

**NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
TRAINING GRANT FINAL REPORT**

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List of Abbreviations

ACGME	Accreditation Council for Graduate Medical Education
ACOEM	American College of Occupational and Environmental Medicine
ABPM	American Board of Preventive Medicine
APBM-OM	American Board of Preventive Medicine Examination in Occupational Medicine
AOHC	American Occupational Health Conference
CEET	Center for Environmental Toxicology
CCC	Clinical Competency Committee
CTS	Clinical Training Site(s)
CITI	Collaborative Institutional Training Initiative
ET	External Track
FEMS	Fire and Emergency Medical Services
HRSA	Health Resources and Services Administration
ISEE	International Society for Environmental Epidemiology
NIEHS	National Institute for Environmental Health Sciences
NIOSH	National Institute for Occupational Safety and Health
OEM	Occupational and Environmental Medicine
OM	Occupational Medicine
PM	Preventive Medicine
PD	Program Director
RAC	Residency Advisory Committee
RRC	Residency Review Committee
RTWP	Return to Work Program
SYP	Second Year Project
SMSAs	Standard Metropolitan Statistical Areas
SNMA	Student National Medical Association
SAR	Subject Area Rotations
IOM	Institute of Medicine
IT	Internal Track
ET	External Track
TP	Training Program
URM	Under-Represented Minority
UPENN	University of Pennsylvania

Abstract

The purpose of the University of Pennsylvania (UPENN), Perelman School of Medicine, Occupational and Environmental Medicine (OEM) Residency Program is to prepare residents for the comprehensive practice of occupational medicine in a variety of settings including academia, hospital based clinics, free-standing occupational medicine practice, private practice, corporate settings, public health programs, governmental agencies and legal or regulatory authorities. It is designed to provide structured, supervised training and experience to ensure that residents achieve competency in the areas required of the American Council on Graduate Education (ACGME), the American Board of Preventive Medicine Examination in Occupational Medicine (APBM-OM) and the American College of Occupational and Environmental Medicine (ACOEM) for the specialist practice in OEM. This highly innovative program is competency based with the goal of producing outstanding OEM physicians who will be leaders in the field and well equipped to move the field forward. Funded by NIOSH since its inception in 1997, this 2-year NIOSH and HRSA supported program meets a critical need by providing mid-career physicians formal ACGME accredited, residency training via its External Track (ET). Physicians within 5 years of graduating medical school are also trained - via the Internal Track (IT).

The UPENN program helps overcome barriers that deter otherwise motivated physicians from specialist training. Being able to award NIOSH training funds helps toward his end. Criteria for NIOSH funds are: service to underserved populations; difficulty accessing a suitable training program (remote location, location without training program, family responsibilities, etc.); specific regional workforce needs; and service to special populations at risk.

There are two tracks: The Internal and External Track. The Internal Track (IT) provides residents the opportunity to complete rotations at the University of Pennsylvania Hospital and affiliated organizations. The External Track (ET) provides supervised practicum training for residents employed full-time in occupational medicine practice, most at community based training sites. The program consists of two interrelated components, a didactic component and an applied clinical component. Both components work in tandem to allow acquisition of the ACGME Milestones for Occupational Medicine. There are 5 subject area rotations (SAR) during the each of the two years, five longitudinal courses during the OM-1 year and one longitudinal course during the OM-2 year. The curriculum includes experiential learning, production of and presentation of supervised projects, including quality improvement and safety projects, direct observation of each resident in various settings and formative and summative evaluations and feedback at multiple points.

We have graduated 107 residents to date. More than 95% of our graduates continue to work in the OEM field in their individual regional areas throughout the country; many are located in non-urban areas. During the study period 29 trainees started the program, 26 of whom have graduated. Six completed their first year during the study period and will graduate in June 2015. The program had been one year in length until 2011, when the ACGME determined that all PM programs be two years in length. The UPENN program started the transition to a 2-year program and was fully transitioned by 2012. During the study period twelve trainees received

NIOSH funds directly. However, all trainees benefit from NIOSH funds given that NIOSH also supports the infrastructure of the program.

The program's Underrepresented Minority (URM) Diversity Committee continues to flourish where all URM trainees and URM graduates remain as members. In addition, other trainees have joined the committee in order to further the mission, which is to increase the number of URMs in the field of OEM, increase the number of physicians in the field of OEM in general, and increase the number of URMs at the UPENN OEM program. During the study period, of the 29 trainees, 6 are URMs (21%). This exceeds the national average of ~7% of medical students being URMs. Clinical training sites continue to be located in diverse settings with more than half of the trainee CTS being located outside of the largest 25 Standard Metropolitan Statistical Areas (SMSA).

Program quality is indicated by the number of graduates who remain in the field, strong performance using evaluation measures including graduates rating of their skills before and after training and ratings that the program met their training needs, faculty ratings of resident performance, and superior performance on the APBM-OM Examination. UPENN residents and graduates continue to score above the national average and on average, exceed the average for residency-trained physicians on the APBM-OM Examination.

The University of Pennsylvania is listed in the top 5 Medical Schools according US News and World Report and is ranked number 2 amongst academic medical centers receiving National Institute of Health support. The academic mission is amply supported by the availability of conference rooms, physical plant, information systems and library facilities. The Emergency Department, OEM Division comprises approximately 14,000 square feet of space and institutional resources enable residents to access a vast array of opportunities to supplement their core program activities. Lectures are delivered by content experts. The OEM clinic serves a diverse client base; this along with the volume ensures a unique opportunity for residents to gain comprehensive clinical instruction and involvement. Subject Area Rotations (SARs) are held on the UPENN campus, which has a diverse group of full-time and adjunct faculty members, teaching and office space, and clinic and laboratory space to support this TP. Residents have access to a wide-ranging library system on campus and remotely. This benefits project completion, required work at UPENN, scholarly work mentored by UPENN faculty, etc. The program received 10-year full accreditation from the ACGME during the study period, the longest period of accreditation given by this body. The focus of the UPENN OEM residency remains to be placed on nurturing academically and clinically exceptional physicians, with attention to diversity, who will utilize their competence and skills in their own diverse regions throughout the United States to take care of the ill and injured worker and keep workers safe and healthy.

SECTION I

Highlights/Significant Results

The UPENN OEM Residency Program has accepted 29 trainees since July 2009 and graduated 23 with 6 now completing their second year. Twelve have received NIOSH funds. The pass rate on the ABPM-OM is 93% in this cohort with 3 not yet having sat the examination.

During the period from **July 2008 to June 2009** there were seven trainees all but one was supported by NIOSH. These residents are Drs. Brody, Broadman, Drummond, Garvin, Lukcso, Reintjes and Subramani. All have been successful on the ABPM-OM examination. Trainee outputs as regards scholarly work included: A scientific session by Dr. Subramani with Dr. McKenzie (PD) at AOHC 2010 on the *Critical Appraisal of the OEM literature* in Orlando, FL; a poster presentation by Dr. Drummond on *Strategies to increase Underrepresented Minorities in Occupational and Environmental Medicine Training Programs* at the US Department of Health and Human Services Office of Minority Health - A Blueprint for Change, US Department of Health and Human Services in February 2009 in Washington, DC; and Dr. Lukcso has published 4 book chapters, 2 peer reviewed reviews with Dr. McKenzie and is co-editor with Dr. McKenzie of the book, Occupational Health Services. Dr. Lukcso also has a manuscript in press for the Annals of Occupational Medicine. He has also presented at AOHC on *Reducing workers' Compensation Costs* with Dr. McKenzie. Dr. Broadman currently serves as a site supervisor for a current resident – Dr. Savanoor.

From **July 2009 to June 2010** all but two trainees were supported by NIOSH. The trainees were Drs. Apostoles, Brewer, Co, Doff, Miller, Nguyen and Phillips-Savoy. All but one sat the ABPM-OM and all who sat were successful. Dr. Brewer has co-authored a book chapter with Dr. McKenzie. Dr. Brewer was a 2010 recipient of a NIOSH pilot grant from the Johns Hopkins ERC with Dr. McKenzie serving as faculty advisor and has presented her work on Body Fluid Exposures at the following national conferences: NORA (2011), ICOH (2011) and AOHC (2011). She recently submitted a manuscript on the same - with co-author Dr. McKenzie. Dr. Brewer moderated a scientific session at ACPM (2012) on *Hospital Infectious Disease*, moderated a Scientific Abstract Presentation session at the 2015 AOHC as well as presented at the 2015 AOHC on *Critical Review of Journal Articles and Guidelines* with Drs. McKenzie and Piacentino (NIOSH). Dr. Co presented on *Reducing workers' Compensation Costs* AOHC (2011) in a scientific presentation (with Dr. McKenzie), where he used methods he had learned in the residency program at his own CTS and presented the outcomes. Dr. Nguyen published in the JOEM Forum on *The Difference between the TST and Quantiferon Gold* (with Dr. McKenzie). Dr. Phillips-Savoy presented at AOHC (2011) on Medications in the Workplace. Dr. Minh Nguyen served as site supervisor for two residents – Drs. Truong Nguyen and Butler.

From **July 2010 to June 2011** there were no trainees as the program was in hiatus due to administrative changes in the University of Pennsylvania Medical Center residency programs, outside of the control of the Occupational Medicine Residency Program.

From **July 2011 to June 2012-3** there were 8 trainees, four of whom were supported by NIOSH. The trainees were Drs. Martinez, Diba, Nguyen and Saberi (NIOSH Supported), Bratman), Nguyen, Hall and Butler. As this was our inaugural second year and only 4 residency spots were available, four continued on to the OM-2 year and the other 4 were graduated. Of the four who continued to the second year 3 choose a research project for their *Second Year Project (SYP)* and all 3 were selected to present their work at AOHC. The fourth resident developed a business plan. Dr. Diba's oral presentation was on *The effects of a 30 day limited duty policy change on time to completion of a return to work program for fire and emergency medical service members* (Faculty mentors-Dr. McKenzie and Shofer). She was awarded the **resident research award**; Dr. Nguyen presented his poster on *The Relationship between Health Risk Appraisal Score and the length of time of Deployment for Navy personnel* (Faculty mentors-Dr. McKenzie and Shofer). Dr. Saberi, currently Section Chief of OM at the Philadelphia VA and Site Supervisor for UPENN Internal Track residents also presented her poster on *Resident Health Complaints and Relationship to Presence of Natural Gas Activity* (Faculty mentors-Dr. McKenzie and Shofer). Drs. Saberi's project resulted in a publication co-authored by Drs. McKenzie and Emmett. Dr. Saberi also successfully competed for pilot funding for this work from the Center for Environmental Toxicology at UPENN (Faculty mentors-Drs. McKenzie and Emmett), which was also presented at the annual meeting of the International Society for Environmental Epidemiology (ISEE). Dr. Nguyen has served as site supervisor for one of our residents. Seven have passed the ABPM-OM and one has yet to sit the exam.

From **July 2012 to June 2014** there were 8 trainees -Drs. Boquet and Duran (NIOSH supported), Malak, Roach, Steinberg, Webb, Vrablik and DeRegis. All 8 residents submitted abstracts were accepted for poster presentation with the projects a result of the Second Year Course. Faculty mentors were Drs. McKenzie, Shofer and Emmett. The topics were as follows: Dr. Boquet -*Medevacs Study: Fitness for Offshore Workers*; Drs. Duran and Malak - *UPENN OMR Residency Outcomes*; Dr. Roach - *Effect of Mandatory Flu Vaccine Policy on HCW compliance*; Dr. Steinberg – *Investigation of Violence in Bus Operators at a Los Angeles Workers Compensation Clinic*; DeRegis- *Outcomes of an Ergonomic Initiative on Injury incidence and Workers' Compensation Costs at a Medium Sized Company*; Dr. Vrablik - *Measuring Ozone Produced by TRU-D Smart UVC Devices & The Relationship of Physician BMI on Practice Behaviors with Oversight Patients*; Commercial Driver FFD; and Dr. Webb - *Fitness for Law Enforcement Duty*. Dr. Vearrier was awarded the **Resident Research Award** for his work entitled *Characterization of the Healthy Worker Effect among Residents of the US*. Both Drs. DeRegis and Bouquet holds an office in the ACOEM Residents and Recent Graduates section.

From July 2013 to June 2015 six trainees were accepted, currently in their second year, they completed their first year during the study period. They are Drs. Kowalski (NIOSH supported), Doria, Vearrier, Isakari, Saito, and Savanoor. All six residents successfully submitted abstracts to the 2015 AOHC with Dr. Vearrier being selected for the Resident Research Award as well as for the inaugural 2015 AOHC Occupational Physician Scholarship Fund Award to attend AOHC. This is his second Resident Research Award. Dr. Kowalski is working with NIOSH scientists on a project entitled Conceptual Models to Evaluate Opioid and Benzodiazepine Medication Use in the Workplace as a part of The Risk Factor Compendium Research Project, designed to provide

resident/trainees support in exploring occupational safety and health issues. NIOSH staff is with the Education and Information Division (EID). The resultant abstract was accepted for poster presentation at the 2015 AOHC meeting. Dr. Kowalski is preparing the manuscript for publication. The other abstracts accepted for poster presentation are as follows: Dr. Isakari- *Lean Methodology to Streamline California's Workers' Compensation Documentation*; Dr. Saito- *Perception of Privacy of Electronic Medical Records*; Dr. Savanoor- *Occupational Medicine: How and Why Practitioners Enter the field*; Dr. Doria- *Free online nutrition program and activity tracker will help employees maintain healthy habits*. Other resident highlights include Dr. Savanoor's role in the ProMedica EBOLA preparedness steering committee. She gave expert advice to the Health System in regards to PPE, drills, community communication, employee communication and education. She was also [featured on WTOL](#). Dr. Doria is involved with Ebola screening at airports, helped create an "Ebola" kit for employees working in Niger, Africa. Established in the summer of 2014, Dr. Doria helps support screening of detainees entering the U.S. who may have communicable diseases. Dr. Vearrier gave an invited presentation at the VI International Seminar of Occupational Health in Mining Operation, Lima, Peru on October 23, 2014 entitled *Occupational Health of Miners at Altitude*. This educational conference was sponsored by the [Instituto de Seguridad Minera](#). Four of these residents successfully sat the ABPM-OM examination during their OM-1 year (in 2014). All were successful scoring above the national average and above the average for residency trained physicians. The other two plan on sitting the examination this year. Dr. Saito also presented a webinar for HRSA on Exposures at Cam LeJeune and presented this work at WHA as well. He holds an office in the Residents and Recent Graduates at ACOEM.

Some innovative aspects of the curriculum developed over the study period include the development of a faculty development initiative where site supervisors and rotation directors are invited to join resident Grand Round sessions live via *GlobalMeet*. Many faculty participate with positive reviews. The OM-2 residents now participate in a table-top exercise conducted during the Emergency Disaster Planning SAR. The OM-1 residents now participate in a 5-hour workshop on Clinical Preventive Medicine, Worksite Wellness, Behavior Change Counseling and Cultural Competency in February 2015. Another experiential learning activity this year was the annual "Speaking with the Media Workshop" held on January 16, 2015 as part of the Environmental Health: Risk Hazard Communication and Control rotation. Residents are interviewed on various OEM topics by media experts in a fictitious TV studio at the Annenberg Center on campus. Experts subject the resident responses to constructive critiques and the process repeats itself as the residents use tools they acquire during the session to improve. As we continue to grow our syllabus The UPENN OEM Residency focus remains to nurture and grow academically and clinically exceptional physicians with attention to diversity who will utilize their competence and skills in their own diverse regions throughout the US.

Outcomes/Relevance/Impact

The UPENN OEM residency is the largest civilian residency program in the United States. During this grant period there have been 29 trainees and all graduates have remained in the field of OEM, many active in ACOEM. Given the challenge of transitioning to a 2-year program and implementing several new ACGME requirements – the program has met the challenge and was awarded full accreditation by the ACGME for 10 years, the longest period of accreditation given. We have had the opportunity to introduce the Second Year Course and Second Year Project in this transition and the success has been evident, as since implementation in 2012, all of our residents have had the opportunity to submit their scholarly work to AOHC and all

abstracts have been accepted. During each of the three years since inception, one of our residents has been a recipient of the Resident Research Award: Dr. Diba (2013) and Dr. Vearrier (2014, 2015). Dr. Vearrier has also been awarded the 2015 Inaugural Occupational Physician Scholarship Fund to attend AOHC. Since the course was instituted, residents have presented twenty posters at national meetings, one at a regional meeting and one at an international meeting. In addition, our residents continue to score well on the ABPM-OM, scoring on average, above the national average for residency trained physicians. We now have the opportunity to offer the MPH to an Internal Track resident, thanks in part to NIOSH funding. Indeed, we have successively been able to train IT residents since 2012 – one each year – one has graduated (Dr. Saberi – now Section Chief at the Philadelphia and IT site supervisor). This year we have accepted two to begin in July 2015.

In accordance with our commitment to diversity - Over half of our residents practice in locations outside of the 25 largest standard metropolitan areas and graduates practice in every geographic region of the country. The URM Diversity Committee has also been successful during this period in that 21% of trainees have been URM. The Diversity Committee has met between 2-4 times per year and has introduced several initiatives to increase the number of URM which success is evidenced. Twenty-nine residents have been trained during this 5-year period and 107 residents have graduated since inception of the program, in 1997 with 12 additional current trainees. Most remain in the field of OEM. The UPENN OEM program continues to achieve set goals.

SECTION II

TECHNICAL REPORT

Background

The UPENN OEM Residency Program is an innovative program that addresses national as well as regional occupational medicine training needs by ensuring well-trained physicians in the field. The IOM recommended measures that included adopting new routes to certification and accreditation. This unique program has been able to address this recommendation by taking mid-career physicians who are already practicing in the field and providing them with a well-planned and thought out practicum utilizing preceptors and faculty who are diplomats of the ABPM and experts in the field. In so doing, the program focuses on one particular aspect of the recommendation: the need to provide rigorous training in Occupational Medicine for experienced physicians making a career shift to Occupational Medicine in a way that enables them to obtain specialty certification from the American Board of Preventive Medicine (ABPM) in Occupational Medicine.

This general shortage of occupational medicine specialists has been documented by the Institute of Medicine (IOM) in several reports, such as Subcommittee on Physician Shortage in Occupational and Environmental Medicine 1988 and Committee to Assess Training Needs for Occupational Safety and Health Personnel in the United States 2000, and also by Castorina and Rosenstock in 1990. The shortage persists. More recently, the IOM issued a report noting that more primary care physicians are needed in order for the graduate medical education to meet the nation's needs. In addition, programs need to start showing their outcomes as regards the quality of other residents (IOM report 2014). Being a primary care specialty, this OEM program is poised to meet the nations' needs and has been, as regards OEM physicians. We document our outcomes each year as we present our reports on program progress.

The UPENN program has graduated 107 residents since its inception almost 17 years ago (starting at Thomas Jefferson Medical Center where it was housed for the first 2 years, at UPENN since) and currently has 12 enrolled. Over the past 20 years, the total number of physicians certified in occupational medicine was just over 3,000 in number with less than one-half of whom remained in practice. Many of the currently board certified OM physicians will retire over the next five years and new OEM physician are needed to take their place. The gap between what we have and what we need, in terms of formally trained board certified physicians, remains. Due to several factors including having non-occupational physician provide occupational medicine services, it is difficult to accurately assess this need. In addition to there being a frank shortage of residency trained board certified OM physicians, achieving formal training can be a challenge especially for those who do not live in proximity to a residency program and are mid-career. Ten years ago there were over 3 dozen OEM residency training programs. As of 2015, only 19 remain with at least one considering closing its doors in the next year or so. This relative lack of training opportunities contributes to the shortage. Having physicians who lack specialty training or ABPM certification provide a considerable proportion of the preventive OEM services, raises concern about the quality and uniformity of the work. Although the need for properly trained occupational physicians has been shown to exceed the supply, the number of physicians taking the ABPM certification examination in OEM has been declining over the past several years. Harber et al., (2012) in their recent work found that formally trained OEM physicians have greater diversity of skills in terms of increased knowledge of population management, clinical, research and leadership skills, which they can impart to the populations they serve. Formally trained OEM physicians also have more opportunities available to them. As such, formally trained, board certified OEM physicians may have a larger

skill set to offer the public than those not formally trained and board certified. An informal survey of residency directors was conducted by the UPENN PD in November 2012, the results of which were reported to the ACOEM House of Delegates (HOD) meeting, per their request regarding the question: What are the perceived gaps in Occupational Medicine Residency education and training. The responses from the residency directors included the fact that the number of residency programs had declined significantly. Although there were 207 ACGME approved positions, only approximately 140 were filled and at least three programs had accepted no residents over the preceding year. Funding was noted as a major issue affecting the viability of OEM programs in the US. Other factors that were noted are that the pipeline of medical students and residents for OEM as a career is inadequate and many physicians are not exposed to the field of OEM until they are mid-career, thus eliminating the opportunity for residents to start formal training after medical school or even during residency. There are also limited options available to residents to make a mid-career change into the OEM field. The shrinking number of programs is considerable factor affecting the pipeline for residency trained, board certified Occupational Medicine physicians available to serve the US population. Given these factors, the UPENN program fills a definite need.

A “summit” on Occupational Medicine Training held in 2006 under the aegis of the ACOEM with representatives of ACOEM, ABPM, the Residency Review Committee (RRC), the ACGME, professional organizations, business, academia, industry and representatives from NIOSH and OSHA in attendance highlighted the need to provide rigorous, high-quality training for experienced physicians making a mid-career shift to the practice of Occupational Medicine. The UPENN program was highlighted as an option given that a significant proportion of the manpower in Occupational Medicine is provided by physicians coming into Occupational Medicine after having practiced in other specialty areas, some of whom seek formal training, which may not be readily available to them at a proximal site. Despite the shortage of training opportunities for OEM physicians, the research suggests that residents who do undertake formal training are satisfied with their training and that the training meets their needs (Baker 2007).

Although racial and ethnic minorities comprise 26% of the total population of the United States, only roughly 6% of practicing physicians are Latino, African American and Native American. Under-represented minority (URM) faculty account for only about 4% of U.S. medical school faculty members and approximately 20% of URM faculty is located at six schools, namely Howard University, Meharry Medical College, Morehouse School of Medicine, and the three medical schools located in Puerto Rican (AAMC 2005). The UPENN program has a commitment to diversity and formed the URM diversity committee. Over the past five years the UPENN program instituted the URM Diversity Committee. Over the past five years the number of URM trainees had been around 21% overall. Prior to the formation of the URM Diversity Committee, the number of URM in the UPENN program had mirrored the percentage of URM practicing physicians nationwide.

Since the start of this grant period the ACGME developed new Program Requirements for Graduate Medical Education in Preventive Medicine in 2011 updated in 2014 and scheduled to be updated further in 2016. The requirement is that all PM program be 2-years in length and that trainees will, in addition to having a MPH or other masters degree, complete the requisite five core courses. The OM-1 practicum year, already competency based, had remained practically remained, where focus is on the achievement of specific measureable competencies rather than the amount of time spent on the desired skill. The OM-2 year was newly designed and executed with positive feedback from residents and faculty. Also competency based, incorporating the ACGME Milestones was achievable.

As in prior years, each resident, at the beginning of each year (both 1st and 2nd), creates, with the advice, support and assistance of the PD, program faculty and CTS supervisor, an educational plan based on the strengths and weaknesses of each individual resident. This plan allows individualized training to meet the unique needs of each resident, identifying areas that need strengthening and additional experiences the resident will need in order to achieve the competencies, as well as help the resident achieve professional goals. As the need for any additional experience is assessed at this time a plan for achieving such is written into the educational plan, which serves as a roadmap for each year and is signed by the resident, the PD and the CTS supervisor.

The OM-1 residents continue to undertake the intensive 3-days per month didactic Subject Area Rotations (SARs) at UPENN. Each session provides approximately 30 hours of direct teaching. A substantive project demonstrating competence in application of skills necessary for OEM specialist practice must be completed for each of the five SAR. The OM-2 year builds upon the first, stressing the acquisition of advanced knowledge and skills, with opportunities for the residents to pursue individual interests relevant to OEM. OM-2 Subject area rotations continue to be competency based. Some OM-1 and OM-2 resident sessions overlap allowing both classes of residents to meet together as a group for some of the sessions facilitating a mentoring relationship. OM-2 residents may lecture OM-1 residents in an area of expertise for the OM-2 resident. The Second Year Project (SYP) is a central component of the second year and is intended as a substantial research effort, the results of which are to be delivered at the end of the year. The residents are afforded the opportunity to pursue areas of particular interest to them, as well as develop, in greater depth, a project that was started during the first year. The work must conform to the standard of a publishable scientific paper, book or implementable plan.

The ACGME Guidelines for Graduate Medical Education in Preventive Medicine stipulate that “prior to completion of the residency program, all residents must complete graduate level courses (credit or non-credit) in clinical occupational medicine; toxicology; occupational epidemiology; industrial hygiene, safety and ergonomics; and risk/hazard control and communication.” These graduate level courses had already been offered by UPENN faculty as non-credit courses since the inception of the program and have improved over the years using resident feedback and faculty development activities. We have formalized the courses to meet this ACGME requirement. Toxicology, Industrial hygiene, Safety and Ergonomics, Risk Hazard Control and Communication will be covered during the first year. Occupational Epidemiology will be covered over the course of the two years. The Clinical Occupational Medicine course is taught over the course of two years by UPENN OEM residency faculty and will consist of core lectures supplementing the clinical work performed at each resident’s clinical training site (CTR). We offer other courses besides the 5 required by the ACGME. Some of these graduate level courses required by the ACGME, e.g. risk/hazard control and communication were part of one of our subject area rotations (SARs) and will remain as such. Others, e.g. Toxicology, were offered as a stand-alone course and will continue to be offered as such. We offer other courses, e.g. Organizational and Healthcare Management, and Critical Review of the Occupational Medicine Literature.

Both OM-1 and OM-2 residents complete their clinical work at approved clinical training sites (CTS) where suitably qualified board certified preventive medicine physicians, whose credentials are reviewed as a part of the residents’ application process, serve as the CTS supervisor. Each resident completes at least 4 months, most times mores, of clinical occupational medicine each year, as per ACGME requirements. Core UPENN residency faculty

visit each external CTS quarterly during the OM-1 year and 3 times during the OM-2 year to observe the resident and meet with the residents and the CTS supervisor together, to ensure educational quality, that each resident continues to achieve the training objectives, responsibilities and supervision and fulfilling training requirements. Internal residents' clinical work (CTS is UPENN) are supervised by core program faculty. The program has evolved and adapted to meet and exceed the changing needs of each resident and the ACGME.

Specific Objectives

The specific objectives laid out in the competing continuation for this grant period were as follows:

1. Train OEM physicians who meet the nation's need
2. Offer the MPH during the course of the program via the newly minted CEPH accredited UPENN MPH program. Previously, trainees had all been required to have already completed an MPH degree at another institution prior to starting.
3. Develop the Internal Track (IT) more fully allowing IT trainees to complete the MPH at UPENN with the expectation that the combination of internal and external trainees will enrich the educational experience of both groups and the clinical, in-plant, and research rotations in Philadelphia, primarily developed for internal residents, would also be available for external track residents. Both internal and external residents would undertake an intensive 3-day per month didactic program in Philadelphia arranged around 5, 2-month long competency modules: population occupational medicine; the workplace; the worker; hazard identification; risk assessment and communication; and organizational management. General and clinical competencies will be addressed over the whole period.
4. Overcome barriers that deter otherwise motivated physicians from specialist training by awarding NIOSH training funds on criteria of: service to an underserved population, difficulty in accessing a suitable training program (remote location, location without training program, family responsibilities, etc.), specific regional workforce need and service to special populations at risk, including minority and disadvantaged workers.
5. Increase the diversity of our residents
6. Graduate OEM physicians who:
 - Meet the requisite competencies to perform well on the ABPM-OM examination
 - Take their place as leaders in the field of OEM
 - Remain in the field of OEM.
 - Practice in areas of need including middle sized towns and cities, countering the general trend for medical residents to reside permanently in the metropolitan area where they trained
 - Practice in diverse settings; academic, hospital-based and private clinics/industry /government
 - Are nationally distributed, in all major regions of the country

Results

The quality of the program is indicated by strong performance using evaluation measures, including superior performance on the American Board of Preventive Medicine Certifying examinations compared with other Occupational Medicine Residency trainees (*Exhibit 1*), the graduates' ratings of their skills before and after training (*Exhibit 2a & 2b*), graduates ratings that the program met their training needs, faculty ratings of resident performance (*Exhibit 2*), graduates from this period have all remained in occupational medicine. In addition, the ability of the program to adapt to the changing needs of the residents and to the new ACGME guidelines

and the ability of the program to thrive in a climate where other OEM residency programs have been forced to close.

The program has met its objectives. We have trained OEM physicians to meet the nation's needs. The UPENN OEM residency has achieved full accreditation for the next 10 years and continues to be the largest civilian OEM residency in the US.

We have been successful in offering an Internal Track resident an MPH from UPENN to be completed in conjunction with the residency program. The blended curriculum was planned in 2014 and will come into fruition in 2015 with our first IT resident who will take this route. This was not achieved prior due to lack of funds. The program being 2-years in length also helps to facilitate this eventuality. We will assess the outcomes at the end of the 2-year period.

The Internal Track is now fully developed. Prior to this grant period, over the course of 10 years we had graduated only two IT residents. Since 2012, we have had 3 trainees, one admitted each year, and have admitted two to begin in July 2015. One of our IT graduates chose to remain in the academic setting and is Section Chief at the Philadelphia VA, a Site Supervisor for our IT residents, and is on UPENN OEM Residency faculty directing a SAR.

We have been able to award NIOSH funding to one or more residents. Indeed, NIOSH funding helps support the infrastructure of the program hence NIOSH does support all the residents. More than half the graduates work in areas that are underserved as regards OEM physician density and in practice locations outside of the 25 largest SMSAs (*Exhibit 3a*). Diversity of practice site is also evidenced in that graduates are widespread geographically (*Exhibit 3b*) and diversity of type of employment is also evident although approximately half are hospital based (*Exhibit 3c*).

The diversity committee recruitment plan involves all members, is multi-pronged and seems to have been successful thus far. Committee members informally tell other URM residents and medical students and practicing physicians about the program. Members of the committee have identified and assisted in recruiting suitable URM candidates for training in the program through national and regional professional and scientific meetings such as AOHC or more specific meetings that URM frequent such as the Student National Medical Association (SNMA) meeting for URM medical students. During the study period 21% of the residents have been from URM groups. The URM Diversity committee initiatives over the study period include creating a poster that was shown at AOHC 2013, Poster presentation at a regional conference in 2009 (Dr. Drummond), Creation of a poster by Drs. Duran and Martinez, attendance by committee members at SNMA conferences (Dr. Butler SNMA 2012, Dr. Webb 2014) and NMA conferences (Dr. Northcross NMA 2013). In general, as the number of URM graduates and trainees increase, information via word-of-mouth has also been an effective recruitment tool. Our URM numbers has increased (*Exhibit 4*).

In order to accomplish our goals curricular changes included comprising a brand new second year curriculum, which was instituted seamlessly and is now being used successfully. Innovative features include the table-top exercise the OM-2 residents participate in conducted during the Emergency Disaster Planning SAR in June; the 5-hour workshop on Clinical Preventive Medicine, Worksite Wellness, Behavior Change Counseling and Cultural Competency in which the OM-1 residents partake; the annual experiential learning activity - "Speaking with the Media Workshop" as part of the Environmental Health: Risk Hazard Communication and Control rotation where residents are interviewed on various OEM topics by media experts in a fictitious TV studio at the Annenberg Center on campus. Experts subject the

resident responses to constructive critiques and the process repeats itself as the residents use tools they acquire during the session to improve (*Exhibit 5*).

We continue to update our syllabus mapping our clinical rotations, SARs and longitudinal courses with ACGME, ACOEM and UPENN program competencies to ensure we cover all required items. All rotation projects are based on actual scenarios and challenges drawn from the residents' worksites, which are tackled and solutions offered. Both faculty and residents critique the presentation providing instantaneous feedback. Often the residents present their critiqued projects to their respective medical boards (*Exhibit 6*). The Research Methods Course was introduced in 2012 and has added to the ability of the program to increase mentorship of the residents in scholarly work. Outcomes of this course include 100% acceptance of resident submitted abstracts to AOHC and award of the Resident Research Prize awardees three years in a row since the course was introduced. As of 2012 our program now has a robust Internal Track. The Internal Track resident(s) complete their clinical rotations at the Philadelphia Veteran's Administration Medical Center and at the Hospital of the University of Pennsylvania. Their curriculum is otherwise exactly the same as the External Track residents.

We have established the Grand Round sessions live via *GlobalMeet* for faculty development and invite site supervisors and rotation directors to partake in the Grand Rounds with the residents. We hope to add journal club to the offering via *Global Meet*. Faculty participate with positive reviews. Another added feature to the program is the "Site Visitor Panel" composed of the PD, program faculty as well as former residents, selected by the program directors who are senior and knowledgeable OEM physicians. The goal is to have one visit to each resident performed by a former resident who is a member of this panel, and who will also serve as an additional mentor for the resident. This feature was requested by the residents and has achieved success.

Trainees rate the program highly and indicate that they became more competent at the completion of the program and that the program met their training needs (*Exhibit 2a & 2b*). Faculty are committed as evidenced by our low turnover – we have lost two faculty one to retirement (Dr. Bonner who has nonetheless returned to teach) and one (Dr. Elizabeth Genovese, sorely missed) passed away. Faculty rate the residents' performance highly. The ability of the program to adapt to the changing needs of the residents, to the new ACGME requirements and to the changing healthcare environment and its aptitude to thrive in this climate of change.

Discussion

In keeping with the ACGME Program Requirements for Graduate Medical Education in Preventive Medicine, we have transitioned our program from being 1-year in length to being 2-years in length. In order to do so we devised an entire new curriculum for the second year, which we have been able to execute seamlessly and successfully to include six 1-month long subject area rotations (SARs) and two more graduate level courses. Many of the ideas used to help guide the curriculum for the second year of the program came from a retreat convened with RAC members and faculty members in attendance, while the program was in hiatus in 2010-2011.

The goals of the UPENN OEM Program are in keeping with the Mission of the University of Pennsylvania, which is to create the future of medicine® through: Patient Care and Service

Excellence; Educational Pre-eminence; New Knowledge and Innovation; and National and International Leadership. As regards education specifically, the mission is for the education programs to develop the next generations of leaders in medicine and biomedical research and to attract the most qualified students and trainees. UPENN has been supportive of this OEM Residency Program providing an atmosphere where, under the leadership of the PD the program can meet the needs of the residents. The program is based in the Emergency Department. The chair of the ED is a member of the Residency Advisory Committee.

Conclusions

We will continue to train OEM physician to meet the needs of the 21st century and beyond who can take their place in industry, administration, clinical venues, government and academics. Our unique, competency based, UPENN residency program is aligned with NIOSH objectives. By providing a highly successful OEM Residency training program, directed primarily at experienced physicians making a mid-career change to full-time OEM practice our program is helping address workforce shortages in the health profession and specifically in preventive medicine, and helping increase the diversity of the workforce. Our committed and dedicated faculty and staff, hardworking and motivated residents and much appreciated funding from NIOSH have been instrumental in helping us to continue to achieve and surpass our goals enabling us to contribute to the fabric of our society. We are committed to developing clinically exceptional physicians with attention to diversity who will utilize their competence and skills in their own diverse regions throughout the US.

The UPENN OEM program is *innovative* in that it takes mid-career physicians who have not had much of an option in the past at accessing formal OEM training and provides them residency training affording them to opportunity to become board certified preventive medicine-occupational medicine physicians. The UPENN program has been *successful* over this study period in that the residents in this study period have a 92% pass rate on the ABPM-OM. All graduates from this study period and over 95% of graduates since program inception (100% during the study period), have remained in the field. Our residents indicate that they are satisfied with the program and their knowledge grew substantially in all competency areas as a result of being in the program. The Our UPENN program is *productive and impactful* having produced a large number of graduates, 107 since inception of the program in 1997 with 12 currently in training. Our graduates practice OEM all over the US and in various capacities, most located in underserved areas outside the 25 largest Standard Metropolitan Statistical Areas (SMSAs). Our UPENN program helps address the *manpower shortage* by having our graduates remain in the area from which they came. Our residents and graduates are widely distributed across the United States, including Hawaii and Puerto Rico.

All residents have a *Portfolio* – electronic and paper, maintained by our residency coordinator, which houses all their academic work carried out during their tenure in UPENN OMR. This includes all their Grand Rounds and Journal Club presentation, Rotation Projects, Longitudinal Project, any outside talks they may give locally, regionally or nationally. It also houses their monthly logs that document their clinical work and procedures performed at their clinical site, as well as all evaluations of them by their site superiors, subject area rotation (SAR) directors, and patients. This Portfolio is consulted during the bi-annual feedback sessions between each resident and the PD or Associate PD. The residents can access their Portfolio at any time.

Our faculty members are involved in *faculty development* and remain active in teaching and research. They read the scientific literature, including JOEM, to help abreast of medical progress. They attend AOHC, and often present educational sessions there. Three of our faculty members are past presidents of ACOEM. The PD is the 2015 recipient of the ACOEM KEHOE Lifetime Achievement Award for Teaching and/or Research and is on 2015 AOHC planning committee. Faculty are diplomats of the ABPM and maintain their certification. They may participate in our journal club and grand rounds presentation in person or via *GlobalMeet*. We value and utilize faculty feedback to improve the program and we value their feedback from the program.

We have invited *governmental public health agencies* including the Director of NIOSH, the NIOSH Director of Science and the OSHA Medical Officer to speak with our residents on possibilities of working in government and other aspects of the public health continuum over the course of the existence of the program. Our residents have participated in rotations at NIOSH, OSHA and ATSDR and many have visited both OSHA and NIOSH in order to see firsthand the important activities carried out at these institutions. We receive notices of the NIOSH health hazard evaluations, which we distribute to our residents such that they may participate in their area to make it more relevant to them, or merely read them to gain a better understanding of the institution. The NIOSH Associate Director for Science teaches in our program annually on Surveillance and/or Exposure Assessment.

We published a description of our program in 2001 and presented our outcomes at the 2014 AOHC. We intend to publish a manuscript on our program outcomes within the next few months. We collaborate with other PDs and educators on improving OEM education and on increasing awareness of the field among medical students and residents and expect that fruit will come to bear from initiatives in this regard in the near future. We have been the largest civilian OEM residency program in the US, with the exception of the military, over the past decade and so have improved the capacity for education of OEM physicians. The UPENN OEM program has a commitment to URM which is borne out by our *proportion of URM*s in our UPENN program in recent years and since the Diversity Committee was started.

Our program continues to be *competency based* where we stress achievement of competencies rather than evaluate merely on the basis of the amount of time spent on trying to master a skill. We constantly update our competencies so that we stay current and relevant. Our program focuses on the individual, in that we meet each resident where they are. We tailor the educational experience to each resident, based on each resident's educational plan, which is written by the resident in conjunction with the site supervisor, faculty advisor and PD. An educational plan is written at the beginning of the first year and at the beginning of the second year. As such some residents may partake in supplementary activities whereas others may choose other supplementary activities. However, all resident partake of the main activities that are based on ACGME, ACOEM and other OEM core competencies.

We are dedicated to continuous improvement. Our Second year curriculum, developed and executed during this study period, guided by ACGME guidelines, ACOEM competencies, ACGME competencies, input from faculty and RAC members and resident feedback has been successful. We have been able to evaluate residents on their achievement of ACGME Occupational Medicine Milestones. We expect that our curriculum will continue to evolve in order for us to stay current. We embrace any evolution that keeps us current and relevant in order to adequately prepare our residents for the future. The UPENN program is designed to accommodate change in order to produce outstanding OEM physician in the service of the nation's workforce.

Our residents participate in the Journal Club sessions twice a month in which various aspects of completed research are discussed including the responsible conduct of research, and issues including full disclosure of possible conflicts of interest. The School of Medicine has a comprehensive program for the responsible conduct of research. Prior to the start of any research activity all residents are required to complete the on-line research Ethics Certification program and the online Patient Oriented Research (POR) Certification program. Our program fosters and develops their ability to teach as residents give numerous presentations over the course of the year. In addition UPENN residents are called upon to give several presentations before their tenure is up in the program. They present journal club articles, grand rounds, rotation projects presentations and other work. A significant part of their activities as a resident is creating presentations in power point and presenting them. Proficiency is required before graduation.

Our track record shows that we have had a successful and productive residency program. Through our innovative program we have trained residents committed to the field; virtually all our graduates (>95%) have remained working the field of OEM. Outcome measures of our past performance, indicate that our residents have superior performance on the ABPM-OM, more than half of our graduates work in underserved areas as regards occupational medicine physician density, we have a higher proportion of underrepresented minorities (URMs) than the national average (as of 2006) for residents and the institution is committed to diversity, having recently hired a Dean for Diversity. In addition, graduates report that the program met their needs and they report that their knowledge of OEM improved while in the program. The leadership transition during the grant period has been seamless as Dr. McKenzie assumed the role of PD and Dr. Emmett became the Associate PD and program Mentor. The addition of Jamie Curran as the residency coordinator has been seamless. We intend to continue this highly productive and successful competency based OEM residency program and in this way we will be able to continue to contribute to the health, well-being and productivity of the Nations' workforce, in particular and the population in general.

Publications

Research Publications, Peer-Reviewed:

Roy, B. Lopez, R. Sturdevant, R. The Evaluation and Management of the Acutely Injured Worker. *Am Fam Physician*. 2014 Jan 1;89(1):17-24

Steffen MW; Murad MH; Hays JT; **Newcomb RD**; Molella RG; Cha SS; Hagen PT. Self-Report of Tobacco use Status: Comparison of Paper-based Questionnaire, Online Questionnaire, and Direct Face-to-Face Interview – Implications for Meaningful Use, Population Health Management; 17(3):185-9, June 2014.

Newcomb, RD. Does Screening for Depression in a Medical Center Occupational Clinic Improve Outcomes? 2014. Submission pending (*Occupational Medicine*)

Vanichkachorn, G. Roy, B. Lopez, R. Sturdevant, R. The Evaluation and Management of the Acutely Injured Worker. *Am Fam Physician*. 2014 Jan 1;89(1):17-24

Berestnev KV, Moffitt GL, Vancil DS, Green-McKenzie J: Outcomes of the Introduction of a Standardized Fitness-For-Duty Evaluation of Commercial Truck Drivers in the Incidence of Low Back Pain Injuries and Workers' Compensation costs. *Journal of Occupational and Environmental Medicine* 56(4): 431-434, April 2014.

Gompf S, Velez AP, Green-McKenzie J: Leptospirosis. *Emedicine* May 2014 Notes:

<http://emedicine.medscape.com/article/220563-overview>.

Saberi P, Probert KJ, Powers M, Emmett E, McKenzie J: Field Survey of Health Perception and Complaints of Pennsylvania Residents in the Marcellus Shale Region. *Int J Env Research Pub Hlth* 11(6), June 2014.

Powers, **M. Saberi**, P. Pepino, R. Strupp, E. Bugos, E., Cannuscio, CC: Popular Epidemiology and "Fracking": Citizens' Concerns Regarding the Economic, Environmental, Health and Social Impacts of Unconventional Natural Gas Drilling Operations. *J Comm Health*, Nov 2014.

Steffen, M; Hagen, P; Benkhadra, K; Molella, R; Newcomb, RD; Murad, M. A survey of physicians' perceptions of their health care needs"; *Occup Med*; 65(1):49-53 October 2014.

Lukcso D, Guidotti T, Franklin D, Burt A. Characteristics and Building-Related Symptoms in a Federal Government Complex. *Archives of Environmental and Occupational Health* (In revision)

Saberi P. Navigating medical issues in shale territory. *New solutions: a journal of environmental and occupational health policy*. 23(1): 209-21, 2013

Roy, B. **Vanichkachorn, G.** Low Back Pain. *ACSM Health and Fitness Journal*. 2013 March/April; 17(2):5.

Sturchio GM; **Newcomb RD**; Molella R; Varkey P; Hagen PT; Schueler BA. Protective Eyewear Selection for Interventional Fluoroscopy", *Operational Radiation Safety*; vol.104, Supplement 1 February 2013.

Green-McKenzie J, Watkins M, **Shofer F**: Outcomes of a consultation program to emergency medicine clinicians for postexposure management of occupational bloodborne pathogen exposures. *American Journal of Infection Control* February 2012.

Spitzer AR, **Broadman M**. A retrospective review of the sleep characteristics in patients with chronic fatigue syndrome and fibromyalgia. *Pain practice: the official journal of World Institute of Pain*. 10(4): 294-300, Jul-Aug 2010

Drosdoweck DS, Turner RG, Lawendy AR, **Garvin G**. Periarticular neurofibroma of the shoulder: a case report. *J Bone Joint Surg Am*. 92(3): 715-20, Mar 2010

Spitzer AR, **Broadman M**. Treatment of the narcoleptiform sleep disorder in chronic fatigue syndrome and fibromyalgia with sodium oxybate. *Pain practice: the official journal of World Institute of Pain*. 10(1): 54-9, Jan-Feb 2010.

Green-McKenzie J, Shoff B: Leptospirosis in humans Textbook of Emergency Medicine January 2010 Notes: Available at: www.emedicine.com.

Nolan LA, Nolan JM, Shofer FS, Rodway N, Emmett EA. Congenital Anomalies, Labor/Delivery Complications, Maternal Risk Factors and Their Relationship with Perfluorooctanoic Acid (PFOA)-Contaminated Public Drinking Water. *Reprod Toxicol* 29: 147-155, 2010. PMCID: PMC3038105

Shoff W, Green-McKenzie J, Edwards C, Behrman A, Shepherd S.: Acute pyelonephritis. Medscape Reference March 2010 Notes: Available at: <http://emedicine.medscape.com/article/245559-overview>.

Emmett EA, Zhang H, Shofer FS, Rodway N, Desai C, Freeman D, Hufford M. Development and successful application of a “community-first” communication model for community based environmental health research. *J Occup. Environ. Med.* 51: 146-156, 2009. PMCID: PMC3074972

Nolan LA, Nolan J, Shofer FS, Rodway NV, Emmett EA. The Relationship Between Birth Weight, Gestational Age and Perfluorooctanoic Acid (PFOA)-Contaminated Public Drinking Water. *Reproductive Toxicology*, 27:231-238, 2009. PMCID: PMC3039136

Baker BA, Katya S, Greaves IA, Rice HR, **Emmett EA**, Meyer JD. Occupational Medicine Residency Graduate Survey: Assessment of Training Programs and Core Competencies. *J Occupat Environ Med.* 49: 1325-1338, 2007.

Research Publications, Peer-Reviewed Reviews

Green-McKenzie J, Pak V: What is the role of thiurams in allergy to latex products? *Journal of Occupational and Environmental Medicine* 54(5): 649-50, May 2012.

Nguyen MQ, Green-McKenzie J: What are some of the differences between the Tuberculin Skin Test (TST) and the QuantiFERON®-TB Gold test? *Journal of Occupational and Environmental Medicine.* 54(9), September 2012.

Luksco D, Green-McKenzie J: What are some terms commonly encountered by the physician expert witness? (Companion to essential elements for physicians in the role of expert witness). *Journal of Occupational and Environmental Medicine.* 52(1): 109-110, January 2010.

Luksco D, Green-McKenzie J: What are some of the essential elements physicians should consider when in the role of expert witness. *Journal of Occupational and Environmental Medicine.* 51(11): 1350-1352, November 2009.

Green-McKenzie J, Pak V, Crawford G: Thiuram allergy - a potential dermal allergy among health care workers. *AAOHN Journal* 57(4): 139-141, April 2009.

Grants

PI: Ronda Brewer, MD, MPH

Characterization of Occupational Blood Born Pathogen Exposures in Health Care Workers at a University Hospital: A Three Year Retrospective Study, The Johns Hopkins NIOSH Education and Research Center, 7/2009-6/2010 (**Judith Green-McKenzie, Co-Investigator**)

PI: Poune Saberi, MD, MPH

Field survey of health perception and complaints of Pennsylvania residents in Marcellus Shale Regions. The Center of Excellence for Environmental Toxicology (CEET) University of Pennsylvania Health System, 7/2012-6/2013 (**Judith Green-McKenzie, Faculty Advisor, Emmett E, Co-Investigator**)

Book Chapters

Vanichkachorn, G. Green-McKenzie J, Emmett E. Occupational Health Care. In Family Medicine: Principles and Practice 7th Edition. In Press.

Lukcso D. Independent Medical Evaluations In: Occupational Health Services: A Practical Approach. Eds. T. Guidotti, M. Suzanne Arnold, **D Lukcso, J Green-McKenzie**, J Bender, M Rothstein, F Leone, K O'Hara, M Stecklow: 2nd Ed. Routledge, NY 2013

Lukcso D. Impairment Assessment In: Occupational Health Services: A Practical Approach. Routledge, Eds. T. Guidotti, M. Suzanne Arnold, **D Lukcso, J Green-McKenzie**, J Bender, M Rothstein, F Leone, K O'Hara, M Stecklow: 2nd Ed. Routledge, NY 2013

Lukcso D. Drug and Alcohol Testing In: Occupational Health Services: A Practical Approach. Routledge, Eds. T. Guidotti, M. Suzanne Arnold, **D Lukcso, J Green-McKenzie**, J Bender, M Rothstein, F Leone, K O'Hara, M Stecklow: 2nd Ed. Routledge, NY 2013

Lukcso D. Employee Assistance Programs In: Occupational Health Services: A Practical Approach. Routledge, Eds. T. Guidotti, M. Suzanne Arnold, **D Lukcso, J Green-McKenzie**, J Bender, M Rothstein, F Leone, K O'Hara, M Stecklow: 2nd Ed. Routledge, NY 2013

Green-McKenzie J, Brewer McCarthy R. Occupational health and safety regulation In: Occupational Health Services: A Practical Approach, Eds. T. Guidotti, M. Suzanne Arnold, **D Lukcso, J Green-McKenzie**, J Bender, M Rothstein, F Leone, K O'Hara, M Stecklow: Eds. T. Guidotti, M. Suzanne Arnold, **D Lukcso, J Green-McKenzie**, J Bender, M Rothstein, F Leone, K O'Hara, M Stecklow: 2nd Ed. Routledge, NY 2013

Green-McKenzie J, D'Souza D: Hospitals and medical groups. Occupational Health Services: A Practical Approach Routledge, October 2012

Green-McKenzie J, Jacobs J, MacDonald C, Wood E, Stark J, Kaufman L, Jones A: Hip disorders and groin disorders: occupational medicine practice guidelines. Occupational Medicine Practice Guidelines. Hegmann K (eds.). American College of Occupational and Environmental Medicine, May 2010 Notes: Evidence-based Practice Hip Panel Co-Chair. Greaves W, **Green-McKenzie J:** Work-relatedness. Occupational Medicine Practice Guidelines. Hegmann K (eds.). American College of Occupational and Environmental Medicine, 2010. Turner D, Rempel D, **Green-McKenzie J,** Rabenhorst A: Prevention. Occupational Medicine Practice Guidelines. Hegmann K (eds.). American College of Occupational and Environmental Medicine, 2010.

Books

Guidotti T, Arnold M, **Lukcso D, Green-McKenzie J,** Bender J, Rothstein M, Leone F, O'Hara K, Stecklow M: *Occupational health services: a practical approach*. Routledge, October 2012.

Abstracts

Saito K, Shofer F, McKenzie J: Perception of Privacy with Electronic Medical Records. AOHC May 2015.

Savanoor U, Shofer F, McKenzie J: Occupational Medicine: How and Why Practitioners Entered the Field. AOHC May 2015.

Kowalski M, Pandalai S, Schulte P, **McKenzie J:** Conceptual Models to Evaluate Opioid and Benzodiazepine Medication Use in the Workplace. AOHC May 2015.

Isakari M, McKenzie J: A Lean Approach to California Worker Compensation Documentation. AOHC May 2015.

Doria M, Rooney B, **Emmett E,** Scorby W: Free Online Nutrition Program and Activity Tracker Will Help Employees Maintain Healthy Habits. AOHC May 2015.

Vearrier D, Greenberg M: Proposed Methodology for Modification of Inhalational Exposure Limits at High Altitude. AOHC May 2015

Saito K, Saberi P: Possible Environmental Exposures at Camp Lejeune, NC as seen at the VA Medical Center. Poster Presentation, September 2014. Military Exposure: Marines at Camp Lejeune, San Diego, CA. Western Occupational and Environmental Medicine annual conference.

Boquet M: Outcomes of the use of NFPA Guidelines and VO2 Max Scores in Selection of Volunteer Part-time Oilfield Firefighters from a Cohort of Offshore Platform Workers. AOHC April 2014

Malak P & Duran H: Outcomes of an Innovative Competency Based Occupational Medicine Residency. AOHC April 2014

Roach B: Influenza Mask Policy Implementation and its Possible Effects on Hospital Employee Influenza Vaccination Compliance Rates. AOHC April 2014

Steinberg R: Incidence of Violence to Transit Bus Operators in the City of Los Angeles. AOHC April 2014

Vrablik K: A Potential Source of Ozone with Concomitant Health Effects in the Hospital Environment. AOHC April 2014

Webb A: The Benefits of a Mandatory Medical Program in Federal Officers to Determine Fitness for Duty. AOHC April 2014

Vearrier D: Characterization of the Healthy Worker Effect among Residents of the United States. AOHC April 2014

McKeever RG, LaSala GS, **Vearrier D**, Greenberg MI. The effect of ginkgo biloba and panax ginseng on driving ability: A pilot study [abstract]. Clin Tox 2014;52(7):688.

LaSala GS, **Vearrier D**, Cresswell A, Greenberg MI. Initial ethylene glycol levels as a predictor of intensive care unit admission or hemodialysis [abstract]. Clin Tox 2014;52(7):747.

McKeever RG, Sexton KJ, **Vearrier D**, Greenberg MI. Characteristics of salicylate ingestions reported to the ToxIC registry [abstract]. Clin Tox 2014;52(7):808.

Okaneku J, **Vearrier D**, Greenberg, MI. The change in perceived risk associated with marijuana use in the United States from 2002 to 2012 [abstract]. Clin Tox 2014;52(7):711.

Diba R, Shofer F, McKenzie J: The effects of a 30 day limited duty policy change on time to completion of a return to work program for fire and emergency medical service members. *American Occupational Health Conference*. May 2013

McCarty P, McKenzie J, Shofer F, Emmett, E: Occupational medicine (OM) residency program survey. *American Occupational Health Conference*. May 2013.

Nguyen T, Shofer F, McKenzie J: Effects of military deployment on self-reported health risk behaviors among military members. *American Occupational Health Conference*. May 2013.

Saberi P, McKenzie J, Powers M, **Emmett E**, Probert K: Field survey of health perception and complaints of Pennsylvania residents in Marcellus Shale Regions. *American Occupational Health Conference*. May 2013.

Saberi P, McKenzie J, Powers M, **Emmett E**, Probert K: Perception of health concerns and complaints of Pennsylvania residents in Marcellus Shale Regions. *American Occupational Health Conference*. May 2013.

Duran H, Malak P, Shofer F, Emmett E, Green-McKenzie J: Outcomes of an Innovative Competency Based Occupational Medicine Residency. American Occupational Health Conference May 2013 Notes: San Antonio, Texas.

Brewer McCarthy R, Green-McKenzie J: Occupational body fluid exposures in health care workers at a university hospital: a three year retrospective study. *National Occupational Health Conference*. August 2011.

Brewer-McCarthy R, Green-McKenzie J, Taylor L: Characterization of occupational bloodborne pathogen exposures in health care workers at a university hospital: a three year retrospective study. *National Occupational Research Agenda*. July 2011.

Brewer-McCarthy R, Green-McKenzie J, Taylor L: Characterization of occupational bloodborne pathogen exposures in health care workers at a university hospital. *American Occupational Health Conference*. May 2011.

Green-McKenzie J, Brewer R, Shofer F: Characterization of occupational blood and body fluid exposures at a university hospital after the needlestick safety and prevention act. *International Conference on Occupational Health*. April 2011.

Green-McKenzie J, Drummond J: Strategies to increase underrepresented minorities in occupational and environmental medicine training programs. *US Department of Health and Human Services Office of Minority Health. Third National Leadership Summit - Eliminating Racial and Ethnic Disparities in Health: A Blueprint for Change*. US Department of Health and Human Services. February 2009.

Tables/Illustrations

APPENDIX

Exhibit 1.

The average ABPM-OM examination scores from 2008-2014

	<i>UPENN Residency</i>	<i>OM Trained</i>
	<i>Avg for your program</i>	<i>Avg for National OM residency trained</i>
2014 Core	517	502.66
2014 Specialty	501.5	477.16
2013 Core	509.4	502.69
2013 Specialty	494.6	489.84
2012 Core	537.5	509.46
2012 Specialty	515.25	487.73
2011 Core	<i>Program in Hiatus</i>	<i>Program in Hiatus</i>
2011 Specialty	<i>Program in Hiatus</i>	<i>Program in Hiatus</i>
2010 Core	476.56	463.4
2010 Specialty	474.88	476.37
2009 Core	483.5	460.79
2009 Specialty	493.83	467.92
2008 Core	480.5	464.25
2008 Specialty	669.33	544.15

Exhibit 2a.

Results of Before and After Resident Self-Assessment Against Competency Objectives and if Program 1st Year Met Training Needs (Range 1:not competent to 5:competent) 2006-2012			
Overall Average	Before Program	After Program	Program Met Needs
2006-2007	2.98	4.59	4.69
2007-2008	3.15	4.73	4.85
2008-2009	2.91	4.61	4.7
2009-2010	2.93	4.94	4.95
2010-2011	No residents in pgm		
2011-2012*	2.72	4.66	4.61
2012-2014*	2.86	4.86	4.88

Exhibit 2b.

**UNIVERSITY OF PENNSYLVANIA MEDICAL CENTER OCCUPATIONAL MEDICINE
RESIDENCY PRACTICUM OM1 YEAR**

Program Competency Summary Report - OM1

Clinical Occupational & Environmental Medicine Competencies

I. Patient Care

a. Develop proficiency in the major types of clinical encounters in Occupational and Environmental Medicine including acute injury management, fitness for duty and return to work, certifications (CDL and others), surveillance, drug and alcohol medical review officer, disability assessment, executive physical and health promotion, preplacement and consultations as to causation, management and impairment.

b. Participate in several surveillance programs, develop and implement at least one new surveillance program.

c. Manage the health status of individuals who work in diverse work settings.

d. Develop proficiency in repair of lacerations, in slit-lamp examinations, and in removal of foreign bodies from the cornea.

e. Develop and carry out health care plans using appropriate clinical guidelines in coordination with attending occupational physicians including communicating work restrictions to management for job placement and playing an active role in the overall case management of occupational injuries and illnesses.

f. Recognize outbreak events of public health significance and apply screening methods to detect substance abuse and other potential behavioral problems affecting worker performance.

g. Provide patient care that is compassionate, appropriate, and effective for the treatment of occupational and environmental medicine health problems and for the promotion of general health.

II. Medical Knowledge

a. Demonstrate knowledge about established and evolving biomedical, clinical toxicologic, and cognate (e.g. epidemiological and social-behavioral) sciences and the application of this knowledge to patient care.

Class 2013-2015 (OM1)		
OM1 Initial Rating	OM1 Final Rating	OM1 Program Met Needs
3.5	4.8	5
2.67	5	5
3.67	5	5
4	4.4	4.6
3.5	4.4	5
2.67	4.4	5
4.5	5	4.8
3.17	5	5

b. Become familiar with the causation, diagnosis management and prevention of the common and rarer occupational injuries and diseases seen in the practice of Occupational and Environmental Medicine.	3.17	5	4.8
c. Enhance knowledge of systemic pharmacotherapy, and minor surgical procedures including local injections for musculoskeletal conditions.	3	4.75	4.75
d. Enhance knowledge of scientific underpinnings and interpretation of laboratory test results used in occupational medicine including audiometry, drug and alcohol testing, spirometry and other pulmonary function measurement, imaging procedures, patch testing, toxicologic testing, Functional Capacity Evaluations, EMG/NCV Reports, MSDS Sheets, and the interpretation of industrial hygiene data and toxicologic information.	3.17	4.25	4.75
III. Practice Based Learning and Improvement			
a. Critically appraise and assimilate scientific evidence from current medical literature.	2.67	4.25	5
b. Analyze knowledge base in the full spectrum of the practice of occupational and environmental medicine; identify areas for improvement.	2.83	4.5	4.75
c. Use information technology to broaden skills and knowledge in occupational and environmental medicine.	2.67	4.5	4.75
IV. Interpersonal and Communication Skills			
a. Work effectively with other members of the clinic team including physicians, nurses, medical assistants, therapists, administrators, and support staff.	4.17	4.75	5
b. Demonstrate effective interpersonal and communication skills with patients, professional associates, primary care physicians and specialists in other disciplines, plant supervisors and management, union officials and public health and workers compensation insurance representatives.	4	4.75	5
c. Provide accurate and complete documentation of diagnosis, management and causation including that required for workers compensation and legal purposes.	3.33	4.75	5
d. Demonstrate ability to write effective reports and to understand and apply the principles underlying Independent Medical Examinations and impairment ratings.	2.67	4.5	4.75
e. Teach occupational and environmental medicine to professional audiences including the use of Power point presentation software.	3	5	4.75
V. Professionalism			
a. Carry out all expected professional responsibilities with sense of responsibility, and appropriate time management, prioritization and planning.	4.5	4.75	5
b. Display respect and altruism.	4.83	5	4.75
c. Adhere to ethical principles.	4.83	5	5
d. Be sensitive to cultural, age, gender and disability issues.	4.83	5	5
e. Demonstrate conflict resolution and problem solving skills.	4.5	4.6	5
f. Develop skills in time management, planning, work prioritization and follow through to ensure completion of tasks and projects.	4	4.4	4.8
VI. Systems-based Practice			
a. Demonstrate an awareness and responsiveness to the role of occupational and environmental medicine in providing responsive and cost-effective care which improves clinical and productivity outcomes.	2.83	4.6	5

b. Make effective use of employee assistance programs, and safety, industrial hygiene and ergonomic resources in the practice of occupational and environmental medicine.

c. Deliver effective and cost-effective care, including through appropriate and effective use of medical system and referral services.

d. Demonstrate the ability to evaluate the effectiveness and cost-effectiveness of interventions on patient outcomes.

e. Apply an understanding of Workers Compensation, Disability and Group Health Insurance in providing optimum medical services for employee populations.

Specific Rotation Competency Objectives

I. The Workplace: Hazard Recognition, Evaluation and Control

A. Recognize major types of Hazards

Physical

Chemical

Biological

Psychosocial

B. Perform hazard characterization

Perform walk-through assessment for safety and health

Interpret and appropriately request industrial hygiene surveys

C. Interpret existing standards

OSHA safety standards

Hazards communication

Lock-out, tag-out

OSHA PEL

OSHA general duty clause

Unofficial standards such as ACGIH TLVs and BEIs

EPA standards

D. Ergonomics

Recognize and evaluate ergonomic hazards

Perform a simple ergonomic job analysis for specific hazards including lifting and repetitive motion

Apply corrective workplace design and work practice interventions and controls

E. Recognize, evaluate and apply principles of control to physical hazards

Mechanical and electrical hazards

Vibration

Ionizing radiation

Radioactive contamination

Non-ionizing radiation

Lasers

Noise

Sound level measurements

High and low pressure

Dysbarism

High and low temperature

Heat stress

F. Hazard Communication

Interpret and advise on content of material safety data sheets (MSDSs)

G. Develop and Monitor Medical Programs

3	4.4	4.8
3.33	4.4	4.4
2.33	4.2	4.5
2.5	4.4	4.8
3.33	4.8	4.8
3.17	4.6	4.6
3.67	4.6	4.6
2.67	4.6	4.6
3	4.6	4.8
2.5	4.4	4.8
2.83	4.6	4.6
2.17	4.8	4.6
1.83	4.4	4.6
2.67	4.6	4.8
2.17	4.6	4.6
2.33	4.2	4.6
2.8	4.2	4.6
2.67	4.6	4.6
2.17	4.4	4.6
2	4.5	4.25
2.83	4.4	4.8
2.67	4.6	4.8
2.67	4.5	4.6
2.67	4.4	4.8
2	4.4	4.8
2.5	4.2	4.6
2.83	4.6	4.8
2.5	4.6	5
2.33	4.2	4.8
2.5	4.4	4.6
3	4.4	4.6
3.17	4.2	4.8
3.33	4.6	4.80

Respirator Clearance	3.33	4.6	4.80
Hearing conservation	3.17	5.00	4.80
H. Industrial Hygiene Control			
Recognize industrial hygiene hazards and principles of general program design	2.33	4.2	4.6
Identify key principles in the collection of industrial hygiene data	2.17	4	4.6
Perform an environmental risk analysis	2.17	4.4	4.6
Recommend appropriate personal protective equipment	2.33	4.2	4.6
Assist in development of administrative controls	2.17	4.6	4.6
Recommend the need for engineering controls	1.83	4.2	4.6
Understand the regulatory context	2.33	4	4.6
Communicate industrial hygiene findings and their consequences	1.83	4.2	4.6
I. Safety and Accident Investigation	2.00	4.25	4.40
Perform an accident investigation using principles of a fault tree	1.6	4.40	4.4
J. Workplace Culture			
Identify important characteristics of workplace culture at a workplace	3.5	4.4	4.6
Formulate measures to change workplace culture with respect to health and safety	3.5	4.4	4.6
II. The Worker: Disability and Work Fitness			
A. Disability prevention and management			
Demonstrate ability to identify issues early	3	4.6	4.8
Recognize risk factors	3.33	4.6	4.8
Manage the effects on illness or injury of			
a. Psychological issues	2.83	4.6	4.8
b. Substance abuse	3.17	4.6	4.8
c. Family	2.83	4.6	4.8
Recommend appropriate accommodations			
a. Permanent	2.83	4.6	4.6
b. Temporary	3	4.6	4.6
Develop prevention plan for recovered employees			
B. Make appropriate recommendations with regard to the Americans with Disabilities Act			
Undue risk	2.17	4.4	4.6
Direct threat	2.33	4.4	4.6
Accommodations	2.33	4.4	4.6
Preplacement examinations	2.67	4.4	4.6
C. Fitness for Duty and Return to work			
Conduct and interpret functional work capacity evaluations	3	4.8	4.8
Apply impairment ratings to examinations results	3.17	4.8	4.8
Conduct Department of Transportation (D.O.T.) examinations	3.33	4.8	4.8
Understand Principles Behind Federal Aviation Administration (F.A.A.) examinations	2.5	4.8	5
Recognize special needs and make appropriate recommendation with regard to:			
a. heavy exertional work	2.83	4.8	5
b. chemical hazards	3	5	4.8
c. hazardous waste	2.83	4.8	4.8
d. pregnant workers	2.5	4.6	4.6
e. travel	2.83	4.6	4.6
f. physical handicaps	2.5	4.6	4.6
g. injury or illnesses	2.83	4.8	4.6

D. Understand and interpret regulations and the role of government agencies			
Workers Compensation	3.17	4.8	5
D.O.T.	4	4.6	4.6
F.A.A.	3	4.6	4.6
Family and Medical leave Act (F.M.L.A.)	2.67	4.2	4.4
E. Relate recommendations to workplace culture			
Develop recommendations which are feasible and likely to succeed in terms of business imperatives and organizational culture	2.83	4.5	5.00
F. Work/Rest Cycles			
Relate effects of shift work on circadian rhythm and sleep/wake cycles	2.83	4.6	5
Recommend methods for fatigue reduction in multiple time zone flights	3	4.4	4.6
Develop rotating shift schedules	2.5	4.4	4.6
III. Organizational Management			
<u>A. Management</u>			
Develop a business plan for an occupational and environmental health service.	2.33	4.4	4.6
Apply principles of teamwork and diversity in management activities.	2.67	4.2	4.8
Apply methods of strategic planning in an occupational health setting.	2.33	4.4	4.8
Work effectively with employee representatives and organized labor.	2.67	4.2	4.8
Be aware of the goals and major areas of human resource management.	2.67	4.2	4.6
Audit and review an occupational health program	2.17	4.4	4.6
Apply monitoring tools and appreciate the health consequences of performance measurement including performance appraisal.	2.33	4	4.8
Communicate effectively with the media	2.5	4.4	4.8
Market an occupational health program	2.67	4.2	5
Design a program, establish performance indicators, and evaluate effectiveness.	2.17	4.2	5
Adapt behavior to a specific corporate context and culture	2.5	4.4	4.8
Apply conflict resolution skills in occupational and environmental health settings	2.67	4.2	4.8
<u>B. Health Administration and Economics</u>			
Be able to strategically position occupational and environmental health services within an organizations human resource policies and practices	2.67	4.2	4.4
Apply principles of quality assurance and management in an occupational health program including: quality management, risk management, demand management, case management, utilization management and practice guidelines	2.67	4.2	4.4
Apply a working knowledge to an O.M. program and provide consultation for health care delivery system, insurance concepts and benefit design	2.67	4.2	5
Develop and monitor cost containment measures	2	4.4	5
Determine the relative merits of outsourcing or in-service provision of occupational and environmental health services	1.67	4.25	5
Perform a simple cost-benefit analysis for a health measure	2	4	5
IV. Environmental Health , Risk Assessment and Risk Communication			
A. Perform a Risk Assessment	2.5	4.75	5
B. Recognize and apply principles of "Community Right to Know"	2.5	4.5	5
Interact positively with community advisory panels	2.33	4.4	5
C. Interpret result of Environmental Monitoring	2.33	4.6	5
D. Identify and make recommendations concerning human health effects			
Pulmonary	2.83	4.4	5
Reproductive	2.5	4.4	5
Neoplastic	2.67	4.6	5

Other	2.67	4.6	5
E. Assess and communicate the risks from and make diagnostic evaluations of the health effects from Environmental Exposure			
Release of industrial chemicals	2.67	4.4	4.8
Human and animal wastes	2.5	4.4	4.4
Outdoor air pollution	4.40	4.40	4.60
a. Priority pollutants	2.5	4.40	4.6
Indoor air pollution	2.67	4.4	4.6
Water pollution	2.5	4.4	4.6
Hazardous wastes			
a. Chemical	2.67	4.2	4.6
b. Radioactive	2.67	4.6	4.6
c. Infectious	2.5	4.6	4.6
Radon	2.83	4.40	4.60
8. Household chemicals	2.5	4.4	4.6
9. Pesticides	2.67	4.6	4.8
F. Hazard Communication			
Develop a risk communication program for a specific community and risk	2.33	4.4	4.80
G. Understanding and interpret regulations and the role of government agencies			
1. EPA	2.67	5.00	5.00
H. Understand the role of quality and responsible care in environmental issues	2.83	5.00	5.00
V. Population Based Occupational Medicine			
A. Ethics			
Address issues related to individual privacy and confidentiality of records	3.5	4.6	4.8
Interpret governmental regulations and make appropriate recommendations	3.33	4.6	4.8
Appreciate and be able to handle different roles including whose agent the physician is under in different circumstances	3	4.8	5
Address issues contained in a standard code of ethics, e.g., the ACOEM Code of Ethical Practice.	3	4.8	5
B. Record Keeping			
Recognize regulatory requirements for OSHA record keeping	2.67	4.6	4.80
C. Computers and informatics			
Utilize the following applications in an occupational health setting:			
a. Database Management	2.33	4.6	4.8
b. Spreadsheets	2.33	4.6	4.6
c. Word Processing	2.67	4.6	4.6
d. Patient Records	2.67	4.6	4.4
e. Billing	2.33	4.4	4.4
f. Performance Tracking	2.33	4.4	4.4
g. Disability Management	2.5	4.4	4.4
D. Health Promotion and Clinical Prevention			
Develop and implement population-based programs in the following areas:			
a. Fitness	3	4.4	4.8
b. Health Promotion	3	4.4	4.8
c. Nutrition	2.83	4.4	4.8
d. Smoking Cessation	2.83	4.4	4.8
Apply health risk assessment tools to populations	2.5	4.4	4.8
Apply screening to populations	2.67	4.4	4.8

Develop intervention for targeted high risk groups	2.5	4.4	4.8
E. Statistics and Epidemiology			
Design a simple epidemiological study	3	4.4	4.6
Interpret the results of an epidemiological study	3	4.6	4.4
Prepare a risk assessment based upon existing data	2.83	4.4	4.6
Design a medical surveillance program	2.83	4.6	4.6
Recognize and act upon regulatory reporting requirements	2.5	4.8	4.8
F. Emergency Planning			
Hazardous materials incidents	3	4.4	4.4
Disaster planning	3	4.4	4.4
G. Employee Assistance Programs			
Recognize behavioral, psychiatric and substance abuse issues in the workplace	3.17	4.6	4.6
Select appropriate counseling services	2.5	4.6	4.6
H. Develop and conduct Workplace Health Surveillance			
Medical surveillance programs	2.5	4.8	5
Data analysis of injury and illness experience	2.17	4.8	5
Identify sentinel health events	2.17	4.6	5
Perform simple cluster analysis	2.17	5	5
Derive appropriate intervention from surveillance data	2.33	4.6	5

Exhibit 3a.

PROGRAM GRADUATES WITH PRACTICE LOCATIONS WITHIN THE 25 LARGEST STANDARD METROPOLITAN STATISTICAL AREAS FOR RESIDENTS ENTERING THE PROGRAM 2008-2015 (N=36)	
Within the 25 largest SMSAs	12
Outside the 25 largest SMSAs	24

Exhibit 3b.

2008-2015 PROGRAM GRADUATES GEOGRAPHICAL LOCATION OF EMPLOYMENT (N=36)	
Northeast	(NY – 2 , PA – 11) 13
Mid-Atlantic	(DC – 1, VA – 3,) 4
Midwest	(MO – 2, MI – 1, OH – 2, WI – 1) 6
Mountain & Southwest	(CO – 1, NV – 2) 3
Southeast	(LA – 2) 2
West Coast & Hawaii	(CA – 7) 7
U.S. Territories	(PR – 1) 1

Exhibit 3c.

Program Graduates' Types of Employment for Residents entering the program 2008-2015 (N=36)	
• Industry	4
• Government	4
• University	2
• Hospital System based	1
• Occupational Medicine Clinical Group	14
• Private Group	1
• Unknown	0

Exhibit 4.**Diversity Committee of The University of Pennsylvania Occupational Medicine Residency Program – Annual Report**

June 2014

The Diversity Committee of the University of Pennsylvania Occupational Medicine Residency met in October 2013 and March 2014. Dr. Arthur Webb presented at the Student National Medical Association in April 2014. Dr. Webb reports: My time at SNMA was a great way to educate medical students about the field of Occupational Medicine. Very few medical students if any are aware of the specialty, what it entails, and how it differs from other specialties. One of the benefits of the conference was the exposure to so many young and energetic underrepresented medical students. There were questions about our specialty and the University of Pennsylvania residency program.

As we all know, the field of Occupational Medicine is filled with physicians who have migrated from other specialties. So regardless of the initial specialty of choice of these up and coming medical students, it is always nice to make them aware of our specialty for their consideration in the future.

Dr. Harry Duran co-authored a poster for the April 2014 AOHC meeting in San Antonio, TX. The poster, Outcomes of an Innovative, Competency Based Occupational Medicine Residency, was co-authored by: Harry Leo Duran, MD, MPH, PhD, Paul Malak, MD, MPH, CHCQM, Frances Shofer, PhD, Edward Emmett, MD, MBBS, and Judith Green-McKenzie, MD, MPH. Dr. Gail Northcross represented the UPENN OMR and distributed UPENN OMR recruitment information at the ACOEM chapter of the Western Occupational and Environmental Medicine Association (WOEMA) in Hawaii in 2013.

Records from the University of Pennsylvania Occupational Medicine Residency (UPENN OMR) indicated that there were 6 under-represented minority graduates from 2000 – 2013; 5 African-Americans, and 1 Hispanic. This year, 2014 there will be 2 African American and 1 Hispanic graduates. In the past 3 years (2011-2014) 5 underrepresented minority residents have completed the UPENN OMR; 3 African-Americans and 2 Hispanics. Outreach ideas included ongoing presentations on OEM at the SNMA, recruitment campaigns at the AOHC and ACOEM regional chapters (eg. WOEMA) and to strategize means of making OEM better known among medical students as a residency option.

Respectfully submitted: Harry Leo Duran MD, MPH, PhD, Class of 2014

Exhibit 5.**DIAGRAMMATIC REPRESENTATION OF ORGANIZATION OF DIDACTIC SESSIONS**

Year 1: COMPETENCY SUBJECT AREA ROTATIONS (3 DAYS PER MONTH)	
MONTHS	ROTATION
JULY	Introduction – General
AUGUST/SEPTEMBER	Workplace (Industrial Hygiene, Safety and Ergonomics)
OCTOBER/NOVEMBER	Organizational Management
DECEMBER/JANUARY	Environmental hazards, Risk Assessment and Risk Communication
FEBRUARY/MARCH	Population Based Occupational Medicine
APRIL/MAY	Worker, Disability and Work Fitness
JUNE	Bridging month: Introduction to the 2 nd year Curriculum and Design of 2 nd year Educational Plan Topics

Year 2: COMPETENCY SUBJECT AREA ROTATIONS AND EXPERIENCES	
MONTH	ROTATION
JULY	Longitudinal Project / Elective
AUGUST	Leadership, Resiliency Training and Team Building
SEPTEMBER	Longitudinal Project / Elective
OCTOBER	Longitudinal / Elective
NOVEMBER	Advanced and Emerging Topics in Organizational Management and Healthcare
DECEMBER	Longitudinal Project / Elective
JANUARY	Career and Personal Development; Negotiation Skills; Travel Medicine;
FEBRUARY	Longitudinal Project / Elective
MARCH	Practical Industrial Hygiene and Environmental Health
APRIL	Disaster Preparedness and Emergency Management Level II;
MAY	Longitudinal Project / Elective
JUNE	Advanced Clinical Topics Graduation

Exhibit 6.

Examples of Resident Subject Area Rotation Projects & and Second Year Projects Trainee Project Titles

Resident Class of 2013-2015

Marcia Isakari

The Workplace: Formaldehyde Exposure a Risk Control Plan

Organizational Management Project: A Lean Approach to California Work Compensation Document

Environmental Health: Review of a Superfund Site: Lab for Energy-related Health Research (LEHR)

Population Based OM Project: A California small-sized suburban Fire Dept: Injury Analysis

The Worker: Disability and Work Fitness Project: Wellness-Fitness Program for a Municipal Fire Department

2nd Year Project: Characterization of Injured Firefighter at City of David Proposal for Medical Director Services to small and medium sized companies(50-500 employees)

Maria Doria

The Workplace: The Workplace: Industrial Hygiene Safety and Ergonomics Project 2013

Organizational Management Project: Improve OHS Productivity with Efficient Documentation and Proper Coding/Billing

Environmental Health: Effect of Gundersen Envision® Program on the Community

Population Based OM Project: Gundersen MyHealth Screen Weight Management Program and Tracking

The Worker: Disability and Work Fitness Project: Implementing Pre-placement Work Screen for Label Printing Company

2nd Year Project: Free online nutrition program and activity tracker will help employees maintain healthy habits.

Michele Kowalski

The Workplace: Industrial Hygiene, Safety and Ergonomics

Organizational Management Project: A Case for the Patient Centered Medical Home

Environmental Health: Risk of Motor Vehicle Accidents with Natural Gas Drilling

Population Based OM Project: A Study of Eye Symptoms among natural gas workers

The Worker: Disability and Work Fitness Project: Safety sensitive jobs and the use of Vicodin or other potentially sedating drugs

2nd Year Project: Conceptual Models to Evaluate Opioid and Benzodiazepine Medication Use in the Workplace as a part of the "The Risk Factor Compendium Research Project

Kenji Saito

The Workplace: Reviving Hearing Conservation Program at the Philadelphia VAMC

Organizational Management Project: Federal Workers' Compensation at the Philadelphia VA Medical Center

Environmental Health: Asbestos

Population Based OM Project: Perception of Privacy and Electronic Medical Records

The Worker: Disability and Work Fitness Project: Implementing and Evaluating a Training Program for Vision Examination in Early Diagnosis in Mild Traumatic Brain Injury
2nd Year Project: Perception of Privacy with Electronic Medical Records

Uma Savanoor

The Workplace: Safe Patient Handling

Organizational Management Project: OccuHealth/Employee Health Services

Environmental Health: Pharmaceutical Waste-Environmental Effects

Population Based OM Project: Population Health

The Worker: Disability and Work Fitness Project: ProMedica and Ohio BWC Pilot Claims Project

2nd Year Project: Occupational Medicine and its current awareness among Occupational medicine providers

David Vearrier

The Workplace: An Ergonomic Evaluation of Three Area Emergency Departments

Organizational Management Project: A Telemedicine Protocol for Medical Toxicology Clinic

Environmental Health: Environmental Health Risk Assessment, & Risk Communication Project

Population Based OM Project: Characterization of the Health Worker Effect among Residents of the United States

The Worker: Disability and Work Fitness Project: Environmental Exposures & Cancer

2nd Year Project: Characterization of the Health Worker Effect among Residents of the United States

Resident Class of 2012-2014

Mark Boquet: Houma, LA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Worksite Evaluation: MRSA
Organizational Management Project: Strategic Plan for Establishing an Occupational Health Clinic

Environmental Health: Risk Hazard Communication and Control Project: Benzene: Human Risk Assessment

Population Based OM Project: Medevacs Study of Workers for Fitness for Duty Exam

The Worker: Disability and Work Fitness Project: Fitness for Offshore Duty

2nd Year Project: Outcomes of the use of NFPA Guidelines and VO2 Max Scores in Selection of Volunteer Part-time Oilfield Firefighters from a Cohort of Offshore Platform Workers: A Pilot Study

David DeRegis: Ithaca, NY

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Hazard Recognition, Evaluation and Control: Noise & Hearing Conservation in the Workplace

Organizational Management Project: Surviving Medical Depositions

Environmental Health: Risk Hazard Communication and Control Project: Mesothelioma & Asbestos

Population Based OM Project: Obesity Epidemic in the United States

The Worker: Disability and Work Fitness Project: Occupational Noise Exposures

2nd Year Project: Outcomes of an Ergonomic Initiative

Harry Duran: Elko, NV

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Respiratory Protection Program

Organizational Management Project: Occupational Wellness Program

Environmental Health: Risk Hazard Communication and Control Project: Benzene: Cyanide in Gold Mining

Population Based OM Project: Obesity Among Mine Rescue Teams in Nevada

The Worker: Disability and Work Fitness Project: Worker Fitness in Mining Operations

2nd Year Project: Outcomes of an innovative Occupational Medicine Residency Program

Paul Malak: St. Louis, MO

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Workplace Evaluation and Risk Assessment

Organizational Management Project: New Corporate Office Business Plan

Environmental Health: Risk Hazard Communication and Control Project: Environmental Health Risk Assessment of Lead

Population Based OM Project: Creve Coeur Firefighters

The Worker: Disability and Work Fitness Project: The Worker Disability & Work Fitness – ADB Fitness

2nd Year Project: Outcomes of an Innovative Competency Based Occupational Medicine Residency

Beth Roach: Camp Hill, PA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Workplace Hazards

Organizational Management Project: Occupational Medicine Clinic Management

Environmental Health: Risk Hazard Communication and Control Project: Formaldehyde: An Overview of Chemical Exposure & Risk Management

Population Based OM Project: Comparison of Workers' Compensation Costs for Injured Workers

The Worker: Disability and Work Fitness Project: Return-to-Work Program Proposal: Holy Spirit Hospital

2nd Year Project: Influenza Mask Policy Implementation and its Possible Effects on Hospital Employee Influenza Vaccination Compliance Rates

Rebecca Steinberg: Los Angeles, CA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Prevention of Injuries in Janitorial Workers Utilizing Backpack Vacuums

Organizational Management Project: A Thrifty Marketing Plan to Enhance Urgent Care Traffic at ProActive Work Health

Environmental Health: Risk Hazard Communication and Control Project: Earthquake Safety in Southern California

Population Based OM Project: Comparison of the Army Tape Test with Other Non-Invasive Methods in Women Greater than Age 30

The Worker: Disability and Work Fitness Project: Alleviation of Symptoms of Shift Work Disorder with Exercise

2nd Year Project: Incidence of Violence to Transit Bus Operators in Los Angeles

Kevin Vrablik: Allentown, PA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: A Case for Digital Radiology Organizational Management Project: Health Works Respiratory Clearance PIP
Environmental Health: Risk Hazard Communication and Control Project: Measuring Ozone Produced by TRU-D SmartUVC Devices at Lehigh Valley Health Network
Population Based OM Project: The Relationship of Physician BMI on Practice Behaviors with Oversight Patients

The Worker: Disability and Work Fitness Project: Commercial Driver FFD
2nd Year Project: A Potential Source of Ozone with Commitment Health Effects in the Hospital Environment; The Relationship of Body Mass Index on Primary Care Physician Practice Care Behaviors with their Overweight and Obese Patients

Arthur Webb: Arlington, VA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Ethanol on The Ice
Organizational Management Project: Implementation of a Wellness Program for the National Science Foundation

Environmental Health: Risk Hazard Communication and Control Project: Indoor Air Quality at a Government Facility

Population Based OM Project: Comparison of Participation in an Influenza Clinic

The Worker: Disability and Work Fitness Project: Fitness for Law Enforcement Duty

2nd Year Project: The Benefits of a Mandatory Medical Program in Federal Officers to Determine Fitness for Duty

Resident Class of 2011-2013

Roxana Diba: Washington, DC

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Bloodborne Pathogens: Post- Exposure Protocol

Organizational Management Project: Wellness Programs: DC Fire Fitness Evaluation

Environmental Health: Risk Hazard Communication and Control Project: Formaldehyde

Population Based OM Project: Success of DC FEMS Return to Work Program

The Worker: Disability and Work Fitness Project: Comparison of Length of Time of Return to Work Program for District of Columbia Fire & EMS (DCFEMS) Members

2nd Year Project: Effects of How 30 Day Limited Duty Policy Change Affects the Amount of Time it Took to Complete a Return To Work Program for a Fire & Emergency Medical Service (FEMS) Members.

Luis Martinez: Ponce, PR

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Occupational Stress Program

Organizational Management Project: Corporate Health Solutions of Puerto Rico

Environmental Health: Risk Hazard Communication and Control Project: Operating Rooms and their impact to the Environment

Population Based OM Project: Influenza Vaccines

The Worker: Disability and Work Fitness Project: Weight Loss Workplace Intervention

2nd Year Project: Biosecurity and Bioterrorism Preparedness

Patrick McCarty: Sterling, VA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Bloodborne Pathogen Protocol

Organizational Management Project: Predicting a New Clinic Location Visit Flow Using Existing Proprietary Models

Environmental Health: Risk Hazard Communication and Control Project: Understanding and Preventing Malaria on your Trip to Ghana

Population Based OM Project: Pilot & Flight Attendant Vaccinations

The Worker: Disability and Work Fitness Project: Sleep Apnea Screening Study

2nd Year Project: The Impact of a Unique Occupational Medicine Residency Program on the Careers of its' Residents: Results of a Survey of Past Residents

Truong Nguyen: La Mesa, CA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Oleoresin Capsicum Spray Medical Safety Brief

Organizational Management Project: Healthy People 2020: Health and Productivity Management

Environmental Health: Risk Hazard Communication and Control Project: Formerly Utilized Defense Sites

Population Based OM Project: Effects of Military Deployment on Self-Reported Health Risk Behaviors Among Military Members

The Worker: Disability and Work Fitness Project: Reducing Musculoskeletal Injury Case Duration and Cost Using Complementary Alternative Modalities in Occupational Medicine

2nd Year Project: Effects of Military Deployment on Self-Reported Health Risk Behaviors Among Military Members

Resident Class of 2011-2012

Steven Bratman: Denver, CO

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Laradon Alternative School
Organizational Management Project: Transforming Primary care Providers into Providers of Occupational Medicine

Environmental Health: Risk Hazard Communication and Control Project: Noise Exposure

Population Based OM Project: Work Injury Rates: The Effect of the Recession

The Worker: Disability and Work Fitness Project: Getting Past 1990

Frederic Butler: Murrieta, CA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Medical Surveillance Program for Southwest Health Care Workers Exposed to Antineoplastics

Organizational Management Project: Making a Case for Digital X-ray

Environmental Health: Risk Hazard Communication and Control Project: Arsine Gas Risk Management and Communication

Population Based OM Project: Arsenic Speciation After Ingestion of Shrimp in Semiconductor Workers

The Worker: Disability and Work Fitness Project: The Association of Onsite Worker Fitness Center Participation, BMI and Lost Work Days Among Casino Workers

John Hall: San Francisco, CA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: Workplace Intervention

Organizational Management Project: Improving Patient Access in the Occupational Medicine Physical Therapy Department in San Francisco Kaiser Permanente Office

Environmental Health: Risk Hazard Communication and Control Project: Implementation of the Cal/OSHA Aerosol Transmissible Disease (ATD) Standard Training for the San Francisco Fire Dept

Population Based OM Project: Analysis of Possible Injury Reduction Attributable to Ergo Nurse
The Worker: Disability and Work Fitness Project: Measuring the Effectiveness of Implementing an Integrated Disability Management Program

Poune Saberi: Philadelphia, PA

The Workplace: Industrial Hygiene, Safety and Ergonomics Project: A Community Health Center's Occupational Exposure Control and Management Program

Organizational Management Project: How to make Occupational Medicine at Penn competitive in the Region

Environmental Health: Risk Hazard Communication and Control Project: The Story of Barium in Bradford County, PA

Population Based OM Project: Perception of Causes of Health Symptoms in Pennsylvania

The Worker: Disability and Work Fitness Project: Body Fluid Exposure at Philadelphia Veterans Affairs

LITERATURE CITED

Proceedings

- Institute of Medicine. 1988. Role of the Primary Care Physician in Occupational and Environmental Medicine. Washington, DC: National Academy Press.
- Institute of Medicine July 29th 2014. Graduate Medical Education that Meets the Nation's Health needs. Washington, DC: National Academy Press.
- Institute of Medicine 1990. Meeting Physicians' Needs for Medical Information on Occupations and Environments. Washington, DC: National Academy Press.
- Institute of Medicine 1991. Addressing the Physician Shortage in Occupational and Environmental Medicine. Washington, DC: National Academy Press.
- Institute of Medicine 1993. Environmental Medicine and the Medical School Curriculum. Washington, DC: National Academy Press.
- Institute of Medicine 1995. Environmental Medicine: Integrating a Missing Element into Medical Education. Washington, DC: National Academy Press.
- Institute of Medicine, 2000. Report of Committee to Assess Training Needs for Occupational Safety and health Personnel in the United States. Washington, DC. National Academy Press.

Guidelines

- Accreditation Council for Graduate Medical Education. (ACGME) Program Requirements for Graduate Medical Education in Preventive Medicine Effective July 1, 2011.
- American College of Occupational and Environmental Medicine (ACOEM) Core Competencies 2014. ACOEM OEM Competencies Task Force. http://www.acoem.org/uploadedfiles/publications/oem_competencies/acoem%20oem%20competencies.pdf

Articles

- American College of Physicians: Racial and Ethnic disparities in Health Care. Position paper of the American College of Physicians. March 31 2003 at <http://www.acponline.org/journals/news/may03/racial.htm>.
- APM. 1995. Report of the APM Diversity Subcommittee: Review of Issues and Initiatives in Minority Recruitment and Faculty Development. *The American Journal of Medicine*. 98:105-108
- Association of American Medical Colleges (AAMC). Minorities in Medical Education. Facts & Figures 2005, Association of American Medical Colleges, Division of Diversity Policy and Programs. Spring 2005.
- Baker BA, Dodd K, Greaves I, Zheng CJ, Brosseau, L, Guidotti T. Occupational Medicine Physicians in the United States: Demographic and Core Competencies. *J Occup Environ Med* 2007; 49:388-400.
- Baker BA, Katya S, Greaves IA, Rice HR, Emmett EA, Meyer JD. 2007. Occupational Medicine Residency Graduate Survey: Assessment of Training Programs and Core Competencies. *J Occup Environ Med* 49: 1325-1338, 2007
- Castorina J, Rosenstock L. 1990. Physician shortage in occupational and environmental medicine. *Ann. Intern. Med.* 113:983-6.
- Emmett E.A and Green-McKenzie J. 2001: External practicum-year residency training in occupational and environmental medicine. *J. Occup. Env. Med* 43:501-511.
- Green-McKenzie, J. 2006. Outcomes from the Occupational Physicians Scholarship Fund: Private Support for Residency Training. *J. Occup. Env. Med* 48:513-522.
- Green-McKenzie, J. 2003. Occupational and Environmental Medicine: a Veritable Choice. *Journal for Minority Medical Students* 15(3).
- Harber, P, Bontemps J, Saechao K, Wu S, Liu Y, Elashoff, D. Career Paths in Occupational Medicine. *J Occup Env Med* 54(11):1324-1329, November 2012.