Facilities and Other Resources
(In association with Dr. Jason Adams and Dr. Nicholas Anderson)

Laboratory: *Not applicable*

Animal: *Not applicable*

Clinical:
Pulmonary Clinical Trials Research Unit: The Division of Pulmonary, Critical Care, and Sleep Medicine Clinical Trials Research Unit consists of numerous faculty and 9 clinical research coordinator members who are engaged in clinical research for people with pulmonary disorders, such as acute lung injury (ALI), sepsis, cystic fibrosis (CF), chronic obstructive pulmonary disease (COPD), interstitial lung disease (ILD), and pulmonary arterial hypertension (PAH). At present, more than 35 federal, industry, and investigator initiated clinical trials. This unit under the direction of Dr. Brian Morrissey and Lead CRC Maya Juarez is one of the most successful clinical research units at UC Davis. It has a long history of collaborative efforts with UCSF through the NHLBI ARDSnet and PETAL networks in acute lung injury. This same unit will now lead efforts for PrecISE consortium. In addition to local clinics, this unit has a strong history of engagement and recruitment through patient and disease-based organizations in the Sacramento and San Joaquin Valleys including through the ARDS Foundation, the Sepsis Alliance, the UC Davis Medical Center Patient Support Group, The Cystic Fibrosis Foundation, the UC Davis UCAN/ROAD (Reversible Obstructive Airways Disease) Program, the Central Valley Pulmonary Fibrosis Support Group in Sacramento, and the Pulmonary Hypertension Sacramento Support Group. *The institutional facilities and focus on fundamental ventilation and pulmonary research will provide a collaborative and engaging environment for research and data acquisition activities related to Aim 1 of this proposal.*

Centers for Health Technology and Center for Virtual Care: The CHT is home to one of the nation's leading telehealth programs, and offers a unique group of services that include telemedicine, education, innovation and research. The Center is housed in a 52,000 sq. ft. building with state-of-the-art facilities to support virtual training in a variety of areas. It is one of the University of California's premiere facilities for developing innovations in clinical care, health research and medical education. The Center combines telehealth, simulation technology and media production to support an integrated approach for PhD students, postdoctoral fellows and mentors to exchange information in the areas of biomedicine and information technology. The uniquely designed facility offers customized classrooms, fully equipped telemedicine and simulation training laboratories, including a simulated critical care environment, including the Center for Virtual Care (CVC), which supports a full complement of wired and wireless patient instrumentation, monitoring, and equipment to simulate patient metabolic experiences and clinical workflows. The Center participates in the UC-wide CITRIS program (Center for Information Technology Research in the Interest of Society), which links UC Davis to UC Berkeley, UC Merced and UC Santa Cruz, providing bridges to engineering and bioinformatics.

The CVC provides an excellent facility to test algorithm development and validation. This will aid in ensuring our computer software is correct and is applicable in a clinical setting.

UC Davis Clinical and Translational Science Center (CTSC): The UC Clinical and Translational Sciences is one of the first NIH Clinical and Translational Science Awards, now with 62-members distributed over 31 states and the District of Columbia. The CTSC provides key services to investigators and staff to facilitate clinical and translational research to meet the mission and goals of the Center. Specific to this proposal, the **CTSC Biomedical Informatics Program** (Directed by Anderson) develops strategies, tools and training to manage clinical and translational research data. Programmers are available to assist this investigator with database design and management, data harmonization and profiling, data sharing and security, electronic data capture, and analytic design.

The Bioinformatics Core of UC Davis provides expertise and infrastructure for the acquisition, curation, analysis, and distribution of large complex datasets, as well as develop and perform computations, analyses and simulations addressing a wide variety of biological questions from genomics to network biology. The Core has seven staff members with overlapping expertise in computing infrastructure, Web/database, scientific programming, biological annotation and statistics. The Core provides bioinformatics support for the wet lab service cores as well as for researchers with individual bioinformatics needs. The computing infrastructure of the Core includes:

1. high performance computing clusters: a 110-node cluster of 4-core AMD Opteron CPUs with 4GB of RAM (32 nodes have 8GB of RAM), a mixed cluster consisting of ~80 nodes of Intel and AMD Opteron CPUs (10 nodes have 32BG RAM);
2. data storage servers of 300TB spreading across several fileservers including three Sun X4500, Isilon storage cluster and Linux based fileservers;

3. backup servers: a 16TB fileserver in offsite for disk to disk backup, a Sun/StorageTek backup server with a 2TB disk array and a 30-slot LTO3 tape jukebox for tape backup;
4. ultra large memory machines: three servers with 128GB, 144GB and 512GB of RAM respectively;
5. application servers: a Windows server for Windows specific Bioinformatics software tools and work stations for software developers and guests;
6. cloud computing: a preserved instance in Amazon Cloud and tools to access scalable resources provided by the Amazon Cloud Services;
7. network bandwidth: a 10Gbit/s network connection to Corporation for Education Network Initiatives in California (CENIC) and National Lambda Rail.

UC Davis Office of Graduate Studies The mission of the Office of Graduate Studies is to advocate on behalf of graduate students and postdoctoral scholars, to support the faculty and staff engaged in delivering graduate education, and to administer academic and administrative policies affecting graduate students and postdoctoral scholars in ways that foster a culturally and intellectually diverse environment characterized by high academic standards. Graduate Studies at UC Davis includes 94 dynamic degree programs and a diverse and interactive student body from around the world. Known for our state-of-the-art research facilities, productive laboratories and progressive spirit – UC Davis offers collaborative and interdisciplinary curricula through graduate groups and designated emphasis options – bringing students and faculty of different academic disciplines together to address real-world challenges.

The UC Davis Office of Graduate Studies provides Professional Development Opportunities for graduate students and postdoctoral fellows to develop their knowledge and skills beyond their formal academic training. These opportunities help supplement students' and scholars' efforts to succeed while at UC Davis and in their future careers. The Office of Graduate Studies offers several programs in professional development that will be valuable to our Scholars.

GradPathways, a premier professional development program, offers a variety of workshops, seminars and panel discussions on topics of interest to graduate students and postdoctoral scholars. This series includes a framework for professional development based on eight essential core competencies with four tiers of programming designed to meet student/scholar needs at the appropriate times in their graduate school or postdoctoral experience. Core competencies include writing and publishing; teaching and mentoring; leadership and management; scholarly integrity and professionalism; and career exploration, job searching and networking.

Career Services: Graduate Student and Postdoctoral Career Services are offered by the Office of Graduate Studies in partnership with the Internship and Career Center. These services include one-on-one career advising, resume review, and workshops and seminars. The Pathways Career Symposium is a day-long event featuring 12 concurrent panel discussions on career and professional development issues and a networking luncheon. Panels feature distinguished professionals from academia, industry, and government. Workshops include the Job Search Jump Start and the Academic Job Search Series.

The Responsible Conduct of Research (RCR) program is a joint effort of the Office of Graduate Studies and the Office of Research. The objective of the RCR program is to provide graduate students, postdoctoral scholars, faculty, staff and NSF-funded undergraduate students with information, training, and tools to address the increasingly complex issues that they will confront during their careers.

Information and Educational Technology

Information and Educational Technology (IET) is the subject matter expert in technological solutions for the campus. IET manages 120,000 computing accounts, maintains more than 3,600 wireless access points, runs 20 computer labs, and manages the central data center. IET provides a broad range of instructional, research, and outreach services, from full production to training and consultation. This includes multimedia and graphic design; Web development; digital photography and video production; audio-visual support; computer rooms and classroom tech support; video-conferencing, podcasting, and webcasting; online collaboration and communications tools.

The UC Davis Information Technology (IT) Division provides a wide range of computing, communications, and media services in support of faculty and student research. It operates the Center for Advanced Information Technology, which showcases leading-edge technology, presents vendor-donated software/hardware for evaluation, and serves as liaison with vendors in obtaining software/hardware for research projects. The Visualization Laboratory provides researchers with access to scientific visualization software, statistical and mathematical programs, software libraries (including SAS, BMDP, SPSS, Minitab, IMSL, and NAG), geographic information systems, molecular visualization tools, and specialized programs for linear and nonlinear optimization. IT also offers access to desktop and time-share computing locally, and allocations of time for researchers at supercomputing centers nationally through computing accounts.

Scholar and Mentor accounts allow electronic mail and library use and access to the campus high-speed data network, including access to a dedicated research network at speeds up to 10 Gbps. High-speed interconnects are provided to regional, national and global-wide research networks such as Internet2, the National Lambda Rail and ESnet. High-speed optical interconnection is supported between the main Davis campus and the UC Davis Medical Center located in Sacramento. The campus fiber optic backbone is being extended into research spaces. Other services include IT security, encrypted wireless network, VPN access for secure off- campus connectivity, database client/server access, remote backup, and firewall and host-level security management services.

Personal Computer: The PI uses three computers: 1) An Apple MacBook Pro (OSX El Capitan 10.11.6, 2 CPU cores, 8GB memory, 512GB storage, encrypted through Apple) used for daily tasks and light data analytics. 2) An iMac (OSX El Capitan 10.11.6, 1TB storage, encrypted through UC Davis School of Medicine) located in the laboratory that has access to UCDMC electronic medical record (EMR) and provides storage for ventilator waveform data. 3) High- powered lab server, with dual 2.4 GHz quad core CPUs, 192 GB of high speed RAM, and 16 TB of encrypted hard drive storage for research and development work, located at a UCDMC collocation center that is used for data analytics.

The PI also has access to 60 Raspberry Pi (RPi) 3 devices. These devices are stored on carts strategically located in the ED and various ICUs. Currently about 10 RPi devices are being utilized in the ED, and 20 devices are in various ICUs. 30 RPi's are currently located the laboratory awaiting eventual rotation with other devices currently in use.

The PI has access to information located in patient EMR records via request to the Clinical Information Technology Department. EMR data is collected via application programming interfaces (APIs) supplied by Epic (Epic Systems Corporation; Verona, WI).

The computing resources at the PI's disposal are more than sufficient to conduct the required data analytics research and model development.

Office: The PI has access to a desk in one of 4 cubicles located the office located in the Medical Education Building. *This desk ensures that the PI has necessary space to conduct work of data analysis and model development.*