thus eliminating the disincentive that junior faculty may experience in moving from a KL2 to an individual K award.

- Timely support to make the K to R transition. We have piloted support for transition from the K award to research independence with the R01. Such support had primarily occurred in one-on-one advising. We have identified that early formulation of robust Specific Aims, Significance, and Innovation sections of the R01 grant as the primary barrier to the development of successful R01 applications. We will encourage our Scholars early during their K period to begin the process of developing Specific Aims and gathering feedback. In order to reach a broader group of Scholars, we will expand our K to R “Grant Writing Workshop.” This intensive workshop of 5 small group feedback sessions for 4-6 Scholars actively writing NIH R grants will be led by Tom Mitchell and Core Faculty member Richard Grant, and will be focused primarily on these first 3 sections of an R01 grant application. We will also introduce a new mock study section review of R01 applications 2-3 months prior to submission to provide constructive feedback.

**B.3.iii. Number and duration of KL2 Awards.**

In 2015-16, UCSF supports a total of 19 KL2 awardees, but as directed by the RFA, by 2020 we will reduce the number of Scholars to 9. To achieve this reduction we will reduce the number of new Scholars that we accept and limit both current and new KL2 awardees to a total of 3 years of full KL2 support. This approach will allow us to continue to recruit new KL2 awardees every year and still provide at least 3 years of support for existing KL2 Scholars. Thus, we plan to support a total of 15 KL2 Scholars in 2016-17, 12 in 2017-18 and 2018-19, 10 in 2019-20, and 9 in 2020-21. As we will shorten the period of the KL2 award, we will also enhance support to allow for the successful transition to an individual K award (see Section B.3.ii above). In the past, 42% of our KL2 awardees have successfully transitioned to individual K awards after 1-3 years of KL2 support, and we will aim to have at least 75% make this transition in the future.

**B.3.iv. Scholars funded by institutional K12 awards and individual K mechanisms.** As noted, support provided by all 4 professional schools at UCSF (see Deans’ Letter of Support) allows us to offer clinical and translational research training and mentored infrastructure and services for junior faculty at UCSF who have received other K12 and individual K-type career development awards. This structure incentivizes our KL2 awardees to transition to Individual Ks, as this permits them to remain in the Program, and be supported through their subsequent transition to the R01 or equivalent.

**Aim 2: To expand and enhance training and mentoring at the frontiers of clinical research, in partnership with other CTSI programs, emphasizing cutting edge research methods.**

We will build on our proven program of didactic and mentored learning to expand the breadth and depth of K Scholar training and mentoring with particular emphasis on emerging research methods and skills, as described in the Sub-aims following:

**Aim 2a. Educate, train, and mentor KL2 Scholars to take full advantage of technology-enabled research methods.** Emerging technology is enabling major new approaches to conducting clinical and translational research. Near-universal implementation of electronic health record (EHR) systems provides a rich source of health-related data on the majority of Americans. Increasing use of Internet technologies (e.g., tablets and smartphones) provides new ways to interface with potential research subjects in nearly every subset of our society, including previously underserved and understudied populations. Emerging wearable sensor technologies, including sensors built into and linked to smartphones, are making it possible to collect real-time physiologic and behavioral data, as well as enabling novel interventions to improve health outcomes. Plummeting costs of genome sequencing and sophisticated biomarker measures have made “precision medicine” possible. Growing regional and national research networks are facilitating large-scale collaborative research and making major investments to harmonize data and technology.

To enable K Scholars to capitalize on these emerging approaches to designing and conducting efficient, high-quality, technology-enabled research, we propose to ensure that they attain a basic understanding of research informatics and big data research methods. We aim to equip them to know the
strengths, weaknesses, and optimal use cases for electronic databases, mHealth technology, and direct-to-participant research methods. We will collaborate with the CTSI Informatics and Research Innovation (IRI) program (see U54, Part B), the UCSF Institute for Computational Health Sciences, the Center for Digital Health Innovation, the Division of Epidemiology and Biostatistics, and TICR to create didactics and training experiences to prepare K Scholars to successfully conduct technology-enabled research.

**Didactic courses.** Our aim is not to educate our K Scholars to become informaticists, but to enable them to understand technology and work effectively with informaticists to take full advantage of large electronic databases and technology-enabled research methods. The TICR didactic program already includes courses on data management and advanced biostatistical courses focused on causal inference in observational data. In addition, we are developing a series of courses on informatics, data science, and use of large datasets that will be available to K Scholars:

- **Medical Informatics** – led by Ida Sim, MD PhD, Co-Director of the CTSI Informatics and Research Innovation (IRI) Program, provides instruction in core concepts of informatics and how computers are used to manage information and to support clinical research.
- **Big Data Science** – led by Charles McCulloch, PhD, Head of the UCSF Division of Biostatistics and K Scholars Program Associate Director will provide an introduction to the opportunities and challenges of using large datasets for biomedical research. Topics to be covered include: What is data science/big data? What makes it different from non-big data? What big data can and cannot do. Phases of data science: obtaining the data, merging and cleaning data, storing and accessing data, data visualizing, and drawing conclusions from data.
- **Other courses planned for 2016-17** with applications to clinical and translational science problems include Multi-level Risk Prediction, which will cover methods of predictive modeling including metrics for predictive quality, model selection, validation and cross-validation, and net reclassification; and Methods of Machine Learning and Data Mining, which will cover concepts of supervised and unsupervised data mining, data handling (including data munging, data wrangling and harmonization), a review of standard regression approaches, and ensemble learning methods.
- **UCSF Clinical and Research Data Warehouse (CRDW)** – led by David Dobbs, Executive Director of Network Data Warehousing, provides an introduction to healthcare syntactic and semantic data standards to facilitate understanding the structure and meaning of clinical data. Scholars will be trained in hands-on exercises to pull mock datasets from UCSF’s CRDW to address specific research questions.
- **Epic Clarity** database training. Scholars wishing to work directly with UCSF’s EHR (Epic) Clarity database must be trained and certified at Epic Systems Headquarters in Verona, WI. Trainees learn how clinical data may be extracted and analyzed in a generic Epic EHR System and are given tools and techniques to understand their institution’s specific implementation. After training they are prepared to create extracts and reports with guidance from local experts familiar with their site’s specific implementation.
- **Scholars who desire more rigorous training in informatics also have access to courses in the UCSF Pathway in Bioinformatics within the Biological and Medical Informatics Graduate Program.**

Additional courses are available from the UC Berkeley Information School:

- Exploring and Analyzing Data
- Data Visualization and Communication
- Machine Learning at Scale
- Storing and Retrieving Data
- Applied Machine learning
- Scaling Up! Really Big Data

**Training Experiences.** We will expose all K Scholars to the potential of developing and utilizing novel technology through seminars and WIPs specifically for K Scholars and via optional research experiences.

- **WIPS and seminars.** Once per month, the regular Friday morning K seminar will feature technology-enabled research. Specifically, the seminars will feature leaders in research informatics at UCSF such as Dr. Atul Butte, Director of the Institute for Computational Health Sciences, and Dr. Michael Blum, UCSF Chief Medical Informatics Officer and Director of the Center for Digital Health Innovation. In addition, faculty and trainees who are conducting cutting-edge technology-enabled research will present their work with a focus on opportunities and challenges related to informatics and technology. A few examples are provided in Table F. In our regular WIPs, where K Scholars present their own work, we will focus on pushing the envelope using technology-enabled methods. (see Vignettes, below)
- **The Informatics Lunch Series,** hosted by the IRI Program, occurs weekly. Providers of informatics-related resources from UCSF, network partners, and regional commercial providers present their **capabilities and**
**Informatics Day**, a semi-annual campus-wide event co-hosted by CTSI and other UCSF organizations, is aimed at presenting the state-of-the-art of informatics research and resources. The event features presentations and practical hands-on booths on data access (e.g., EPIC, Academic Research Systems, Clinical and Research Data Warehouse, UCSF Library), data capture and management (e.g., Cancer Center Computing Cluster, Center for Digital Health Innovation, Institute for Human Genetics Computing Cluster, Sandler Center Functional Genomics Core Facility) and comprehensive research services (e.g., CTSI Consultation Services, SF Coordinating Center, Translational Informatics Core).

**CTSI Consultation Service (CS).** The Data Management Unit of the CS will provide expert advice to Scholars on accessing and using EHR data from UCSF, the SF Veterans Affairs Medical Center (and nationwide VA data), San Francisco General Hospital, and the SF Bay Area Collaborative Research Network. (see U54, Part E.1)

**Center for Digital Health Innovation (CDHI) Internship.** CDHI provides 2- to 6-month internships for trainees interested in development, testing, and integration of digital health solutions to healthcare problems. Interns are placed with a CDHI on-going project team and a CDHI faculty mentor, work with the team to develop the product, and prepare a written summary of the project.

**Vignette: A KL2 Scholar’s technology-enabled RCTs to increase physical activity.** Dr. Yoshimi Fukuoka, Associate Professor of Nursing and recent KL2 Program graduate, illustrates how our trainees utilize technology to enhance their research. Dr. Fukuoka is the PI of 3 NIH funded mHealth RCTs using mobile devices to “text” activity prompts and to collect data on daily levels of activity. She also collaborates with experts in machine learning at the University of California, Berkeley to design more effective dynamic treatment response messaging.

**Academic Research Systems (ARS) trains investigators in the use of the UCSF Research Data Browser and the UC BRAID Browser tools, which provide query access to de-identified information from UCSF’s EPIC EHR and to UC-wide Research Exchange (ReX) data (which includes over 13 million patients, and assist users in using these tools to identify cohorts to select appropriate inclusion and exclusion criteria.

**The CTSI-sponsorede Catalyst Program** supports translation of early discoveries towards clinical applicability through research funding, expert consultation, identification of resources and building partnerships (U54 proposal, Part H1). Catalyst supports a digital health track, where Scholars who are developing mobile health tools to support research can receive advice and development funding. K Scholars may also take part in the Catalyst Internship Program, which places interns on a Catalyst-funded product development team led by academic investigators and industry experts, and work with the team throughout the full cycle of product development.

**Vignette: A KL2 Scholar’s technology-enabled RCT for pediatric migraine.** The research of a current KL2 Scholar demonstrates the type of technology-enabled work that we hope to promote. Dr. Amy Gelfand, Assistant Professor of Pediatrics, has initiated the Brain-M Study (Bringing Relief to Adolescents Naturally with Melatonin), a direct-to-participant placebo controlled pilot trial designed to test the effectiveness of melatonin at reducing migraine frequency in adolescents. Potential participants are identified using the EHR, headache frequency is measured via a smartphone app diary. The project has built a Web portal with coordinated delivery of REDcap surveys, obtained IRB approval, and started remote consenting and randomization across California. Participants are examined pre-randomization and receive study medication by express delivery.

**Aim 2b. Educate, train, and mentor KL2 Scholars to plan and conduct high-quality, efficient multisite studies and trials, and successfully disseminate and implement study results.** Well-designed, adequately powered, and efficiently conducted multisite observational studies and trials remain among the most powerful

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<th>Table F. Selected UCSF Technology-enabled Research Studies</th>
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| **Mark Pletcher, MD**  
MAS, Director of CTSI Informatics and Research Innovation Program, and K Scholar Program Core Faculty | Health eHeart: EHR data, direct to participant methods, and data from remote sensors and biomarkers to study risk factors for health disease (>20,000 participants) |
| **Mike Weiner, MD,**  
Director of the Center for Imaging of Neurodegenerative Diseases | Brain Health Registry: direct to participant registry using Web-based methods to collect data on risk factors for cognitive decline (>28,000 participants) |
| **Pierre Gourraud, PhD,**  
Co-PI MS Bioscreen | MS Bioscreen: accesses and integrates patients’ medical records with data from the MS-EPIC study, making it possible to optimize individual treatment. |
| **Mitchell Lunn, MD; Co-PI of PRIDE** | PRIDE: Web-based prospective cohort of gay, lesbian and transgendered persons across the US using Salesforce platform and Apple ResearchKit (>13,000 participants). |
tools to generate high quality medical knowledge. The CTSI-sponsored Clinical Research Service, and the Liaisons to NCATS Trial Innovation and Recruitment Innovation Centers offer a wealth of resources to support single and multisite trials, including assistance with trial planning, start-up, budgeting, contracting regulatory approvals and recruitment (see U54, Parts F and G).

Despite access to these resources, feedback from UCSF K Scholars consistently indicates a desire for mentored learning about the real-world design, conduct, and analysis of multisite studies, particularly randomized trials. For example, recently accepted KL2 Scholars Katrina Abuabara, MD, Assistant Professor of Dermatology, and Erin Van Blarigan, PhD, Assistant Professor of Epidemiology and Biostatistics, have proposed multisite designs to study the effects of environmental factors on chronic eczema and of diet quality on colorectal cancer risk. Further, many K Scholars aspire to eventually conduct large, definitive trials that have a strong and sustained impact on public health. Lastly, dissemination and implementation of trial results remains underdeveloped and poorly executed. To improve the ability of our K Scholars to design, manage, interpret, and implement multisite studies, and address the unique challenges of trials coupled with clinical data collected from the electronic medical record (“Big Data”), we propose to improve our existing multisite training by developing a new comprehensive approach to K Scholar multisite study training.

Existing Multisite Training for K Scholars. In addition to foundational coursework on study design and biostatistics, and seminars that address specific trial issues, such as adaptive designs, the ethics of randomization, and analysis of repeated measurements, K Scholars will enroll in any of several existing clinical trial courses offered by the Schools of Medicine, Nursing and Pharmacy. For example, TICR offers the following courses each year:

- **Clinical Trials (Epi 205)**, led by Dr. Dennis Black, Professor of Epidemiology and Biostatistics, covers experimental design options; methods of randomization; blinding; developing interventions and controls; measuring outcomes and adverse effects; follow-up; compliance and post-randomization problems.

- **Statistical Issues in Design, Monitoring, and Analysis of Randomized Controlled Trials (Biostat 226)**, led by Dr. Joan F. Hilton, Professor of Biostatistics, covers a variety of classical and adaptive study designs for clinical trials, methods behind interim monitoring of Phase III trials, superiority or non-inferiority trial designs, and Bayesian designs and analyses.

In addition, the UCSF-Stanford Center for Excellence in Regulatory Science and Innovation (CERSI) offers a lecture series on regulatory science and affairs (monthly in-person and available on YouTube), weekly talks by visiting FDA scientists, and the CERSI mini-course on Regulatory Framework for Mobile Medical Technologies.

New Multisite Study Coursework. To provide additional skills to investigators planning multisite studies and trials, we propose a new course, Multisite Study Design and Methods, led by Dr. Dennis Black, an internationally known trialist, with input from other K faculty including Drs. Steven Cummings, Doug Bauer, and Deborah Grady, each of whom has led large multisite, nationwide studies and trials. This new course will cover the following critical issues not addressed in existing courses: multisite study leadership, organization and communication, site recruitment and management, biospecimens, collection and analysis of adverse events, use of EHR data, harmonization and quality control across sites, monitoring, centralized endpoint adjudication, multisite data collection, cleaning and analysis, and organization and management of publications and ancillary studies.

Practicum with San Francisco Coordinating Center (SFCC) Investigators. The San Francisco Coordinating Center is a non-profit, academic research organization with over 20 years of experience in conducting multisite studies and clinical trials. Led by Steven Cummings, MD FACP, the SFCC is a collaborative enterprise among investigators from the California Pacific Medical Center Research Institute and UCSF. The Coordinating Center has led a number of large ongoing multisite observational studies including the Study of Osteoporotic Fractures (4 centers, 9400 participants), Osteoporosis in Men Study (6 centers, n=5900), and Osteoarthritis Initiative (4 centers, n=4690), and multisite trials including the Fracture Intervention Trial (18 centers, n=6400) and the Trial of Late Surfactant to Prevent BPD (19 centers, N=135). The SFCC has a large repository of data, biospecimens, radiographic images, and genotype data from long-term studies on important health outcomes. We will encourage K Scholars wishing practical multisite experience to consult or collaborate with SFCC investigators, project directors, and statistician/analysts. To facilitate such interactions, we will introduce a new K Scholars seminar on Novel approaches to Multisite Trials led by Drs. Cummings or Bauer, and encourage K Scholars to attend SFCC staff and research meetings, which are held most Fridays in the same facility as our K Program activities.
Multisite Trial Advisors. We will enlist K Program faculty with expertise in multisite studies and trials (Drs. Cummings, Grady, Bauer, and Black) to provide individualized advice and research mentoring for K Scholars developing multisite projects, requesting CTSI team science pilot funding (see below), or writing K- and R-level multisite proposals. The consultations will focus on ensuring grant proposals include innovative and rigorous multisite methods and adequate attention to issues that are often overlooked by junior investigators, including efficient recruitment, study wide leadership and communication, and biospecimens.

Training in implementation science. Implementation science (ImS) seeks to translate the results of clinical research into everyday clinical practice and public health. The goal of ImS is to ensure that the knowledge and materials produced by health research actually lead to improved population health by: 1) reaching the people for whom they are intended; 2) being adapted to local circumstances; and 3) being implemented effectively, safely, equitably, and in a timely and patient-centered manner. The goals and methods of implementation science research are distinct from those of conventional clinical research. They focus on care structures and processes, and require sustained engagement with the individuals, communities, and organizations targeted by health interventions. CTSI established one of the first ImS programs in the nation, initially directed by Ralph Gonzales, MD (KL2 Co-director until 2014), now Co-directed by Margaret Handley, MD, and former K Scholar Adithya Cattamanchi, MD. ImS offers 6 courses to instill 12 competencies across 7 domains: identification and rating of evidence for translation, context identification, community engagement, behavior change, implementation strategy design, implementation strategy evaluation, and team science (see Appendix 2).

To support K Scholars who wish to pursue implementation science research, we will work with leaders of the ImS Program to:

- **Develop an ImS Certificate Program.** Working with the CTSI Online Learning Program, we will use existing course content to create a blended format that incorporates online video and reading assignments, coupled with in person, faculty-led discussion, project development and peer learning. This format will also allow us to offer the ImS Certificate program to other CTSA hubs outside UCSF using a fully asynchronous online faculty-led small group format with discussion fora and interactive working groups.

- **ImS Special Interest Group.** We will form an ImS interest group among the K Scholars. The interest group will bring together Scholars at different points in their training for seminars and workshops on specific ImS-related topics (e.g., qualitative research methods, logic models, etc.).

- **ImS Advisors.** We will enlist faculty with expertise in ImS (Drs. Gonzales, Handley, and Cattamanchi) to provide advice and research mentoring for K Scholars developing implementation science projects and writing K and R-level grants focused on implementation science projects. The consultations will focus on ensuring grant proposals include 10 key ingredients for ImS research proposals outlined by Proctor et al., and grant-specific methodological issues.

Aim 2c. Promote research in traditionally understudied special populations and enhance efforts to address health inequities.

The UCSF CTSI has identified research in special populations (pediatrics, geriatrics, vulnerable populations) as a priority area (see U54, Part C.1 Special Populations Initiative [SPI]). The K Scholars program has traditionally attracted junior faculty with these interests. Over the past 5 years we have had 29 Scholars (36%) whose research focuses on vulnerable populations. A pilot TICR offering for SPI was launched this year with “Health Disparities Research Methods I” (EPI 222), built on prior courses created by Dr. Eliseo Perez-Stable (now Director of NIMHD) and updated by Dr. Bibbins-Domingo and others to reflect content from the NIH course in health disparities. The course attracted 25 participants who completed intensive 2-hour in-person sessions weekly for 10 weeks, with required reading in social epidemiology and health disparities, and development of a research project. We will add new courses and a Social Epi and Health Disparities Track for the Master’s in Clinical Research (MCR):

Vignette: A KL2 Scholar’s focus on implementation science. Dr. Adithya Cattamanchi, now Assistant Professor of Medicine at UCSF, was a K Scholar and the first graduate of the newly established Implementation Science track within the Master’s Degree in Clinical Research. Since 2014, Dr. Cattamanchi has co-directed the ImS Program and is the course director of Epidemiology 245, Translating Evidence into Practice: Theory and Design.
• Health Disparities Research Methods I will be offered in both a 5-week and 10-week format, the former to an audience beyond students in the Master’s or K program; the course will maintain its overview of key concepts in multi-level determinants of health and health disparities; we will also develop and offer an online version for UC BRAID and other CTSAs. K Scholars and other Master’s students will take the full 10-week course.

• Launch “Health Disparities Research Methods II” to focus on study design and statistical methods required for health disparities research, e.g., choice of multivariable models, statistical interaction, latent variables, and measurement issues related to health disparities research.

• New Social Epidemiology and Health Disparities Track in the MCR. In addition to the MCR requirements the track will include: 1) Health Disparities Research Methods I and II, 2) 4 elective courses from the implementation sciences track, advanced biostatistics, genetic epidemiology, or bioinformatics (with approval by the track director, Dr. Bibbins-Domingo), and 3) Journal Club with readings in social epidemiology and health disparities.

In addition to these expanded TICR didactic courses (see Appendix 2), we will support training and mentorship to advance the careers of junior faculty conducting research in these areas in the following ways:

Collaborate with the SPI to broaden the opportunities for research in the rich networks supported and promoted through CTSI’s Special Populations Initiative (SPI) (see U54, Part F, SPI Achievements Table). These networks, sited throughout the SF Bay Area and California, provide opportunities for research collaboration, venues for recruiting study participants, and for engaging communities and healthcare systems that care for such populations.

Provide a SPI Special Interest Groups forum within the K Scholars Program to address the commonly encountered ethical, methodological, and logistical issues in conducting research in special populations. Dr. Bibbins-Domingo (CTST Director), who studies vulnerable populations and health disparities, Dr. Walter (K Program Associate Director and geriatrician), and Dr. Roberta Keller (former K Scholar and pediatrician), will lead a “Special Interest Group” of K Scholars conducting research in special populations. Examples of topics to be covered in the Special Interest Group will include ethical issues in vulnerable populations, and critical measurement domains that span all 3 populations: function and cognition; caregiver burden and context; family dynamics and social support; and social determination, poverty, and health literacy. The Special Interest Group will also identify topics for deeper exploration guided by experience of K Scholars themselves and will use the discourse within this group to continue to identify existing and novel resources to support this research.

Collaborate with the SPI to provide enhanced mentorship for K Scholars conducting research in special populations. While K Scholars join the program with mentoring teams in place, these teams may not be fully equipped to address all of the methodological, ethical, and logistical issues that may be encountered in conducting research in these traditionally understudied groups. The K Scholars program provides an effective means to link Scholars with leaders of the CTSI SPI.

Aim 3. Promote multidisciplinary collaboration and team science through leadership training, team science courses and workshops, and the creation of K Scholar “teamlets” focused on addressing a specific research problem.

Successful clinical and translational investigators typically lead or participate in team efforts requiring collaborative skills in addition to traditional research expertise. We will employ the services of the UCSF Center for Health Professions, the CTSI Comprehensive Mentoring Program and other professional development groups to design and implement a series of seminars and workshops to address leadership training and improving mentoring relationships. We will also introduce and support Scholar-faculty teamlets designed to promote collaborative, multidisciplinary research interactions. The goal of these new programs is to foster enthusiasm and competence in team science.

Leadership Training. Leadership experience, knowledge, and expertise are critical skills for successful clinical and translational investigators. In addition to participation in leadership seminars and promoting emerging leadership roles for our Scholars, we have successfully partnered with the UCSF Center for Health Professions to develop and pilot a leadership training and development workshop customized for CTSI K Scholars. The overall goal of this development opportunity is to provide a foundation for the leadership development of K Scholars and provide tools needed to achieve their career goals and become leaders in their fields. The first pilot workshop (see Appendix 5 for program overview) was offered to 14 K Scholars in Spring 2015 and consisted of assigned reading and other preparation prior to 3 half-day sessions plus 1 or more executive coaching sessions, all led by experienced Center for Health Professions faculty. The workshop began with completion of the Myers-Briggs Type Indicator® (personality indicator), and included discussions of the...
importance of leadership skills, awareness of personal leadership styles, development and communication of a personal mission/vision, giving and receiving feedback, elements of high performing teams, difficult conversations, and tools for effectively motivating and persuading others. Based on outstanding feedback from K Scholar participants (value of the 3 sessions was rated between 4-4.82 on a 5-point scale), we plan to offer the workshop each year and further expand the topics covered with a particular emphasis on team management and communication.

Team Science course. In collaboration with team science experts in the UCS Research Development Office and the CTSI Online Education program, the CTSI Team Science (TS) Working Group plans to develop and share an online, interactive course that focuses on the fundamentals of team science leadership, diversity, organization, communication, mutual fair recognition, conflict management, and incorporating resources from Northwestern University’s SciTS initiative and other shared CTSA materials. We will also use instructive “case studies” of both successful and unsuccessful teams. Beginning in Spring 2016, this course will be required for all of our level-specific training programs, including the K Scholars.

Team Science workshops. In addition to the online Team Science course, we will organize seminars presented by multidisciplinary teams who have been awarded CTSI Team Science pilot funds. Teams will share tips for effectively developing and working in teams, as well as identifying common pitfalls and strategies to avoid problems.

K Scholar Teamlets. Team-based clinical care is increasingly common in healthcare settings and has been recognized as an efficient and effective approach in the setting of complex medical needs. We propose to utilize the teamlet concept to promote K Scholar team-based science. We define teamlets as a small number of team members, typically 2-3, from different disciplines or departments with distinct but complementary skills who work collaboratively to address a specific issue or problem of interest to all members. We have observed spontaneous examples of such collaborative efforts during our regular WIPs, where Scholars recognize natural synergies among their fellow Scholars and seek their advice and collaboration. To promote, formalize, and expand these interactions, we propose that each new and existing KL2 Scholar form a teamlet with other K Scholars/Faculty, and potentially with 1-2 investigators outside of the K Scholar Program; a K Scholar Program faculty member will act as advisor to address these topics of mutual interest.

- **K Program Support of Teamlets.** During the first year, we will ask each K Scholar to identify a short list of high priority research or methodologic interests, and use the UCSF Profiles to find other investigators with similar interests. UCSF Profiles, a nationally recognized research networking tool, creates a Web page for each faculty member that lists publications, grants, and co-authors indexed to searchable keywords, which allows them to be easily found by potential collaborators. We will facilitate teamlet meetings with logistic support, advice and refreshments. Additional support and specific consultations for teamlets will be available from the CTSI Team Science Working Group and the UCSF Research Development Office (team leadership, organization, communication, mutual fair recognition, and conflict management), and from K Core Faculty and others, including a) access to informatics infrastructure/expertise (Pletcher and McCulloch) b) data and biospecimens from multisite trials (Bauer and Cummings); c) advice on how to study the very young and very old (Walter, Keller, Covinsky) or health inequality (Bibbins-Domingo, Chelsa); d) assistance with writing the results (Markowitz); and e) assistance leveraging the preliminary research for larger scale studies.

- **Teamlet Expectations, Outcomes, and Evaluation.** Each Scholar-led teamlet will be expected to meet at least monthly, define goals, formulate an approach, identify existing and needed expertise, and report back to the K Program on their progress. After 6 and 12 months, we will request feedback from both Scholars and faculty, and evaluate progress and track products such as study protocols, manuscripts, funding proposals, and additional metrics to be developed during the first year in collaboration with the CTSI Program Evaluation Team. During the first year we will develop mechanisms to assist Scholars with non-productive teamlets and to recommend changes in teamlet composition.

Other Efforts to Promote Team Science. The UCSF CTSI has formed a Team Science Working Group (see U54 Part C.2) with K Scholars Program representation (Bibbins-Domingo) that meets monthly to discuss challenges to team science, develop potential solutions, and effect change within UCSF. Facilitation of multidisciplinary Team Science is a specific objective of the UCSF CTSI. Programs and resources that are available to K Scholars include the following:

- **Team Science Awards** (see Pilot Translational and Clinical Awards, U54, Part D.2) support research that brings together multidisciplinary teams to tackle important questions in clinical and translational...
science and those focused on multisite clinical trials. A total of 13 projects have been supported to date; K Scholars are eligible for these awards.

- **Updated promotions guidelines to support team science.** The Team Science Working Group has initiated discussions with campus leaders to identify ways to recognize the unique contributions of members of interdisciplinary teams, and the Department of Medicine recently incorporated recognition of team science in its revised promotions guidelines. These changes now allow faculty a mechanism to highlight their important contributions to team science in the promotions process and provide a clear model for improving the promotions process in other departments and across the institution. Team Science workshops will ensure that K Scholars understand how to appropriately document their team science accomplishments by obtaining appropriate letters of support and highlighting team science accomplishments on the CV.

- **Multidisciplinary team development.** UCSF Profiles is a powerful online research networking tool for collaboration and team development. On their Profiles page, faculty feature their work and index it to searchable keywords, allowing them to be more easily identified by (or identify) potential interdisciplinary collaborators. Searches may identify others doing similar work, explore grants, projects, and publications, and see co-authors. In Team Science workshops, we will ensure that Scholars fully understand how to use Profiles to search for collaborators, and that they use their own page to optimize the likelihood that others can find them.

Aim 4. To share and disseminate the successful elements of our K Program as a model for regional collaboration.

The CTSI K program is pleased to be an active participant in the California CTSA Education Consortium, which includes the leaders of training programs from CTSA sites throughout California, including the 5 UC CTSA sites, collectively called UC BRAID (UC Davis, Irvine, Los Angeles, San Diego, and San Francisco), USC, and Stanford University. We meet monthly by conference call and convened in 2015 for a 1-day retreat in San Diego to develop priorities for statewide collaboration.

**We have identified 2 priority areas** where sharing of training resources on a platform for broader dissemination will enable the ability of junior faculty to develop careers in clinical and translational research: 1) research and training in special populations, an area that is particularly relevant in a state as diverse as California, and 2) research and training in informatics, an area of focus across the CTSA sites and one that is greatly enhanced by the UC BRAID infrastructure.

The CTSA Education Consortium will continue to meet monthly by webinar to discuss topics related to the conduct of research in special populations and research informatics, to share education and training materials, to develop joint training events, and to plan an annual UC-wide K Scholars symposium on these topics.

Several elements within the K Scholars program are of particular interest and present distinct opportunities for regional and national collaborations. For example, with support from the CTSI Online Learning program and an R25 from NHLBI led by Dr. Bibbins-Domingo, we created a 2-week online implementation science “boot camp” for junior faculty with K awards from around the country as a part of the Program to Increase Diversity Among Individuals Engaged in Health-Related Research (PRIDE). This successful summer course will be repeated for K Scholars from the California CTSA sites, extending the number of Scholars trained in this area of strength at UCSF, and increasing opportunities for regional collaboration among Scholars. Ongoing training will be facilitated by online courses that CTSI Online Education is developing in collaboration with the UCSF Implementation Sciences program.

The California CTSA Education Consortium is also planning regional training in informatics and technology-enabled research to promote collaboration and use of statewide networks such as UC ReX (which provides access to EHR data from approximately 13 million patients across the 5 UC Medical Centers), and the PHoENIX network of safety net settings across California for special populations.

Finally, the CTSI Comprehensive Mentoring Program is developing an Online version of the Mentor Training Program (see Aim 3), including modules on mentoring across differences, which will be beta-tested in the California Consortium CTSA hubs and subsequently to all CTSA hubs nationwide.

B.4. Program Evaluation

The KL2 Program will establish and track metrics aligned with Program Aims and incorporate common metrics developed by NCATS (Table G). We will work with the CTSI Program Evaluation Team (PET) to develop scorecards and dashboards to document our progress. Below we describe the metrics to be tracked and the processes employed for evaluation and tracking. The metrics emphasize Scholar progress during the Program,
as well as Scholar career outcomes following completion of the Program. Measures of Scholar satisfaction with the Program components inform our ongoing improvement efforts. Metrics for each of the Aims of this proposal will be evaluated and tracked at least semi-annually by the KL2 Program in the context of the CTSI’s overall program planning, evaluation, and tracking program (see U54, Part A. Sec. C.1).

### Table G. KL2 Aims, Milestones and Metrics

<table>
<thead>
<tr>
<th>Aim 1. Recruit outstanding diverse Scholars and provide them with career development support leading to independence</th>
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<tbody>
<tr>
<td><strong>Scholar Diversity</strong></td>
</tr>
<tr>
<td>#/% URM applicants and selected Scholars</td>
</tr>
<tr>
<td>#/% of UCSF schools/departments represented by Scholars</td>
</tr>
<tr>
<td><strong>Scholar Progress</strong></td>
</tr>
<tr>
<td>#/% Scholars who obtain individual NIH K awards during program</td>
</tr>
<tr>
<td>#/% Scholars submitting R01 grant during program</td>
</tr>
<tr>
<td># publications as first or last author during program</td>
</tr>
<tr>
<td><strong>Scholar Achievements</strong></td>
</tr>
<tr>
<td>#/% Scholars in academic medicine or other research career 5 yrs after program completion</td>
</tr>
<tr>
<td>#/% Scholars active in clinical and translational research 5 yrs after program completion</td>
</tr>
<tr>
<td># publications as first or last author 5 yrs after program completion</td>
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</table>

<table>
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<tr>
<th>Aim 2. Expand and enhance training and mentoring</th>
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<tbody>
<tr>
<td><strong>Research informatics</strong></td>
</tr>
<tr>
<td>#/% Scholars taking courses in informatics</td>
</tr>
<tr>
<td>#/% Scholar publications involving research technology and informatics, digital health</td>
</tr>
<tr>
<td><strong>Multisite trials</strong></td>
</tr>
<tr>
<td>#/% Scholars taking courses in clinical trials</td>
</tr>
<tr>
<td>#/% Scholar publications in multisite trials</td>
</tr>
<tr>
<td><strong>Special populations research</strong></td>
</tr>
<tr>
<td>#/% of Scholars in new course(s) on health disparities</td>
</tr>
<tr>
<td>#/% Scholars with K research in special populations</td>
</tr>
<tr>
<td><strong>Leadership and Media skills</strong></td>
</tr>
<tr>
<td>#/% Scholars participating in leadership workshop</td>
</tr>
<tr>
<td>#/% Scholars participating in media workshop</td>
</tr>
<tr>
<td>#/% Scholar participating in negotiations workshop</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aims 3. Promote multidisciplinary collaboration and team science</th>
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</thead>
<tbody>
<tr>
<td>#/% Scholars in leadership workshop</td>
</tr>
<tr>
<td>#/% Scholars in “teamlets”</td>
</tr>
<tr>
<td>#/% “teamlets” submit manuscript for publication</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aim 4. Share and disseminate successful elements of our KL2 program</th>
</tr>
</thead>
<tbody>
<tr>
<td># of UCSF online courses offered to other KL2 programs</td>
</tr>
<tr>
<td># of collaborations undertaken with other CTSAs</td>
</tr>
</tbody>
</table>

The KL2 Program submits Program aims, metrics, initiatives, and budgets to CTSI that are maintained in a Web-based balanced scorecard system called “Process Based Leadership” (PBL). K Program staff use data from our Application, Review and Tracking system as well as other sources to update the scorecard twice a year with actual achievements in meeting established targets. PBL provides an efficient platform for incorporating NCATS common metrics as well. The CTST Director (Bibbings-Domingo), KL2 Program Director (Bauer) and Deputy Director (Ireland) attend formal meetings with the CTSI Operations Committee at mid-year and end-of-year reviews that focus on our performance against targets and objectives. The Operations Committee offers semi-annual strategic, operational, and tactical guidance in writing to the CTST and K Scholars Program Directors. The partial screen shot from the PBL Program Scorecard indicates how metrics are tracked, as well as the targets and achievements in each of the past 3 years.

**K Scholars Program Evaluation Activities.** In addition to vigorous participation in the CTSI program planning, evaluation, and tracking efforts, the K Scholars Program conducts its own evaluation with the goals of improving the program and evaluating the success of our Scholars, both KL2 and Individual K awardees.
• Scholar Satisfaction. We survey our Scholars twice per year to evaluate the K Scholars Program activities: Works-in-Progress sessions, Pilot R01 Grant Writing Workshop (2014-15), faculty-led seminars, and the K program faculty. Scholars are asked to evaluate these elements as to their value to the Scholars’ career development on a scale of 1 to 5 (5 is the highest value). Table H summarizes the results of the Scholar evaluation from 2014-15.

<table>
<thead>
<tr>
<th>Program Element</th>
<th>N Responses</th>
<th>Mean score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Program</td>
<td>35</td>
<td>4.5</td>
</tr>
<tr>
<td>WIPs</td>
<td>35</td>
<td>4.5</td>
</tr>
<tr>
<td>Pilot R01 Didactics--Overall</td>
<td>7</td>
<td>4.9</td>
</tr>
<tr>
<td>K Program Faculty</td>
<td>9-28 (range)</td>
<td>4.2-4.9 (range)</td>
</tr>
<tr>
<td>Seminars</td>
<td>10-20 (range)</td>
<td>3.3-4.8 (range)</td>
</tr>
</tbody>
</table>

We are pleased that Scholar satisfaction for the overall program, WIPs, and program faculty is high, as is the rating of the Pilot R01 Grant writing workshop led by K Program faculty (Grant and Mitchell), an important part of our effort to enhance the ability of K Scholars to transition to independence. We also meet in person with Scholars over a year-end special lunch to solicit their feedback on what went well during the year, what they would like to do differently, what types of activities they would like to see in the coming year. Examples of changes we made in 2015-16 based on Scholar feedback are: increasing WIPs for Scholars in their third or fourth year from once to twice a month and changing WIPs and seminars schedules to encourage more Scholars to attend our regular networking lunches.

• Scholar Progress During the Program. The K Scholars Program uses milestones to assess Scholar progress during the Program (see Section B.5). We expect all K Scholars to submit 2 peer-reviewed publications each year by the end of their first year, and a NIH R01 grant or the equivalent by end of the third year. All Scholars meet at least annually with their K Scholar Program Advisor to discuss their Career Development Plan. At that meeting, progress toward meeting Program milestones with respect to publications and grants are discussed, and goals for the next period are established. The milestones for publications and grants are included in the metrics tracked in the K Scholar Scorecard, as described above.

An important goal for our KL2 Scholars is to obtain an NIH Career Development Award (K award) to extend their years of mentored career development and have their own award as PI; 42% of all KL2 funded Scholars over the past 10 years have obtained an NIH K Award and 55% of Scholars in their third or fourth year of the Program have submitted an R01 grant. We expect all KL2 Scholars to apply for an independent K award by the end of the second year.

• Scholar Career Outcomes. Scholars who have completed the program are surveyed every 2 years, up to 10 years after completing (or leaving) the program, to assess their subsequent career outcomes and to rate how participation in the K Scholars Program affected their current skills and expertise, ability to get a desired position, and ability to obtain grants. Surveys are created and collected using the Application, Review, and Tracking (ART) system developed by CTSI for this purpose.

Pilot Study of Common Metrics for Evaluation of KL2 Programs. UC BRAID has collaborated on a pilot study led by UC Irvine to examine the feasibility of establishing a set of common metrics for evaluating early outcomes of the KL2 Programs. Data were provided by each of the KL2 Programs from their own tracking data and did not require participation from individual Scholars. A combined dataset was created, including information on characteristics of KL2 awardees, their initial productivity, and early career outcomes of trainees who completed the programs. This initial effort will help to inform the CTSAs’ continuing efforts to develop a set of common metrics for evaluating the success of the KL2 programs across the UC system and nationwide. A manuscript describing the programs and their Scholars within the UC system and analysis of early outcomes was submitted to the Clinical and Translational Science Journal in September 2015.

The overarching goal of the CTSA KL2 workforce development effort is facilitating sustainable careers in translational science. One of the findings in the manuscript was that almost all (98%) of the 79 UC CTSA KL2 Scholars who had terminated the award by the end of 2014 continued to conduct research after their K award ended, and an identical proportion held positions in an academic environment.7

B.5. KL2 Candidates and Scholars

The KL2 application is designed for UCSF junior faculty with an appointment above the Clinical Instructor level who have not been PI of an NIH R01, or project leader of an NIH P01, U54, P50, P60, or an NIH career development award, such as a K23. The pool of candidates is deep – approximately 275 individuals are appointed at the Assistant Professor level every year. Due to the number of highly competitive applications we receive, the KL2 Selection Committee has established that applicants must have at least 1 first-authored, peer-reviewed publication in the topic area of the KL2 proposal; strong lead and secondary mentors from more than 1 discipline, and clear commitment and resources from the Scholar’s home department.
Applicants and Selected Scholars. In the past 5 years, the K Scholars Program received 143 applications and appointed 44 KL2 Scholars. Table I includes the gender, race, prior degree, and department of the applicants and selected KL2 Scholars from 2011-2015. Overall, ~75% of applicants and selected Scholars are women and 9% of applicants and selected Scholars are underrepresented minorities (see also Data Table 10). We have had KL2 Scholars from all 4 UCSF professional schools, although 85% of applicants and 84% of selected Scholars are from the School of Medicine. KL2 applicants were from 21 different departments at UCSF; the largest numbers of applicants are from the Departments of Medicine (41%), Neurology (11%) and Pediatrics (10%). Within the Department of Medicine, there are Scholars from 14 different divisions/specialties.

| Table I. KL2 CANDIDATES AND ACCEPTED KL2 SCHOLARS (Entering Cohorts 2011-2015) |
|-----------------|----------------|-------------|-------------|-------------|-------------|
| **Characteristic** | **2011** | **2012** | **2013** | **2014** | **2015** |
| **Total N** | 30 | 20 | 13 | 13 | 13 | 30 | 27 | 143 | 44 |
| **Gender** | | | | | | | | | |
| Male | 6 (20%) | 2 (20%) | 8 (62%) | 2 (25%) | 9 (69%) | 4 (31%) | 9 (50%) | 3 (38%) | 5 (19%) |
| Female | 24 (80%) | 18 (80%) | 14 (38%) | 11 (13%) | 1 (7%) | 1 (7%) | 1 (7%) | 1 (7%) | 1 (4%) |
| **Ethnicity/Race** | | | | | | | | | |
| Hispanic | 2 (7%) | 1 (5%) | 3 (23%) | 0 (0%) | 2 (15%) | 0 (0%) | 2 (15%) | 0 (0%) | 2 (9%) |
| Asian | 7 (23%) | 1 (5%) | 7 (53%) | 2 (15%) | 1 (8%) | 6 (20%) | 1 (8%) | 1 (8%) | 0 (0%) |
| Black | 1 (3%) | 0 (0%) | 1 (8%) | 0 (0%) | 1 (8%) | 0 (0%) | 1 (8%) | 0 (0%) | 1 (4%) |
| White | 21 (71%) | 19 (95%) | 13 (55%) | 5 (38%) | 3 (23%) | 9 (69%) | 16 (53%) | 5 (59%) | 16 (59%) |
| Multi/Unclassified | 1 (3%) | 0 (0%) | 2 (15%) | 0 (0%) | 4 (31%) | 1 (8%) | 5 (38%) | 2 (15%) | 0 (0%) |
| **Degree** | | | | | | | | | |
| MD only | 5 (17%) | 1 (5%) | 4 (31%) | 1 (8%) | 3 (23%) | 2 (15%) | 9 (69%) | 3 (23%) | 2 (9%) |
| MD PhD | 13 (43%) | 8 (40%) | 1 (8%) | 0 (0%) | 1 (8%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| MD/PhD/RMPH | 14 (47%) | 6 (30%) | 11 (85%) | 4 (31%) | 7 (54%) | 1 (8%) | 1 (8%) | 1 (8%) | 0 (0%) |
| PhD | 10 (33%) | 2 (10%) | 10 (77%) | 2 (15%) | 0 (0%) | 4 (31%) | 12 (50%) | 2 (15%) | 1 (8%) |
| Pharm/DPhD | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| **School** | | | | | | | | | |
| Medical | 25 (83%) | 20 (91%) | 20 (91%) | 11 (85%) | 23 (83%) | 6 (75%) | 21 (75%) | 4 (31%) | 12 (65%) |
| Nursing | 1 (3%) | 1 (5%) | 0 (0%) | 0 (0%) | 4 (31%) | 1 (8%) | 1 (8%) | 1 (8%) | 0 (0%) |
| Pharmacy | 3 (10%) | 0 (0%) | 2 (15%) | 0 (0%) | 0 (0%) | 1 (8%) | 0 (0%) | 0 (0%) | 1 (4%) |
| Dentistry | 1 (3%) | 0 (0%) | 1 (8%) | 0 (0%) | 0 (0%) | 1 (8%) | 1 (8%) | 0 (0%) | 0 (0%) |
| **Department** | | | | | | | | | |
| Biomedical Engineering | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Clinical Pharm | 2 (7%) | 0 (0%) | 2 (15%) | 1 (8%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Comm Health | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Dermatology | 1 (3%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Emergency | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Epidemiology | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Family Medicine | 1 (3%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Family Nursing | 1 (3%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Medicine | 15 (50%) | 4 (40%) | 11 (50%) | 6 (75%) | 14 (41%) | 6 (46%) | 12 (40%) | 2 (25%) | 6 (22%) |
| Neurology | 0 (0%) | 0 (0%) | 2 (15%) | 0 (0%) | 4 (31%) | 4 (31%) | 5 (17%) | 2 (25%) | 5 (17%) |
| OB/Gyn | 1 (3%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Pediatrics | 1 (3%) | 0 (0%) | 2 (15%) | 1 (8%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Phys Nursing | 0 (0%) | 0 (0%) | 1 (8%) | 0 (0%) | 2 (15%) | 1 (8%) | 1 (8%) | 1 (8%) | 0 (0%) |
| Dentistry | 1 (3%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 1 (8%) | 1 (8%) | 0 (0%) |
| Psychiatry | 1 (3%) | 0 (0%) | 1 (8%) | 0 (0%) | 0 (0%) | 0 (0%) | 1 (8%) | 0 (0%) | 0 (0%) |
| Surgery | 3 (10%) | 1 (5%) | 0 (0%) | 0 (0%) | 0 (0%) | 1 (8%) | 1 (8%) | 0 (0%) | 0 (0%) |
| Other | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |

Request for Applications. We issue a call in October for applications due in February, with a start date of July 1. This call is announced in CTSI email communications distributed to all UCSF faculty, departments, and units. The KL2 award continues to be announced in CTSI communications until the deadline for the application has passed. The KL2 Award is well known, highly valued and respected, and has a large alumni Scholar representation among junior and mid-level faculty at UCSF; our annual call for applications is anticipated across campus. Applicants are required to submit an online application that is modeled on the NIH K23 grant application, providing applicants the experience of preparing a rigorous application. For those applicants who are not selected, the KL2 application may be used to apply for other NIH career development awards.

- **Application Format.** The KL2 application is modeled on the NIH K Award grant application; required elements include Candidate and Mentor biosketches, Candidate Statement, Specific Aims, Research Strategy, Protection of Human Subjects plus KL2 specific requirements addressing the KL2 selection criteria, and letters of support from mentors and Department Chair.

- **Recruitment of URM.** In the call for applications each year and on our Web site, we strongly encourage applications from URM faculty. We are dependent on the representativeness of the UCSF faculty to ensure a pool of URM candidates. Six percent of UCSF faculty are URM; over the past 10 years, KL2 Scholars have been 11% URM (Table K below). Increasing the proportion of URM faculty at UCSF (see U54, Part
D.1.C) and for the K Program are among our highest priorities. Detailed plans for recruitment of URM Scholars is described in the Recruitment and Retention to Enhance Diversity section of this proposal.

• Recruitment Across Disciplines. One of the strengths of the KL2 selection process described below is that after the Selection Committee ranks applications on merit, the Director (Bauer) and Associate Directors (Walter and McCulloch) review these rankings and consider other contributing factors that would raise candidates in the rankings. The final selection process incorporates consideration of multiple disciplines in a very intentional way. A diversity of disciplines and Scholar backgrounds is an important component of team science and we are proud of the fact that 45% of alumni Scholars surveyed reported that they have had at least 1 collaboration with a K Scholar from another discipline as a direct result of being in the program.

• Electronic application and review process. We use the Application, Review and Tracking (ART) software, developed by CTSI in 2010 to create applications, collect completed applications for review, securely distribute pdf applications to reviewers, collect and collate reviews, and eventually to track Scholars. Reviewers log onto the ART Web site where they view applications, reviewer assignments, and review criteria, and post their reviews of the application.

Selection Process. A Selection Committee of 12 senior faculty representing all 4 UCSF professional schools and including KL2 program faculty and Senior KL2 Scholars, reviews the Scholar applications. Each application is assigned to a primary, secondary, and tertiary reviewer. Primary and secondary reviewers interview the applicants in person. Primary reviewers prepare a 1-page written critique that later is adjusted based on the discussion of the Selection Committee and provided to the applicant. Depending on the number of applications, a triage process is used in which the primary reviewers and Associate Director Walter make decisions about whether to triage an applicant before interviews. The Selection Committee makes final decisions during a 5-hour meeting, following the model of the NIH peer review process.

• Selection criteria. Selection criteria focus on the strengths and potential of the candidate to become a leading multidisciplinary clinical investigator judged in 5 major domains:
  1. **Track Record**: Creativity of the candidate and potential to lead innovative multidisciplinary research based on prior training, areas of expertise, publications, funded grants, and collaborations.
  2. **Research Plan**: Scientific strength, potential clinical importance, and feasibility of the proposed multidisciplinary research plan.
  3. **Training Plan**: Strength, appropriateness, and multidisciplinary complementarity of the proposed mentors, mentor resources, and plan for didactic education and training at UCSF or elsewhere.
  4. **Resources**: Tangible commitment and resources provided by the home department or unit (salary, space, administrative support, mentoring), and suitability of the available clinical and laboratory infrastructure and multidisciplinary team.
  5. **Career Potential**: Global assessment of the likelihood that the candidate will develop a career as an outstanding investigator who will lead multidisciplinary teams and have an important impact on health.

• Scoring. The NIH scoring system is used. Reviewers score each of the 5 selection criteria with a whole number using the entire range, from 1-9, with 1 being outstanding.

• Ranking and Final Selection of Candidates. Program staff collect the reviewers’ scores and compute rankings for each candidate. Finally, the Director and Associate Directors review and discuss the ranking of candidates, making adjustments as discussed above to enhance the diversity of disciplines, schools, departments, and racial/ethnic backgrounds.

Review of Scholar progress and criteria for reappointment. As discussed in Sections B.2 and B.5 above, all K Program Scholars, in consultation with their K Program Advisor and their Lead and Co-Mentors, create and periodically review a tailored Career Development Plan (Appendix 4). These reviews are the main opportunities to discuss ways to enhance the Scholar’s career development infrastructure, and to identify actions the Scholar needs to take to ensure continuation in the Program the following July. Since our shared goal is for Scholars to become independently funded academics by the end of their K award period (or earlier), our general guidelines or milestones for publications and grant submissions are shared by most academic departments (Table J).
C. Institutional Environment and Commitment

UCSF has 4 highly decorated professional schools in Dentistry, Medicine, Nursing, and Pharmacy, as well as a Graduate Division. In 2014 for the second year in a row, UCSF’s four schools topped the nation in NIH funding, with the graduate-level university as a whole receiving the most of any public recipient and second most overall. The UCSF School of Medicine topped the list of NIH funding for medical schools for the third year in a row in 2014, at $480.6 million. The UCSF schools of Pharmacy, Dentistry and Nursing also ranked first in their fields: Pharmacy for the 35th consecutive year, with $31.8 million in grants; Dentistry for the 23rd year, with $15.5 million; and Nursing for the 10th time in the last dozen years, with $10.1 million. All told, UCSF received more than $538.1 million total in NIH grants, with an additional $8.5 million in NIH contracts.

UCSF has a longstanding commitment to training junior faculty to develop independent research careers. Among institutions with Clinical and Translational Science Awards, UCSF ranks first in the number of individual K awards (350 awards between 2006-13), substantially more than the second (251 awards) and third (203 awards) ranked institutions. The institutional commitment to training junior faculty to conduct research is reflected in the support by the highest institutional officials for the development of the K Scholars Program and the sustained interest of departments and programs in all four professional schools in encouraging participation of their junior faculty in the K Scholars Program.

The K Scholars Program receives significant financial support from the Deans of all 4 professional schools: of the $3MM overall support from the School of Medicine (see Talmadge King Letter of Support), $480,000 annually is earmarked for the K Scholars Program, in addition to $25,000 per scholar per year from the Schools of Pharmacy, Dentistry, and Nursing for Scholars selected from their Schools. These resources are used to support program administration, program Core Faculty and other expenses. Institutional funding supports the comprehensive K Scholars Program, which includes KL2 Scholars, as well as other K Scholars supported by institutional NIH K12 awards, individual NIH K awards and NIH diversity supplements. This commitment at the highest level of the institution reflects the clear value of the comprehensive K Scholar Program to the UCSF campus in the career mentorship, methodological training, peer support, and advanced manuscript and grant-writing skill development to enhance the transition to research career independence that the program provides. The K Scholars Program includes KL2 awardees supported by the CTSI grant, as well as junior faculty from other institutional K12 programs or with career development awards or diversity supplements directly from the NIH.

All K Scholars are required to participate in in-person activities weekly or twice monthly, in addition to conducting mentored research and participating in didactic activities. The broad and sustained participation of so many junior faculty in the KL2 program and the broader K Scholars Program reflects commitment on the part of these individuals as well as their departments and schools in protecting the time required for research and skill development, as well as significant financial commitment on the part of departments to fund the “gap” in salary between the $85,000 per year provided by the KL2 award, and the total salary of the KL2 Scholar (which is generally substantially more than $85,000) that is required to protect 75% effort for research and career development activities.
D. Recruitment and Retention Plan to Enhance Diversity

The shared vision of CTSI, its associated training programs (KL2 and TL1), and leadership across UCSF is that UCSF trainees, staff, faculty and study participants will represent the rich diversity of the San Francisco Bay Area. CTSI collaborates with the UCSF Office of Outreach and Diversity to achieve this vision.

The K Program tracks numbers and proportions of underrepresented minority (URM) and women applicants and trainees annually and overall. The distribution of sex and ethnicity of applicants is similar to that of Scholars (Table I), and our Scholars broadly represent the diversity of the SF Bay Area. Overall, 11% of KL2 Scholars supported since 2006 are underrepresented minorities. Including Scholars in the larger K Program, 12% are URM (Table K, and Data Table 10). Our URM Scholars are diverse in discipline (14 MDs, 4 PhDs, 1 DDS) and from 17 departments or divisions. Over the past 5 years, 75% of KL2 trainees have been women (Table I).

### Table K. Diversity within the UCSF K Scholars Program

<table>
<thead>
<tr>
<th></th>
<th>KL2</th>
<th>Other K*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>K Scholars 2006-2015</td>
<td>96</td>
<td>64</td>
<td>160</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>8 (8%)</td>
<td>3 (5%)</td>
<td>11 (7%)</td>
</tr>
<tr>
<td>Black/African American</td>
<td>1 (1%)</td>
<td>5 (8%)</td>
<td>6 (4%)</td>
</tr>
<tr>
<td>Am Indian/Native Alaska /Hawaiian/Pacific Islander</td>
<td>2 (2%)</td>
<td>0 (0%)</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Total URM</td>
<td>11 (11%)</td>
<td>8 (13%)</td>
<td>19 (12%)</td>
</tr>
</tbody>
</table>

*UCSF K12, NIH K awards, faculty NIH diversity supplements and minority-targeted career development awards

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**Vignette: KL2 URM Trainees leverage K Awards to further success.** Christina Mangurian, MD MAS, Associate Professor of Psychiatry, aims to improve diabetes screening of people with severe mental illness, focusing on underserved minority populations. She received the KL2 in 2010; a K23 from NIDDK in 2012; and an R03 in 2015. Carmen Peralta, MD MAS, Associate Professor of Nephrology, focuses on mechanisms for racial/ethnic disparities in kidney disease and hypertension, and novel biomarkers for detection, classification and risk stratification of early kidney disease. She received the KL2 award in 2008; a K23 from NIDDK in 2009; an R03 in 2013; and an R01 in 2014. Elena Flowers, PhD, a current KL2 Scholar exemplifies the potential of efforts to improve the pipeline to enhance diversity. She was a TL1 trainee in 2009 and completed the Advanced Training in Clinical Research Certificate. Upon completion of her PhD in Nursing (2012), she was appointed Assistant Prof. in the Department of Physiological Nursing. She works on interdisciplinary teams that include molecular biologists, engineers, and systems biologists for her KL2 research on epigenetic factors and Type 2 Diabetes risk in high-risk racial groups.

**UCSF and CTSI efforts to enhance diversity** are described in full in the U54, Part 1.5. Many of these programs are designed to increase the diversity of our “pipeline” to the K Program, including the Pre-health Undergraduate and U54 SF BUILD programs for URM undergraduates, the VESP Clerkship Program for URM professional students, the Diversity Supplement initiative for URM trainees at multiple levels, and the URM Faculty Research Awards for junior faculty. To improve the overall culture of diversity at UCSF, CTSI has been a strong supporter to the Chancellor’s initiative Chancellor’s office to create the UCSF “Culture of Equity and Inclusion.” Finally, the UCSF Department Chairs’ Diversity Initiative will provide $9.7MM per year for URM faculty start-up and retention packages and to help URM trainees transition to faculty.

**KL2 Scholars Program efforts to enhance diversity.**

During our annual call for applications we contact all Department and Division Chairs across all 4 UCSF Professional Schools. We also work with Vice Chancellor for Diversity and Outreach, Renee Navarro to directly contact all UCSF URM fellows, post-doctoral students, and junior faculty to notify them of the KL2 opportunity; we offer to work with them to help them find mentors, if needed, and to prepare their KL2 application. In addition, we will:

- **Establish one-on-one mentoring for all URM Scholars** facilitated by Dr. Kirsten Bibbins-Domingo, KL2 Co-Director and an African American woman.
- **Provide training on mentoring for KL2 faculty advisors,** led by Dr. Mitchell Feldman, Director of CTSI Comprehensive Mentoring Program, with an emphasis on culturally competent and cross-gender mentoring.
- **Require training in Unconscious Bias** for all mentors of KL2 Scholars, provided by Dr. Rene Salazar, Director of Diversity for Graduate Medical Education.
- **Offer a half-day session on negotiation skills** for all Scholars led by K Program faculty and Dr. Gretchen Kiser, Director of the UCSF Research Development Office.
- **Offer a 12-hour leadership workshop** for all Scholars led by K Program faculty and the Coro Center for Civic Leadership, a nationally recognized leadership training organization.
- **Continue to offer training on work-life balance,** led by staff of the Campus Council on Faculty Life.
- **Establish a support group for women Scholars.** Dr. Catherine Chesla, Professor of Nursing, and a behavioral scientist, will facilitate this group quarterly on Friday mornings when Scholars attend regular KL2 activities. We will evaluate this pilot effort and expand, improve, or discontinue, based on the results.
## I. Institutional Career Development Core

### List of Appendices

<table>
<thead>
<tr>
<th>Appendix #</th>
<th>Title and Brief Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Master's in Clinical Research Degree Program.</strong> The UCSF Master's Degree in Clinical Research is required for KL2 Scholars who don't have this degree or equivalent.</td>
</tr>
<tr>
<td>2</td>
<td><strong>TICR Course Descriptions.</strong> Brief course descriptions from the TICR website of 44 courses.</td>
</tr>
<tr>
<td>3</td>
<td><strong>K Scholar Weekly Schedule, Sept-Dec 2015.</strong> The schedule illustrates Friday morning activities for K Scholars for the first semester.</td>
</tr>
<tr>
<td>4</td>
<td><strong>K Scholar Career Development Plan (CDP) Format.</strong> K Scholars are required to complete and update their CDP in formal meetings with their K Advisors twice a year.</td>
</tr>
<tr>
<td>5</td>
<td><strong>Leadership Workshop.</strong> Overview of a 3 session workshop offered by the UCSF Office of Career Development to K Scholars as a pilot in 2014-15. We plan to continue this in the new grant period, adjusting it based on K Scholar evaluations.</td>
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</table>
Applications are due **March 23, 2015** for admission in July 2015

Applications for the combined MD, Master's degree program are due **January 5, 2015**.

Program begins on **July 27, 2015** with an Orientation Session.

**OVERVIEW**

The Master's Degree Program in Clinical Research is a two-year course of study intended for scholars who wish to master clinical research methods and pursue clinical research careers. Clinical research is defined broadly as any health-related research where individual human beings or groups of human beings are the unit of observation. This includes patient-oriented, translational, epidemiologic, comparative effectiveness, behavioral, outcomes, or health services research. Program graduates are poised to work in a variety of research settings, including universities, public health departments, foundations, and private industry. Regardless of setting, the program strives to train individuals who will become leaders of research efforts and teams.

Coursework extends beyond that which is required for the ATCR Certificate Program to include instruction in advanced epidemiologic and biostatistical methods and specialized topics such as qualitative research, medical informatics, molecular methods in clinical research, and decision and cost-effectiveness analysis. A focused track in implementation science is also available for students pursuing careers in the translation of evidence into practice. In addition to coursework, requirements include a comprehensive review of the literature in the scholar's field, presentation of original work at a national or international scientific meeting, and publication of a peer-reviewed manuscript. Scholars will work closely with mentors in their research fields and preceptors chosen from TICR Program faculty.

The Master's Degree Program can either be taken as a stand-alone educational program or as a stepping stone to a more advanced degree such as the UCSF Ph.D. Program in Epidemiology and Translational Sciences.

**OBJECTIVES**

To complete the program, scholars must satisfy program objectives, which are to:

1. Acquire a mastery of a broad set of clinical research methods.
2. Plan and implement one or more clinical research projects.
3. Present research findings at a national or international meeting.
4. Write a comprehensive literature critique and publish one or more first-authored peer-reviewed original research papers.
5. Obtain experience in the instruction of clinical research methods.

**PREREQUISITES**

- Possession of an undergraduate degree from an accredited institution with a minimum grade point average (GPA) of 3.0 (equal to a letter grade of "B"). Preference will be given to scholars who have demonstrated knowledge or experience in some aspect of a health-related field (e.g., clinical practice, public health, health promotion) by virtue of either possession of a graduate or professional doctoral degree (MD, DDS, PharmD, PhD or international equivalent), being currently enrolled in such a program, or relevant work experience. Although not required, this prior knowledge or experience is preferred because program scholars will be required to perform original research in an area of their choosing to fulfill graduation requirements. Prior
substantive knowledge or experience in a health-related field can be very helpful in identifying a research area of interest and in maintaining motivation for the work.

- Established relationship with a research mentor at UCSF, defined as a faculty member in either of the Schools of Medicine, Nursing, Pharmacy, or Dentistry. Scholars already at UCSF should have this established by the time of application. Those who are applying from outside UCSF should have this established by the beginning of the program.
- For scholars who are primarily based in other training programs at UCSF, supervisor's assurance that at least 70% of time will be available August through May to divide between the activities of this program and the conduct of the trainee's clinical research projects.
- Affirmation of the Professional Conduct Statement (signed during orientation).

## TRACKS

The Master's Degree Program currently has one optional track of specialized instruction in which scholars can elect to enroll and anticipates other tracks in the future. Scholars in these tracks will be required to take the core set of courses in epidemiologic and biostatistical methods that underlie clinical research and will use their elective courses for focused instruction in their track's specific objectives.

### Implementation Science Track

Implementation science (IS) aims to improve the adoption of evidence-based practices and policies in clinical care and public health, and the development of best evidence through community engagement. The Master's Program IS track responds to the increasing concern of the World Health Organization (WHO) and U.S. National Institutes of Health and Institute of Medicine that the tremendous advances we have achieved in developing effective tests, treatments and preventive measures are not being fully translated into improved population health. IS research relates to the second arm of what is popularly known as translational research: the first arm ("T1") being the translation of knowledge from the laboratory to human subjects, and the second arm ("T2") involving the translation of clinical research (behaviors, therapies, or devices) into practice in real-world settings.

The IS Track is ideal for researchers who plan to pursue the development, implementation and/or evaluation of policies, practice-based interventions and/or community-based programs designed to: 1) improve uptake/safety/quality/access; 2) reach diverse populations; 3) reduce the overuse of diagnostic tests or treatments; or 4) provide preventative medicine or health promotion programs. Coursework in the track is guided by a conceptual framework that illustrates the different groups and organizations targeted by implementation research, and emphasizes the importance of interdisciplinary collaboration and community participation for the effective translation of evidence into practice. Master's Program scholars who elect the IS track begin coursework in the spring quarter of their first year and typically enroll in at least one IS course per quarter during the second year. In addition to course requirements, IS Track scholars receive career mentoring and specialized feedback on their research protocols. Scholars completing this track may list “Master of Advanced Study, Clinical Research with Specialization in Implementation Science” on their curriculum vitae.

The IS Track is co-sponsored by the UCSF Implementation Science Program and is directed by Dr. Margaret Handley and Dr. Adithya Cattamanchi. One distinction of IS research is its emphasis on multidisciplinary collaboration and teamwork. The IS track increases scholars' exposure to and contact with a broad spectrum of UCSF faculty conducting IS research - an important step in developing a research network that scholars can call upon throughout their careers.

## PROGRAM OF STUDY

### 1. COURSES

This is a two-year program of study. 36 quarter units are required. Trainees will take the majority of their coursework in the first year allowing for focus on independent research in the second year. Grading policy is determined by the UCSF Graduate Division. In particular, scholars should note that UCSF graduate students must maintain at least a 3.0 (B average). It is the policy of the TICR Program that one "C" grade or less (or one "U" grade) will trigger a discussion between the program director and the student about the expected level of performance in the program; two "C" grades or less (or two "U" grades) will trigger a formal review by the TICR Advisory Committee and may result in the student being
dismissed from the program. Please also note that letter grades cannot be converted to "S/U" after the
deadline for the quarter.

**TICR Policy Regarding Academic Credit for Courses Taken in the Past.**

Other policies and procedures governing graduate study at UCSF may be found at the Graduate Division
website.

**Course Registration:** All students matriculated in the Master's in Clinical Research Degree program
must follow the registration process established by the UCSF Office of Admissions and Registrar. Please refer
to the Office of Admissions and Registrar website for further information about the registration
process, deadlines for filing study lists, adding/dropping courses, and other matters.

**Required and Elective Courses**

**Sample Course Schedule**

### 2. ACCOMPLISHMENT OF THE FOLLOWING PRODUCTS OF CLINICAL RESEARCH

- **Preparation of a comprehensive literature critique:** For this requirement, the scholar will compose a comprehensive and systematic review and critique of the literature pertinent to a specific research question (or set of related questions) in his or her research field. "Comprehensive and systematic" means a complete and unbiased search for all relevant sources with explicit description of how this search was done. Questions that have already been adequately reviewed by others should be avoided. This review should take the form of a five to ten page double-spaced report (not including tables, figures, or references) that demonstrates the scholar's mastery of the field's literature. In some cases, but not all, the review will provide the rationale for the scholar's primary research project (the first authored manuscript requirement). Emphasis should be placed not only on describing the nominal findings of prior work but also on providing a methodologic critique of the prior research. Importantly, the fundamental objective of this literature review requirement is for the scholar to demonstrate that he/she can evaluate a number (at least 4, but preferably more) of papers/reports regarding a particular substantive question (or set of related questions), provide high-level critique of the threats to validity in the individual papers, and then come to a conclusion about the question(s) in hand. The conclusion could be that the research question can be answered with the available literature (and state what the answer is) or that because of too many threats to validity the question cannot be answered and hence needs more research. If appropriate, a quantitative meta-analysis can be performed, but this is not required. This report should be constructed with an eye towards formal publication, but this is not required. It is expected, although not required, that this requirement be completed by the end of the first year in the program.

- **First-authored oral or poster presentation at a national or international meeting:** This requirement involves submission of a first-authored abstract to a nationally or internationally recognized scientific meeting/conference within the scholar's academic field and acceptance of that abstract for either poster or oral presentation. The abstract should describe a study of a comparative nature (not simply a case report or case series) using data analyzed (but not necessarily collected) during residence in the Master's Program. It may be acceptable in selected cases, with pre-approval by the scholar's Master's Committee, to present work that was started prior to enrollment in the program. It is expected that the work represent a substantive contribution to the scholar's research field. The format should follow that suggested by the conference to which submission is intended. Achievement of this requirement will be considered complete upon satisfactory review by the scholar's Master's Committee and upon written confirmation indicating acceptance of the abstract by a committee-approved conference.

- **Submission as first author of a peer-reviewed manuscript:** Using data analyzed (but not necessarily collected) during residence in the Master's program, the scholar will prepare and submit a first-authored manuscript for publication in a peer-reviewed journal that is approved by the Master's Committee. It may be acceptable in selected cases, upon approval of the scholar's Committee, to submit work that was started prior to enrollment in the program. The manuscript should describe a study of a comparative nature and not simply a case report or case series. The manuscript may be a comprehensive extension of the work submitted in abstract form to a
national meeting. It is expected that the work represent a substantive contribution to the scholar's research field. The format should follow that suggested by the journal to which submission is intended. Achievement of this requirement will be considered complete upon satisfactory review by the scholar's Master's Committee and upon written correspondence indicating receipt of the manuscript by an approved peer-reviewed journal. Of note, it is not acceptable for a scholar to present an already submitted, accepted, or published manuscript to his/her committee and expect automatic approval. The final arbiters of the soundness of the work will be the Master's Committee members and not the journal editors or its reviewers.

Of note, these three written requirements follow the natural progression of a research project. First, thorough review of the existing literature is essential prior to embarking on any project. Second, research findings are typically first presented at scientific meetings, which give researchers an opportunity to get early feedback on their work. Finally, publishing research represents the culmination of the work. Thus, participation in the Master's Degree Program requires no extraneous capstone products; all of the required work is directly relevant to research productivity.

3. INSTRUCTIONAL EXPERIENCE IN CLINICAL RESEARCH

All scholars will be required to serve as instructional assistants (typically in their second year) for one or more courses in the TICR Program. This experience will typically involve leading a weekly small-group discussion section of 10 to 15 students, holding office hours for students, and grading homework assignments and projects. Scholars will receive feedback on their performance both from the Course Director and from students, who are polled anonymously using the TICR Program's web-based course evaluation system.

4. FILING FOR GRADUATION

The UCSF Graduate Division's Completion of Degree Requirements form should be used to document the completion of the required number of course units and the three required products of clinical research. Scholars should use this form to have their Master's Committee members mark their signatures attesting to the satisfactory completion of each written requirement. Scholars must be registered for the quarter during which they complete the last of their requirements, whether it is coursework or any of the written products. The Completion of Degree Requirements form must be completed and submitted to the Program Coordinator along with electronic files of all these required products by the end of the quarter during which the scholar plans to graduate.

The Completion of Degree Requirements form is available in a ready-to-use Microsoft Word format. To use this, click on the "Microsoft Word Format" button below. The word document should then appear in your browser. Next select "File > Save As" from the menu bar and save a local copy of the document to your computer. Make sure to save a copy of the file on your computer before attempting to use the file.

If you are not able to access the application in the Microsoft Word format, please download the .pdf version of the form by clicking on the pdf button above.

The following serves as the Master's Degree Program Policy on Student Progress. Each scholar will be asked to form a Master's Committee, which will consist of three faculty members:

1. A representative from the scholar's academic field (e.g., cardiology). This individual should be conducting primary research in the scholar's chosen field and will typically be a faculty member at UCSF. Upon approval from the TICR Master's Degree Program Director, individuals from outside of UCSF (e.g., UC, Berkeley; Stanford; or Biotechnology/Pharmaceutical Industry) may serve in this capacity. To request to include an individual outside of UCSF, scholars should
provide the Master's Program Director with the individual's curriculum vitae and a letter of justification.

2. An epidemiologist/clinical researcher faculty member (primary or secondary/affiliated appointment) from the UCSF Department of Epidemiology and Biostatistics. If possible, a faculty member with working knowledge of the scholar’s substantive interests should be chosen.

3. A biostatistician faculty member (primary or secondary/affiliated appointment) from the UCSF Department of Epidemiology and Biostatistics. A biostatistician will be assigned to you according to your substantive interests and methodologic needs.

The purpose of this committee is both to provide mentorship and to evaluate the achievement of the requirements for graduation. With the exception of the biostatistician (who will be assigned by the program), scholars should select and submit committee members to the Master's Program Director by the end of the Winter Quarter in the first year. One committee member should be selected as the Chairperson, whose role is to arbitrate when there is significant disagreement among committee members or to advocate for the scholar if he/she is experiencing difficulties gaining access to other committee members or scheduling meetings of the committee. The Chairperson must hold either a primary or secondary/affiliated faculty appointment in the Department of Epidemiology and Biostatistics. It is expected that scholars will meet with their committees at least quarterly to review progress and set future objectives.

By the end of their first year, scholars will be required to complete the "Initial Committee Review" form indicating: 1) that they have had at least one meeting with all 3 members of their Master's Committee present and, 2) that the committee members and scholar agree that the scholar is making satisfactory progress toward meeting the program requirements (i.e., the comprehensive literature review, first-authored presentation and manuscript). The completed form should be sent to Clair Dunne at Box 0560 by June 30 of the first year in the program. Scholars must complete this form in order to be eligible to register for subsequent quarters.

At no less than 6 months prior to the date that scholars anticipate completing the last of their original research products (i.e., the comprehensive literature review, first-authored presentation and manuscript), scholars are required to complete the "Pre-Graduation Review" form indicating that they have had at least one meeting with all 3 members of their Master's Committee present where the content and timeline were agreed upon regarding the completion of the three research products. For example, if the scholar plans to graduate at the end of the Spring quarter of the second year (the minimum length of stay in the program), then he/she will need to file for graduation by approximately June 5 and thus should complete the "Pre-Graduation Review" form by no later than December 5. The purpose of this "Pre-Graduation Review" meeting is to ensure that the Committee is well aware of the exact projects the scholars have chosen to fulfill their requirements. The completed form should be sent to Clair Dunne at Box 0560.

At no less than 3 months prior to the date that scholars anticipate completing the last of their original research products (i.e., the comprehensive literature review, first-authored presentation and manuscript), scholars are also required to complete the "Final Graduation Review" form indicating that they have had at least one meeting with all 3 members of their Master's Committee present where a final plan and timeline were agreed upon regarding the content and completion of the three research products. For example, if the scholar plans to graduate at the end of the Spring quarter of the second year (the minimum length of stay in the program), then he/she will need to file for graduation by approximately June 5 and thus should complete the "Final Graduation Review" form by no later than March 6. The purpose of this "Final Graduation Review" meeting is to ensure that the Committee is well aware of and agrees with the final plans the scholar has made to fulfill the program's research product requirements. The objective is to avoid last minute submissions to Committee members, which defeat the purpose of obtaining the members’ well-reasoned advice. It is, however, anticipated that the scholar will continue to meet with Committee members, either together or individually, after this required “Final Graduation
Review” meeting for further mentoring and review of the scholar’s work. When planning for final approval of products by Master’s Committee members, scholars should expect that Committee members may require as long as three weeks to return comments to the scholar. Therefore, Committee members should be presented with drafts of the required products well before the scholars’ anticipated graduation. The completed form and electronic files of all three required products should be sent to Clair Dunne at Box 0560.

At all required Committee meetings (and any other meetings held with the full committee), the scholar should take the responsibility for setting the agenda for the meeting, including sending out the agenda and accompanying materials (e.g., drafts of products) by e-mail at least one week prior to the meeting.

UCSF GRADUATION

In mid-May of each year, the UCSF Graduate Division invites all Master's Program scholars who anticipate graduating in the calendar year to participate in university-wide graduation ceremonies. Information about the ceremony is distributed in approximately March of each year.

APPLICATION

To apply for the Master's program starting in Summer 2015, you must complete the online UCSF Graduate Division application, and pay the $80 nonrefundable processing fee by March 23, 2015.

In addition to the Graduate Division application, you must also complete a detailed Master's Degree Program application. The Master's application is available in a ready-to-use Microsoft Word format. To use this, click on the "Microsoft Word Format" button below. The word document should then appear in your browser. Next select "File > Save As" from the menu bar and save a local copy of the document to your computer. Make sure to save a copy of the file on your computer before attempting to use the file.

If you are not able to access the application in the Microsoft Word format, please download the .pdf version of the application by clicking on the pdf button below. This can then be printed out and completed by typing where indicated.

Reference Report Form (Microsoft Word Format)
Reference Report Form (PDF Format)

Scholars either currently in or graduated from the ATCR Credit-bearing Certificate Program may submit updated versions of their original applications to the ATCR Program. Note that such scholars must still provide three new or updated letters of recommendation for the Master's Degree Program application.

Scholars who graduated from the ATCR Credit-bearing Certificate Program longer ago than 2 academic years will require a discussion with Program officials about which courses might have to be re-taken (because they have evolved substantially since the scholar took them). Such scholars will also be subject to a $500 re-entry fee.

Completed Master's applications in MS Word or .pdf format should be sent by email to Olivia De Leon (olivia@epi.ucsf.edu). A signed hard copy of the application should also be sent to:
International Applicants: The Master's in Clinical Research program welcomes applications from international scholars who meet the prerequisites, but the program does not provide any financial aid. In addition to meeting the same admission requirements domestic students must meet, international applicants from non-English speaking countries must also demonstrate proficiency in English by completing one year of study with a minimum grade point average (GPA) of 3.00 at an accredited college or university in the United States, OR by obtaining the following minimum scores on the Test of English as a Foreign Language (TOEFL) – administered by ETS, or the IELTS - International English Language Testing System: paper-based TOEFL – 550; computer based TOEFL – 213; internet-based TOEFL (iBT) – 80; or IELTS – 7.

Once an international applicant has been accepted into the Master's program, the scholar is expected to work with UCSF’s International Students and Scholars Office (ISSO) to obtain the appropriate visa. Note that the program begins on July 27, 2015 so travel arrangements should be made to arrive in San Francisco by July 26, 2015.

The UCSF Graduate Division will evaluate foreign transcripts for those individuals who have applied. Students may be required to have their transcripts verified by a third party company, such as Educational Credential Evaluators, Inc. or World Education Services, if the Graduate Division is unable to verify your degree.

Deadline: Applications are due by March 23, 2015 for admission in Summer 2015. All materials must be received by this date. If any portion of the application is not received by this date, the application will be considered incomplete and will not be further considered without petition, explanation, and payment of $150 late fee. Additional late fees may apply for exceptionally late transactions. Scholars who desire an admissions decision prior to May may request this.

5-Year Combined MD/MAS Applicants: The application deadline for the 5-year combined MD/MAS applicants is January 5, 2015. Please complete the Master's Program application as described above and send it by e-mail to Peter Chin-Hong (peter.chin-hong@ucsf.edu) by January 5, 2015.

Costs: The Master's Program is a minimum two-year course of study, requiring registration for seven quarters (Summer, Fall, Winter, Spring in the first year and Fall, Winter, Spring in the second year). Fees for 2015-16 are $26,234. Fees are subject to change without notice. Withdrawal after enrollment into the program will be subject to a $150 non-refundable fee. Selected applicants will be eligible to have their fees offset by a Department of Epidemiology and Biostatistics Scholarship of up to $8,215 the first year. Based on the current fee structure, we anticipate that in the second year, selected applicants will have their fees offset by up to an additional $3,000 to compensate for teaching assistance required in the second year (for a total offset of up to $11,215, although this is subject to change). Those applicants who meet the following criteria will be eligible for the fee offset:

1. Demonstrated excellence in the performance of academic work and clinical care, based on prior transcripts, publications, and letters of recommendation. This criterion will be evaluated by the Master's Degree Program Admissions Committee.
2. Concurrent enrollment in a UCSF/UCB-sponsored residency or post-doctoral fellowship program that is recognized by the UCSF Office of Graduate Medical Education; or a registered student in one of the professional schools or graduate programs at UCSF/UCB (in a program other than the
Procedures for Tuition Payment

Health Insurance: Please note the student service fee included as part of the tuition for the Master's Program DOES NOT include student health insurance. If you do not have health insurance coverage, you will need to arrange and pay for this yourself. As a graduate student at UCSF, you are eligible for coverage through the Scholars and Researchers Health Plan. Please contact Student Health and Counseling Services (SHCS) directly at 476-1281.

Late payments: Please note that when you are accepted to the Master's Program, you will receive a payment form with a deadline for fee payment. If you miss this deadline, we reserve the right to charge you a late fee of $150. This is in addition to the fee that may be charged by the Office of Admission and Registrar.

Scholars are also strongly encouraged to own a wireless-capable laptop computer for use in computer labs in various courses and to take advantage of the wireless internet network at the TICR Program's facility at Mission Hall in the UCSF Mission Bay Campus.

The statistical software package Stata (Stata Corporation, College Station, Texas) is used in the program. The TICR Program has arranged for a sizeable discount for UCSF-affiliated personnel via the Stata GradPlan program.

Interviews: Selected applicants will be interviewed by the admissions committee or its designate.

Changing Degree Objective to ATCR Certificate: If you decide after enrolling in the program that you do not want to continue in the Master's degree program and instead wish to stop your training after the first year and earn the Advanced Training in Clinical Research Certificate, you will need to obtain the approval of the TICR Program Director, and officially change your degree objective with the Office of Admission and Registrar. You will then be charged the fee for the year-long ATCR Credit Bearing program.
Overview of Courses

Courses by Quarter

Summer  Fall  Winter  Spring

Courses by Topic

- Epidemiologic Methods
- Biostatistical Methods
- Drug/Device Development
- Qualitative Methods
- Medical Informatics
- Genetic Epidemiologic Methods
- Decision and Cost-Effectiveness Analysis
- Implementation Science
- Practical/Professional Skills
- Subject Matter-Specific

With the exception of the Master's and ATCR Seminars and Epi 212, all courses are open to individuals both within and outside the UCSF community. Those not in the ATCR or Master's programs pay fees which can also be found in the course applications.

*Courses Offered in Online Format

**Summer**

*Designing Clinical Research* (EPI 150.03 and EPI 202)
These courses provide instruction in developing a clinical research question and creating a concise protocol that includes literature review, study design, subject sampling and recruitment, instruments and other measurement approaches, sample size, consent form, budget and timetable. Each trainee reviews and supports the work of colleagues. The course closely follows the textbook *Designing Clinical Research*, by S. Hulley and other TICR faculty, now in its fourth edition. **EPI 150.03** is intended for undergraduate and professional students as well as clinical residents. **EPI 202** is intended for doctoral students, fellows, or faculty members.

* Database Management Systems for Clinical Research (EPI 218)
Instruction in choosing the appropriate data management system; design of research databases; options in data entry; form and report generation; computer security; and budgeting for data management personnel and equipment.

* Introduction to Statistical Computing in Clinical Research (BIOSTAT 212)
Instruction in use of statistical software for exploring and analyzing clinical research data. While the roles of spreadsheet and relational database programs will be discussed, the course will focus on the STATA statistical software package for analyzing and presenting data.
**Designing Clinical Research for Clinical Residents**
This course provides instruction in developing a clinical research question and creating a concise protocol that includes literature review, study design, subject sampling and recruitment, instruments and other measurement approaches, sample size, consent form, budget and timetable. Each trainee reviews and supports the work of colleagues. The course closely follows the textbook *Designing Clinical Research*, by S. Hulley and other TICR faculty, now in its fourth edition. This course is intended for clinical residents at UCSF.

* **Epidemiologic Methods** (EPI 203)
Instruction in the diverse array of study designs, and their theoretical interrelatedness, available in clinical and epidemiologic research; importance of measurement; different types of measures of disease occurrence; methods to measure exposure - disease association; measures of attributable risk; effect-measure modification; approaches to identify and minimize selection, measurement and confounding bias; and conceptual motivation for more sophisticated methods (e.g., regression or marginal structural approaches) to manage confounding, which are increasingly common tools in epidemiologic analyses.

* **Clinical Epidemiology** (EPI 204)
Instruction in the research implications of evidence-based clinical medicine, including the specifications of diagnostic tests, screening tests, and prognostic tests.

* **Biostatistical Methods for Clinical Research I** (BIOSTAT 200)
Introduction to descriptive statistics, distributions, probability, exploratory data analysis, and selected variable parametric and non-parametric inference. The STATA software package will be used throughout to implement concepts learned in class and to allow scholars to begin to explore their own data.

**Biostatistical Methods for Clinical Research IV** (BIOSTAT 210)
A continuation in the biostatistics for clinical research sequence, covering advanced methods for building and evaluating regression models. The emphasis is on methods which cut across common families of regression models in biostatistics: predictor selection, model diagnostics, and missing data. The statistics package STATA will be used throughout the course.

**Qualitative Research Methods** (EPI 240)
Introduces basic qualitative research methods used in clinical settings: question design and interviewing techniques; focus group analysis; ethographic fieldwork, notes and narrative analysis; and audio and video data collection and analysis.

**Program Evaluation in Clinical and Public Health Settings** (EPI 242)
Instruction in different types of program evaluation, including needs assessment, formative research, process evaluation, monitoring of outputs and outcomes and impact assessment; developing an evaluation plan and using systematically collected information about a program to understand whether and how the program is meeting its stated goals and objectives; improve program effectiveness; make decisions about future programming.

**Infectious Disease Epidemiology** (EPI 253)
Instruction in intermediate and advanced concepts in infectious disease epidemiology. Topics include social network analysis, vaccine efficacy, epidemic dynamics, evaluation of communicable disease interventions, surveying hard-to-reach populations, prophylaxis and mass drug administration.

**Demographic Methods for Health** (EPI 263)
Instruction in basic demographic methods, including population dynamics, fertility, mortality, migration, urbanization, aging, and family structure. The emphasis will be on how and why understanding these factors is important for public health practitioners.

**Spatial Epidemiology** (EPI 264)
Introduction to the concepts, principles, and methods for the visualization and analysis of spatially
referenced health data. Lectures, discussion and assignments will highlight spatial data analysis techniques with applications in malaria and other infectious and non-infectious diseases prevalent in international settings.

**Grant Writing Workshop on Mentored Career Development Awards**
Instruction in writing successful grant applications for NIH mentored career development awards. Workshop uses examples from patient-oriented research career development awards (K23s). Underlying concepts for the career development plan, mentoring plan, and research plan also apply to research scientist development awards (K01s) and clinical scientist development awards (K08s).

**Masters Seminar I** (EPI 220)
The seminar provides a forum for presenting scholar's projects, and for evaluating controversies in clinical research.

**Masters Seminar II Fall** (EPI 221)
The seminar provides a forum for scholars to present their projects and specialized methodologic topics.

**ATCR Seminar** (EPI 230)
These monthly seminars provide a support group for discussing the design or conduct of trainees' studies and for critique of contemporary clinical research literature.

**Winter**

**Clinical Trials** (EPI 205)
Instruction in experimental design options; methods of randomization; blinding, interventions and controls; measuring outcomes and adverse effects; follow-up, compliance and postrandomization problems; ethical issues; and working with pharmaceutical companies.

**Biostatistical Methods for Clinical Research II** (BIOSTAT 208)
Instruction in multiple predictor analyses as a tool for control of confounding and for constructing predictive models. Topics will include linear regression and logistic regression. The STATA statistical package will be used throughout.

**Statistical Issues in Design, Monitoring, and Analysis of Randomized Controlled Trials** (BIOSTAT 226)
Instruction in advanced topics in biostatistics in two subject areas: 1) issues in the design and analysis of randomized clinical trials; and 2) bioinformatics.

**Decision and Cost Effectiveness Analysis in Medicine** (EPI 213)
Instruction in creating decision trees and other analytic models; obtaining appropriate probabilities, utilities and costs; and completing analyses using customized software.

**Molecular and Genetic Epidemiology I** (EPI 217)
Introduction to the concepts, principles, and use of molecular and genetic methods in epidemiologic and clinical research and how to develop a framework for interpreting, assessing, and incorporating molecular and genetic measures in research.

**Medical Informatics** (EPI 206)
Instruction in the core concepts of medical informatics: vocabularies, interchange standards, decision support systems, and how computers are used to manage information in health care and to support clinical research.

**Translating Evidence Into Practice: System-Centered Implementation Strategies** (EPI 247)
Instruction in translational tools at health care system level to promote the adoption of evidence-based medicine by the public and providers through mechanisms that influence health care delivery systems.
**Translating Evidence Into Practice: Individual-Centered Implementation Strategies** (EPI 246)
Instruction in developing interventions for individual health behavior change, including behavior change strategies at the individual, interpersonal, and system/community level; developing practical frameworks to integrate principles of behavior change theory.

**Translating Evidence Into Policy: Framing Research to Influence Policy** (EPI 249)
Instruction in types of questions that can be addressed with large administrative and clinical databases; gaining access to these databases; determining validity of information; risk adjustment; linking datasets; and building registries. Instruction in the policy process and strategies for collecting and disseminating research findings to inform and influence that process. The course will be taught through a series of lectures and interactive sessions during which trainees will have an opportunity to apply the strategies to their own work.

**Epidemiologic Methods II** (EPI 207)
Topics will include: the interrelationships between various measures of disease occurrence and association; concepts of attributable risk; interactions; practical and theoretical considerations of the most common study designs in observational research; methods of reducing confounding including matching, instrumental variables and propensity scores.

**Epidemiology of Aging** (EPI 210)
Instruction in the issues and methods for the study of the epidemiology of aging with a focus on common chronic diseases in older populations.

**Grant Writing Workshop** (EPI 258)
This course is designed to clarify early investigators’ research and career goals and to learn all the components of NIH pre- and post-doctoral grants.

**Neglected Tropical Diseases** (EPI 261)
This seminar course will provide an overview of neglected tropical diseases (NTDs), especially those transmitted by vectors (arthropods, snails), their public health importance and strategies for their control.

**Pharmacoepidemiology** (EPI 262)
This seminar course will provide an overview of methods, data sources, and other selected topics in pharmacoepidemiology.

**Grant Writing Workshop on Mentored Career Development Awards**
Instruction in writing successful grant applications for NIH mentored career development awards. Workshop uses examples from patient-oriented research career development awards (K23s). Underlying concepts for the career development plan, mentoring plan, and research plan also apply to research scientist development awards (K01s) and clinical scientist development awards (K08s).

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**Masters Seminar II Winter** (EPI 221)
The seminar provides a forum for scholars to present their projects and specialized methodologic topics.

**ATCR Seminar** (EPI 230)
These monthly seminars provide a support group for discussing the design or conduct of trainees’ studies and for critique of contemporary clinical research literature.

**Spring**

**Biostatistical Methods for Clinical Research III** (BIOSTAT 209)
A continuation of the Winter Quarter course in multivariable statistical analysis that includes
instruction in survival analysis and analysis of repeated measures and clustered data. The course culminates with student presentations of statistical analyses of their own research projects.

**Systematic Reviews (EPI 214)**
Instruction in the methods of systematic and unbiased identification of primary research studies; abstraction of data; determination of summary estimates and evaluation of heterogeneity.

**Publishing and Presenting Research (EPI 212)**
Instruction in preparing abstracts, posters, all aspects of manuscripts, and oral presentations; instruction in oral presentations includes videotaping and critique of trainees' presentations.

**Statistical Methods in Genetic Epidemiology (BIOSTAT 219)**
Instruction in selected statistical aspects of population-based and family-based candidate gene association studies, quantitative trait mapping in model organisms, and methods for dealing with multiple comparisons.

**Health Disparities Research Methods (EPI 222)**
An introduction to the information and skills needed to conduct high-quality research in diverse populations, relevant both to health disparities researchers and to any researcher doing work with populations that are diverse with respect to race/ethnicity and/or socioeconomic status.

**Translating Evidence Into Practice: Theory and Design (EPI 245)**
An introduction to the different target audiences and approaches needed to translate biomedical evidence into practice. The course is the gateway for scholars who plan for additional study within this discipline but also suffices as cross-exposure for scholars from other disciplines. In addition to didactic work, scholars are guided through the creation of a research protocol aimed towards translating their particular choice of evidence into practice.

**Translating Practice into Evidence: Community Engaged Research (EPI 248)**
Introduces the principles and applied methods of community engaged research, including defining the community and partnership models for identifying relevant research questions, developing and implementing study designs, interpreting and disseminating findings, and scaling-up studies for translational implementation research.

**Development and Approval of Drugs and Devices (EPI 260)**
Instruction in drug and device development from late preclinical through phase 3 clinical studies; will introduce students to drug/device regulations, investigational new drug filings, assessment of drug candidates, statistics, safety monitoring, clinical study design and conduct.

**Advanced Approaches to the Analysis of Observational Data (BIOSTAT 215)**
A common goal of observational clinical or epidemiologic research is to estimate the causal effect of particular exposures or interventions on some health outcome. This course will describe more advanced methods that may succeed in estimating causal effects in cases where standard approaches break down.

**Cancer Epidemiology (EPI 252)**
This course will cover the basic understanding of the principles and methods of epidemiology, and the application of this knowledge to the study of the epidemiology of neoplastic diseases.

**Epidemiologic Methods III (EPI 265)**
This course will focus on clearly articulating and testing research hypotheses related to the determinants and consequences of chronic conditions. Each session will introduce specific methodological concepts for epidemiologic studies, organized around an illustrative applied research paper. The course will emphasize causal inference from observational data. Most examples will be drawn from literature on social and lifecourse determinants of dementia, stroke, and cardiometabolic disease.

**Advanced Grant Writing Workshop (EPI 259)**
This grant writing course is a continuation of EPI 258. By the end of the course, students will
complete all remaining grant components, including all research and training sections and ancillary materials. Feedback from instructors and peers will hone the students’ applications.

**Grant Writing Workshop on Mentored Career Development Awards**
Instruction in writing successful grant applications for NIH mentored career development awards. Workshop uses examples from patient-oriented research career development awards (K23s). Underlying concepts for the career development plan, mentoring plan, and research plan also apply to research scientist development awards (K01s) and clinical scientist development awards (K08s).

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**ATCR Seminar** (EPI 230)
These monthly seminars provide a support group for discussing the design or conduct of trainees' studies and for critique of contemporary clinical research literature.
## KL2 APPENDIX 3.

### K Scholars Program Schedule, Sept-Dec 2015

**Mission Hall at Mission Bay**

*Please contact [Christian.Leiva@ucsf.edu](mailto:Christian.Leiva@ucsf.edu) to make a change to the schedule*

*Denotes different room*

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<tr>
<th>Date</th>
<th>9 AM Seminar 9:00-10:00</th>
<th>1st Yr WIPs 10:00-11:45</th>
<th>2nd Yr WIPs 10:00-11:45</th>
<th>Senior A WIPs 10:00-11:45</th>
<th>Senior B WIPs 10:00-11:45</th>
<th>Noon Event 12:00-1:00</th>
<th>Other Events see individual listing for times</th>
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<td><strong>Sep 18</strong></td>
<td>MH-2700: Health IT: Richard Grant</td>
<td>MH-2500: Chow Abuabara KBD/McCulloch</td>
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<td>MH-2700: K Networking Meeting and Lunch</td>
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<td>Oct 16</td>
<td><strong>MH-2700: The Writer's Algorithm:</strong> Amy Markowitz</td>
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<td>Oct 23</td>
<td><strong>MH-2700:</strong> Mini Series on Big Data: John Kornak</td>
<td><strong>MH-2500:</strong> Abuabara Ku</td>
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<td><strong>MH-2500:</strong> L. Park Ishida</td>
<td><strong>MH-2700:</strong> Wilson Yoon</td>
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<td><strong>MH-2500:</strong> Scott Ferrara</td>
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KL2 APPENDIX 4

K SCHOLAR CAREER DEVELOPMENT PLAN (CDP) FORMAT

(Please attach updated CV and a page of publications, presentations and grants that are in progress)

Scholar’s Name:
Date of Report:
Primary Mentor’s Name:
Secondary Mentor’s Name:

I. Scientific / clinical goal(s):

A. Objective:
   i. Education/training
   ii. Research activities
   iii. Products (include dates)

B. Objective:
   i. Education/training
   ii. Research activities
   iii. Products (include dates)

II. Career / leadership goal(s):

A. Objective:
   i. Education/training
   ii. Other related career activities
   iii. Products (include dates)
Suggestions for Completing the Career Development Plan

GOALS
Please succinctly describe your long-term (~10 year) goals.

1. The Scientific/Clinical goal should reflect your vision of how your research will ultimately improve human health. For example, one goal could be “To improve the early detection of patients with multiple sclerosis.”

2. The Career Goal should reflect a leadership role you may want, such as Chief of a Division or leader of an enterprise. For example, a goal could be “To lead a Center for Study of Pediatric Obesity”.

OBJECTIVES
For each goal, specify 2 to 5 objectives that are important to achieving your scientific or career goals. These objectives may include mastery and application of technique that is applied to the condition of interest. For example, one objective could be “To apply cost-effectiveness analyses to tests to select cancer patients for use of very expensive chemotherapies.” A career objective may include promotion.

Educational/training activities
For each Objective, please indicate any training you need. For example, if you plan to apply cost effectiveness analyses to selection of cancer patients for treatment, you may want training in cost-effectiveness analysis. Regarding leadership, you may want to take a leadership training program for academic medicine.

Research activities
For each Objective, please indicate any projects that will assist you in meeting that Objective. For example, if you want to study congestive heart failure in young adults, you may want to 'develop a registry of young adults with congestive heart failure with DNA and imaging studies.'

Other related career activities
For each Objective within the career goal, list related activities that may be important for allowing you to achieve this objective, including specific administrative or leadership opportunities.

Products
For each Objective, please indicate what individual products (degrees, publications, presentations, grants) are expected to contribute to you achieving your Objectives. For example, if you are studying CHF in young adults, you may want to complete a ‘Systematic review of genetic studies of CHF in young adults.’ Keep the scholar milestones (listed on the first page) in mind as you consider these products, and please include expected date of completion.
I. PROGRAM OVERVIEW

The Center for the Health Professions (the Center) is pleased to offer the K-Scholars Program leadership training and development. As K-Scholars, you are in a unique position to affect change in patient and community health, and strong leadership skills will support you to navigate a rapidly changing environment and ensure success as clinicians and researchers. The goal of this training and development series is to provide a foundation for your leadership development and give you the tools you need to achieve your career goals and become leaders in your fields.

II. OBJECTIVES

Over the course of program, you will participate in 3 half-day sessions and other learning experiences that will increase your ability and motivation to:

1. Demonstrate greater self-awareness and self-efficacy in leadership capabilities
2. Communicate effectively to gain buy-in and guide the efforts of others
3. Foster open communication in your teams and with other stakeholders
4. Engage in an ongoing process of developing leadership capabilities

III. PROGRAM ELEMENTS

The K-Scholars Leadership Program will take place over a six-week period and will include the following elements:

- **In person sessions**: Three, half-day sessions that focus on the skills and competencies needed in leadership. These sessions provide interactive, experiential lessons that build self awareness.

- **Inter-session Coaching**: In-between Sessions, participants participate in one-on-one coaching with a specialized executive coach matched with each participant’s development needs.

- **Personal Development Plan**: Participants develop and implement leadership development goals.
VI. SESSIONS

Participants attend three half-day Sessions over the course of the two-month program.

The following table outlines the curriculum for the program:

| BEFORE SESSION 1 | • Complete MBTI assessment instrument  
|                  | • Complete coaching intake  
|                  | • Readings on leadership |
| *SESSION 1: YOUR LEADERSHIP DEVELOPMENT PLAN* | Course and Program introduction:  
|        | • How the program works & expected outcomes  
| April 24th, 2015 | • Get to know each other |
| 12 pm - 4 pm | Leadership Development:  
| UCSF, Mission Bay | • Understand why leadership development is crucial to achieving your career goals and job satisfaction as a clinical researcher  
|                  | • Develop an awareness of personal leadership style through the MBTI tool |
| **FACULTY:** | Sunita Mutha, MD  
| Professor of Medicine, Director of the Center for the Health Professions (UCSF) |
| Niraj Sehgal, MD | Professor of Medicine, Director of the UCSF Institute for Physician Leadership and the IPC-UCSF Fellowship for Hospitalist Leaders |
| *SESSION 2: DEFINING & SHARING YOUR PERSONAL MISSION AND VISION* | • Explore the connection between vision and strategy  
| May 8th, 2015 | • Develop your personal mission/visibility  
| 12 pm - 4 pm | • Communicate your personal mission/visibility effectively  
| UCSF, Mission Bay | • Practice giving and receiving feedback |
| **FACULTY:** | Sunita Mutha, MD  
| Professor of Medicine, Director of the Center for the Health Professions (UCSF) |
| Executive Coaching: Between Sessions 1 & 2 | • Identify and finalize your personal development goals  
| | • Reflect on MBTI assessment and how it can inform your personal development goals |
| *SESSION 3: WORKING WITH AND THROUGH OTHERS* | • Understand the elements of high performing teams  
| May 22nd, 2015 | • Practice having difficult conversations that lead to stronger relationships and positive work environments  
| 12 pm - 4 pm | • Learn tools for effectively working with and through others |
| UCSF, Mission Bay | **FACULTY:**  
| Nancy Friedman, MBA | Executive Coach  
| and Leadership Development Consultant |
| *AFTER SESSION 3 (OPTIONAL): EXECUTIVE COACHING PART 2: A PATH TOWARD LIFELONG DEVELOPMENT* | • Reflect on lessons learned in seminars  
| | • Create an action plan for ongoing learning and development  
| | • Determine if professional coaching will continue |
IX. PROGRAM EXPECTATIONS AND SUGGESTIONS

Our goal is to provide a meaningful and challenging set of learning opportunities over the course of the two-month program. Following are a few suggestions for helping you make the most of this experience.

• Every leadership experience is unique. Take the time to learn from and share your lessons with others in the program.
• Take advantage of the assessment process of the program – review your results from time-to-time, build on your strengths, and strengthen your weaknesses or areas that are less comfortable.
• Don’t be disappointed if you experience setbacks -- this is part of the learning experience. Use these opportunities for reflection and growth. Remember nothing ventured, nothing gained.
• To help you get the most out of the face-to-face sessions, we expect that:
  • Participants will complete assessments on time.
  • Participants will attend and engage in all sessions and coaching activities
  • Sessions will start on time.
  • Cell phones & beepers will be off during sessions.

PROGRAM CONTACT INFORMATION:

PROGRAM STAFF:
Ami Ehrlich, MA, Program Manager, ami.ehrlich@ucsf.edu, 415-476-9325
Shaine Helsloot, MA, Program Associate, shaine.helsloot@ucsf.edu, 415-502-6772
Christian Lieva, Coordinator, Christian.Leiva@ucsf.edu, 415-514-8141

FACULTY:
Nancy Friedman, MBA
Sunita Mutha, MD
Niraj Sehgal, MD

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<th>NAME</th>
<th>ROLE</th>
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<tr>
<td>Ami Ehrlich</td>
<td>Program Manager</td>
<td>Responsible for the overall management of the program.</td>
<td><a href="mailto:ami.ehrlich@ucsf.edu">ami.ehrlich@ucsf.edu</a> 415-476-9325</td>
</tr>
<tr>
<td>Shaine Helsloot</td>
<td>Program Associate</td>
<td>Responsible for tracking and analyzing participant assignments. Key contact for the Faculty, Coaches, and Participants</td>
<td><a href="mailto:shaine.helsloot@ucsf.edu">shaine.helsloot@ucsf.edu</a> 415-502-6772</td>
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FACILITIES AND OTHER RESOURCES
UNIVERSITY OF CALIFORNIA, SAN FRANCISCO (UCSF)

GENERAL
The University of California, San Francisco (UCSF), one of the ten campuses of the University of California, is devoted solely to graduate education and research in the health sciences. UCSF is composed of the Schools of Medicine, Dentistry, Pharmacy, and Nursing, and the Graduate Division. In both size and number of students, UC San Francisco is the smallest of the UC campuses. Nevertheless, its relative size belies its distinction as one of the leading biomedical research and health science education centers in the world. In addition, UCSF is a major health care delivery center in northern California with a high volume of regional, national, and international patient referrals.

Over the last century, the original nucleus of academic schools and divisions has grown to include a School of Nursing (1939); the Langley Porter Psychiatric Institute (1942), which contains the city's first psychiatric hospital; and a Graduate Division (1961). The Graduate Division functions as the administrative and quality control unit for more than 2,940 students enrolled in PhD and master's programs and 1,030 academic postdoctoral fellows, representing 94 countries. UCSF also is home to 11 research institutes, 1,500 laboratories, more than 5,000 ongoing research projects, and a library with a state-of-the-art computing and communications infrastructure. UCSF’s four professional schools (Dentistry, Medicine, Nursing, and Pharmacy) are ranked in the top tier nationally and internationally (measured by academic quality, publication citations of faculty, and amount of extramural support for research and education) as centers for education and research in the various disciplines. UCSF’s graduate academic PhD programs are also ranked in the top tiers of programs in the biomedical bio-psychosocial disciplines. There are 35 academic departments, 17 multidisciplinary research centers, and many NIH-funded multidisciplinary research grants including 19 Research Program Projects (P01), 12 Center Core Grants (P30), 12 Specialized Center Grants (P50), and 64 Project (U01)/Program (U19)/Center (U54) Cooperative Agreements. The Graduate Division offers 19 degree programs to students pursuing masters and doctoral degrees in disciplines ranging from bioengineering to chemical biology, from biopharmaceutical sciences and pharmacogenomics to nursing, and from global health to sociology. Graduate programs are organized around several interdisciplinary research areas that often contain members from several departments. UCSF also offers a CTSI-supported Advanced Training in Clinical Research Certificate program and a Master’s Degree in Clinical Research as part of the Training in Clinical Research Program described below. UCSF has taken national leadership in the establishment of quality standards for the selection, appointment, compensation, and education of postdoctoral scholars. UCSF is committed to recruiting and retaining a diverse population. Of the 20,400 UCSF staff, 56% are minorities and 68% are women. Of the 2,500 faculty, 29% are minorities and 45% are women. Of the 3,000 students and trainees, 49% are minorities and 57% are women.

UCSF is one of the leading biomedical research and graduate education centers in the world, and it ranks in the top group of institutions of higher learning in total federal funding for research and training. UCSF has an annual budget of over $3.3 billion to support its various research, teaching, and patient care activities. A large portion of the extramural funds received is allocated for biomedical research. Research funding primarily is obtained on a competitive basis from the federal government. Additional research funding is received annually from the State of California, the University of California Office of the President, private research foundations, state and local government agencies, private philanthropy, and industry. UCSF was awarded $546.5M in NIH funding in 2014, which was first among public institutions and second among all institutions nationwide. In 2014, the UCSF School of Dentistry received $15.5M (ranked first), the School of Nursing received $10.1M (ranked first), the School of Pharmacy received $31.8M (ranked first), and the School of Medicine received $480.6M (ranked first). Among its faculty are five Nobel laureates, 39 National Academy of Sciences members, 57 American Academy of Arts and Sciences members, 79 National Academy of Medicine (formerly the Institute of Medicine) members, and 16 Howard Hughes Medical Institute investigators.

Over the past decade, UCSF’s capacity for clinical and translational research in the context of world-class graduate education has been redoubled by the construction of academic facilities at the new UCSF Mission Bay Campus, which is continuing with the 265,000 sq. ft. Global Health & Clinical Sciences Building, which houses the CTSI, and the 878,000 sq. ft. children’s, women’s specialty, and cancer hospital complex. Currently, UCSF has over 1.5 million assignable square feet (ASF) of research space: ~62,000 ASF in the School of Dentistry, ~1.3 million ASF in the School of Medicine, ~32,000 ASF in the School of Nursing, and ~126,000 ASF in the School of Pharmacy. This total space supports approximately 2,400 Principal
Investigators with active sponsored awards. Research and clinical activities take place on the six main San Francisco campuses of UCSF: Parnassus, Mount Zion, Laurel Heights, San Francisco General Hospital, San Francisco Veterans Administration Medical Center, and Mission Bay. A frequent UCSF shuttle bus service (running every 20 minutes) allows for efficient staff, reagent, and mail travel between all main campus facilities.

**UCSF INSTITUTIONAL SUPPORT FOR THE K SCHOLAR PROGRAM**

The K Scholars Program has received significant financial support from the Deans of all 4 professional schools, including $480,000 annually from the Dean of the School of Medicine, as well as $25,000 per Scholar per year for Scholars from the Schools of the Schools of Pharmacy, Dentistry, and Nursing (see Letters of Support). These resources are used to support program administration, program Core Faculty and other expenses. Institutional funding supports the comprehensive K Scholars Program, which includes KL2 Scholars, as well as other K Scholars supported by institutional NIH K12 awards, individual NIH K awards and NIH diversity supplements. This commitment at the highest level of the institution reflects the clear value of the comprehensive K Scholar Program to the UCSF campus in the career mentorship, methodological training, peer support, and advanced manuscript and grant-writing skill development to enhance the transition to research career independence that the program provides.

All K Scholars are required to participate in in-person activities weekly or twice monthly, in addition to conducting mentored research and participating in didactic activities. The broad and sustained participation of so many junior faculty in the KL2 program and the broader K Scholars Program reflects commitment on the part of these individuals as well as their departments and schools in protecting the time required for research and skill development. In addition, departments make a substantial financial commitment to fund the “gap” in salary between the $85,000 per year provided by the KL2 award, and the total salary of the KL2 Scholar, which is generally substantially more than $85,000.

**FACILITIES AND SPACE FOR K SCHOLAR PROGRAM: MISSION BAY CAMPUS**

The core components of the K Scholars Program take place at Mission Hall, the newest building on the UCSF Mission Bay Campus completed in September 2014. K Scholars meet in person every Friday in state of the art conference rooms at Mission Hall. Many K Program Faculty have their primary offices at Mission Hall and the building’s Activity Based Design provides an ideal environment for K scholars to work individually, meet with other K scholars and program faculty or meet with other colleagues housed at Mission Hall.

Mission Hall provides a flexible arrangement for staff and faculty and removes traditional hierarchies. Every individual has an assigned workstation and unscheduled access to all additional spaces used in day-to-day work. This might involve moving to enclosed space for concentrated and focused work or moving to more informal shared spaces which enhance interaction and collaboration.

- Approximately 1500 people in 1453 assigned open workstations (includes space for future growth)
- 52 hotel work stations (drop-in)
- 376 focus rooms for 1-2 people (non-scheduled); 1 focus room for 4 workstations
- 76 huddle rooms for 3-4 people (non-scheduled); 1 huddle room for 20 workstations
- Variety of small, medium and large conference rooms
- Variety of storage rooms per floor (200 ASF, 250 ASF, 80 ASF)
- Secure personal storage at each work station (9 Linear Feet)

Several current K scholars have their primary offices at Mission Hall. K Scholars have their own assigned work space in their departments, but many choose to spend all day Friday working at Mission Hall after the Friday morning K Scholar activities conclude.

The following major departments or units of UCSF are housed in Mission Hall on Floors 2-7 including: Epidemiology & Biostatistics, Global Health Sciences, Pacific Aids Education & Training Center (PAETC), Prevention Science, Helen Diller Family Comprehensive Cancer Center Finance, Clinical and Translational Institute (CTSI), Research Management Services Women's Health Clinical Research Center (WHCRC)

Mission Hall also houses a learning center on the first floor, including 11 classrooms with seating for 15-100 persons. The classrooms include state of the art technology: video/audio conferencing; lecture capture
SMART podiums with built in computer and multiple displays; touch panel controls to name a few features. All TICR courses are delivered in Mission Hall, making this facility the central hub for K Scholars matriculated in the Master's Degree or ATCR programs or taking individual courses.

UCSF PROFESSIONAL SCHOOLS

UCSF School of Medicine
Established in 1864, the SOM is the oldest continuously operating medical school in the western states. Ranked as one of the top five medical schools in the country, it operates facilities at seven campuses in San Francisco and Fresno. It was ranked number one in NIH funding, receiving over $439M in total awards and over $14.5M in training awards in FY2013. With 28 departments, nine organized research units and seven interdisciplinary centers, medical school faculty and staff reach beyond the neighborhood to bring cutting-edge scientific research and complex clinical care to the nation and the world.

UCSF School of Pharmacy
Founded in 1872, the in the UCSF School of Pharmacy (SOP) was the first college of pharmacy established in the west and the tenth in the US. It continues to be ranked as the best Doctor of Pharmacy degree program in the nation by US News and World Report and has been the largest school of pharmacy recipient of NIH research funding every year since 1979 (with $292M in FY2013). It was the first to train pharmacists as clinical health care providers who specialize in a patient's comprehensive drug therapy and management. The School of Pharmacy administers the California Poison Control System and responds to approximately 600,000 poisoning inquiries each year, saving $30 million annually in medical treatment costs.

UCSF School of Dentistry
The UCSF School of Dentistry (SOD) ranks first among all dental schools in research funding from National Institutes of Health. The school has held this ranking for the past 13 years. School of Dentistry has created multiple centers for creativity and research: an NIH-funded Comprehensive Oral Health Research Center of Discovery (one of only three centers hosted by US dental schools and the only such in California); the Center for the Health Professions; the UC San Francisco AIDS Specimen Bank; the Oral AIDS Center; the NIH-funded Oral Cancer Research Program; the Center on Oral Health Disparities; and SICCA, an international registry network dedicated to the study of Sjögren's Syndrome.

UCSF School of Nursing
The UCSF School of Nursing (SON), founded in 1939 as the first autonomous School of Nursing in any state university, was the first university west of the Mississippi to offer a doctoral degree in nursing. The school ranks first in NIH funding, with $8.6 million in 2013. It is designated as a World Health Organization Collaborating Center in Nursing and is one of five John Hartford Centers for Geriatric Nursing Excellence. UCSF Schools of Nursing and Dentistry have joined forces in Elev8 Healthy Students & Families, a new model for inter-disciplinary education of advanced practice nursing and dental students in community-based health care, delivering primary health and dental care to vulnerable children in middle schools. Community partners include Safe Passages, Alameda County Health Care Services Agency, the Oakland Unified School District, community federally-qualified health clinics and the UCSF Institute for Health Policy Studies.

Space for the SON is distributed as follows: research space, including research labs, offices, and service areas is 20,484 ASF; academic office space is 12,991 ASF; and the total School of Nursing space is 65,007 ASF, which includes classrooms, administrative, learning labs, and other such non-research or academic office space. The administrative structure of the School includes Associate Deans for Student Affairs, Academic Affairs, Research, International Programs, and Administration who report to the Dean. In addition, each of the five units identified above also report to the Dean. A Center for Symptom Management promotes cross departmental and multidisciplinary research focusing on interventions to prevent and alleviate symptoms; a Center for Research and Innovation in Patient Care focuses on patient safety, nurse staffing effectiveness, and strategic performance improvement through collaboration with partners.

The UCSF School of Nursing has an Office of Research that is to facilitate the nursing research enterprise by offering programs and resources to support faculty and staff in the development, submission, conduct and publication of research.
UCSF GRADUATE DIVISION
The Graduate Division of UCSF offers top-ranked Graduate Programs in the biological, biomedical, pharmaceutical, nursing, and social and behavioral sciences. UCSF graduate students conduct research in basic, clinical, social, and behavioral sciences. Their work ultimately will help to ensure the health of human beings, shape health care systems, and influence public education about the prevention of disease. Our degree-granting programs are organized around several inter-disciplinary research areas, which often contain members from several departments.

Currently, there are 25 degree programs, the majority of which are ranked in the top ten, nationally, according to a survey released by the National Research Council (NRC) in September 2010. The survey, the first of its kind since 1995, did not assign a single rank to any program, but intentionally placed the programs within a range in their fields, such as first to third. Based on the NRC analysis, ten of the 12 UCSF programs fell within a range that included the top six programs in their fields, with three of those including the No. 1 rank. The top-ranked UCSF programs were Nursing, Biochemistry and Molecular Biology, and Bioengineering. The range for three other programs included second place: Neuroscience, Biophysics, and Biomedical Sciences. The range for Cell Biology started at No. 3. The other five programs in which UCSF was scored—Medical Anthropology, Chemistry and Chemical Biology, Sociology, Genetics, and Oral and Craniofacial Sciences—also ranked among the nation’s best.

UCSF CLINICAL FACILITIES
Patients for clinical studies are recruited from Moffitt, Long, and Benioff Children’s Hospitals, the San Francisco General Hospital, the San Francisco Veterans Affairs Medical Center, Langley Porter Psychiatric Institute, UCSF outpatient clinics, and from community health clinics. A new, 289-bed, 878,000 gross sq. ft. children’s, women’s specialty, and cancer hospital complex at Mission Bay opened in 2015, and a new 448,000 sq. ft. SFGH building, which will have 284 inpatient beds will open in 2016. The Medical Center at Mission Bay will be the third major site providing patient care and will focus on children’s health, women’s health, and cancer medicine. K Scholars who are physicians have a clinical practice based at one of the UCSF hospitals and associated clinics/units described below.

UCSF Medical Center (Moffitt-Long Hospitals)
UCSF Medical Center is one of the most distinguished healthcare institutions in the world, renowned for its integration of medical research and clinical care for the benefit of patients. The 600-bed hospital admits approximately 23,000 patients annually and has an extensive outpatient program, with more than 600,000 visits a year in 90 specialty clinics. The physicians, nurses, and other health professionals are leaders in their fields, providing a wide range of services from routine exams to highly specialized diagnosis and treatment.

UCSF Benioff Children’s Hospital
Benioff Children's Hospital is one of the top children's hospitals in the nation, according to a ranking by US News & World Report. Expertise covers virtually all pediatric conditions, including cancer, heart disease, neurological disorders, organ transplants and orthopedics as well as the care of critically ill newborns. The 180-bed UCSF Benioff Children's Hospital is a "hospital within a hospital" with more than 150 specialists in almost 50 specialties. We have programs designed specifically for young patients, such as a 50-bed Neonatal Intensive Care Nursery, recreational therapy for recovering kids and 60 specialty care clinics throughout Northern California. Our doctors were the first in the world to successfully perform surgery on a baby still in the womb. They also developed life-saving treatments for premature infants whose lungs aren't fully developed. Hospital services customized for young patients include:

- Child Life to help children and their families adjust to hospitalization and make their stay as positive as possible
- Compass Care, comprehensive palliative care for children with chronic life-threatening conditions, as well as those who need end-of-life care
- Social workers, who are trained in the needs of children and their families

In the area of neurology and neurosurgery, Benioff Children’s Hospital is one of the leading hospitals in the nation. We have the largest brain tumor treatment program in the nation and the only comprehensive epilepsy center in Northern California.

Benioff Children’s Hospital also has one of one of the nation's largest centers for kidney and liver transplants. Its AIDS program is the most comprehensive in the nation, and its surgical eye care program is the largest in
Northern California. In the area of orthopedics, it is internationally recognized for treating the spine, including deformities, degenerative disc disease, tumors and fractures.

**UCSF Mount Zion Medical Center**

Mount Zion Hospital was established in 1887 as a voluntary, non-profit hospital to render "medical and surgical aid and service to the needy and distressed sick of the community... without regard to race or creed." Today, Mount Zion is operated by UCSF. It is located in the heart of San Francisco, about two and a half miles from the UCSF Medical Center at Parnassus and connected by frequent shuttle bus services. The growing network of outpatient care includes comprehensive diagnostic services, dermatology, general medicine, and sports medicine as well as an Outpatient Surgery Center and Urgent Care. Much of Mount Zion is devoted to specialized centers and clinics. The Center is dedicated to researching, diagnosing, and treating many forms of the disease. A state-of-the-art, five-story Clinical Cancer Building is part of this complex. The Center offers a variety of support services to patients and their families. For example, the Cancer Resource Center contains books, pamphlets, and other reading material and provides computers with Internet access for gathering health information. Other specialized centers include the national Center of Excellence in Women's Health, Osher Center for Integrative Medicine, Sleep Disorders Center, Multiple Sclerosis Center, and the Pain Management Center. The Center on Aging helps older adults maintain health and independence and includes an Alzheimer's Day Center, which provides nursing and social work services and structured activities.

**San Francisco General Hospital (SFGH)**

SFGH is a large public general hospital owned and operated by the Department of Public Health of the City and County of San Francisco. It is licensed for 550 hospital beds and offers acute inpatient care in the areas of general medicine, AIDS care, surgery, critical care, women and children services, and psychiatry. The hospital treats approximately 100,000 inpatients and 80,000 outpatients annually, more than one-third of whom are uninsured. Outpatient services are provided through over 100 primary care, specialty care, and subspecialty care clinics. These clinics are organized under the general services of Medicine, Surgical Specialties, Obstetrics/Gynecology, Pediatrics, and Family Practice. Emergency services are available 24 hours a day. SFGH is the designated trauma center for the West Bay counties. UCSF physicians and residents provide one-third of the teaching for students and house staff. SFGH is also home to more than 20 UCSF research centers, affiliated institutes, and major laboratories, including a CTSI CRC site, the Division of Experimental Medicine, the Rice Liver Laboratories, and the Rosalind Russell Arthritis Center. More than 160 UCSF principal investigators are based at SFGH. Approximately 30% of current K Scholars are based at SFGH; these scholars provide medical care for vulnerable populations.

**Veterans Affairs Medical Center (VAMC)**

The VAMC in San Francisco is part of the nationwide Federal health-care system for veterans operated by the US Department of Veterans Affairs. Established in 1934, it is the major health care center for veterans from the City of San Francisco to the Oregon border. SF-VAMC has its major affiliation with the Medical, Dental, Pharmacy, and Nursing Schools at UCSF.

SF-VAMC is recognized for its quality of patient care, its strong educational programs, and its leadership in medical and scientific research. SF-VAMC is a 344-bed acute general medical and surgical center. State-of-the-art primary, secondary, and tertiary care in all major diagnostic and treatment specialization is provided. In addition, the VAMC serves as a major diagnostic referral center for veterans throughout the Western Region and is a tertiary referral center for acute care patients. A 120-bed nursing home provides skilled nursing and hospice care. SF-VAMC provides extensive outpatient services through clinics in most subspecialty areas. An estimated 190,000 outpatient visits are made each year to the various clinics. SF-VAMC is renowned for its state-of-the-art acute medical, neurological, surgical, and psychiatric care. It is at the leading edge of medical technology in such subspecialty areas as: cardiac and vascular surgery, interventional radiology, neurology and neurosurgery, ophthalmology, otolaryngology, oral surgery, urology, endocrinology and metabolism, dermatology, hematology and oncology, dialysis, orthopedics, cardiac catheterization and angioplasty, alcohol and drug abuse, and mental hygiene. SF-VAMC plays a leading role in the treatment and research of AIDS and has been designated as one of the six nationwide AIDS Clinical Centers.

**Langley-Porter Psychiatric Hospital and Clinics (LPPH&C)**

The LPPH&C is located at 401 Parnassus Avenue, and is part of the Parnassus campus of UCSF. LPPH&C consists of an adult inpatient unit (22 licensed beds), an adult Partial Hospitalization Program (daily census ranges from 12-17) and adult/child outpatient services (approximately 20,200 visits per year). Primary diagnoses for patients in all services include major depression, anxiety and psychosis. LPPH&C serves all
ethnic and socio-economic groups who reside in San Francisco and the greater Bay Area, as well as those referred from areas throughout the Western United States. Departmental administrative and computer support offices are available at this site, and it is the hub for a shuttle service that links the main campus and other sites, including SFGH and SF-VAMC.

UCSF CLINICAL AND TRANSLATIONAL RESEARCH RESOURCES

UCSF Clinical Trials
Our patients have the opportunity to participate in clinical trials, which are studies to test the safety and effectiveness of new, experimental medications and treatments. Clinical trials make new drugs, therapies and surgical procedures available to patients before they're widely available to the general public. In addition to the national search tool found at ClinicalTrials.gov, Similarly, UCSF has a trial search tool (http://www.ucsfhealth.org/clinical_trials/index.html) to enable patients to identify clinical trial opportunities specifically at UCSF.

CTSI Clinical Research Service (CRS)
The CTSI Clinical Research Service (CTSI-CRS) program offers infrastructure and services at multiple locations. These units are available to UCSF investigators and provide specialized research services, including skilled nursing for a wide variety of multidisciplinary clinical research protocols conducted in both inpatient and outpatient settings. The CRS provides services to more than 289 clinical investigators, representing the UCSF Schools of Medicine, Nursing and Pharmacy. The CRS provides Nursing, Sample Processing, Body Composition, Neuropsychological Development, and Neonatal Clinical Research cores.

CRS Inpatient Units
- The adult unit at Moffitt Hospital is comprised of 2 inpatient beds. Protocols include the Islet Cell Transplant program, Fronto-temporal Dementia studies, CJD protocols, Drugs of Abuse NIDA studies, and the large Brain Tumor Consortium Clinical Trials.
- The 5270 sq. ft. adult unit at San Francisco General Hospital includes 8 inpatient beds. The world-renowned unit develops treatment and prevention innovations for diseases that particularly afflict vulnerable urban populations.

CRS Outpatient Units
- The UCSF Clinical Research Center at Parnassus features 2500 sq. ft. of newly opened outpatient space is specially staffed and equipped for phase I, II and III trials. The center includes a large waiting room, infusion space and multiple exam and procedure rooms.
- The Pediatric Clinical Research Center, located at UCSF Benioff Children’s Hospital, is a 3080 sq. ft. facility. Acute care mobile research nurse staff also complete research procedures and data collection within inpatient Pediatric units.
- The outpatient unit at San Francisco Veterans Affairs Medical Center (VAMC) includes an outpatient suite and consultation rooms with 202 sq. ft. of exclusive use facilities and 445 sq. ft. of shared use facilities.
- The 2700 sq. ft. CHORI Children’s Hospital Adult and Pediatric outpatient centers located at the Children’s Hospital and Research Center Oakland (CHRCO) serves both children and adults in Oakland's diverse population of 400,000. Research groups include adult neurology, pediatric endocrinology, pediatric hematology, family medicine, complementary medicine, and the Cholesterol Research Center.

Other CRS Cores
- The Sample Processing Core supports more than 200 clinical research protocols annually. Dedicated laboratories are located at Parnassus, SFGH, Mission Bay, and Mount Zion Hospitals, comprising 1600 sq. ft. in total. Each facility is staffed with dedicated research laboratory technicians. Services available include routine sample processing, shipping of hazardous materials, PBMC isolation and viable cryopreservation of cells, and short-term sample storage.
- The Body Composition, Exercise Physiology and Energy Metabolism Core provides diverse services to support multiple principal investigators at the Parnassus campus. Exercise testing services include treadmill testing, cycle ergometry, 6-minute walk tests, gait-speed, and shuttle walk. Other services offered include muscle function testing, respiratory gas analysis, high resolution 3D optical whole body scanning, bioimpedance measures, and DXA scanning.
The Neuropsychological Development Core carries out extensive neuropsychological evaluations of children with various medical conditions who participate in medical studies under the auspices of the CRS. The association between neuropsychological outcomes and imaging studies, as well as clinical phenotype, is an important component of the pediatric clinical research portfolio. Besides the direct neuropsychological assessment of children, this work has increasingly included participation in study design for upcoming projects and consultation about choice of goal-appropriate measures, test use, scoring, data collection in ongoing studies, as well as the publication of findings. When appropriate, services will be provided to investigators at other CRS units with neuro-developmental assessments.

The Neonatal Clinical Research Center facilitates the research process through support of multidisciplinary investigators in the conduct of innovative clinical research in the UCSF Neonatal Intensive Care Unit (NICU), Pediatric Intensive Care Unit (PICU), and Pediatric Cardiac Intensive Care Units (PCIC). A Clinical Research Coordinator offers the following services: eligibility screening, coordination of procedure scheduling and follow-up with the families of participants.

UCSF CLINICAL RESEARCH EDUCATION AND CAREER DEVELOPMENT RESOURCES

Training in Clinical Research (TICR)
The TICR Program at UCSF was established in 1999 to provide high quality and comprehensive research training to investigators who are focused on human subjects and populations, defined as those participating in patient-oriented, translational, epidemiologic, behavioral, outcomes or health services research. K Scholars interact with the TICR Program through one of 44 different graduate-level individual courses or by participating in one or more of four educational programs. These programs include:

- Clinical Research Workshop (over 200 students 8-weeks each summer)
- One-year Advanced Training in Clinical Research Certificate (ATCR) Program (25-30 students each year)
- Two-year Master's Degree in Clinical Research program (25-30 students each year)

The Master's Degree Program in Clinical Research is a two-year course of study intended for scholars who wish to master clinical research methods and pursue clinical research careers. KL2 Scholars are required to have or achieve Master's level (or equivalent) education in clinical and translational research. Scholars may attain this level of education by completing the Masters in Clinical Research Degree. Many Scholars enter the K Program with Master's level training and use TICR courses to focus and expand their education. In some cases, Scholars may obtain the one-year Advanced Training in Clinical Research (ATCR) Certificate. Over the past 10 years, 25 (27%) KL2 funded scholars have obtained a Master's Degree in Clinical Research or ATCR Certificate during their KL2 training period. The TICR Program is directed by Dr. Jeffrey Martin, Professor of Epidemiology and Biostatistics. It is administratively housed in the UCSF Department of Epidemiology and Biostatistics and supported by the UCSF Clinical and Translational Science Institute. The program is guided by policies from the UCSF Graduate Division, informed by an internal advisory committee, and accredited by the Western Association of Schools and Colleges.

PhD in Epidemiology & Translational Science
The PhD program in Epidemiology and Translational Science is a new degree track in the Department of Epidemiology and Biostatistics (DEB) at the UCSF School of Medicine, offered in collaboration with UCSF's renowned Clinical and Translational Sciences Institute. Doctoral students receive high caliber training in core skills of epidemiologic and biostatistical methods along with opportunities for practical experience to enhance classroom training.

TL1 Training Program: see TL1 Application
KL2 Career Development Program: see KL2 Application
UCSF/UCB Joint Graduate Group in Bioengineering
The close proximity of UCSF and UCB has fostered numerous collaborations among faculty members on the two campuses with regard to developing quantitative approaches to addressing fundamental problems in biological and clinical sciences. In the early 1980s, scientists who were heavily involved in these interactions on the two campuses proposed the formation of the UCSF/UCB Joint Graduate Group in Bioengineering (JGGB). This fully integrated educational program was approved in 1983 and is authorized to offer Ph.D. degrees that are conferred jointly by the Graduate Divisions of both campuses. Over the past twenty-three years, the JGGB has become one of the pre-eminent educational programs in the country and is well known for the diversity and excellence of the training it provides. Its objective is to teach doctoral students to bring the
methods of modern engineering to bear on problems in biology and medicine, and to learn how to teach others to do the same. This combination of expertise is very much in demand in academia and in industry, and provides a wide range of employment opportunities to graduates of the JGGB. Of particular interest to students is the multi-disciplinary environment that is provided by the two campuses, which means that the breadth and depth of the training offered to students is of an order larger than a single department could provide. Faculty in the JGGB come from more than twenty departments in the professional schools at UCSF, six departments from the College of Engineering at UCB and several non-engineering departments. Hence, there is a wide array of research opportunities and state-of-the art facilities available to the students.

**Master of Translational Medicine (MTM)**
This multidisciplinary program focuses on technology and teaches the critical-thinking skills needed to navigate the challenges inherent in translating research from the laboratory bench to patient bedside. The course work, which is designed to complement this diversity, gives students the opportunity to address real-world problems, such as the critical need for expediting new therapies to treat devastating diseases, and it is anticipated that some of this work will lead to innovations with commercial potential. The master’s program spans an intensive 12-month curriculum with coursework that includes fundamentals of bioengineering, physiology, disease processes, core medical principles, clinical research methods, clinical trials design, and key concepts in business and management. The program culminates in a capstone design-project experience in which students work in interdisciplinary teams co-advised by an engineering faculty member and an MD, PharmD, or clinician. Projects cover various phases of the translational process, and often have the potential to continue beyond the scope of the master’s program.

**Biological and Medical Informatics Program (BMI)**
The development of the current BMI Program began in 1997 and led to the creation of tracks in basic biology and medical sciences. The focus for faculty in BTS will be the Biological Informatics (BI) component, which has its own training grant and recruitment process. There are 23 faculty members in this track from six departments whose mission is to train students from quantitative backgrounds in computer science, mathematics and statistics, whose interests are aimed at performing research at the interface of biology, computation and informatics. There are currently 29 students in the program, with expected incoming classes of 6-10 students per year. To enhance the range of training opportunities that are available to their students, the BI group has formed an alliance with faculty focused on Biophysics and Systems Biology to develop a core curriculum for training students in quantitative biology. The recent HHMI/NIBIB Interfaces Grant Program that was designed to sponsor graduate training programs in interdisciplinary research has funded curriculum development. This includes boot camps in biology, mathematics and computation, as well as team challenges that teach students to rely upon interdisciplinary collaboration to solve complex biological questions. Electives in algorithm design, objective oriented programming, statistical methods in bioinformatics and scientific software development ensure that the students get exposure to quantitative analysis methodology. A new Bioinformatics track in Quantitative Genetics/Genomics is under development in collaboration with the Institute for Human Genetics, and is expected to attract students with interests in statistical and population genetics and related areas.

**Biomedical Sciences Graduate Program (BMS)**
The UCSF BMS Program is an interdisciplinary graduate research program that seeks to equip students with the training and research tools to study the function of tissue and organ systems in development, physiology, and disease. The Program is based on training students for higher levels of biological systems integration by the incorporation of two features that were not part of traditional department-based graduate instruction in fields such as physiology, experimental pathology, and anatomy. First, students in the program must acquire a level of competence in molecular biology, biochemistry, and cell biology comparable to that expected of students in traditional biochemistry and molecular biology programs. Second, the study of key developmental, physiological, and pathological features of human biology is also incorporated into the curriculum. This new approach to training will result in a new generation of inter-disciplinary biomedical scientists who are able to forge collaborations that break down traditional research boundaries.

**Masters Of Science In Biomedical Imaging (MBI)**
This MS program in Biomedical Imaging enrolled its first entering class in the fall of 2011. The program is intended for advanced pre-doctoral students, postdoctoral fellows, medical residents, and faculty members who wish to utilize imaging sciences to broaden their investigative projects. Coursework includes instruction in core theory drawn from imaging physics, engineering, and mathematics, linked to physiology and disease processes. Hands-on laboratory courses are an important part of the curriculum with experiments relevant for characterizing pathologies, monitoring response to therapy, and assessing underlying disease processes.
Specialized topics such as quantitative imaging, research design, image analysis, and technology assessment will be available through electives.

**Neuroscience Graduate Program**

UCSF offers an interdisciplinary program for graduate training in neuroscience. The purpose of this program is to train doctoral students for independent research and teaching in neuroscience. The UCSF Neuroscience program seeks to train students who will be expert in one particular approach to neuroscientific research and in its related basic science disciplines, but who will have a strong background in other areas of neuroscience as well.

**Pharmaceutical Sciences & Pharmacogenomics (PSPG)**

The graduate program leading to a PhD in PSPG is multidisciplinary. It has a dual focus on Pharmaceutical Sciences, which includes the scope of disciplines from chemistry to biology and from pharmacology to bioinformatics that are involved in the discovery and development of medications, and Pharmacogenomics, which covers the application of genetics and genomics to drug action and disposition. The 51 faculty members in the program come from both the School of Pharmacy and the School of Medicine. There are currently 51 graduate students in the program; of those who have selected research advisors, 24 are mentored in SOP laboratories and 19 are mentored in SOM laboratories. The program is based at Mission Bay but there are a significant number of faculty and students at Parnassus and at other UCSF locations. The PSPG program is partially funded by a NIH training grant. The graduates are highly sought after and upon completion of their thesis, 39% of the graduates go into academic positions or postdoctoral fellowships, 44% go into industry; the remainder goes into other health related occupations.

**Bioinformatics Sciences**

Graduate studies in Bioinformatics (BI) equip PhD students with the skills and knowledge in applied mathematics, informatics, statistics, computer science, physics, chemistry, and biology needed to study biological composition, structure, function, and evolution at the molecular, cellular, and systems levels. The goal of the BI pathway is to train the next generation of bioinformatics researchers for academia and industry by focusing on three research areas: bioinformatics and computational biology, genetics and genomics, and systems biology. Within the curriculum, core courses provide training in bioinformatics, algorithms, and statistics with optional courses in macromolecular structures, cellular biophysics, and computation of biological molecules. The BI pathway also offers two optional designated emphases in Computational Biology and Bioinformatics (CBBI) and Complex Biological Systems (CBS).

**Center for the Health Professions at UCSF**

Since 1992, the Center for the Health Professions at the University of California, San Francisco has offered solutions-driven approaches to the toughest health care challenges through three areas of focus:

- **Leadership Programs** to empower change agents at every level and within all sectors of the health care system
- **Research** to understand today's workforce issues and design actionable strategies to solve them.
- **Consulting Services** to creatively and collaboratively address individual and organizational needs

The Center offers customized services in the areas of Leadership Development, Research, Assessment and Coaching and in 2014, the Center for the Health Professions designed and led a Leadership Program tailored to our K Scholars (See Appendix 5). This pilot program was successful and we plan to make improvements based on Scholar feedback and offer this in the next funding period.

**Office of Career and Professional Development (OCPD)**

The UCSF Office of Career and Professional Development (OCPD) and the UCSF Graduate Student Internships for Career Exploration (GSICE) program provide seminars, workshops, individual services and resources addressing a wide variety of training topics recognized as critical for the career advancement of graduate-level students and postdoctoral trainees in the biomedical, biological, social and health sciences.

**Breadth and Depth of Career and Professional Development Offerings:** With a staff of more than 6.0 combined FTE specifically serving the career development needs of graduate student and postdocs in the biomedical sciences, UCSF is able to offer both depth and breadth in the area of career development training and support. The following topics are addressed:

- Grant and fellowship writing skills
- Oral presentation skills
• Manuscript-writing skills
• Mentoring skills and how to be mentored effectively
• Career awareness for academic and non-academic career paths
• Conflict management and negotiation skills
• Classroom and small group teaching skills and practice
• Ethics and the responsible conduct of research
• Management and scientific leadership skills
• Job search workshops for both academic and non-academic career options
• Individual job search coaching for both academic and non-academic career options
• Individual career counseling and guidance for trainees exploring non-academic career options
• Support for UCSF’s unique internship program for graduate students, “GSICE”
• Individual Development Plan training, using the “myIDP” web-based career planning tool, authored by OCPD staff

For each of the training topics listed, the OCPD provides didactic instruction, online self-help resources, and/or individual counseling or guidance.

Program Formats: Some of the training topics listed above are offered through organized annual series, including:

• “Job Hunting in Biotech” Series
• “PFF-Preparing Future Faculty” Series (academic job search skills, academic career awareness) and the
• “PSR-Professional Skills for Researchers” series (grant writing, manuscript writing, oral presentation, mentoring, negotiation, communication skills).

Depending on the audience and area being addressed, other training topics are offered as single seminars. Annually, the OCPD delivers 130-150 seminars and workshops.

Utilization: At UCSF, participation in career development activities has become part of the campus training culture. Career development offerings are highly utilized and many seminars and workshops are over-subscribed. A 2008 survey of UCSF postdoctoral scholars (N=476; 48% response rate), showed that nearly 80% of postdocs who had been at UCSF at least 3 years reported that they had voluntarily attended one or more OCPD seminars.

Motivating INformed Decisions (MIND) Program

MIND is an experimental career exploration program that provides training and resources to UCSF students and postdocs, as well as a resource for career exploration that can be utilized by trainees nationwide (MINDbank), and challenges the current perceptions of PhD training. The program will bring together UCSF students and postdocs, UCSF faculty, and professional partners who are applying their PhD in diverse fields outside tenure-track research, so that UCSF can meet the growing need to place exceptional trainees into positions where they will make exceptional impacts on society, both within and outside basic research. The program’s first cohort was recruited in 2014 and the grant program runs through until mid-2018. MIND participation is voluntary, and is open only to PhD students after they pass their qualifying exams, as well as postdocs during or after their 2nd year at UCSF.

Graduate Student Internships for Career Exploration Program

Founded in 2009, the Graduate Student Internships for Career Exploration (GSICE) Program at UC San Francisco (UCSF) addresses current gaps in graduate training by preparing doctoral students in the basic and biomedical sciences for careers outside of academia. There are four main components to the GSICE program

• structured career path education
• professional skills training
• mentorship
• hands-on experience (the actual internship)

The program is designed to incorporate all of these components into a cohesive training experience that will prepare students to pursue the diversity of available science careers post-graduation. In support of this work, the Gordon and Betty Moore Foundation (GBMF) awarded GSICE with a $0.7 M dollar three-year non-renewable grant in February 2013. The goal of this grant is for GSICE to demonstrate a proof-of-concept, scalable model that will ensure future PhD scientists can pursue the multiple careers that will contribute to strengthening the workforce across all sectors of science.
Here at UCSF, the GSICE program is now entering its seventh year. Since its inception, GSICE has trained over 150 students. About half of them matriculate to actual internships, so far hosted by more than 20 different internship sites. The program continues to be a thriving collaboration between the School of Medicine, the Office of Career and Professional Development, and the Graduate Division. The GSICE Executive Committee will be:

- Keith Yamamoto, Vice Chancellor for Research; Executive Vice Dean, School of Medicine; Professor, Cellular & Molecular Pharmacology
- Terri O’Brien, Associate Dean for Research Strategy, School of Medicine; Assistant Vice Chancellor for Research; Assistant Professor, Cellular & Molecular Pharmacology
- Bill Lindstaedt, Director, Office of Career and Professional Development

RELEVANT UCSF ADMINISTRATIVE RESOURCES

Office for Innovation, Technology & Alliances (ITA)
The UCSF ITA brings research and industry together to advance health science through innovation and entrepreneurship. Its services and programs are designed to 1) optimize the creation and management of innovative alliances with commercial, non-profit, and government funding and regulatory organizations; 2) aid in the transfer of UCSF technologies to commercial organizations for development and public benefit; and 3) help the creation of new companies focused on the commercialization of UCSF intellectual property. The ITA works in close coordination with the CTSI to support the commercialization of academic inventions. The individual programs within ITA include the Entrepreneurship Center, which provides courses and networking opportunities; Strategic Alliances, whose business development team catalyzes creation of innovative partnerships and drives the alliance development with team members from contracting and licensing, the scientists and the partner, and whose alliance management team provides continuing support of the partnership; the Industry Contracts Division, which is responsible for negotiating and signing all industry research contracts between UCSF and Industry Sponsors; and the Office of Technology Management, which has the mission of transferring and commercializing UCSF’s life science and medical technologies for public use and benefit, while generating income to support campus research and education.

- The Office of Technology Management (OTM) is an active partner in the technology development process and works to develop individualized out-licensing strategies from the moment a project enters the Hub, and coordinates partnering strategies with the Strategic Alliances team. This support, together with project management and tracking of each project, maximizes the likelihood of achieving stated development milestones and translation into highly valuable out-licensing opportunities. Once a technology has reached a commercially attractive stage in development, the OTM team works with the research team to market the invention to appropriate candidate partners. The OTM considers industry needs and market trends when developing licensing strategies, including whether exclusivity is needed to attract the investment required for commercialization, and if so, whether field-limited exclusivity might be appropriate. During license negotiations, whether with UCSF start-ups or with existing companies, the OTM works with industry partners to find mutually beneficial terms under which the technology can be most efficiently and effectively commercialized. For start-ups, this includes taking into consideration some of the start-up specific challenges that need to be addressed, such as funding status. To ensure that a promising technology is diligently developed and isn’t used solely for defensive purposes, the OTM includes diligence milestones in all of its exclusive licenses, while allowing for some flexibility for our licensees to address the uncertainties that come with taking life science inventions to market.

- The Entrepreneurship Center is a UCSF resource that supports entrepreneurial interests in life sciences and healthcare. The Center has built a cluster of resources to educate campus entrepreneurs about the elements required to commercialize an invention that are not technology-based. It accomplishes this through a suite of courses and workshops, networking events, speakers on topics of interest to entrepreneurs, a cadre of mentors and advisors and other resources. Program offerings are open to the entrepreneurial ecosystem in the Bay Area to encourage diversity, as well as to the UC Berkeley and Stanford communities. The Center is housed in the ITA for close coordination with the OTM.

- Bay Area NSF Innovation Corps (I-Corps™) is a collaboration between the University of California Berkeley, University of California San Francisco and Stanford University funded by the National Science Foundation. The goal of I-Corps is to increase the impact of NSF-funded research by setting up innovation ecosystems within universities that will train the next generation of entrepreneurs, encourage partnerships between academia and industry, and commercialize science and technology.
UCSF Research Development Office (RDO)

The RDO’s mission is to promote, support, strengthen, and grow the research enterprise at UCSF. The RDO works through individual faculty members, teams of researchers, and various institutional administrators to nurture the institutional research enterprise: fostering innovative approaches and novel partnerships; and developing and implementing strategies that increase institutional competitiveness and attract research funding.

- Resource Allocation Program (RAP): The RAP manages the dissemination, submission, review, and award for these opportunities, while enabling the funding agencies to maintain full oversight of their funding mechanisms and awardees. The Resource Allocation Program (RAP) was created by CTSI and is now a campus-wide program that acts as a one-stop shop for intramural funding mechanisms. This program makes the application process for intramural research funding more efficient, increases accessibility to funding for a broad range of applicants, and minimizes the redundancy of the application and review process among different funding agencies. Currently, it coordinates a consortium of 18 funding sources and up to 30 different grant mechanisms.

- Limited Submission Program (LSP): The LSP manages the dissemination, solicitation and selection of proposals for limited submission funding opportunities. Limited submission opportunities (LSOs) are extramural funding opportunities that either limit the number of applications UCSF may put forward to a given sponsor or require another kind of internal coordination (e.g., to eliminate unnecessary duplication of instrument requests). LSP is responsible for notifying the campus of these opportunities, coordinating the internal review and selection process, and notifying all applicants of outcomes.

- Large Grant Development Program (LGDP): Project grants are, by necessity, complex in nature and may present obstacles during the proposal development stage that investigators are not used to encountering. The RDO assists investigators navigate through the rough waters of developing and preparing these proposals. The PhD-trained staff of the LGDP are with investigators every step of the way, from the initial scientific brainstorm sessions to the later stages of writing and editing. Specifically, the RDO offers: project management of the proposal development and preparation process, including timeline development and tracking, liaison with the funding agency or Research Management Services; access to a library of template language for grant proposals; technical writing and editing; strategy input

- Team Science for Research innovation Program (TSRIP): RDO TSRIP fosters and facilitates scientific collaborations between internal and external research teams. TSRIP utilizes several different formats for team formation, including facilitated networking symposiums and workshops, “speed-networking” events, “collaboratory meet-ups”. In addition, the TSRIP offers teaming consults to increase collaborative effectiveness, addressing topics such team diversity, conflict management, communication methods, and leadership.

UCSF Library

The UCSF Library and Center for Knowledge Management is one of the preeminent health sciences libraries in the world, containing an extensive and exceptionally rich collection of monographic and periodical literature in the health sciences, with substantial holdings in the biological and physical sciences, the social sciences, psychiatry, and psychology. The collection contains over 844,214 volumes, 57,440 electronic full-text serials and 13,068 electronic health sciences serials. The library incorporates state of the art library computer systems, such as MyAccess that replaces the card catalog with a streamlined computer search system. The library also houses The Center for Instructional Technology, which offers a wide range of documentation and training on using the Collaborative Learning Environment (CLE). The CLE provides a versatile framework designed to meet the current and future needs for learner-centered environments, collaborative learning, and other collaborative activities at UCSF. Library materials not available on the San Francisco campus may be requested through other University of California campuses.

Special collections contain both secondary and primary source material from the earliest medical history to contemporary projects in AIDS, tobacco control, biotechnology, and managed care. Historical materials are concentrated in the history of the health sciences, California medicine, anesthesia, Osleriana, medical artifacts, and East Asian medicine. All faculty and students have access to print and electronic resources regardless of UCSF departmental or programmatic affiliation.

- Digital Library: GALEN is the Digital Library at UCSF. PubMed@UCSF is publicly available, but access to full text articles is limited to computers on the UCSF network or to approved offsite computers. It provides access to the MEDLINE database as well as other NLM databases, and is strong in clinical and basic sciences, nursing, dentistry, and health care planning and administration from 1966 to the present.
References published between 1958 and 1965 can be viewed through OLDMEDLINE. The MELVYL Catalog is used to locate books at all UC libraries, and California Periodicals to find journals/titles at other University of California, California State University, and California libraries. Many other important databases are available, including Current Contents, BIOSIS, and PsycINFO.

- Center for Knowledge Management: The Center for Knowledge Management is an innovative division of the library. Its multidisciplinary staff develops knowledge bases and on-line tools for the health sciences, pursues applied research projects related to UCSF informatics problems, serves as a laboratory for graduate students who are interested in using new technologies to solve important health sciences information problems, and supports the library’s sophisticated computing and communications infrastructure.

- Interactive Learning Centers: The Interactive Learning Centers maintain student-computing facilities in the library and in the Medical Sciences Building, with PC and Macintosh computers, printers, software, documentation, consulting support, and connections to the Internet. Electronic classrooms are available at both locations for reservation by UCSF faculty members. The Multimedia Development Lab (MDL) provides hardware, software, and consulting support for development of curriculum-integrated, educational materials. Video digitizing, flat art scanning and slide scanning are among the capabilities available in the MDL. Education and Consulting Services offers curriculum-integrated instruction and scheduled seminars that assist students and faculty in the use of information management tools such as databases, the Internet, and personal file management software. Librarians consult with faculty and students topics of high interest.

**COMPUTATIONAL RESOURCES RELEVANT TO KL2 PROGRAM**

**UCSF Information Technology Services (ITS)**

The ITS provides a campus-wide high-speed network infrastructure, which allows investigators to access a wide variety of computing technologies. Because the UCSF campus is geographically diverse, ITS uses a high speed SONNET Ring backbone infrastructure to allow virtually instantaneous access to campus computing resources from any campus location, including a number of clinical facilities affiliated with UCSF. The computing capabilities of the campus are constantly growing and expanding. Computing resources are conveniently located throughout the campus.

All investigators and research staff have a high-speed desktop personal computer connected to the UCSF ITS backbone and the Internet. The Information Services Unit (ISU) technical support staff offer a full range of computing and network-based services, including a private, secure wired network, along with a wireless network that contains secure internal and visitor zones, a server room with fire suppression that meets all security and safety requirements, and a disaster-recovery failover site for critical functions co-located in a separate building one mile away. ISU provides standardization of hardware/software and centralization of services for the user. Utilizing a server-based support model, users store files in a central location and can access them from any remote computer that has Internet access. This model offers some additional benefits, such as heightened security, a longer useful life for end user hardware, streamlined labor for ISU support staff, and the availability of many applications running from a central server.

An overview of the services provided by ISU support staff is listed below:

- Email: maintenance of email servers and administration of email accounts
- Nightly workstation and server backups, offsite tape storage, failover site for mission critical servers
- Maintenance of remote access servers, Terminal Server accounts, and network storage space
- Centralized management of software licensing agreements
- Maintenance of network printers and print servers
- Full hardware/software support for workstations and laptops
- Support of private wired and wireless networks
- Server/infrastructure support for housed database systems and websites
- Operation of recharge for cost distribution
- Support for fiber uplink to internet
- Infrastructure support for HIPAA compliance

All research data reside in Microsoft SQL 2005 Server databases and are backed up daily. There is an on-site, self-managed electronic mail/group collaboration system (Microsoft Exchange) that is used extensively for memos, document transfer, and outside communications with project collaborators via email on the Internet, as well as three private web servers, an automated forms-processing system and a computerized voice-mail system. All servers are physically housed within a restricted-access server room within a restricted-access
computer support suite. All systems (i.e. network and servers) are monitored 24 hours a day, seven days a week. The LAN features a 100 MB uplink to the Internet. All servers and workstations run Sophos Antivirus software that is automatically updated from the vendor site via the Internet. Hosted based and hardware firewalls with Intrusion Detections Systems within the datacenter further protect the system from intrusion.

Software supported:

- **Operating systems:** Windows XP
- **Word processing:** Microsoft Word
- **Internet browsers:** Internet Explorer and Mozilla
- **Email:** Microsoft Outlook and Webmail
- **Accounting:** Excel
- **Survey Design:** Adobe Framemaker, Microsoft Word
- **Statistical:** SAS, Stata, SPSS
- **Web Design and Graphics:** Macromedia Dreamweaver, Adobe Photoshop CS3, Microsoft Publisher
- **Data Management:** CSPro, EpInfo, Mindware, Microsoft Excel, Microsoft Access
- **Dietary Collection and Analysis:** Nutrition Data System for Research (NDSR)
- **Security/secure shell:** Internet Connection Firewall, Sophos Antivirus, Hosted based and hardware firewalls with Intrusion Detections Systems
- **Miscellaneous:** Adobe Acrobat 7.0, Endnote, Microsoft PowerPoint

**Computer Resources Laboratory—Interactive Learning Center (ILC)**

Located in the UCSF Library, the ILC provides computer services (70 desktop computers, slide-makers, scanners, and color and laser printers) and UCSF intranet and internet access for UCSF students and faculty in all four schools. In addition, it maintains a small facility that allows 24-hour student access to laptop network ports and five computer workstations. In addition, the ILC holds classes throughout the year on such topics as statistical software (SPSS, SAS), reference software (EndNote), Galen, Melvyl/MedLine, Internet, and Netscape Communicator, which are available to all grant staff.

**MyResearch**

Where patient or other sensitive data storage and analysis requires added security, UCSF’s Secure MyResearch environment is available for use. This HIPAA compliant desktop environment is hosted on servers housed at the UCSF Data Center on Minnesota Street. The MyResearch environment is hosted on six Dell PowerEdge R710s and Five EqualLogic PS6100E SAN, which are located inside the locked rack. There are two layers of physical redundant Cisco firewalls that protect the servers and SAN. The MyResearch environment utilizes VM Ware View Virtual Desktop, which must be logged into using UCSF Active Directory credentials. The servers are locked inside a rack locked with a combination lock. The rack is located in a data center secured by two sets of locked doors.

Data sets can be stored in the Principal Investigator’s group network folder in the remote MyResearch environment where only the research team members are able to view the data sets and this access is audited. This folder is physically located in a data store on the SAN in the locked rack. Network traffic between MyResearch and the UCSF campus network traverses a SSL VPN tunnel in encrypted format. Analysis tools are hosted in the environment contiguous to data storage.

**High Performance Computing**

At the University of California, San Francisco (UCSF), we currently maintain a high performance computing (HPC) cluster to support the research of a range of quantitative/computational investigators. This cluster is associated with the California Institute for Quantitative Biosciences (QB3) and is located in Byers Hall at the Mission Bay campus. This cluster has been in operation since 2005, and is periodically upgraded with additional nodes; the last major upgrade was 2 years ago when 1152 cores were added to the system. The cluster operates on a co-op basis, whereby individual investigators provide funds for the addition of new hardware, maintenance, and system administration; the access to the cluster is then proportional to the amount of funds invested. The cluster currently has 4,678 cores of a variety of types (most are dual-processor 4- or 6-core Xeon64 machines, each with at least 2 GB RAM per core and a 120 GB hard disk), primarily backed by 36 TB of fast network array storage. The cluster supports approximately 30 research groups, primarily in the areas of structural biology, systems biology and biomedical imaging.

At the same time, UCSF has a large group of genetics researchers who are now benefiting from recent developments in human genomics, in particular the ability to produce vast amounts of human DNA sequence data at continuously lower prices. This has created a serious challenge for these researchers because the
computing demand greatly exceeds the capabilities of the QB3 cluster, especially in terms of rapid and long term storage. To support this need, the UCSF Institute for Human Genetics invested internal funds in a new HPC cluster installed at the UCSF Data Facility located at Minnesota Street, near the Mission Bay campus. In addition, the university established a high-speed (10Gbit) link between the Genomics Core Facility at the Parnassus Campus, which maintains several Illumina HiSeq 2500 and other DNA sequencers, and the IHG computing cluster at Minnesota Street to facilitate rapid data transfer and analysis. This pipeline was created to support a variety of high throughput next generation sequencing projects. This system currently has 52/864 nodes/CPUs and 52TB of fast storage and 300TB of archival storage to support the genomic applications. Moreover, as part of a general platform supporting the advancement of Precision Medicine, UCSF has recently established an Institute for Computational Health Sciences (ICHS; see below), whose mission is to create a world class environment for health science researchers, including the further development of high performance computing infrastructure and recruitment of additional computational faculty.

VIDEOCONFERENCES AND CLASSROOM COMPUTING
UCSF is committed to providing students with technology that will enhance their education and learning. The division of Student Academic Affairs (SAA) continues to update the classrooms and large lecture halls with state of the art videoconference resources, computers, large color monitors, Internet connection through the campus backbone and fiber optic network, and high technology equipment to be able to tap the educational promise of electronic communication via the Internet. Grand rounds, seminars, and satellite downlinks can be received at the Parnassus site and broadcast via microwave transmission or intranet links to any of the campus classrooms at the Parnassus site as well as Mission Bay, Mount Zion, and SFGH campus sites. Additionally, faculty members are able to connect their laptops to the backbone and download information from the Internet, the UCSF intranet, and/or to display instructional material via video projectors in the classrooms and lecture halls.

UCSF CORE RESEARCH FACILITIES
There are 79 core research facilities (CRFs) across UCSF and its affiliates that offer a wide variety of services such as genomics, proteomics, flow cytometry, microscopy, drug development, imaging, drug studies (with CLIA and GCLP compliant facilities), preclinical and clinical therapeutics, and comprehensive specimen banking and repositories. In addition, there are a number of cores that offer even more specialized services such as drug-resistant genotyping of HIV, in-situ biomechanical testing of orthopedic implants, and generation of tumor-bearing animals for preclinical oncology trials. Users have easy access to the CRFs via web-based research cores search tool managed by the Research Resource Program (RRP), including an updated database with summaries of services, equipment, and contact information. The UCSF Cores Search website (currently supporting 867 resources, 246 categories, and 83 providers) is designed to help researchers easily find shared research resources at UCSF. This site was developed by UCSF’s Research Resource Program (RRP) and Clinical and Translational Science Institute (CTSI) and is powered by the open source Plumage interface to eagle-i. Plumage was developed by CTSI at UCSF, and builds on the eagle-i research resource ontology developed by the eagle-i Consortium, also supported by NIH.

MyCORES
RRP also offers MyCORES, a web-based management system that facilitates the purchase of products and services from the University's core facilities and shared resources. This software is a system developed Vanderbilt University called Core Ordering and Reporting Enterprise SystemTM (CORES™).

RELEVANT CROSSCUTTING RESEARCH INSTITUTES AND CENTERS
These multidisciplinary units are organized around specific themes and have faculty members from multiple departments. They provide substantial resources to the biomedical research community and receive funding from the NIH, NSF, state, private foundations and industrial partnerships, as well as acting as a focus for philanthropy.

California Institute for Quantitative Biosciences (QB3)
The QB3 Institute was created by Governor Gray Davis as one of the four California Institutes of Science and Innovation. Spanning UCSF, UC Berkeley and UC Santa Cruz, it promotes basic research in quantitative biosciences and works to ensure that new discoveries are commercialized as quickly as possible. QB3 has
grown to include over 220 research groups with 40 members of the National Academies and two Nobel laureates. It has helped to launch 65 companies and has formed three major industry partnerships. The QB3 incubator network began in 2006 and has grown dramatically to include three campus sites and two private partners, with 51 companies currently renting space. Companies in the network have created more than 280 jobs and raised over $230 million in venture financing. The QB3 building at the Mission Bay campus has 96,000 sq. ft. of space on five floors designed to house multi-department and multi-disciplinary laboratories, lecture halls, and shared scientific resources. It also includes the Surbeck Lab for Advanced Imaging, of which Dr. Nelson is the Director. Other critical technology resources are the QB3 Cluster (described below), the Nikon Imaging Center, the Biomedical Micro-and Nanotechnology Fabrication Laboratory, and the Center for Advanced Technology.

Institute For Computational Health Sciences

The UCSF Institute for Computational Health Sciences (ICHS) was created by the Chancellor in 2012 to develop and enhance UCSF’s computational efforts and strategies in basic, translational, clinical and population-based biomedical research. It will be a campus hub for computer scientists and for researchers who employ computation as a primary tool in their biomedical research and will serve as a cornerstone of the university’s efforts to harness the power of “big data,” to lead to faster and more effective cures for patients worldwide. ICHS is a critical component of a global UCSF initiative in Precision Medicine, which seeks to aggregate and integrate vast, disparate datasets to advance understanding of biological processes, determine mechanisms of disease, and inform diagnosis and treatment of patients. UCSF recruited a world-renowned expert in medical technology, Atul Butte, MD, PhD, to lead the ICHS. A noted expert in pediatrics and medical informatics, most recently from Stanford University, Butte brings the rare combination of deep knowledge in medicine and biomedical research, and technological fluency to lead in the new realm of computational health. Butte’s research laboratory builds and applies tools that convert more than 400 trillion points of molecular, clinical, and epidemiological data – measured by researchers and clinicians over the past decade and now colloquially known as “big data” – into diagnostics, therapeutics, and new insights into disease. In addition to his own computational biomedical research, as the Director of the ICHS, he will coalesce the computational faculty already dispersed among our four top-ranked professional schools (Dentistry, Medicine, Nursing, and Pharmacy) and Graduate Division, superb research programs and outstanding Medical Center, establish a central convening center around biomedical research, computational science and bioinformatics, hire additional faculty, and build programs for research and education that will include substantive training in bioinformatics and computational science. Dr. Butte co-directs the Informatics and Research Innovation part of the CTSI.

Institute for Human Genetics (IHG)

The Institute for Human Genetics (IHG) is the central hub for human genetics research, education, and practice at UCSF. Initiated in 2006, the Institute has grown considerably over the past 7 years through active recruitment, whereby 29 new faculty members have joined the IHG. The major aim of the IHG is to create an exciting, productive, and collaborative environment for research, training, and clinical application in human genetics. The IHG also provides institutional support and resources, such as the Genomics Core Facilities, which have a large variety of state of the art technology platforms and support services for cost effective, flexible solutions for genomics projects of any size, ranging from full-service, large-scale projects to equipment only support. The UCSF Genomics Core is made up of several satellites located across the UCSF campuses. The current membership includes 72 active researchers, educators, and practitioners. Most of these individuals use the latest in genomics technology in their research, and quite a few are highly computational in their research. With the advent of high throughput sequencing based methods, such as next generation approaches to whole genome and whole exome sequencing, along with RNA-seq and ChiP-Seq applications, and continuously dropping prices, the demand for access to these technologies by our faculty has dramatically increased over the past several years. As a consequence, the IHG and the EVCP’s office have made several important investments to advance genomics research. Specifically, the IHG has acquired and upgraded two Illumina HiSeq 2500 systems.

Helen Diller Family Comprehensive Cancer Center (HDFCCC)

The original facility at Mt. Zion is an NCI-designated matrix center, conducting a wide range of inter-disciplinary research in the areas of laboratory, clinical, and population sciences. The HDFCCC integrates activities of more than 250 members working at four major campus and hospital locations (Parnassus, Mt. Zion, SF General Hospital, VA Hospital). The HDFCCC has placed a major emphasis on the integration of programs that include new therapeutic approaches, new ways of detecting cancers and classifying them by molecular
markers, population studies that identify risk factors for the disease, and strong basic efforts to increase the understanding of cancer at the molecular level. The HDFCCC also provides support for several core facilities that are used extensively by faculty at UCSF and are available for use by trainees (http://cancer.ucsf.edu/cores/index.php). These include a state-of-the-art Mass Spectroscopy Core, an Array and Genome Analysis Core, a Cell Analysis Core for quantitative PCR and flow cytometry, a Transgenic Mutagenesis core for engineering mutations into the mouse germline, Mouse and Molecular Pathology Cores for analysis of mouse and human tissues and a Pre-Clinical Core for carrying out preclinical oncology trials.

Gladstone Institutes
The J. David Gladstone Institutes of Neurological Disease (GIND) brings together nine independent laboratories in a highly interactive environment that is squarely focused on unraveling disease mechanisms underlying major neurological disorders and on discovering novel therapeutic strategies for these conditions. Since its inauguration in 1998, the GIND has been directed by Dr. Lennart Mucke, who also is an Associate Director of the ADRC. Supported by outstanding core facilities, most investigators in this institute study processes that result in neurodegeneration and cognitive impairments, with particular emphasis on the pathogenesis of AD, FTD, and dementia with Lewy bodies (DLB). In this research program, potential etiologic factors and pathways are dissected at the molecular, cellular, network, and behavioral level in transgenic mouse models and neural cultures. The relevance of results obtained in experimental models is assessed by comparative analyses of human postmortem tissues and clinical specimens. Animal models are also used to examine the efficacy and safety of novel treatment strategies at the preclinical level. The ADRC has enabled several GIND investigators to validate and follow up on their experimental discoveries in human subjects and clinical investigations. Based in good part on the pioneering efforts of Nobel laureate Shinya Yamanaka, who holds joint appointments at GIND, UCSF and Kyoto University, GIND has become a leading force in the application of stem cell technology in neuroscience and other areas of biomedical research, an exciting development that is reflected in Dr. Huang’s new ADRC project. In projects supported fully or partially by the ADRC, they identified novel compounds as well as already FDA-approved drugs that we are looking forward to testing in clinical trials for AD or FTD in the near future. The GIND has an endowment that provides funds for pilot projects, major equipment, facility upgrades, and a proportion of administrative/operational services. The GIND has been ranked, seven times in a row, one of the top 10 best places to work in academia and among the top 10 best institutions for postdoctoral training in North America by The Scientist magazine, which reflects the exceptional quality of its research environment and training program.

UCSF/Kaiser Center for Transdisciplinary ELSI Research in Translational Genomics (CT2G)
CT2G is UCSF’s NHGRI-funded “Center of Excellence” in ELSI Research (CEER). UCSF CTSI Co-investigator, Dr. Barbara Koenig, is the co-director of the center. CT2G is committed to building a network of social scientists, basic scientists, clinicians, bioethicists, and legal scholars to foster interdisciplinary research on the ethical, legal, social, and policy implications of emerging genomic technologies. Based on the core themes of translation and transdisciplinarity, the center is a collaborative effort among UCSF, Kaiser Permanente, and UC Hastings College of Law. The Center provides core infrastructure for a range of funded empirical bioethics research projects, focused on topics such as non-invasive prenatal genetic testing, using genetic markers to guide prevention and early detection efforts to reduce the burden of breast cancer, newborn screening policy and practice, and issues raised by the use of next generation sequencing technologies, such as the management of incidental genetic findings.

Since its inception in 2013, CT2G has developed active research working groups focused on ELSI issues, including, 1) the changing research/care boundary which challenges established practices in human research protection, 2) the use of race categories in structuring research and providing clinical care, and 3) best practices in community engagement and governance, including a focus on community engagements based on deliberative democracy theories. CT2G’s relationship with Kaiser Permanente encourages interaction among experts in the fields of genomics, health policy, and epidemiology, and allows for consideration of the perspective of an integrated health care system’s approaches to translating genomics into the clinic. The collaboration also offers links to Kaiser Permanente’s biorepository known as the “Research Program on Genes, Environment, and Health,” which is home to over 200,000 patient biospecimens linked to electronic medical record data. The CT2G explores issues of governance that arise from research biorepositories and clinical collections of biospecimens.

The primary purpose of CT2G is to create intellectual community and support collaborative research. CT2G includes seminars and symposia focused on specific topics in the translation of genomic findings into clinical practice and educational programs for clinical fellows and post doctoral trainees. CT2G provides the
intellectual home for “responsible conduct of research” activities at UCSF, with CTSI’s education program providing infrastructure support. In addition to CT2G’s funding as an NHGRI P20 center, infrastructure support for cross-UCSF bioethics activities comes from the office of the UCSF executive vice chancellor and provost.

**UCSF CLINICAL LABORATORIES**
The Clinical Laboratories are directed by faculty of the UCSF Department of Laboratory Medicine and are affiliated with the San Francisco General Hospital Clinical Laboratories, the San Francisco Veterans Administration Medical Center Laboratories and the Blood Centers Research Institute (BSRI). The various laboratories, along with the Departmental research faculty, are constantly involved in the evaluation of new testing technologies as well as the development of industry partnerships to bring new testing methods into clinical use. Examples include: the Center for Accelerated Innovation (CAI) work to develop next-generation sequencing (NGS) in the diagnosis of pneumonia, the TickChip assay for Lyme disease diagnosis, and software analysis for the evaluation of NGS data in pathogen detection; BSRI is actively engaged with industry partners to implement new pathogen reduction methods in blood component and to develop novel cellular therapeutics; Dr. Alan Wu (SFGH) is involved in evaluating Point-of-Care devices for Troponin and CD4/CD8 counts as well as high resolution mass spectrometry for forensic toxicology. Therefore the Dept. of Laboratory Medicine faculty, the UCSF Clinical laboratories and the affiliated laboratories that we direct provide a robust environment for test evaluation, translational development and industry partnerships.

**Blood Systems Research Institute (BSRI)**
The Blood Systems Research Institute (BSRI) is a UCSF CTSI-affiliated research institute embedded within Blood Centers of the Pacific and Blood System, Inc., the blood banking/transfusion medicine organization that serves UCSF and much of the western and Southern US. In addition to sophisticated research facilities, BSRI's unique placement and organizational structure facilitate extensive collaborations between academia and industry. While the bulk of BSRI funding is from traditional government sources (NIH, DoD), funded product development projects include partnerships with Novartis Diagnostics (recently acquired by Grifols) and TerumoBCT. These translational projects aim to improve blood bank diagnostics and develop and implement new pathogen reduction methods for traditional blood components and novel cellular therapies. One of the unique skill sets that BSRI brings is in regulatory interactions with the FDA, and this expertise is shared with UCSF collaborators in advancing novel therapies through the FDA testing and approval process.

**UCSF LABORATORY ANIMAL RESOURCE CENTER**
All animal research is monitored by the UCSF Laboratory Animal Resource Center (LARC), which occupies extensive facilities, and is staffed by full time veterinarians. UCSF animal imaging facilities have access to physiological monitors, equipment for intubation and respiratory support, anesthesia, and surgical equipment. Digital autoradiography (Molecular Dynamics Phosphor Imager), a dedicated scintillation camera for animal research, radioisotope well-counters, and cryogenic autoradiography are available. The China Basin Facility animal research suite is designed to accommodate small animal research. It includes a procedure room, adjacent preparation and recovery space, holding areas with self-contained cage storage, non-recirculating air, and 24/7 ventilation and heating.

The LARC maintains animal facilities at all UCSF sub-campuses. The use of a common administrative structure and guidelines enables research animals to be freely transferred between all facilities. The LARC's mission is to (1) provide quality care for all animals used at UCSF, (2) assist the faculty in their mission of quality research with respect to the use of laboratory animals, (3) act as a resource center for the faculty on all issues relating to laboratory animals, and (4) assist the University to meet its goal of humane treatment of laboratory animals. The LARC achieves these goals through a staff of trained husbandry technicians responsible for the everyday care, health monitoring, and sanitation of the UCSF animal facilities; rodent veterinary nurses responsible for monitoring rodent health, and attending to any rodent health conditions that are in need of attention; and veterinarians who provide clinical services and support for the UCSF research animals. Veterinarians are also responsible to ensure the humane use and care of all animals.