



MASS GENERAL
RESEARCH INSTITUTE

DIVISION OF
CLINICAL RESEARCH

Division of Clinical Research MGH Research Institute Progress Report 2016



Division of Clinical Research, MGH Research Institute
Progress Report 2016

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Division of Clinical Research (DCR), MGH Research Institute 2016 Executive Summary

Maurizio Fava, M.D., Director

Founded in 1996, the DCR (formerly known as MGH CRP) is now entering its 21st year.

Since its inception, the DCR has had a simple and constant Mission: **to increase the quality, quantity, and efficiency of translating basic science advances into improved care for our patients.**

Following DCR's Mission as well as MGH Strategic Plan recommendations, the following progress has been made in 2016:

DCR Centers	DCR Units
<ul style="list-style-type: none">• Biostatistics Center• Clinical Research Center (CRC)• Translational Research Center (TRC)• The Yvonne L. Munn Center for Nursing Research• Partners Biobank at MGH• Pediatric Translational Research Center (PTRC)• Think Tanks• Bioinformatics Consortium	<ul style="list-style-type: none">• Clinical Research Support• Comparative Effectiveness• Drug Discovery Rounds• Education• Electronic Health Records Research• Imaging Biomarkers• Information Technology• Omics• Patient-Centered Outcomes Research• Qualitative Analysis• Survey Research

Here are some of the highlights for the Centers and Units as well as other DCR initiative:

Drug Discovery Rounds are face-to-face advisory sessions with Key Advisors:

- Mark Fishman (president of Novartis Institutes for BioMedical Research)
- Edward Scolnick (former president of Merck Research Laboratories)
- Steve Paul (former president of president of the Lilly Research Laboratories)
- Henri Termeer (former CEO of Genzyme)

Pediatric Translational Research Center (PTRC), led by Alessio Fasano, Associate Chief of the MGH Department of Pediatrics. With the appreciation that the biological events in childhood can strongly influence disease onset in both childhood and adulthood, we intend to propose a much stronger and integrated model by formally establishing the PTRC to facilitate Industry-Academia partnership so that specific projects can be shaped together from their inception rather than along the way. The creation of a PTRC within the DCR allows us to expand our current research portfolio in order to become a unique asset complementary to the overall mission of the MGH Research Institute.

“Think Tanks” are meetings with representatives from academia, pharma/biotech etc. to discuss programmatic collaboration. Current Think Tanks include:

- Think Tank on Rare Diseases (chaired by Florian Eichler)
- Think Tank on Neuroinflammation (chaired by Rudy Tanzi and Chris McDougale)
- Think Tank on Microbiome (chaired by Alessio Fasano and Ashwin Ananthkrishnan)

Bioinformatics Consortium, lead by Ruslan Sadreyev. The goal is to provide bioinformatics and wider genomics service, consulting, education and training for biological, pre-clinical, and clinical investigators at MGH and in the broader research community.

Harvard Catalyst: DCR continues to build close partnership with Harvard Catalyst.

Translational Research and Clinical Research Centers (TCRC): 18-bed unit on White 12.

The TRC's overall goal is to facilitate moving basic scientific discoveries and new technologies, discovered both at the MGH and in the local biopharma community, toward the clinic to improve diagnostic capabilities and therapeutic interventions. With the opening of the new Translational and Clinical Research Centers (TCRC) in the fall of 2016, the TRC can now also evaluate the utility of those technologies in early stage, patient-based clinical trials. The TRC spent most of 2016 preparing for the opening of the new TCRC. This effort was a continuation of the groundwork laid in 2015, focusing on three key elements: 1) working with the construction crew to ensure the new TCRC was ready to open by the end of the year; 2) continuing to work with Partners to improve administrative processes that are required to conduct clinical trials at the MGH; 3) hiring key individuals that can provide the administrative infrastructure that can support clinical investigators engaged in clinical trials, particularly those partnered with industry partners.

Simches 2: continues to make the space on Simches a one stop-shop for clinical investigators by:

- Continuing to provide CRC and PM support for MGH investigators
- Creating a CRC satellite
- Moving/consolidating bioinformatics
- Establishing CTO, IRB and PHS Innovation office hours

iSuggest continues to be a key vehicle for Clinical Research Community at and beyond MGH (include BWH and PHS)

Expanded version of the 2016 DCR progress report, including reports from all Centers and Units, can be found online - MGH Research Institute, DCR website at <http://www.massgeneral.org/research/dcr>

Clinical Research Support Office (CRSO)

Andrew A. Nierenberg, M.D., Director

GOALS

The role of the MGH Clinical Research Support Office (CRSO) is to provide infrastructure & logistical support for clinical research faculty, particularly for early career investigators seeking training and transitional support as well as for established investigators. Our goals are to:

- **Build** the pipeline of early career physician-scientists;
- **Support** clinical research infrastructures;
- **Facilitate** subject recruitment.

In addition, the CRSO supported Partners initiatives to enhance subject recruitment to clinical studies and supported the launch of Epic electronic health record and one on one and group training for the MGH research community.

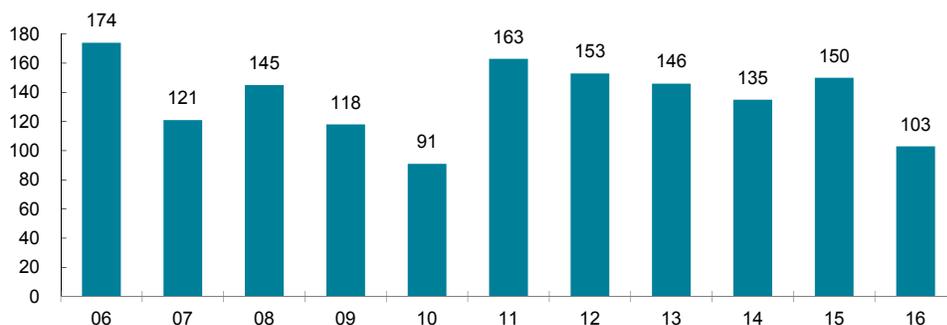
ACCOMPLISHMENTS

Clinical Research Faculty Mentoring with an Emphasis on NIH K Awards and the Patient Centered Outcomes Research Institute

CRSO and DCR faculty members mentor clinical researchers at MGH, with a focus on early and midcareer development. CRSO mentors augment departmental mentors to provide additional perspectives and a broader overview of clinical research career development. The goal is to help junior and mid-rank faculty advance their careers and their clinical research.

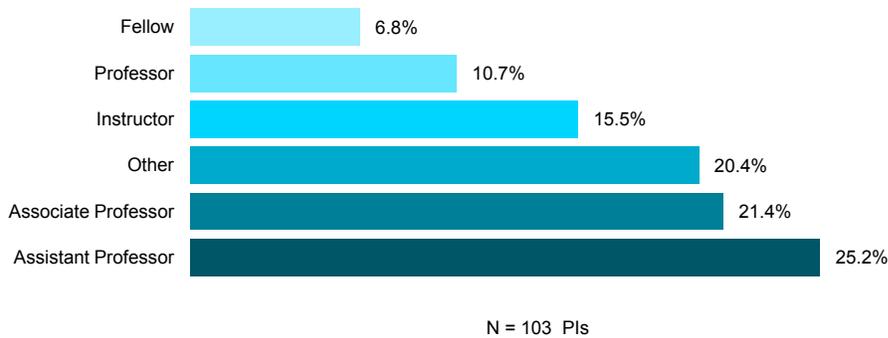
- In collaboration with the Clinical Research Education Unit (CREU), Dr. Nierenberg & Dr. Karen Miller designed and implemented the “Conquering the K” interactive workshop in spring 2016. Of note, the K workshop was part of the philosophy of the CRSO and CREU to shift from passive to active learning based on principles of adult learning.
- 103 faculty and research fellows reached out to the CRSO in 2016 (Fig. 1a). Dr. Nierenberg has staffed consultations ranging from junior faculty preparing new Career Development (K) grant applications to working with current K award recipients in applying for independent funding to consulting on resubmissions of federal grants and assisting with study design issues for new clinical studies and research networks.

Figure 1a: CRSO: PIs Served per Year, 2006-2016



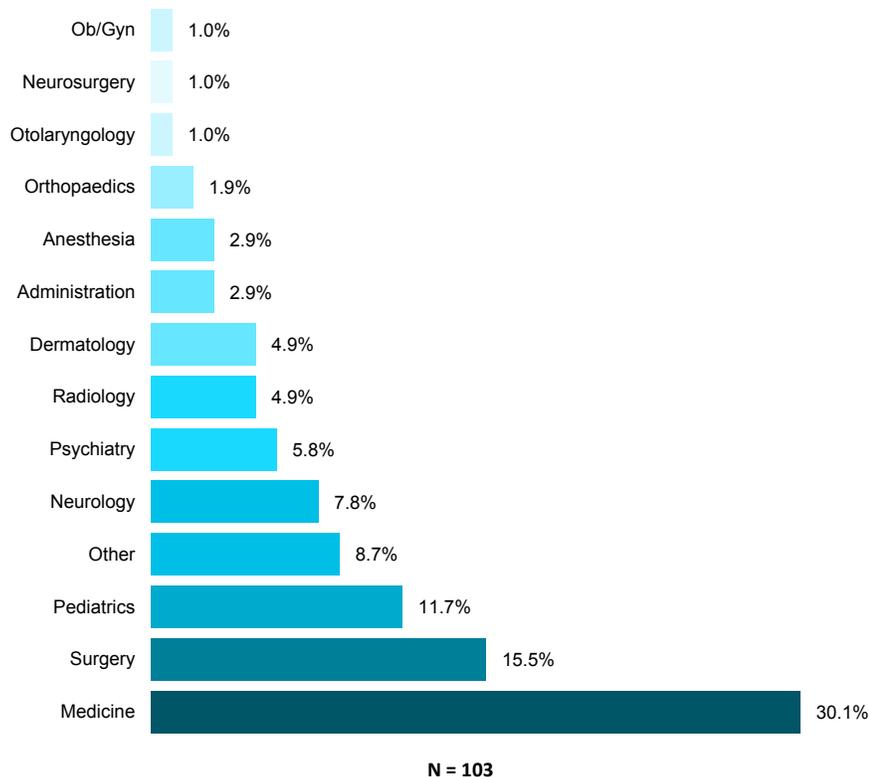
- Over 50% of Investigators utilized more than one CRSO service during 2016. These services include utilizing Project Manager (PM) support to assist with assembling the administrative sections of grant applications, developing study budgets and training new staff to use the PM tools.
- Of the 103 investigators assisted by CRSO, 41.8% were junior faculty members (instructors and assistant professors), 33.6% were senior faculty (associate professors and professors), and 21.4% were other non faculty professional staff such as doctorally prepared nurses, and department administrators (Fig. 1b).

Figure 1b: CRSO: PI's Served by Faculty Rank in 2016



Collectively faculty in Medicine, Surgery, and Pediatrics accounted for over 55% of all investigators served. (Fig. 1c)

Figure 1c: CRSO: Served by Dept., 2016



Study Coordinator Pool

Many clinical research investigators need staff to manage the day-to-day logistics of conducting clinical research. The CRSO fills this gap by providing temporary, as-needed, trained study coordinators.

The CRSO study coordinator pool assists with all aspects of a clinical study for a flat hourly rate of \$45 and represents the only charged service of the DCR. Study coordinators manage study start up (IRB submissions) day-to-day clinical study coordination including data collection and entry and study close out.

- DCR study coordinators supported 40 individual clinical investigators on 72 individual studies (Fig. 2a & 2b). Clinical investigators often contract with the DCR for experienced study coordinators for multiple studies.
- A growing number of investigators and study staff seeking advice and consultations on IRB submissions, either prior to their submission to the IRB or in drafting responses to the IRB's questions.

Figure 2a: Study Coordinators: Projects by Dept., 2016

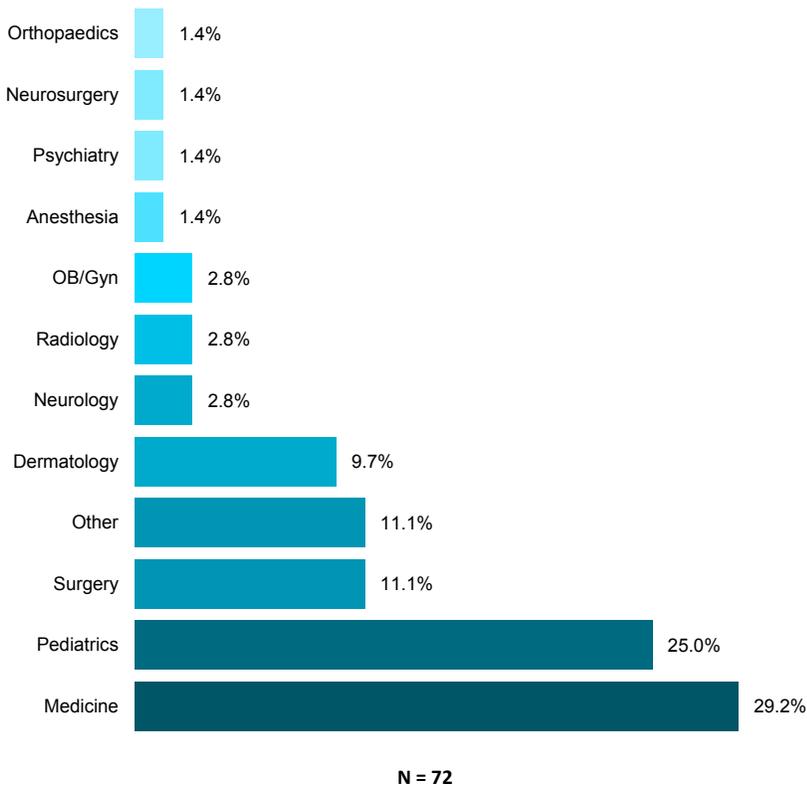
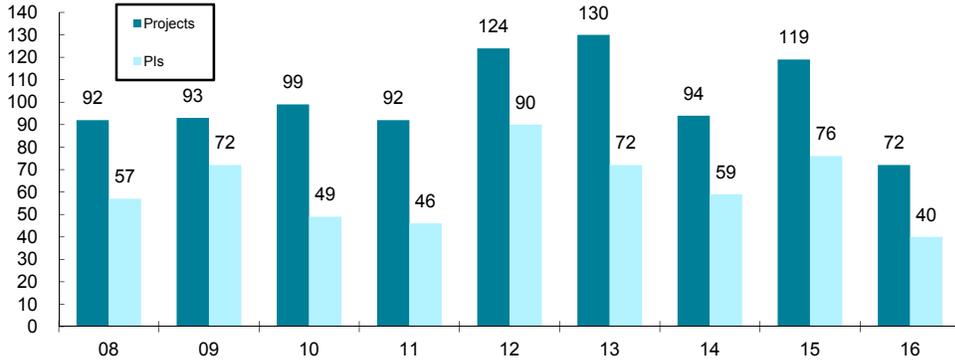


Figure 2b: Study Coordinators: Projects & PIs per Year, 2008 - 2016



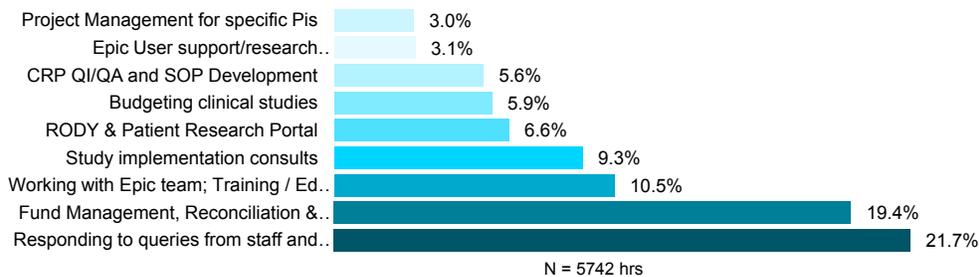
CRSO study coordinators play an important role in training other study staff throughout the MGH. DCR study coordinators have been accredited by the Norman Knight Nursing Center for Clinical and Professional Development to train MGH non-nurse study coordinators in basic phlebotomy, measuring vital signs, and performing ECGs thus leveraging the CRP’s programs into the clinical operations. Since 2010, the CRSO in collaboration with the DCR’s Education Unit has trained about 1400 MGH research coordinators.

Project Management (PM) Support

To support the largely unmet needs of MGH clinical investigators for assistance in project implementation and financial management, the CRSO developed a Project Manager (PM) service to address these issues.

- PMs provided 25 MGH investigators conducting a total of 32 protocols with monthly reports verifying fund expenditures, provided a realistic assessment of projected fund balances, and reviewed sponsor amendments which may affect study budgets.
- PMs invoice sponsors based on achievement of study milestones, and managed final fund reconciliation allowing PIs to close study funds quickly and avoid deficits caused by untimely accounting practices.
- In addition to fund reconciliation, PMs also assist PIs by researching funding opportunities, budgeting clinical studies, participating in the DCR’s Educational Unit programs, and advising on study implementation. (Fig. 2c)

Figure 2c: CRSO: Consulting Hours by Service Type in 2016



Expanded Project Management Support

Support of Research Programs and Departmental initiatives:

- In 2016, a DCR project manager managed study coordinator staffing and subject recruitment for a large PI-initiated cardiac study which successfully recruited and completed data collection of 600+ subjects over 6 months. This was followed by a study which recruited a 100 patient cohort in 6 months.
- In response to a request from the Department of Surgery, a project manager was assigned to act as a one-on-one faculty “navigator” for surgery faculty seeking funding opportunities and help in starting up new clinical studies which includes IRB submission, subject recruitment, data collection and analysis.

Support of Programs to Facilitate Subject Recruitment

The Research Study Volunteer Program (RSVP for Health) is a DCR-initiated study volunteer registry where individuals self register to receive information about clinical research studies. This program was launched in 2005 and used by both MGH and BWH research staff use this program as a resource to recruit study subjects. The heaviest users are investigators in the departments of Medicine, Psychiatry, and Radiology. In 2016 RSVP for Health contained over 27,000 registrants. (Fig. 4)

Figure 4: RSVP for Health: Registrants' Demographics

Category	Count	Registrants	%
Gender			
Female	17,472		64%
Male	8,390		31%
Not Recorded	1,297		5%
Total	27,159		100%
Race			
American Indian/Alaskan Native	101		0.4%
Asian	1,479		5.4%
Black or African American	3,172		11.7%
Native Hawaiian/Pacific Islander	83		0.3%
White	17,976		66.2%
Other	1,256		4.6%
Not Recorded	3,092		11.4%
Total	27,159		100.0%
Ethnicity			
Hispanic or Latino	1,884		6.9%
Not Hispanic or Latino	18,183		67.0%
Not Recorded	7,092		26.1%
Total	27,159		100.0%
Age			
<35	11,815		43.5%
36-45	4,406		16.2%
46-65	7,415		27.3%
66+	3,072		11.3%
Not recorded	448		1.6%
Total	27,156		100.0%
Contact Method			
Email	22,903		84.3%
Post	4,256		15.7%
Total:	27,159		100.0%

Research Opportunities Direct to You (RODY)

In July 2016, the MGH launched Research Opportunities Direct to You (RODY), a program where MGH patients are given the opportunity to elect to receive announcements of clinical research studies directly from MGH researchers.

- Since its initiation, about 27K patients have elected to receive study announcements by mail or email.
- The program has expanded to BWH and will over time be initiated in MGH community health centers and other Partners affiliated hospitals.

Support for Launch of the Epic Electronic Health Record

In 2016 the CRSO supported the launch of the Epic Electronic Health Record by offering one on one and group training to the MGH research Community principal investigators, study coordinators and departmental project managers. In the April - May pre Go Live phase 320 MGH research staff met with CRSO and Partners Epic Research Team for consultation on managing their studies in Epic. From June to December over 800 MGH research staff reached out to CRSO staff for consultations and training.

CRSO project management staff also prepared 32 Epic Research Tip Sheets which were based on queries received from our research community. These Epic Research Tip Sheets are posted on an intranet site available to the MGH research community.

LESSONS LEARNED

- Clinical researchers continue to need and use the CRSO coordinators and project managers.
- The Conquering the K series has efficiently replaced individual consultations while still meeting the needs of the junior researcher community.
- Subject recruitment continues to be a challenge and time will tell if the Research Opportunities Direct to You (RODY) initiative helps.

ADAPTATIONS PLANNED

- **Communicate** directly with mentors and department chiefs about how CRSO services can benefit their department.
- **Encourage** department chiefs to consider having Associate Professors in their departments apply for K24 awards.
- **Expand** the K Award workshop to a mid-K award seminar and planning for the first R submission without duplicating Catalyst efforts.
- **Continue** to expand the library of K award submissions.

Clinical Research Education Unit (CREU)

Andrew Nierenberg, M.D., and Karen Miller, M.D., Co-Directors

GOAL

The goal of the Clinical Research Education Unit (CREU) is to improve the quality and quantity of clinical research within MGH by providing educational opportunities for clinical investigators and study staff.

ACCOMPLISHMENTS

CREU courses were well attended in 2016 (fig. 1). The CREU offered 155 lectures and 6 online courses (fig. 2). There were significantly more attendees at lectures in 2016 when compared to 2015.

In 2015 the CREU offered 10 online courses; however, that number decreased to 6 in 2016. The CREU upgraded production software to Articulate Storyline and switched online platforms to Healthstream. In order to use Healthstream, our current online courses needed to be taken offline, revised and redesigned. The number of online views in 2016 was comparable to 2015 with 4 fewer courses available, demonstrating significant interest in online learning.

Figure #1: Course Attendance

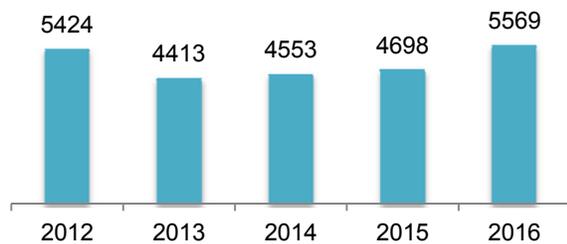
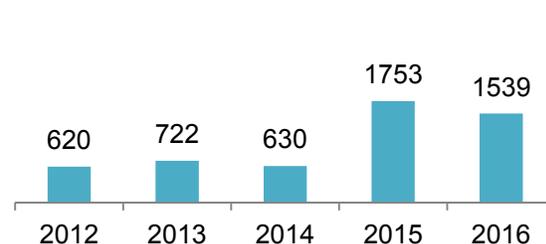


Figure #2: Views for Online Training



Investigator Program

The investigator track continues to be extremely popular with 2,972 attendees. The CREU offers a core curriculum to support junior investigators as well as advanced courses for professional development.

In 2016, the CREU partnered with the MGH Research Institute and the Alan Alda Center for Communicating Science to offer a session on How to Communicate Science and Influence People. The CREU, in conjunction with the Bioinformatics Center, developed a series on bioinformatics – Introduction to Bioinformatics. Philanthropy at MGH: The Role of Philanthropy in the Clinical Research Process and Identifying External Funding Opportunities with COS Pivot were two new initiatives for 2016. The CREU continues to support the OMICS Unit with logistical support for new courses such as Biobanking for Biomarker and Personalized Medicine Research.

On an annual basis, the CREU offers Conquering the K: Applying for an NIH Career Development Award. Due to a large number of applicants in 2015, a K08 track was added to the K23 track for 2016. During the application review process, it was noted that applicants needed more information on K Awards, in turn the CREU developed an introductory course to support those investigators - Considering Applying for an NIH Career Development Award (K Award)? What You Should Know Before Applying.

Study Staff Program

The study staff curriculum supports MGH clinical investigators by providing educational resources and training for study staff. This track is a widely used resource, with 2,597 attendees in 2016. A major initiative in 2016 was continuing the monthly Clinical Research Spotlight Series to keep study staff informed of new developments in clinical research. New topics for 2016 included Biobank Portal, Transitioning a study to a new clinical research coordinator, and Marketing your study in print and online.

To support experienced study staff and encourage continued education, the CREU offered a certification exam through the Society for Clinical Research Associates (SOCRA). In addition to the exam, the CREU co-sponsors SOCRA meetings to provide continuing education on-site for certified members of SOCRA.

Three hundred and seventy-five (375) participants took advantage of the CREU's Clinical Skills Trainings (phlebotomy, ECG and vital signs).

Online Course Development

In 2016, the CREU upgraded production software to Articulate Storyline and switched online platforms to Healthstream. These changes support a better, more interactive learning experience for the research community.

Courses live in Healthstream:

- Clinical Research Conduct: Training for Research Staff at MGH
- Guide to the Patient Data Registry (RPDR)
- Clinical Research Study Staff Orientation Manual
- Insight eIRB Training
- Art of Scientific Presentation

Courses in production include (post in 2017):

- Manuscript Writing
- Critiquing an Article
- Recruitment and Retention

The Research Training Education Committee (RITE Committee) is a multi-functional group made up of members from the CREU, Environmental Health and Safety, Radiation Safety and Comparative Medicine. Each group has a set of required trainings produced in different formats and posted on different platforms. In an effort to consolidate training, offer online training in a consistent format and in an easily accessible manner, the CREU is producing these trainings in Articulate Storyline and posting/managing on Healthstream.

Revised courses posted on Healthstream include:

- Fire and Safety in Laboratories
- Irradiator Retraining
- Radiation Retraining

Courses in production include (post in 2017):

- Hazard Communication Training - Non-Lab Staff
- IATA Shipping Training for Transportation of Biological Materials and Dry Ice Chemical Hygiene in Laboratories
- Chemical Safety in Laboratories
- Chemical Hazard Communication in Laboratories

Additional Efforts

The CREU is working closely with the Lab of Computer Science to develop LEARN, a learning management system for MGH. It is expected that this system will enable researchers to create a profile

for each employee involved in research at MGH, coordinate training requirements for compliance across the hospital, manage elective training and offer state-of-the-art course production tools. The CREU, MGH Research Compliance, and the Laboratory of Computer Science developed a personnel survey and course directory to coordinate research-related mandatory training across MGH. Based on survey responses, a personalized course list will be generated allowing employees to see a list of required trainings and links to those courses. The CREU is responsible for administering, tracking, and escalating compliance for the survey. The official launch to all new hires at MGH was March 2016. To date, over 1,400 new hires have completed the survey.

Members of the CREU have participated in Healthstream Administrator training and continue to be part of the hospital-wide Healthstream working group. This training allows the CREU to post, revise and track online courses. As part of our course consolidation effort, the CREU Healthstream Administrators provide services to other departments such as Comparative Medicine.

The CREU is working with members of ECOR and the Research Institute to create a consistent format for advertising research-related news at MGH. The goal of the new format is to promote consistently and limit the number of emails sent by different groups.

Clinical Research Day continues as an important venue to celebrate clinical research. Clinical Research Day showcases the DCR's efforts to build and support a viable community of clinical investigators and study staff across the institution. The Keynote Address, The Clinical Applications of Gene Editing Technologies, was presented by Charles Albright, Chief Scientific Officer, Editas Medicine. Participation in the 2016 Clinical Research Day was robust, with 350 attendees, 349 submitted abstracts, 43 team awards, 31 departmental awards and a vibrant and well-attended poster presentation session.

LESSONS LEARNED

1. **Interest.** Interest in CREU educational programming at the local level remains high. There is a continuing demand for basic level courses as well as more advanced content for clinical investigators and study staff.
2. **Curriculum.** Attendees prefer focused, topic specific, small group courses with hands-on workshops led by experienced instructor/preceptors. Over the next year, the CREU will incorporate more hybrid-type courses into the curriculum.
3. **Online Education.** Online education is a highly valuable resource to the MGH clinical research community. By making courses accessible at all times, the CREU is able to increase its impact and provide even better services and resources to the clinical research community.

ADAPTATIONS PLANNED

1. The CREU will continue to invest in online education by enhancing and promoting its online education resources and creating additional online educational opportunities using new production software. Online courses to be developed in 2017 include Mentoring Basics, Peer to Peer Auditing, Biospecimen Collection, Processing and Storage and Transitioning a Study.
2. The CREU is working to enhance its curriculum by adding live courses on Presenting Scientific Data, eConsent, Biorepository Panel and Internet of Things.
3. The CREU alongside the RITE Committee will implement a new learning management system to establish profiles, manage event planning, improve online course production using principles of adult learning, and provide a mechanism for tracking and reporting. The ultimate goal is to provide researchers with a user friendly dashboard.

Comparative Effectiveness Research and Survey Unit (CERSU)

James Meigs M.D., M.P.H. and Eric Campbell Ph.D., Co-Directors

GOALS

The Comparative Effectiveness Research and Survey Unit has three main objectives:

- Support clinical research aimed to improve the clinical practice of medicine and population health,
- Provide mentorship and advice for academic research careers in clinical epidemiology and effectiveness,
- Help investigators design and conduct excellent clinical outcomes and survey research studies.

The CERSU focuses specifically on the “Second Translational Block” that exists between basic science, step I translational research and clinical trial, and step II translational research that implements these advances to improve clinical practice and public health. The principal activity of the CERSU has been research mentoring for MGH trainees and faculty at all levels. Most mentoring is for MGH’s junior faculty investigators. We provide advice and support for research that addresses a spectrum of approaches and topics from disease pathogenesis to the effectiveness, efficiency, and equity of health care delivery and delivery systems. Careers in this area are fundable and can lead to stable research and administrative careers, especially in the era of the Affordable Care Act and its Patient Centered Research arm, PCORI. We aim to support and attract the best and brightest MGH clinical investigators into these fields, as well as to help with their career development and retention.

In response to increasing health care costs, the need for payment reform, and the continuing gap between evidence and practice, the Federal Government has substantially increased available funding to support comparative effectiveness research (CER). Defined as the conduct of research comparing the benefits and harms of different health care interventions and strategies, CER seeks to assess a wide range of health outcomes for diverse patients, patient populations and patient subgroups. This research requires the development, expansion, and use of data sources and methods to determine comparative effectiveness and disseminate the results.

ACCOMPLISHMENTS

Clinical Innovation Award (CIA): Translating Clinical Insights into Improved Care 2005-2016

The Clinical Innovation Award (CIA) program was initiated in 2005 in collaboration with the MGH President and CEO, Peter Slavin M.D. Solicitation and evaluation of research proposals to integrate clinical insights into improved patient care were conducted using a NIH-type review and award model. In 2011, CIA operations were transferred to MGH’s Department of Quality and Safety and where it continued until 2014 to be supported by Michael Jaff D.O., leader of MGH/MGPO Care Redesign Initiative. The award supported a portion of the PI’s salary to allow protected time to devote to the project (up to 20%); research infrastructure support necessary to carry out the project (e.g. biostatistics, project management, informatics development, study coordinators for data collection, and research assistant/study coordinator support); and faculty co-mentorship (with the Quality and Safety Office) from the MGH DCR to help design, execute and evaluate the projects.

Below are reported two-year post award (2014-2106) outcome data for awardees completing their two-year award period at the end of the CIA program in 2014 (2012-2014). Data are for grants and papers directly or indirectly resulting from MGH CIA program support. Four awardees have published 10 papers and received three externally funded grants as a result of MGH CIA Program support. The status of four Clinical Innovation Awards is as follows:

Erica S Shenoy, PhD, MD, Assistant Professor of Medicine, Massachusetts General Hospital, Infectious Disease Unit. "The Impact of Methicillin-Resistant Staphylococcus aureus (MRSA) Colonization Status on Patient Care and Resource Utilization".

Grants

1. The Impact of Methicillin-Resistant Staphylococcus aureus (MRSA) Colonization Status on Patient Care and Resource Utilization. President and Fellows of Harvard University **KL2 MeRIT Scholar Award** PI (\$226,800). The goals of this study are to quantify the impact of Contact Precautions on patient care and resource utilization and establish a research career focused on optimization of infection control strategies. 2011-2014

2. Integrating Clinical Systems to Identify MRSA-colonized Patients in the Outpatient Setting with Rapid Detection Methods. **CIMIT 12-1082**. Co-PI, with Drs. David C. Hooper and Eric Weil (\$100,000). This grant supported a pilot study to assess integration of rapid, commercial-PCR screening of MRSA colonized patients in the ambulatory setting. 2014-2017

3. Improving clinical, operational and economic outcomes related to MRSA. NIAID/K01AI110524-01 PI (\$410,679). This grant proposes three hypothesis-driven aims to advance the fields of infection control, hospital epidemiology and antimicrobial resistance: 1) to estimate the relationship between colonization history and antimicrobial prescribing, time-to-bed-assignment and within-hospital patient transfers, using a novel patient data warehouse; 2) to design and validate a DES model of patient flow in a tertiary care hospital; and 3) to apply the validated DES model to estimate the clinical and resource utilization outcomes of alternative infection control strategies.

Papers

1. Shenoy ES, Hsu H, Noubary F, Hooper DC, Walensky RP. National survey of infection preventionists: Policies for discontinuation of contact precautions for methicillin-resistant staphylococcus aureus and vancomycin-resistant enterococcus. *Infect Control Hosp Epidemiol*. 2012 Dec;33(12):1272-5.

2. Shenoy ES, Walensky RP, Lee H, Orcutt B, Hooper DC. Resource burden associated with contact precautions for methicillin-resistant staphylococcus aureus and vancomycin-resistant enterococcus: The patient access managers' perspective. *Infect Control Hosp Epidemiol*. 2012 Aug;33(8):849-52.

3. Shenoy ES, Kim J, Rosenberg ES, Cotter JA, Lee H, Walensky RP, et al. Discontinuation of contact precautions for methicillin-resistant staphylococcus aureus: A randomized controlled trial comparing passive and active screening with culture and polymerase chain reaction. *Clin Infect Dis*. 2013 Jul;57(2):176-84.

And a child project that was not funded by the CIA but #3 above provided the basis for a CIMIT award and hospital support:

Shenoy ES, Lee H, Cotter JA, Ware E, Kelbaugh D, Weil E, Walensky RP and Hooper DC. Impact of Rapid Screening for Discontinuation of MRSA Contact Precautions. *Am J Infect. Control*, 2016; 44 (2): 215-221.[PMID: 26440593; PMCID: PMC4728016]

4. Shenoy ES, Noubary F, Kim J, Rosenberg ES, Cotter JA, Lee H, et al. Concordance of PCR and culture from nasal swabs for detection of methicillin-resistant staphylococcus aureus in a setting of concurrent antistaphylococcal antibiotics. *J Clin Microbiol*. 2014 Apr;52(4):1235-7.

Dr. Shenoy reports: "This grant totally launched this research and would absolutely NOT have been possible otherwise. There's no grant that I am aware of that stage that would have supported the clinical trial, and *since I do interdisciplinary work that did not fit within any one mentor R01*, it's not as if I could access any of those resources. *So I was on a T32 and able to do a real RCT!* I have come across others

doing interdisciplinary work that is very innovative and high quality, but there's no real support... I am happy to speak to anyone about how important this award is."

Leigh Simmons, MD and Karen Sepucha, PhD "Enhanced shared decision making for patients with acute low back pain".

Abstracts

1. Leigh Simmons, Sarah Hewitt, Lauren Leavitt, Karen Sepucha. Gaps in patients' expectations and knowledge of acute low back pain. Massachusetts General Hospital Clinical Research Day. October, 2014
2. Leigh Simmons, Sarah Hewitt, Lauren Leavitt, Karen Sepucha. Evaluation of a patient decision aid for acute low back pain. New England Regional Society for General Internal Medicine. March, 2015

Papers

1. Shared Decision Making in Common Chronic Conditions: Impact of a Resident Training Workshop. Simmons L, Leavitt L, Ray A, Fosburgh B, Sepucha K. Teach Learn Med. 2016;28(2):202-9. PMID: 27064722
2. Ten Years, Forty Decision Aids, And Thousands Of Patient Uses: Shared Decision Making At Massachusetts General Hospital. Sepucha KR, Simmons LH, Barry MJ, Edgman-Levitan S, Licurse AM, Chaguturu SK. Health Aff (Millwood). 2016 Apr;35(4):630-6. PMID: 27044963

Benjamin White, MD Director of Clinical Operations in the ED, and Assistant Professor of Emergency Medicine at HMS. "Applying systems engineering and improvement science in the MGH Emergency Department".

Papers

1. White BA, Chang Y, Grabowski B, Brown DF. Using Lean-Based Systems Engineering to Increase Capacity in the Emergency Department. West J Emerg Med. 2014; 15: 770-6. PMID: 25493117.
2. White BA, Chang Y, Grabowski BG, Brown DF. In Response to: Using Lean-Based Systems Engineering to Increase Capacity in the Emergency Department. West J Emerg Med. 2015;16:210-1. PMID: 25671044.
3. White BA, Baron J, Dighe A, Camargo CA, Brown DF. Applying Lean Methodologies Reduces ED Laboratory Turnaround Times. Am J Emerg Med. 2015; 33: 1572-6. PMID: 26145581.

Theresa McDonnell, RN, NP and Jennifer Temel, MD "IMPACT: Improving Care after Chemotherapy"

Papers

Nursing intervention to enhance outpatient chemotherapy symptom management: Patient-reported outcomes of a randomized controlled trial.
Traeger L, McDonnell TM, McCarty CE, Greer JA, El-Jawahri A, Temel JS.
Cancer. 2015 Nov 1;121(21):3905-13. doi: 10.1002/cncr.29585.

Support for Clinical Effectiveness Research and Surveys

The CERSU provides MGH's clinical investigative community with the only MGH program for individual mentorship in the domains of epidemiology, study design, questionnaire and survey methods, and use of large clinical databases. The CERSU also provides data management and analytic support for

investigators, operational planning for the use of clinical care data for clinical research, assistance with grant and Internal Review Board (IRB) preparation, and as a resource for locating potential funding.

Mentorship and Consultation

The research that the CERSU supports seeks to increase translation of evidence from clinical studies into clinical practice at the patient, provider and system levels. The Figures below show distributions of the 74 consults that CERSU provided in 2016, including mentoring services, consultation on career mentoring, hypothesis generation, study design and survey development, and data analysis/data management to the MGH community. The 74 consultations were across a wide breadth of MGH departments, academic ranks and topic and methodological areas. We have had a strong year of growth: the prior year, 2015, we reported 37 consultations, total. Mentor and Design Consults went from 14 last year to 36 this year, indicating a major increase in research support provided to the MGH research community through the CERSU in the current year.

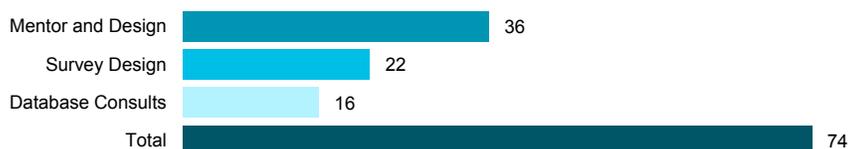
Database Consulting and RPDR support

Wei He, M.P.H. and Sue Regan, Ph.D. provided database consulting and RPDR support services, including: obtaining and providing cleaned RPDR, TSI, IDX and other electronic data searches in Access file format, review of protocol and data collection forms and review of existing or planned data entry systems. In addition, the service offers training in skills for day-to-day management of ongoing projects in Access databases such as report and query design, integrating external sources of data (e.g. from laboratories, other sites), and data export for analysis. In 2016, they conducted 16 database design, construction and RPDR support service consults, including providing data for papers and grant applications. Database Consulting and RPDR support grew rapidly this year, up from just 2 consults in the prior year.

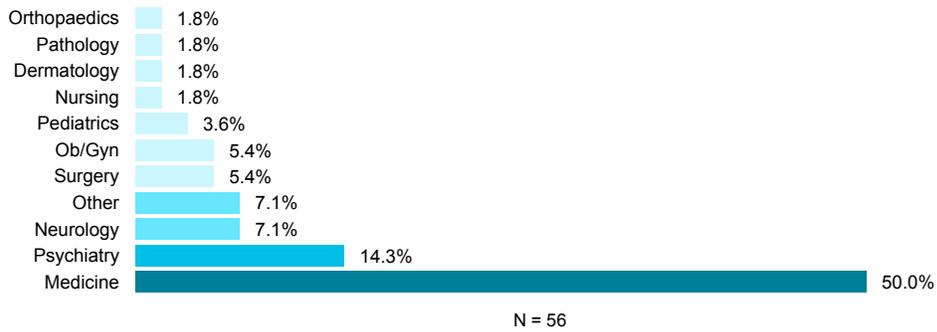
Survey Consultation Service

Eric Campbell, Ph.D., Professor of Medicine and member of MGH's Institute for Health Policy and HMS, provides survey consultations and advice for all aspects of study design, execution and interpretation of survey data. During 2015-2016 survey consult topics ranged from surveys about local quality improvement and patient quality of life to national information and attitude gathering surveys to health professionals. In 2016, Dr. Campbell provided 22 survey design consults, holding steady versus 21 consults, or about 1 new consult every two weeks, in 2016.

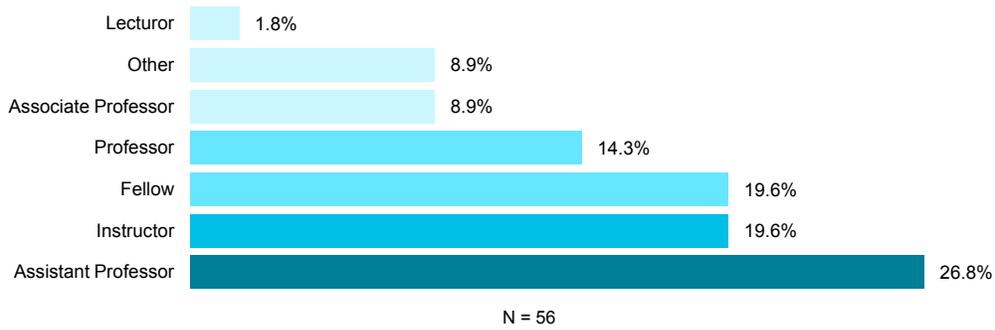
Numbers of CERSU Consults, 2016



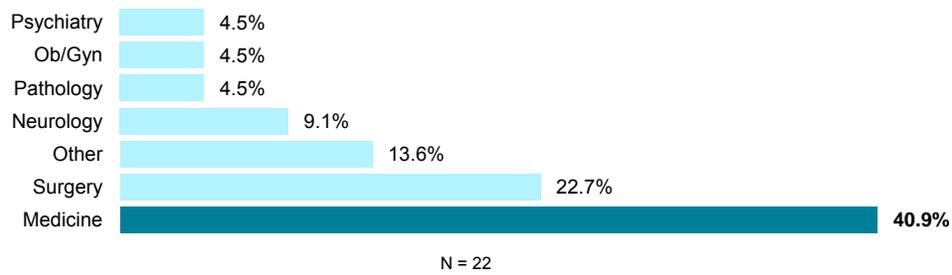
Clinical Effectiveness Unit & Survey (CERSU): Consultations by Dept. 2016



Clinical Effectiveness & Survey Unit (CERSU): Consultations by Rank 2016



CERSU Survey Research Consultations by Dept. 2016



LESSONS LEARNED

The MGH DCR CERSU is a successful and well-established part of the MGH research and operations mission. Every year the CERSU is kept busy by a continuing and growing demand for advice and mentorship from the MGH clinical research community. Together we provide, on average, more than one consult per week year-around, including many ongoing consults supporting manuscript and grant proposal development and ongoing career mentoring advice. During 2016, CERSU consult numbers increased markedly from 37 in the prior period to 74 in the present period, indicating that our hard work to expand our resource offerings and our continuous promotion of the unit have paid large dividends in terms of reach and depth of support provided.

One growth area that we anticipate to continue to be fruitful in the coming year is the category of established investigators new to MGH. Many departments seem to be expanding their clinical research enterprise, as we have seen steady growth in experienced investigators newly recruited. We serve as a one stop resource for all the services they left behind at their prior institution, or never had in the first place. We will continuously seek to assist these investigators as well as the more typical and common early career investigators that have historically been our main source of consults. Annually we hear from potential investigators that they have been unaware of the DCR's diverse offerings. This says to us that we need to keep working on maintaining and increasing our visibility and exposure to make sure that we are reaching potential investigators who might benefit from our advice.

There appears to be a strong, rising interest in comparative effectiveness, clinical outcomes, clinical epidemiology, care redesign, patient affordability and accelerating improvements in efficiency research, at least as indicated by our increased consult numbers in the current period. The rise in direct data base consults is consistent with the electronic clinical record-based data that these research approaches require. We have shown repeatedly over many years that we can help young clinicians develop careers in clinical research. Finally, it bears emphasizing that the MGH DCR CERSU remains unique and visionary in the clinical research support it provides, as nothing comparable is available elsewhere in Partners or the Harvard Catalyst systems.

ADAPTATIONS PLANNED

CERSU adaptations to its support services considered for 2017 will focus on increasing our exposure to the MGH community in an attempt to reach the broadest possible constituency.

CER Consults:

The CERSU is always seeking to find new ways to identify talented future MGH research faculty by increasing interactions with trainees (residents and fellows) through consulting with faculty in positions to mentor these individuals. To this end we will present the CERSU to all new, incoming Fellows in July, participate in MGH house staff research activities, and present the CERSU intermittently at the monthly Clinical Research Council meetings, among other opportunities for public exposure. We remain available year around to provide consultation advice, and can usually meet with new consults within a week of the initial request. We will continue to offer one-on-one consultation and mentoring, for both simple advice as well as long-term support for a specific project or paper. At 74 consults per year, we feel that we are operating gear full capacity, which is fine, but further growth may necessitate review of our faculty size.

We will continue to provide RPDR search and data management support services for those projects that need these services. To this end we are working with the RPDR to add a "splash screen" at application launch, that points new investigators to our services, for them to consider in advance of trying to gather RPDR data on their own without prior guidance in study design or RPDR data collection.

CERSU Clinical Effectiveness Research Course: Using Electronic Health Record Data for Clinical Outcomes Research

Since 2010, the CERSU has offered a Clinical Effectiveness Research course in collaboration with the DCR Education Unit. Advertising reached out to chiefs and fellows directly, and specifically, to fellows and junior faculty planning a research project using electronic health record data. We used an application process, with attendance limited to M.D.s and Ph.D.s who completed a brief application form. The course goals are to 1) help fellows and junior faculty prepare a research project, 2) develop a “table one” as preliminary data for a research grant or paper, and 3) create a project draft to move onto the next step of a personal DCR consultation.

The course outline is shown below. In 2016, 22 students enrolled in the course. Students were from a diverse array of departments, with a diverse array of topics they seek to study. We plan to offer this course again in 2017.

Date	Session	Content	Format
Session 1 November 10 3:30pm - 5pm Garrod-Mendel	<i>Framing a Testable Hypothesis, Designing a Clinical Outcomes Research Study</i> James Meigs, MD, MPH	<ul style="list-style-type: none"> • Course Overview • Interactive session, using student's own plans, covering the following topics • Developing a testable hypothesis from a clinical question. • Choosing an appropriate study design • Exposure, outcome, confounding and bias • Each student discusses his/her idea for a research project • Review what to expect in the rest of the course 	Discussion & Workshop
Session 2 November 17 3:30pm - 5pm Garrod-Mendel	<i>Using Clinical Care Data</i> Roy Perlis, MD, MSc	<ul style="list-style-type: none"> • Highlight large databases available for use at MGH for research purposes. • Point out / show / that RPDR can be used without an IRB – i.e. what can and can't be done without and IRB • Validate outcomes - what coded and uncoded data are available in RPDR. • How the MGH Biobank can be used for CE research. • Obtaining and using mortality data 	Lecture & Discussion
Session 3 December 1 3:30pm - 5pm Garrod-Mendel	<i>Workshop: Submitting your Medical Records Protocol to the IRB for Expedited Review</i> Megan Morash, RN	<ul style="list-style-type: none"> • Brief overview of the IRB submission process. • Description of key elements to include in your submission. • Prepare and submit your medical records review application to the IRB for review and approval. 	Workshop
Session 4 December 8 3:30pm - 5pm Garrod-Mendel	<i>Overview of Research Using the Research Patient Data Registry (RPDR)</i> <i>RPDR Demonstration</i> Stacey Duey	<ul style="list-style-type: none"> • What is the RPDR? Or put “what can and can't be done without and IRB • Create an RPDR query using a test project • Request data using the RPDR data wizard. • Understand the data returned in a query <p><i>Once the IRB approves your protocol obtain access to RPDR, complete RPDR online training.</i></p>	Lecture & Demonstration
Session 5 December 15 3:30pm - 5pm Garrod-Mendel	<i>Project Discussion</i> James Meigs, MD, MPH Roy Perlis, MD, MSc	<ul style="list-style-type: none"> • Study Hypothesis • Basic Study design • RPDR search strategy • Study progress and results, if any • Future direction for project 	Workshop

Omics Unit

Jordan Smoller, M.D., Sc.D., Director

GOALS

The missions of the Division of Clinical Research's Omics Unit are three-fold:

- Provide consultative support for clinical investigators initiating or planning genetic and genomic studies at Massachusetts General Hospital (MGH);
- Provide ongoing education/courses as to emerging tools and technologies in the Omics arena
- Provide a link between the MGH clinical research community and the educational and technological platforms in Omics research of the Partners HealthCare System and the greater Harvard Medical community.

As genomic and precision medicine become a reality, the Omics Unit continues to make significant progress in arming MGH clinical research teams with the knowledge and tools needed to incorporate or expand genomic and other omics into their clinical research studies. Further, the Omics Unit is well positioned to help MGH investigators capitalize on Partners Biobank opportunities.

ACCOMPLISHMENTS

Omics research has arrived at a singular moment in which the technology, expertise, and resources for transformative discovery and clinical translation are now feasible. The Omics Unit is fortunate to be situated within a network of world-class scientific and medical research communities that are driving innovation and translational investigation. To enhance the scientific opportunities and resources available to MGH investigators, the Omics Unit has developed collaborative relationships with other key genetics and genomics centers and investigators.

Partners HealthCare Biobank. The Partners Biobank is a large-scale research project designed to facilitate medical discovery and improvements in clinical care by creating a repository of biological samples linked to electronic health records and other health information. More than 53,000 patients have enrolled thus far, and the Biobank is a key component of the MGH Strategic Plan. Dr. Smoller is co-Director of the Biobank at MGH, and the Omics Unit is working with the MGH clinical research community to leverage this unique resource. Through our alliance with the Partners Biobank, we hope to continue the expansion of the phenotypic and biological sample resource and increase investigator participation at MGH.

The **MGH Center for Human Genetic Research (CHGR)** is a trans-disciplinary research center devoted to human genetics and encompassing scientists and laboratories from numerous departments at MGH (including neurology, psychiatry, medicine, surgery, and pediatrics). As a senior faculty member at CHGR, Dr. Smoller (Director of CHGR's Psychiatric and Neurodevelopmental Genetics Unit) has been able to enlist other CHGR faculty to participate in the Omics Unit's research consultation and educational programs. The core facilities of CHGR are also available to MGH investigators seeking genotyping and other services. CHGR's clinical and phenotyping research space on Simches 2 provides clinical resources (exam rooms, interview/observation rooms, phlebotomy stations, and a specimen preparation laboratory) for phenotypic characterization of research participants.

The **Analytic and Translational Genetics Unit (ATGU)** is an investigative group within the Department of Medicine. Its overall mission is to focus on the interpretation of individual genome sequence data for both the discovery of the genetic underpinnings of human disease and for the development of paradigms by which individuals' genome sequence can be effectively integrated into clinical decision making. Drs. Mark Daly, Benjamin Neale and Daniel MacArthur have lectured at courses offered by the Omics Unit.

The **Broad Institute of MIT and Harvard** is a leading research institute in the areas of genomics, molecular medicine, and the development of novel therapeutic approaches. As an Associate Member of

the Broad, Drs. Smoller is able to facilitate access to Broad resources and core facilities for MGH researchers involved in Omics research. Members of the Broad community have also played an active role in the educational offerings of the Omics Unit. For example, Institute members Joel Hirschhorn, Mark Daly, Steven McCarroll, Jose Florez, Daniel MacArthur, Manolis Kellis have lectured in recent Omics Unit courses.

Departmental Grand Rounds Program in Genetics and Genomics

The highly successful MGH Seminars in Genetics and Genomics Clinical Grand Rounds Program is developed annually in collaboration with the DCR's Education Unit. The goal of these seminars is to make maximal utilization of the individual clinical departmental Grand Rounds program settings to highlight opportunities and advances in genetic research to the clinical community. Such 'context setting' in clinical arenas will ultimately be crucial to the broader adaption of genetics to personalize medicine in several specialties. Through this series, genetic education is embedded within each department and reaches a unique population of clinicians and clinical investigators. The 2016 Omics Unit Grand Rounds Series is illustrated in Fig. 1.



Educational Curriculum

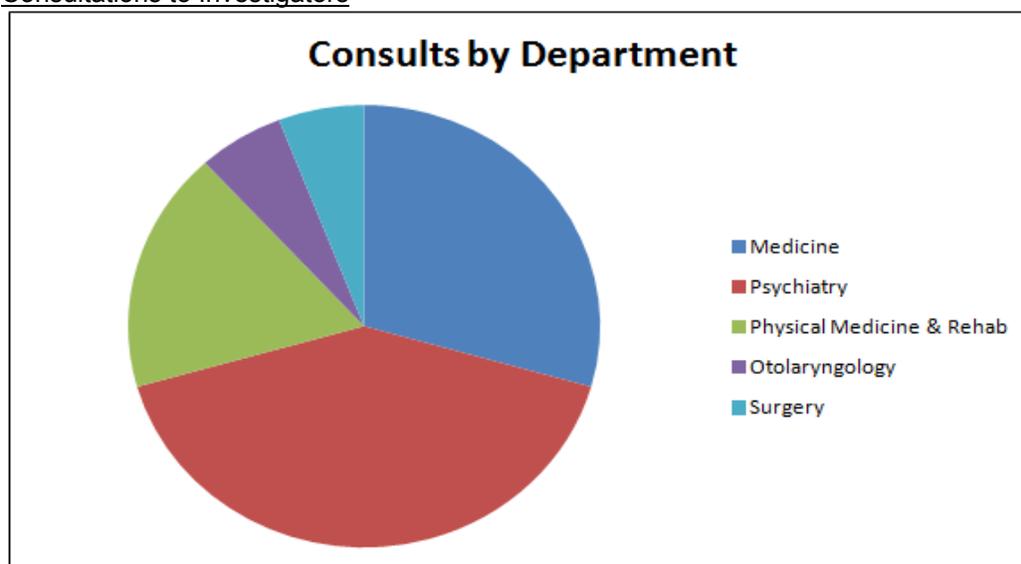
In collaboration with the DCR's Education Unit, the Omics Unit updated its 2016 curriculum in response to feedback from past course participants. This curriculum is primarily aimed at clinical investigators, with some specific courses for clinical research coordinators, nurses, and study staff. Course evaluations were extremely positive for each course, rating consistently "very good" to "excellent".

In 2016, the Omics Unit presented a core genetics curriculum to meet the needs of a variety of learning levels in which the Omics Unit draws heavily on faculty in the MGH Center for Human Genetic Research and the Analytic and Translational Genetics Unit as instructors.

Fig. 2 lists the 2016 Omics Unit courses and faculty.

Course	Date	Attendees	Faculty
A Practical Guide to Biobanking for Biomarker and Personalized Medicine Research	1/12/2016	105	Jordan Smoller, M.D., Scott Weiss, M.D., Elizabeth Karlson, M.D., Pearl O'Rourke, M.D., Lynn Bry, M.D.
Introduction to Proteomics and Metabolomics	2/2/2016	90	Robert Gerszten, M.D, Jacob Jaffe, Ph.D, Clary Clish, Ph.D, Steve Carr, Ph.D
Introduction to "Omics" Research	3/7/16 - 3/11	100	Flagship 5 day course - Faculty included: Jordan Smoller, MD, Radhika Khetani, Clary Clish, Scott Weiss, Feng Zhang, Rob Gerszten, and more
Responsible Conduct of "Omics" Research	5/24/2016	55	Jordan Smoller, MD, Lisa Lehmann, MD, Pearl O'Rourke, MD, Ingrid Holm, MD, Brent Richter, Gretchen Brodnicki, JD , Isaac Kohane, MD
A Primer on Complex Trait Genetics: Principles for the Beginning Investigator	9/13/2016	50	Chris Newton-Cheh, MD, Mark Daly, PhD, Susan Cotman, PhD, Daniel MacArthur, PhD, Ben Neale, PhD, Manolis Kellis, PhD, Keith Joung, MD, Shamil Sunyaev, PhD
Welcome to the Genetic Code: An Overview of Basic Genetics	10/24/2016	86	Jeremiah Scharf, MD, PhD

Consultations to Investigators



One of the Omics Unit's goals is to provide consultation and triage for the MGH clinical research community. A consult request is completed online by individual investigators at all academic levels requesting help in genetic study design and execution, human subject protection, career advice, and/or identification of particular resources. Requests are triaged by the Omics Unit and assigned to specific consultants depending on expertise and availability. In 2016, MGH investigators from numerous departments received consultations through the Unit.

LESSONS LEARNED AND FUTURE DIRECTIONS

Need for expansion of education and services related to emerging frontiers in precision medicine.

In recent years, progress in genomics, large scale data efforts and proof-of-principle therapeutic strategies have brought the concept of precision medicine to the fore. To better serve the clinical/translational community, we have expanded our educational offerings and consultation in this area. Specifically, we will be introducing a new course entitled "Research in Precision Medicine" which will bring together leaders in precision and genomic medicine to provide an introduction to advances in the design, conduct, and scientific discoveries encompassed by precision medicine. The course will include practical applications and how to access resources for precision medicine research.

Information Technology Unit (ITU)

Carl Blesius, M.D. and Henry Chueh, M.D., M.S.

GOALS

The broad goal of the Division of Clinical Research Information Technology Unit (DCR ITU) has been to support the increasing information technology needs of the MGH's clinical investigative community. Its specific approaches to meeting this goal have been:

- Improving existing information management resources while establishing a broad information management infrastructure to support the work of the clinical research community at MGH and PHS
- Providing information tools for MGH clinical investigators that can assist in the recruitment of study subjects and support Division of Clinical Research educational initiatives
- Establishing ongoing partnerships with clinical researchers to pilot applications and studies with new clinical informatics-based interventions that will create reusable technology platforms
- Envisioning and creating transformative informatics and IT solutions for the clinical research community

These goals are addressed within the more general context of the needs of the entire research community supported by the MGH Research Institute.

ACCOMPLISHMENTS

During the life of the division to date, the Information Technology Unit has added institutional value by supporting clinical investigators with a variety of informatics and IT solutions, both within the DCR, across MGH, and beyond. In addition, the DCR ITU has been responsible for some major innovations including the Partners RPDR and the informatics design of the i2b2 program, among others. Listed briefly below are some highlights:

- **Research Patient Data Registry (RPDR)** – The DCR ITU envisioned and designed the initial version of the RPDR, a terabytes-scale clinical research database that has become a major research IT platform at Partners that has supported upwards of \$100 Million dollars of grant funding.
- **i2b2** – As an extension of DCR ITU activities in clinical research data modeling, Dr. Henry Chueh was the Principal Investigator, architect, and author of the informatics core of the original i2b2 grant. Under the strong direction of Dr. Shawn Murphy and others, i2b2 has grown to be a national model for clinical research data management and analysis.
- **Data for Quality (D4Q)** – The DCR ITU, in collaboration with the CERSU, envisioned models for data management that would support effective outcomes research analysis. Implemented and managed by the Center for Quality and Safety, the D4Q effort represents the integrative approach supported early on by the DCR. The D4Q data warehouse is used across MGH for clinical outcomes research and operations improvement.
- **Clinical trials visibility** – Before clinicaltrials.gov, the DCR ITU established a clinical trials listing website used across the MGH and BWH, providing visibility for study recruitment.
- **Monitor Online Record Access (MORA)** – MORA fills the clinical research community's need to allow monitors to effectively audit clinical records for research purposes. The DCR ITU put MORA

into production in 2012 and it has already saved significant study staff time, which has been better utilized in direct research activities.

- **Population Registries** – The DCR ITU established and supported activities (in collaboration with general medicine, primary care, rheumatology, infectious disease and others) that have led to population registries for clinical care, which also serve as platforms to test clinical interventions. The Partners Population Health Management program currently relies on the TopCare IT platform that was derived from this groundbreaking DCR activity.
- **RSVP for Health (RSVP)** – Envisioned as a way to engage patients more directly in clinical research, RSVP for Health was one of the first websites in the nation to allow patients to subscribe to clinical research areas of interest, and to also allow clinical investigators to connect to those patients anonymously for outreach.
- **Clinical Research Training Hub and Hub Researcher Profiles** – As an evolution of the DCR ITU's intramural support of the DCR Education Unit, the Hub is a knowledge management and learning platform that now also provides a research profiles service.

CURRENT PROJECTS

Our work in 2016 has been focused on continued platform development and adaptation to enable meeting investigator needs in the changing information systems environment, while continuing to meet service needs of investigators. Platform development has focused on these areas:

- **Researcher Profiles**
Problem: Across the enterprise, we have scattered sources/application for reviewing and managing information about staff and their roles. Across these data sources, there is limited and incomplete synchronization. These data divisions of the Research Institute need to be leveraged so that division leadership and staff can quickly pull together summary and granular reports showing research funding from any source (internal or external), view funding application data including attempts, and IRB and IACUC information among other data. DCR leadership and staff also need to be able to message the correct subset of investigators about important events including training sessions and other opportunities, ensure that regulatory and compliance mandates are met in a timely and efficient manner and be manage a given individual's Profile in one place, while allowing any group to use them in a variety of applications with the appropriate privileges.
Solution: We have adapted the Profiles software from our partners at the UCLA Computing Technologies Research Lab and are continuing to augment it to meet our needs. We are providing a modular, robust, and centralized Profiles application that both Administrators and the Research Community can leverage. Part of our work this year has entailed identifying the correct cohorts (e.g. PIs) needed and ensuring that the data are captured in relevant systems including MGH HR, Profiles, and the IdM. We are working with internal groups such as MGH HR, MGH Medical Staffing Office, MGH Police and Security, Partners Physician Compensation Office, and Partners Research Applications to ensure that data are brought from these sources into a centralized location - the IdM and Profiles. While the IdM team continues to add feeds and fields, data are being brought into Profiles as an intermediary step so that the Research Community can begin leveraging it sooner. As the IdM team adds additional feeds and fields, Profiles will migrate to using IdM as the data source for these data. In addition to launching the front-end of the Profiles application in 2017 (including citation and impact factor), our work will also include generation of reports from these data sources at the direction of the DCR.
- **Learning Management System for Research**
Problem: The growing breadth and depth of course offerings in the Division of Clinical Research Education Unit, the difficulty in tracking required training (both for research staff and for administrative needs), and the ongoing institutional changes related to the formation of the MGH Research Institute

made both the expansion of system scope and modernization necessary to meet the Research needs.

Solution: We partnered with an external vendor to create a learning innovation platform to help simplify Training and Certification including onboarding and periodic recertification so that training tracking and compliance documentation is easier and more automated. This new system can be found at <https://learn.partners.org>. The focus is on putting a more user-centric and integrated platform in place for MGH Research, with other institutions and other training resources (including external training) in mind. This project was originally scheduled to be completed mid 2016, but was delayed and we are delivering the final development milestones now (December 2016). The ultimate goal is to provide foundational eLearning components, solid educational event tracking elements, and providing a platform for educational innovation by creating an open and extensible system for content creation and educational tracking that leverages Researcher Profiles to provide tailored educational experience to the research community.

- **Establishment of a research registries service**

Problem: To design and implement a research registry service to support the needs of mid-level research programs that need greater flexibility than can be supported by a strict electronic data capture (EDC) product like REDCap.

Solution: We have created a health EDC system that allows collected data to be transformed into a narrative output that can be shared with the clinician or patient. The Sprout model of data collection *knits together* the patient's clinical and research experiences so that data collected in one setting may be usefully transformed to serve another audience/use. The application is currently used by the MGH Down Syndrome Program and the Department of Urology to support their registry needs. This is now a service that is available to others in the research community.

- **Shared Informatics Platform**

Problem: Currently, different informatics groups, labs and individual researchers run their own infrastructure and write their own software, which often results in duplication of effort and wasted resources across the research enterprise.

Solution: Our goal was to create a shared computing platform that allows easy sharing of both applications across systems and machines and full research computing environments used to run analyses improving the ability to reproduce research results. In August 2016, TSO and LCS jointly carried out a proof-of-concept project with a Docker based container orchestration platform – Red Hat OpenShift. A Platform as a Service (PaaS) environment, OpenShift eliminates the time and effort associated with deploying infrastructure, encourages practices like Agile development, DevOps and Continuous Integration and Development Pipelines, and can more efficiently utilize hardware resources. The platform was designed and built with technical assistance from Red Hat on a high availability cluster of 7 virtual machines. Using Docker containers, the platform supports the automated building, deployment, scaling and monitoring of web-based applications directly from a source code or image repository. We have deployed the Learning Management System for Research on the platform with positive results. Since then multiple projects have expressed a desire to use the tools in a production environment as soon as possible. In summary, as planned we have created an open and shared informatics platform for quickly building, sharing, and running research applications with all the necessary dependencies and are now working with Partners IS to move this project from the proof of concept and pilot phase into production with their support and buy-in.

Research Patient Data Registry (RPDR)

The RPDR project, an innovation that was imagined and developed by the DCR's IT unit, is a successful and widely accessible research database that was expanded through a collaboration between the DCR, Laboratory of Computer Science (LCS), and Partners' Research Computing Group. The RPDR has ~6200 users throughout the Partners Healthcare System. It holds data on over 7 million patients and 2.6 billion coded records from patient encounters, labs and results, and other medical care, as well as 130 million clinical notes. The registry now contains patient demographic data, diagnoses and procedure data, pharmacy data, inpatient and outpatient encounter information, provider information, laboratory data, radiology tests, vital signs and health history, and PROMS

(patient reported outcome measures), Data from electronic health records, Epic, LMR and OnCall are also included. The RPDR has recently added functionality to allow researchers to directly query clinical data that have been updated within the last 24 hours. These data include demographics, lab tests, encounter detail, radiology data, consent information, and clinical notes. These queries can also be scheduled on an ongoing basis to automatically return lists of new patients that meet the query criteria. In addition, the RPDR is working on expanding the scope of the clinical data we receive from Epic; new data for the coming year include an expansion of the PROMS data and the addition of medication administration records.

- **Clinical Trials Recruitment Sites**

We have supported various iterations of a clinical trial listing site for MGH and Partners since 1998 and the RSVP for Health research volunteer registry since 2003 with its over 25,000 registrants. In 2016, the clinical trial listing site and the BWH HOPE initiative were integrated into the Partners Research Portal initiative under the direction of Jeanhee Chung, faculty at the MGH LCS and Director of Patient Engagement for Research at Partners, and supported by Partners Research IS and Computing. The new site builds on the work of ClinicalTrials@Partners and RSVP for Health, but has a Partners-wide mandate to bring patients and clinical researchers together throughout the study lifecycle. The first release replaced the existing clinical trials functionality with a new site designed for the today's media-rich mobile platforms for access of information on the Internet to preserve continuity for users of the old site, the new site can be found at the same URL <http://clinicaltrials.partners.org>. It has significantly improved trial discovery and search mechanisms along with major improvements to site look and feel. This completely new platform continues to experience strong usage (approximately 6,000-7,000 users per month). It is also available as a link in Partners Patient Gateway. In 2017 we plan to explore how RSVP for Health can also be tied into new Partners wide initiatives around clinical trial patient recruitment.

- **Building capacity for data access and integration projects in the EPIC/eCare environment**

The ITU has been building its capacity to support all available modes of access to clinical and administrative data in the Epic/Partners eCare environment for research and operational purposes. This capacity-building has three aspects: technical expertise, awareness of new governance models, and recognition of new training requirements. The purely technical level of learning how to use Epic data service calls has been in many ways the easiest aspect of this capacity-building effort. Understanding the governance model turns out to be a prerequisite for getting to that point. To put through a request for use of any data service, one needs to first have justified the resource cost to Partners eCare through a new and evolving formalized process of "demand management". Having successfully justified one's request, and obtained a technical understanding of how to access the desired data, technical teams need to be able to create test data. In the current training model, the only pathway available to create test data is to go through all the same Partners eCare training courses that end-users of Epic modules in production need to do. There is as yet no clear "road map" to point out how to deal with the governance, training and technical issues. It is fair to expect that as the Partners eCare team gets more practice with meeting the technical, governance and training demands placed on them, that the processes will become more transparent and efficient, and therefore more accessible to a broader number of groups. At present, however, the ITU is in the relatively uncommon position of having some experience with the processes.

- **MORA Phase-out**

We phased out the ITU product MORA (for Monitor Online Record Access) shortly after the MGH transition to the Epic clinical system at the beginning of April 2016. Study monitor access to data during study visits is now supported by Partners eCare through Epic release of information functionality that is accessible through the Physician's Gateway.

LESSONS LEARNED

During this time of significant organizational transformation we continue to look for ways to support clinical research by interfacing with the enterprise at an organizational and technological perspective.

Based on previous major transitions we realize the importance of focusing on critical research community needs, new and present, during this large-scale transformation of the institutional infrastructure. We will take advantage of our experience to meet these needs in the context of the overall goals of the MGH Research Institute.

Our most recent experience supporting the Clinical Research Division's Education Unit and our broadened mandate starting in 2015 made it clear that a shift in focus was needed. Rather than building everything in house, we pursued more of a mixed model to better support the new Research Institute. This model included supporting research community needs by helping push existing Partners IS initiatives forward more quickly (e.g. Identity Management System), proposing and helping setup Partners IS systems/initiatives (e.g. Shared Informatics Platform, pushing Clinical Trials Recruitment from being an ITU only project to a Partners-wide Research Portal project), augmenting internal staff with trusted vendors to support research needs (e.g. Learning Management System), as well as integrating with commercial products where it makes sense (Radiation Safety System and Learning Record Store). This shift in 2016 did introduce interesting and significant challenges. In the case of the Learning System, vendor ramp-up and vendor management were much more difficult than expected and in the case of Research Profiles system interdependencies (e.g. needing IDM to move more quickly) slowed overall progress. We will adjust plans going forward to take these unexpected challenges into account going forward.

Finally, an important lesson learned in 2016 is to be more conservative in promised milestones and related timeline commitments given the increased complexity of the environment, the broadened mandate, and unforeseen challenges highlighted above. Addressing this will promote more timely delivery of future goals so that other Research groups depending on these can plan with greater confidence.

ADAPTATION PLANNED

Learning Management System for Research

For 2017 we have recommended Partners level resource commitments to this project through the Partners Learning Systems Task Force. Specifically, if resources can be secured, we are pushing for pilot funding to prove that this can become one of the main standardized Partners supported platforms and training tools that can be integrated with easily to: 1) track training at the user level, 2) know when and what kind of training is offered independent of organization, 3) know if the research community (and other members of the workforce) are learning what they need to, and 4) reduce the high administrative burden to deliver and report on training. This generalization will both make this system more useful to the research community and will address other aspects of the organizational mission.

MGH Research Profiles with the Partners Identity Management System

In 2016, we have started to clearly see the benefits of the work that has gone into creating the infrastructure that allows for the refinement of the centralized profile database of physicians, researchers, and staff to meet the needs of the MGH research community, while leveraging the Partners Identity Management (IdM) system. Profile data are housed across diverse sources and each application built by MGH departments must request a feed from these sources, process the feed, and import into their own database. A centralized database with a granular "needs based" access layer would streamline the current process significantly and allow all groups to write integration code against a single source. The IdM promises to be this single source. Though progress has been made and we now have a daily feed from the IdM into Profiles, the research community has requested many additional feeds and fields for IdM to consume e.g. the Harvard appointment feed. We continue to meet with the IdM team regularly and are working with Partners leadership on identifying additional resources to work on the IdM to meet critical Research needs.

Translational Research Center (TRC)

Mason Freeman, M.D., Director

GOALS

The TRC's overall goal is to facilitate moving basic scientific discoveries and new technologies, discovered both at the MGH and in the local biopharma community, toward the clinic to improve diagnostic capabilities and therapeutic interventions. With the opening of the new Translational and Clinical Research Centers (TCRC) in the fall of 2016, the TRC can now also evaluate the utility of those technologies in early stage, patient-based clinical trials.

Specifically, the TRC works with investigators to:

Advance projects from pre-clinical findings that suggest clinical benefit through the required stages of development necessary to test the concepts in human trials. This work involves:

- Clarifying the development pathway necessary for a given idea to be taken forward;
- Providing an assessment of the feasibility and cost of pre-clinical studies, including pharmacology, manufacturing, and toxicology;
- Preparing the electronic submission and obtaining an Investigation of a New Drug (IND) license from the FDA;
- Conducting meetings with relevant regulators at the FDA; and
- Assisting in the writing of clinical protocols for submission to the Partners IRB.
- Partnering with MGH investigators and local biotech companies to conduct early patient-based clinical trials in the TCRC.

These activities are typically time-intensive projects and require significant commitments on the part of the TRC staff to become familiar with the details of individual investigator's projects in order to facilitate meaningful interactions with the FDA, external contract research organizations, or third part vendors whose expertise is needed to enable a translational project to advance.

ACCOMPLISHMENTS

- The TRC spent most of 2016 preparing for the opening of the new TCRC. This effort was a continuation of the groundwork laid in 2015, focusing on three key elements: 1) working with the construction crew to ensure the new TCRC was ready to open by the end of the year; 2) continuing to work with Partners to improve administrative processes that are required to conduct clinical trials at the MGH; 3) hiring key individuals that can provide the administrative infrastructure that can support clinical investigators engaged in clinical trials, particularly those partnered with industry partners. Several major steps were completed in 2016.
 1. The original projection for the opening of the TCRC was for 1st quarter 2017. Due to excellent work by the architects and construction teams and very close coordination with the CRC staff, the new facility opened three months early, with the first patients moving into the facility in mid-October. An official ribbon-cutting ceremony was held on November 30th, 2016, by which time the facility was already fully operational and busy. All 16 beds, however, were not available due to temporary housing of TCRC personnel who will reside on White 13, once the construction there is completed. As of December 1, 2016 ten industry-sponsored studies were slated to use the TCRC in late 2016 or first quarter 2017.
 2. The administrative challenges of working with the Partners' offices responsible for getting clinical trials placed in the TCRC continues to evolve, with 2016 reflecting the ebb and flow of these relationships. The full time attorney that was hired in 2015 to work with the TRC and the Departments of Neurology and Psychiatry left after only 5 months and we have had to initiate

another search for this position. An individual has been identified but it remains unclear if the tripartite support that enabled the funding of this position will be retained as the use of per diems and other strategies for more effective contract negotiation may prove cost effective for the Departments involved. This is an important issue that must be resolved in the first quarter of 2017. Suzanne Morin (PHS CTO) and Ravi Thadhani, MD (PHS CTO) are working closely with us to improve contract efficiency as they are fully aware of its importance for the TCRC.

The IRB has further moved to permit outsourcing of phase 2 trials, in addition to phase 3 studies, to independent IRBs. We are waiting for new data to determine if the outsourcing process has resulted in further improvement in IRB approval times. Continuing dialog with Pearl O'Rourke, MD on how to expedite IRB reviews specifically for time-sensitive TCRC studies is ongoing, should the outsourcing process not prove effective enough in solving this issue.

3. The administrative support functions of the TRC staff are now firmly in place. Program and project management support from Yuan-Di Halvorsen, PhD and Roger Albright, MBA has been secured and a third, very experienced project manager, Vera Martin, was recently hired. Xiaoyan Li, PhD is providing data management and pharmacokinetic modeling expertise to investigators. Lynelle Cortellini has assumed responsibility for financial management of TRC funds; Tara Thurber is in place to handle vendor contracts; and Allison Caso is providing overall administrative support. The TRC has implemented use of its own clinical trial management system called HIVE for improving billing and invoice tracking in TRC studies. Kathy Hall and her team in the TCRC developed, in concert with the hospital finance leadership, a new and more transparent billing process for studies conducted in the TCRC and have hired three lower cost clinical research technologists that can perform a variety of trial procedures that previously were performed by much more senior and expensive nursing personnel. This cadre will be expanded as the volume of work in the TCRC grows.
- The TRC team, spearheaded by its Program Manager Dr. Yuan-Di Halvorsen, has continued to provide consultative services to a wide variety of MGH investigators whose research programs have needed input on clinical development, regulatory, or CMC issues of a wide variety. Examples of that support include:
 - a. Several investigators in the Department of Neurology continue to rely on the TRC to help advance clinical trial programs for a variety of neurological diseases. These include: Dr. Michael Schwarzschild of Neurology who is running a Parkinson's trial testing adenosine that is supported by the Fox Foundation; Dr. Anne Louisa Oaklander who is working on immunomodulators for the treatment of small-fiber polyneuropathy; and Dr. Steven Hersch who is developing ovine GM1 as a potential treatment for Huntington's disease.
 - b. In other Departments, the Xencor trial of an antibody directed at the immune system for treatment of IgG4-RD diseases, led by Dr. John Stone of Rheumatology, has successfully transitioned to the clinical trial stage and is being conducted in the infusion center of the TCRC. Dr. Freeman, working closely with Dr. Stone, has also obtained agreement from UCB to support a full-time young faculty member in Rheumatology for two years as part of that company's effort to expand its relationship with the MGH and the TRC. The NIH has solicited Dr. Ed Ryan of Infectious Diseases to submit a new grant to fund his further development of a cholera vaccine that has been a partnered project with the TRC for the past several years. Dr. Daniel Irimia of Surgery consulted with the TRC on his development of a diagnostic device for early detection of sepsis. Drs. Henry Kronenberg and Marc Wein of the Endocrine Unit sought toxicology advice on the potential development of a small molecule kinase inhibitor that might be used to treat osteoporosis.
 - c. Mitobridge, a local biotech company developing novel therapeutics for mitochondrial and muscle disorders signed a sponsored research agreement in which the TRC/TMG staff have helped the company perform its IND enabling studies which are currently ongoing.

- d. The Theracos SGLT2 inhibitor diabetes program has fully entered phase 3 trials and the TMG/TRC staff is supervising a multi-thousand patient trial program that is being conducted internationally. Successful completion of this program should lead to an NDA application to the FDA for commercial marketing. The management of a major market, non-orphan disease phase 3 program has, to our knowledge, never been performed before by an academic group and the successful completion of this program would constitute a significant achievement by our group. The MGH has a licensing royalty to this program.

LESSONS LEARNED

- The administrative interface between the TRC/TCRC and Partners is an area that needs constant attention and work. With changing personnel at Partners, hard fought advances can be jeopardized, so we need to institutionalize the improvements in a more structured and formal way.
- The early success of multiple industry-sponsored studies employing the TCRC is very gratifying, but these studies are largely an outgrowth of existing investigator relationships with faculty members at the MGH already known to local biotech and pharma companies. In order to leverage the full capacity of the TCRC, we need a dedicated business development outreach in 2017 to achieve the goals we have set for the center.

ADAPTATION PLANNED

- A very qualified candidate for the business development position has been identified and is currently in the process of interviewing for the position. This will be a key hire for the TRC if we can negotiate the position, as this person will be charged with networking with the biopharma community to place early stage clinical trials in the TCRC. In addition, the TCRC is hosting the business development team from Parexel in early January with the idea of forming a Partnership with Parexel that will drive activity into the TCRC. This will not be an exclusive relationship with Parexel, but it should be mutually beneficial.
- The TRC is now positioned to build its faculty advisory group in order to better understand the investigator capabilities we have at the institution and to expand faculty participation in the activities of the center

Electronic Health Records (EHR) Research Unit

Roy Perlis, M.D., M.Sc., Director

GOALS

The EHR Research Unit's overall goal is facilitating investigations drawing on large databases, most notably large-scale electronic health records (EHR), but also large ambulatory monitoring studies incorporating passive measures, environmental and cost/utilization databases. These studies run the gamut from regional, national, and international pharmacovigilance, clinical effectiveness, or epidemiologic studies to small single-site proof-of-concept or targeted biobanking efforts.

Specific services offered by the EHR Research Unit include:

- Consultation with investigators to plan and refine investigations making use of large clinical datasets: which data sets might be most appropriate for the research question, strengths and limitations of each data set, how to define key variables.
- Assistance in preparation of materials describing investigations of large clinical data sets for submission to IRB or other regulatory review;
- Assistance in generating descriptions of methods for incorporation in funding applications;
- Assistance in generating pilot data to motivate funding applications, and for incorporation in publications;
- Development of tools to allow researchers to address questions which would otherwise be difficult to study in large data sets;
- Development of large de-identified databases to facilitate research by investigators without programming knowledge;
- Assistance in gaining access to appropriate large data sets and integration of multiple data sets – for example, use of birth and death certificate data, use of environmental exposure data;
- Assistance in development of decision support tools making use of results derived from large clinical data sets, and planning studies to validate and disseminate such tools.
- Assistance in development of platforms necessary to integrate clinical data with mobile health applications.

These services require substantial investment of time by the director and staff to understand the specific project requirements and ensure that they are specified correctly prior to investing programmer and analyst resources in generating and analyzing data sets.

ACCOMPLISHMENTS

- The EHR Research Unit was constituted in the fall of 2014. Since then, consultation rates vary seasonally but average approximately 2/month. Some of these are brief single sessions to address focused questions, but the majority culminates in a longer-term effort to obtain, refine, and analyze a data set. To date, most consultations relate to generation of pilot data and methods for grant submissions (K23/K99 or equivalent; R01 or equivalent).
- The EHR Research Unit jointly sponsors the Clinical Effectiveness course for fellows and junior faculty members interested in making use of EHR or other large data sets for effectiveness research.
- With the availability of the Partners Biobank, we are taking a more active role in advising investigators interested in defining phenotypes for genomic study, and in providing input to Partners precision medicine initiatives.
- We are developing self-study programs for investigators interested in use of electronic health records for clinical and translational investigation.

- We are developing a large de-identified data mart with pre-computed variables of interest to clinical investigators, in an effort to minimize the additional programming skill required for new investigators to address clinically meaningful questions across hospital departments.

LESSONS LEARNED

- The major bottleneck for clinical investigators continues to be the absence of accessible resources for transforming SQL databases or flat files derived from RPDR queries into analyzable data sets. This contributes to the high rate of RPDR data requests that historically have not led to analysis and publication.
- Another challenge continues to be inability to utilize RPDR despite consultation available through research computing. A joint course with the Clinical Effectiveness Unit was modestly successful, but few investigators were actually able to complete a project in the time allotted.
- The transition to Epic remains a massive challenge across the institution, and nowhere more so than for EHR research. At minimum, the discontinuity between LMR and Epic will impact projects seeking to use unstructured data.
- Investigators remain unaware of the additional variables that can be extracted from health records, including imaging and narrative notes.

ADAPTATION PLANNED

- We are working on two strategies to improve the ability of investigators without programming capacity to utilize RPDR data. The first is the generation of deidentified precomputed data sets more familiar in shape and design to clinical investigators. The second is the development or adaptation of tools to simplify transformation of raw clinical data to analyzable form.
- In the meantime, DCR leadership has agreed to support some programmer capacity to allow continued generation of pilot data for investigators new to EHR research. We will work with investigators to include some support for EHR Research Unit's services in federal, foundation, and industry grants as appropriate.
- We will continue to work with other groups within DCR (PCORI, Clinical Effectiveness, Bioinformatics) and across the hospital (Research Computing; Clinical Data Science) to minimize overlap in effort and streamline referrals between groups. The hospital's massive investment in informatics could be substantially more efficiently applied.
- We plan to develop two additional brief courses delivered online in concert with the DCR Education Unit: one mini-course focused on analysis of health records data, and another focused on natural language processing.
- We still need to increase awareness of these resources (in terms of consultation and the data sets themselves) by participating in grand rounds or departmental presentations. We piloted these efforts successfully in 2016 but more outreach is needed.
- We are negotiating partnerships that will allow us to increase the range of services available to investigators seeking to integrate their projects with EHR.

Patient Centered Outcomes Research (PCOR) Unit

Joshua Metlay, M.D., Ph.D., Director

GOALS

The PCOR Unit's overall goal is to facilitate that form of clinical research that addresses the comparative effectiveness of different healthcare options from the perspective of patient outcomes. To a large extent, the PCOR Unit was established to address the research needs and funding opportunities provided by the creation of the Patient Centered Outcomes Research Institute (PCORI), which had a research budget of \$491 million in fiscal year 2016.

Research supported by PCORI has three major components:

- It tests the comparative effectiveness of a range of healthcare interventions, including treatments, diagnostic tests, and system-level strategies;
- It focuses on outcomes that are experienced and reported by patients; and
- Research progresses in a model with substantial stakeholder engagement including input from patients, caregivers and providers.

The PCOR Unit seeks to facilitate research by providing support in each of these domains. Specifically, the PCOR Unit advances work through four complimentary strategies:

- Working with the DCR Education Unit to host a series of educational seminars and workshops to prepare investigators to submit PCORI applications.
- Providing project-specific consultative services through review of investigator-initiated proposals in the pre-award phase.
- Supporting the expansion and evaluation of methods for collecting patient reported outcome measures, specifically as routine components in clinical care settings.
- Establishing best practices for patient and community engagement strategies and disseminating these resources to investigators.

ACCOMPLISHMENTS

- The PCOR Unit was formed in September 2014. Dr. Josh Metlay was named the inaugural director. This report summarizes the accomplishments of the unit during its second year.
- PCOR Unit worked with DCR staff to create web site additions that allowed investigators to rapidly access current resources, including prior PCORI educational presentations, PCORI web-based tools (including methodological guidance documents), and examples of successful PCORI applications.
- The PCOR Unit remained available to provide support for specific MGH investigators submitting PCORI applications. However, the number of requested consultations was significantly lower in CY 2016 compared to the prior year. Whether this represents growing expertise with PCORI grants at MGH is unclear, though many submitted applications represent proposals from MGH investigators with prior PCORI proposals and awards.

Overall, as of October 2016, MGH investigators submitted a total of 22 applications in CY 2016 (28 submitted in 2015) to PCORI and received 5 notices of grant awards (4 primary awards in 2015), including awards to Drs. Evins, Iezzoni, Nierenberg, Sepucha, and Skotko. In addition, collaborating with investigators at University of Wisconsin, Dr. Metlay received one of the first competitive project awards for a study based within our PCORI funded Clinical Data Research Network, a potential model for future, network-based awards.

- Consistent with the reduced demand for consultations, preliminary assessment determined that there was insufficient demand to support repeating the PCORI mini course developed and run in 2015.
- PCOR Unit continued to support early research evaluating the feasibility and validity of using patient reported outcome measures (PROMs) that are collected as part of routine clinical care at Partners. Partners Healthcare System is supporting widespread adoption of PROMs as a component of meaningful use goals and population health management strategies. The primary PHS strategy involves the use of an electronic tool, which is supported on tablet devices and allows patients to report clinical outcomes, health status, preferences, and other self-reported measures while they are in ambulatory care settings. A current General Medicine Fellow, Karen Blumenthal, has completed a series of analyses to link PROMs data with other routine clinical data and claims data to evaluate whether these measures can help predict future healthcare utilization. Results from these studies have been presented at two national meetings and a manuscript is currently under review.
- PCOR Unit/DCR continues to partner with investigators at Chelsea Health Center to build and evaluate a model of stakeholder engagement for clinical researchers. The Chelsea Health Center Research Roundtable, formed in 2013, is a monthly gathering of a diverse group of health professionals and researchers based in Chelsea who are conducting community-based and community-partnered research studies. The roundtable provides a forum for sharing of best practice, feedback on protocols in development, and facilitation of new collaborations. With support from the PCOR Unit, a Chelsea-based community researcher (Amy Novikoff) leads this effort to provide increased support for MGH researchers exploring research opportunities at this site as well as developing standardized approaches for building engagement strategies in other communities where MGH researchers are interested in launching research projects. The research roundtable has also formed an advisory board (including DCR representation) and held a highly successful Community Research Day in October 2016.

LESSONS LEARNED

- There is now an established group of “PCORI Investigators” at MGH. Demand for additional training and consultation has diminished, though the number of submitted and funded applications remains high.
- Stakeholder engagement is critical for successful work under PCORI. We have explored the idea of creating a patient advisory council for research, but have not yet moved forward. However, we have established strong partnerships with community-based researchers and leaders, specifically at Chelsea Health Center, and this remains a major focus for future growth.
- The current funding for PCORI is at risk after 2018, thus there will need to be an ongoing evaluation regarding the need for substantial strategic investment in PCORI research support at MGH and PHS. Moreover, the Institute is reportedly focusing more on targeting funding announcements rather than more open research funding opportunities. On the other hand, robust funding remains available in the upcoming year and the Unit should continue to support and encourage research applications to the Institute; including projects that are based within our PCORI-funded Clinical Data Research Network.

Qualitative Research Unit

Elyse Park, Ph.D., MPH, Director

GOALS

Qualitative Research Unit provides qualitative research services and training (educational courses) to MGH investigators.

We are currently completing the second year of the qualitative research unit. Grant mechanisms, such as PCORI and many NIH funding programs (K and R awards, CTSA) increasingly require qualitative research components. In addition, community-based participatory research (CBPR) and disparities investigations generally require qualitative components. As demands for qualitative research expand, ensuring its rigor is essential to maximize the likelihood of grant applications being funded, facilitate IRB approvals, and ultimately disseminate findings through high-impact peer-reviewed journals.

ACCOMPLISHMENTS

Qualitative Research Unit had two primary components: education and service. This year we significantly added to a third component: grant mentoring and support.

EDUCATION

The qualitative course was held in June 2016. This course consisted of 5 hours, once a week. The students represented many disciplines at MGH. Attendees were research fellows, research nurses, psychologists, and physician investigators.

Education: Fifteen students were selected from the course. The course topics were the following:

- Overview of qualitative and mixed methods
- Selecting your design, recruitment and sample size
- Development of qualitative research instrument (i.e., interview guide)
- Focus group and individual interviewing methodology
- Qualitative data analysis

Several lectures were conducted at MGH, HMS, and for the Harvard Catalyst.

SERVICE

The service mission of the Core is to provide services, in the form of consultation or ongoing support, to investigators at MGH.

Consultation services include:

- Consultation on developing qualitative and mixed methods research design.
- Consultation on grant preparation and manuscript writing.
- Consultation on qualitative instrument development and review.
- Focus group and individual interview facilitation.
- Advice on publishing and presenting qualitative research
- Access to and advice about qualitative research resources (e.g., guidance on books, websites, national trainings)
- Consultation on data analyses

Investigator consultations

In 2016, Qualitative Research Unit provided 28 consultations to investigators from the MGH Departments of Surgery, Nephrology, Addiction Medicine, Medicine, Radiology, Nursing, Oncology, Pediatrics,

Palliative Care, and Psychiatry. Note that consultations are not inclusive of the training grant submissions listed below.

GRANT SUPPORT

Grant submissions

Training Grant submissions

Training grant submission support and mentorship is provided to **17 investigators**. Many of them submitted to several grant mechanisms, and many of them have undergone repeated submissions to a stated mechanism. Investigators are from Surgery, Psychiatry, Cardiology, Medicine, Oncology, Pediatrics, Nephrology, and Medicine.

Ongoing grant support for funded grants

Training grant support

Ongoing grant support is provided to **10 investigators** whose training grants (NIH, foundation, and MGH/HMS mechanisms) were funded. Investigators are from Surgery, Psychiatry, Medicine, Oncology, Nephrology, and Medicine.

Other grant support

We are currently supporting 4 non-training research grants for which additional, ongoing support is needed. This support is being provided to Dr. Deborah Wexler (is assessing the needs for a diabetes group program) and Dr. Kathleen Finn (is assessing the effects of ongoing attending presence for case reviews). Dr. Kelly Irwin received American Cancer Society funding to explore oncology providers' perceptions of treating patients with severe mental illness. Dr. Giselle Perez received an American Cancer Society funding to develop a resiliency intervention for lymphoma survivors.

Staffing Qualitative Projects

An MGH Clinical Project Director, Ms. Kempner, was identified to serve as a qualitative interviewer and data analyst. Ms. Kempner underwent training, with Dr. Park, in qualitative interviewing, data collection, and analyses with NVivo software. Ms. Kempner was available to be assigned to qualitative projects that were funded, but she is no longer available to do so in this per diem capacity. Psychologists Dr. Lara Traeger, Dr. Tina Luberto, and Dr. Christina Psaros were matched with these projects and are serving as qualitative co-investigators.

Biostatistics Unit

Dianne Finkelstein, Ph.D., Director

Hang Lee, Ph.D., Lead Statistician

GOALS

The broad goal of the DCR's Biostatistics Unit is to support the biostatistical needs of the MGH's clinical research community by providing timely and onsite consultative biostatistical expertise. Specifically, the Biostatistics Unit's faculty:

- Assist in the study design for clinical research grant applications prior to submission, and join grant research teams to ensure sufficient statistical support of research once funded;
- Guide MGH's clinical investigators in the selection of the appropriate biostatistical methodology and interpretation of data for papers intended for submission to journals;
- Serve the DCR's educational mission via a biostatistics Lecture Series and individual tutorials in collaboration with the DCR Education Unit;
- Serve on the IRB to provide statistical review of submitted protocols; and
- Provide statistical, database, and web software for applications needed to conduct clinical research.

ACCOMPLISHMENTS

Overview of Principal Activities

In addition to Unit Director, Dianne Finkelstein, Ph.D., seven other biostatistics faculty members from the MGH Biostatistics Center participate in the Unit supported by the DCR: David Schoenfeld, Ph.D., Hang Lee, Ph.D., Douglas Hayden, Ph.D., Eric Macklin, Ph.D., Hui Zheng, Ph.D., Brian Healy, PhD, and Lily Altstein, Ph.D. Our pool of MGH faculty statisticians provides a full spectrum of local biostatistical expertise to match the broad range of needs of the MGH clinical research community.

DCR offers free initial consultations of 4-6 hours to all MGH clinical investigators planning an IRB approved human study. Dr. Lee, Assistant Professor of Medicine and Director of the DCR's Biostatistical Consulting Laboratory, triages each initial inquiry from MGH physician scientists, taking into consideration the nature of the investigator's need, in-house biostatistical expertise, and time required.

The Unit ensures statistical expertise on grants by providing support to each researcher who requests a statistician on his/her grant, guaranteeing that the research will have adequate statistical support for study design, development, conduct, analysis and dissemination.

To outreach further to clinical investigators, DCR statisticians now serve on the MGH IRB, providing statistical review and guidance on protocols reviewed biweekly. When requested, Data Monitoring Committee statistical support is provided as well. The Unit offers both formal lecture series in biostatistics and selective biostatistics workshop sessions within the DCR's Education Unit.

This year, Dr Finkelstein served on the ECOR committee that reviews requests for interim funding ("Bridge support") for grants that did not obtain a fundable score. The purpose of this participation, beyond contributing to this activity, was to help investigators find statistical input when needed.

Finally, investigators often need a short-term commitment of a statistician to do a data analysis that requires more time than is provided for free by the DCR. To offer this, the Biostatistics Unit maintains a Biostatistics Core of statisticians who can offer days or weeks of time on a data analysis. This service is often provided in conjunction with a more senior statistician funded by the DCR who oversees the project. This time fits within the limits of the DCR Biostatistical Unit limits because the scope of work is limited to drawing up a study plan, guiding the statistical analyst and reviewing the project results.

New Initiatives

In response to requests for support in submitting trial results to <https://clinicaltrials.gov>, the Unit has developed a lecture and online tutorials in collaboration with Sarah White at MGH QI and Catalyst Biostatistics Program. In addition, members of the Biostatistics Unit developed programs that provide modules to access the trial data files and produce the statistics, write them in the correct field, check the completeness, and submit the report. For trials that require more direct statistical support, a designated statistician (Amy Shui, MS) of the Biostatistics Unit has been assigned to provide computing support for the Trial Results Reporting to ensure every trial can be reported before its deadline. This support is drawn from the infrastructure of the Biostatistical Core, described above.

Individual Consultations

The Unit supported a total 31 consultations, of which 17 were directed to the Unit exclusively through the DCR in 2016 and 14 had begun in 2015 and has continued until 2016. Most of the extended period consults were K-awardees projects and large multi-center statistical coordinating center grant submissions related consultations. The usage characteristics by the investigators and projects of those 17 new consults are summarized by Figures 1-3.

Figure 1: Percent of Projects by Faculty Ranks

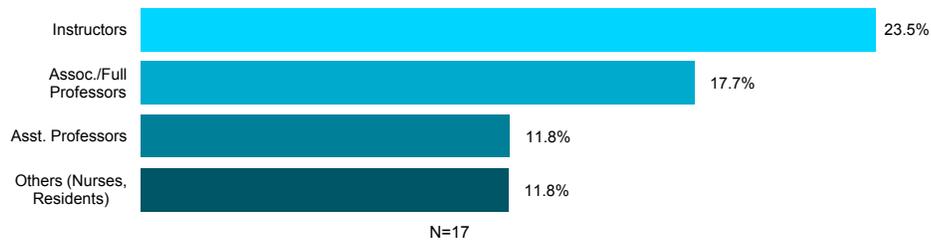


Figure 2: Percent of Projects by Department Specialty

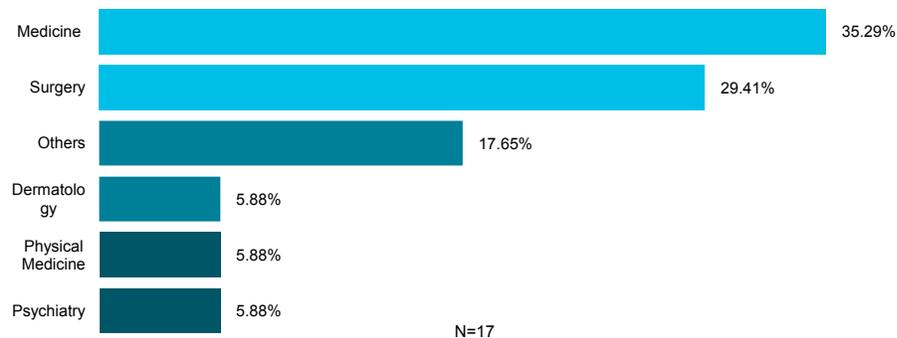
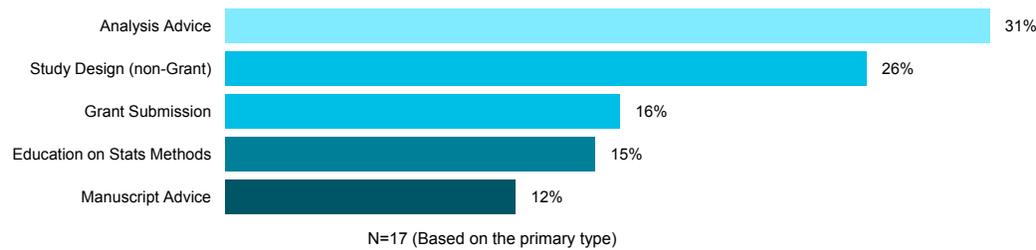


Figure 3: Percent of Projects by Project Types



Grant Submissions:

An important aspect of the DCR support of investigators is the collaboration on research grants. This includes a range of discussions from study design, contributing the statistical considerations to the application to committing a portion of their time to the grant research if it is funded. In 2016, members of the Biostatistics Unit were included as personnel for 133 grants of which 107 were continued from 2015, 26 were newly awarded, and 11 were ended in 2016. This represents a 9% increase compared to 122 total funded grants in 2015. In addition, we participated in 55 new federal grant submissions as PI/Co-I/key personnel, and, if funded, the MGH statistician will then shift a portion of their activities to new personnel to make their time available to the new project.

K-Awardees Mentoring:

Since August 2014, the Unit has been providing increased support to the MGH K-Awardees for extensive consulting and mentoring, which requires more than typical DCR consulting.

- K-awardees, who have no funding for statistical analysis within their K award grant, are now offered free biostatistical support for their projects.
- For junior investigators who seek assistance and statistical computing support to learn and then complete their own analyses, we provide a computing laboratory with statistical software and personnel and library support. The lab is accessible at all hours to MGH investigators.
- Some investigators require extended statistical analysis. The Biostatistics Core provides short-term fee-for-service statistical support for more sophisticated data analysis.

In 2016, there have been 12 junior investigators of whom 4 were new and the other 8 were who continued receiving the consulting and mentoring.

Statistical Computing Lab:

We provide junior investigators open access to a computing laboratory with statistical software and personnel and library support. The average usage was 1-3 hour long one visit per week. The lab computers provide common statistical IT packages, including SAS, STATA, PASS (power and sample size), with newly added Graphad/Prizm, JMP, to meet the requests of laboratory and pharmacokinetics investigators who needed Prizm, and clinical investigators needing factor- and item analyses, ROC analysis, and general linear mixed effects model JMP and SPSS). In 2016, there were increased number of JMP, SAS and Graphad/Prizm users, and we have provided tutorials on JMP, SAS coding, and application of Graphad/Prizm. The lab also provided updated educational material including on-line tutorial books, and lecture notes developed by Dr. Healy, <http://hedwig.mgh.harvard.edu/biostatistics/software> and <http://hedwig.mgh.harvard.edu/biostatistics/stathelp>.

www.Clinicaltrials.gov statistical software and support:

The Unit has developed a lecture and online tutorial as well as statistical computing support to allow investigators to retrieve the summary measures required by the www.clinicaltrials.gov website. This input must be entered directly by the PIs. These summary statistics include target- and accomplished recruitment sizes, efficacy measures with 95% confidence intervals and p-values, adverse event rates, and an indication (or narrative summary) of the statistical methods used. The tutorial is a step-by-step demonstration of calculation of these summary measures. The computing support includes standard preprogrammed modules to access the trial data files and produce the statistics, write them in the correct field, check the completeness, and submit the report. In the case of the trials that require more complex programming beyond this module, the Unit's statistician Amy Shui offers special computing support for the required results extraction from complex trials.

Education:

Dr. Lee participated in delivering the DCR lecture "Study Design: Statistical Perspective session of the Conquering the K: Submitting an NIH Career Development Award Proposal, and currently improving the course in collaboration with the course program director Dr. Karen Miller. Dr. Healy offered the annual DCR lecture, "Basic Biostatistics for Clinical Research", as well as the Harvard Catalyst Certificate in Applied Biostatistics which was offered to the local MGH investigators. Drs. Macklin and Lee participated in the DCR's flagship course "Design and Conduct of Clinical Trials". The level of DCR tutoring topics have become more advanced, and these focused topics are longitudinal data, high throughput gene expression and metabolite data analysis (FDR adjusted type-1 error control), and the multiple imputation techniques to deal with missing data arising from randomized clinical trials.

LESSONS LEARNED

From Consulting Activities

- **Proximity Matters:** A crucial function of the program is to provide MGH's clinical investigative community with local statisticians as interactive collaborators and/or co-investigators on their grant proposals through the consulting activities and laboratory serially over time. As evidenced by the 9% increase in the number of funded grants in collaboration with Biostatistics Unit from 2015, it is essential that these collaborations lead to the statistician becoming an active member in the research. Such close and evolving interactions are facilitated by the singular and onsite commitment of the DCR Biostatistics Unit to the investigators of the MGH. During the year, Biostatistics Unit offered PhD or MA statistician support (more than .5 FTE) to the research programs of several investigators in the MGH, including Drs. James Perrin (Pediatrics), Chris DiGiovanni (Foot and Ankle Surgery), Kenneth Freedberg (Infectious Disease/MPEC) and Ana-Maria Vranceanu (Psychiatry). In response to a rising demand for extended but short-term fee-for service consults for data analysis we have expanded the Biostatistics Core. This service partners with the DCR (limited) service as we are able to offer free DCR consults for Statistical Analysis Plans, which are then carried out by the Core statisticians. This has been especially useful to departments like psychiatry or nursing who have funding to support a limited but substantial portion of a statistician's (FTE) time, but do not have a stable funding support for statistics as a grant would provide.
- **DCR goes beyond Harvard Catalyst:** Harvard Catalyst also provides a consulting service for Harvard investigators and some of our statisticians provide consultations for both Catalyst and DCR. However the DCR efforts summarized above are distinct from those offered by Catalyst in several ways. First, the DCR consultations are guided to the statistical group by DCR faculty and staff who are assisting with other aspects of supporting their individual projects (such as IRB submission, budget preparation etc): Thus these efforts are tightly coordinated by the complete support that is unique to the DCR. Second, both the educational milieu and technological support for the biostatistics support services offered by the DCR is local. Thus, courses and computer lab offered by DCR statisticians are available on-site at MGH and at times that are convenient for physician scientists with complex patient care and clinical responsibilities (in contrast to Catalyst courses which reside solely at the

Longwood campus and during the daytimes only). Finally, statisticians working with investigators on preparation of their individual grant applications are then available to commit their time to the eventual execution of the grant and research effort as a member of the research team in contrast to Catalyst collaborations where only limited consultations for design or analysis plans are supported and there is no commitment to future collaboration. Thus, the spectrum of support provided by DCR's Biostatistical Unit is complete, local (onsite), and comes with a commitment to be part of the research team – unique features that cover the full spectrum of services made available to MGH investigators that distinguish these efforts from the Catalyst supported functions.

From the educational mission

- **The Need is Expanding:** The annual DCR Basic Biostatistics Course has been received very well and enrolled approximately 200 clinical investigators. Many of the MGH's evolving clinical investigative community are now alumni and have developed a collegial relationship with the Biostatistics Unit through our consultative support activities or tutorials. In many cases, these alumni have become part of ongoing research teams that fully integrates the MGH's biostatistics faculty and results in vastly improved applications as well as quality of ultimate outcomes. There are also educational components within the individual biostatistical consulting projects, several of which have become crucial and now required components of NIH career development awards (K series) that often require statistician co-mentors, a role particularly facilitated by our onsite presence. In response to this expanding demand for biostatistics education, we will expand the biostatistics offerings in the coming year in collaboration with the DCR's Education Unit. This collaborative support was launched with a very successful short course in Biostatistics given by Dr. Brian Healy. The course has expanded to offer online homework and blogs for communication between faculty and students. A particularly popular unique aspect of his program is the open office hours where investigators are invited to drop in and discuss their research proposals and analyses. This service also includes standing statistical computing and consult lab in dedicated space contiguous to the Biostatistics Unit.
- There is an interest in providing additional online lectures and tools to allow investigators to learn statistics at their own timing and pace. In the context of consultations on study design, we recently identified a need for a new education module that could focus on "Developing a Study Proposal and Statistical Design". This short course will benefit early career Fellows who plan to propose a clinical study but have not had sufficient clinical research and statistical training. This will be a "light" abridged version of the "Basic Biostatistics for Clinical Research" to cover issues of how to translate medical questions into the framework of testable statistical hypotheses and adequate research design.

ADAPTATION PLANNED

Many MGH investigators would benefit from more statistical support on their grant proposals. Hence, it would be useful if the MGH could establish a new mechanism whereby the DCR's biostatistical review could be inserted into the grant submission process, allowing at least 2-4 weeks prior to submission. This additional support would be especially useful for grants that are availing themselves of the MGH's bridge funding to improve the yield on this institutional investment. Similarly, a mandatory statistical review prior to any IRB approval of all clinical studies coincident with that of IRB review or even required prior to it would ensure that study designs are compatible with research goals and might streamline use of valuable committee time. Dr. Finkelstein's efforts to assist in the ECOR bridge grant funding revealed an unmet opportunity as some grants would have been improved with more statistical input. However, the current grant review by this committee does not allow communication with investigators and hence there is no way to align them with the free statistical support they could obtain through DCR. Drs. Lee and Hayden have been attending MGH IRB Panel A. Expansion of such a role in the review of research grants, awards, and infrastructure decisions could raise awareness of the Unit further.