HHS Public Access

Author manuscript

Am J Ind Med. Author manuscript; available in PMC 2024 April 12.

Published in final edited form as:

Am J Ind Med. 2011 July ; 54(7): 515–520. doi:10.1002/ajim.20964.

An Innovative Approach to Interdisciplinary Occupational Safety and Health Education

Mitchel A. Rosen, MS[1,*], **Jack Caravanos, DrPH, CIH**[2], **Debra Milek, MD**[3], **Iris Udasin, MD**[4]

[1]UMDNJ-School of Public Health, Office of Public Health Practice, Piscataway, New Jersy

[2]Hunter College, NewYork, NewYork

[3]Mount Sinai School of Medicine, NewYork, NewYork

[4]UMDNJ-Robert Wood JohnsonMedical School,Piscataway, New Jersy

Abstract

Background—The New York and New Jersey Education and Research Center (ERC) provides a range of graduate continuing education for occupational safety and health (OSH) professionals in training. A key element of the education is to provide interdisciplinary training to industrial hygienists, ergonomists, occupational medicine physicians and other health and safety trainees to prepare them for the collaboration required to solve the complex occupational health and safety problems they will face in their careers.

Methods—This center has developed an innovative interdisciplinary training approach that provides an historical aspect, while allowing the graduate students to identify solutions to occupational issues from a multi-disciplinary approach. The ERC developed a tour that brings students to sites of historical and/or contemporary significance in the occupational safety and health and environmental fields.

Results—The ERC has conducted five tours, and has included 85 students and residents as participants. 80% of participants rated the tour as providing a high amount of OSH knowledge gained. 98% of the participants felt the goal of providing interdisciplinary education was achieved.

Conclusions—This tour has been successful in bridging the OSH fields to better understand how occupational and environmental exposures have occurred, in order to prevent future exposures so that workplace conditions and health can be improved.

Keywords

safety and health education; innovative approaches; interdisciplinary education; graduate education

[*]Correspondence to: Mitchel A. Rosen, MS, UMDNJ-School of Public Health, Office of Public Health Practice, 683 Hoes LaneWest, Room 115, Piscataway, New Jersey 08854. mrosen@umdnj.edu.

INTRODUCTION

Goals and Challenges of Interdisciplinary Education

Providing interdisciplinary education to students in occupational safety and health training programs is an essential element for a well-rounded education. The National Institute for Occupational Safety and Health funds Education and Research Centers (ERCs) to focus on occupational safety and health training. ERCs are academic institutions that provide interdisciplinary graduate training and continuing education in the core occupational safety and health areas of industrial hygiene (IH), occupational health nursing (OHN), occupational medicine residency (OMR), occupational safety (OS), as well as other closely related occupational safety and health (OSH) fields [Department of Health and Human Services, 2010]. The ERCs address OSH training and research in a cross cutting and integrated manner, intended to result in cross-fertilization among the various disciplines and impact safety and health practice and research. Interdisciplinary cooperation has shown itself to be a prerequisite for being able to analyze and develop solutions to the often very aggregated and complex problems characterizing today's working environment [Limborg, 2001]. Limborg further states that these complex problems can seldom be solved by a professional from one discipline. There is "a divide between the worlds of occupational health and safety practitioners and the medical care professionals who provide services for injured workers" [Rudolph et al., 2001]. Occupational physicians need expertise in handling health and safety problems within a variety of different industries [Meyer et al., 1999]. Vincent reports that "occupational hygiene should be taught firstly in the interdisciplinary context of the whole of occupational health (including occupational medicine, OHN, OS, and ergonomics) and secondly in relation to the wider field of public health (including epidemiology and biostatistics)" [Vincent, 2005]. These articles concur on the need to provide an interdisciplinary approach to training OSH professionals. It is widely believed that integration of medicine, IH, safety, and ergonomics is important for practitioners to fully understand the ways to prevent and treat workplace injuries and illnesses.

The New York/New Jersey Education and Research Center (NY/NJ ERC) has unique challenges amongst the NIOSH sponsored Education and Research Centers (ERCs). The NY/NJ ERC is comprised of five separate educational institutions in New York and New Jersey, each having their own guidelines for course registration, varying distance education technologies, and other procedures that may only apply to one institution. The ERC members are: Mount Sinai School of Medicine (OMR), Hunter College (IH), New York University (Biomechanics/Ergonomics), New Jersey Institute of Technology (OS), and University of Medicine and Dentistry of New Jersey (Robert Wood Johnson Medical School (OMR) and School of Public Health). Each school provides graduate education in the core disciplines of OSH and the UMDNJ-SPH provides continuing education in all core areas. The NY/NJ ERC has successfully tackled geographical challenges to provide interdisciplinary training programs. The NY/NJ ERC offers two interdisciplinary courses annually, an Occupational Safety and Health seminar in the Fall semester and a plant visits course in the Spring semester. Students and faculty from all ERC programs actively participate in both courses.

In 2005, faculty conceptualized development of an OSH industrial tour in order to give trainees a sense of appreciation for the forces that shaped and continue to impact occupational health and safety. Our home base, the northeast, has many potential landmark industrial and environmental sites of historical significance. Sites that were identified include Thetford Mines, Three Mile Island, Boott Cotton Mills, Lackawanna Coal Mine, Pittsburgh steel manufacturing, Ford automobile manufacturing, hydroelectric power generation, and Love Canal. Faculty identified that these sites would provide a historical perspective for students, while teaching them the safety and health issues that workers faced in those industries. Identifying the hazards that workers face at these facilities as well as the environmental issues that arise from the industrial activity provided an excellent opportunity to demonstrate the importance of interdisciplinary education.

The NY/NJ ERC has conducted this tour, the Historical Perspectives Tour, in each of the last five program years utilizing the expertise of faculty occupational physicians, industrial hygienists, safety professionals, and ergonomists to oversee the educational activities of the trainees. The goal of the tour is to provide students with a multi-disciplinary understanding of OSH issues and to give them the opportunity to learn from each other.

METHODS

The key element to providing a trip of this kind is to identify sites that are appropriate for understanding OSH from a multi-disciplinary approach. Equally as important, the site must be receptive to the tour group, allowing group access and ideally providing staff to guide and inform the group about the most salient occupational issues of the site. An atmosphere where questions are welcomed and a desire on the part of the visited site to participate in the training experience is ideal.

Since in each year of the tours, we visited several sites over five to six days, geography is an essential consideration as the organizers must take into account travel, site visit, eating, and sleeping times.

The tour utilizes a coach tour bus to transport the students and faculty to each of the sites. The bus is not only a transportation vehicle but is utilized for trainee assignment completion while in transit as well as presentations by the trainees. Funding for the bus was obtained from NIOSH as part of the interdisciplinary activities for the ERC. Each program provides reimbursement for hotel and meal expenses to their students that participate in the tour. The ERC also provides payment for admission costs for any of the venues that are visited.

The keys to the programmatic success of the tour are related to identification of appropriate sites, the student assignments and presentations, and tour logistics. These are further discussed below.

Initial Identification of Sites

The initial selection of sites was based on discussions between ERC faculty who have long histories of interdisciplinary collaboration and who are strong supporters of this training concept for their students. The potential number of industrial sites that the NY/NJ ERC

could visit is large as the northeast was a key geographic location for the industrial revolution. Many sites of historical significance are located within ground traveling distance. In the early planning stages of the tour, faculty identified Love Canal, Three Mile Island, and the asbestos mines in Thetford Mines, Quebec as potential sites to visit. These sites are of importance in the occupational and environmental fields, as they represent major industries that impacted worker and community health. Love Canal impacted the way that hazardous wastes were managed, and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) was passed largely due to the problems at Love Canal (U.S. Environmental Protection Agency, 2004). Thetford Mines, an active asbestos mine and mill, hosts public tours of their operations. A visit would provide an opportunity for students to gain first-hand knowledge of the hazards and work conditions to which asbestos workers are exposed. Three Mile Island was a landmark case of environmental exposures for workers at the site, and for radiation and nuclear safety issues. However, the tour was not able to arrange visits to Three Mile Island due to security concerns implemented that restricted public access to the site. Once the major sites were mapped we identified other sites that fell within the route. We identified the Boott Cotton Mills in Lowell, MA, McGill University in Montreal, and Corning Glass in Corning, NY. ERC students and residents are encouraged to complete their academic programs in two years. To increase the interdisciplinary opportunities for the students, the ERC faculty created a second tour itinerary so that students in the program could participate in the tour for two years. The second year itinerary followed a path of the industrialization process, and included Lackawanna Coal Mine, Homestead Steel/Carrie Furnaces, Ford River Rouge plant, University of Toronto OSH program, Niagara Power, grain elevators, and Corning Glass.

When identifying sites to visit, it is important to understand the educational value of that site for each of the groups of students. Our program focuses on occupational medicine, IH, OS, and ergonomics. So it is essential that these disciplines or the need for these disciplines are encountered at the sites. The ability to engage with personnel from the sites produces a better opportunity to learn about the hazards and controls in place. Efforts are made by ERC Faculty to make connections with the site personnel to allow for discussion about the operations that occur at each site. Some sites provide hands on experience in wearing PPE or in performing or simulating worker activities that further enriches the experience. On some trips, participants have been required to have respirator clearance enabling them to take advantage of these opportunities. Because active industrial sites are visited and there may be hazards encountered, a form describing risks that may be encountered was developed and review by participants is required prior to a trainee being allowed to participate. Those with health issues are encouraged to seek the advice of their primary care physicians, our participant physicians and/or self-exclude from portions of the trip (Table I).

At these sites, participants were able to understand the hazards faced by the workers. For example, at the Lackawanna Coal Mine, we rode down into the mine 300 feet below the surface. In the mine, we walked through different veins, identifying the tools used and conditions in which coal miners work. The visit provides the history of the Pennsylvania coal mine, and puts into perspective the dangerous conditions and exposures that coal miners face.

Student Assignments and Presentations

Students on the Historical Perspectives Tour receive academic credit for participating in the program. The major deliverable for the students is their participation in developing an interdisciplinary presentation. Students are assigned to a group that represents each of the sites that will be visited. The groups are structured so that they include students from each of the ERC disciplines. For example, a group will be assigned to present health and safety information related to working at a coal mine. The representatives of the group will include students in the IH, safety, ergonomics, and occupational medicine programs. The purpose of the presentation is to provide background information on the site and issues related to IH, OS, occupational medicine, and ergonomics. To ensure comprehensive coverage an overview of the site includes basic information about the site in which we are visiting, the significance of the site, types of jobs and work that takes place at the site, the types of hazards faced, and how to protect the workers from those hazards. The IH student is required to identify the chemical, biological, and physical hazards, the exposed populations, and recommended controls to protect the workers at the site. The safety students are to identify the major safety hazards, recommend control methods, and identify the significant regulations that effect the industry. The occupational medicine residents are required to identify the routes of entry of hazards, pathogenesis, diseases, clinical findings, treatment, and prevention measures. The ergonomics students are to identify the types of injuries typical of the industry, risk factors for musculoskeletal diseases, inadequate environmental conditions, and possible causes and controls for the risk factors. The presentation informs the other participants of the hazards faced by workers at that site, medical issues developed from working at the site, and protective measures that should be taken to protect workers. The groups present their findings to all the other tour participants before we visit the site. Faculty lend their expertise to ensure the information is conveyed in a manner understandable to the trainees in the various disciplines.

Logistics

The logistics of developing the tour are complex and necessitate much coordination. A basic but essential element of the logistics includes securing a bus that is large enough to comfortably transport up to 30 participants. Securing hotels and rooms for the various participants in each of the areas to be visited is another area that takes a lot of coordination. Typically trainees share rooms that occasionally necessitates further coordination. Once those elements are completed, the rest of the logistics revolve around the sites that will be visited. The cost of the tour is approximately $15,000. The expenses include the bus, hotels and meals, and admission to all the sites. All costs are paid by the ERC.

Other logistical issues that need to be addressed include travel outside the United States. The trip to Thetford Mines requires that all students have valid passports, and foreign students have a proper visa to exit and return to the US. Other venues, such as the NIOSH Personal Protective Technology Lab have security issues that require the program to submit copies of international students visas. Another venue required students and faculty to complete medical questionnaire in order for participants to visit their plant.

RESULTS

The Historical Perspectives Tour was initiated in 2006, and the ERC has conducted five tours to date. Eighty-five students have participated in the tours. The distribution of students by academic discipline is displayed in Table II. The success of the tour, and the description of it to other ERC Directors, has lead to the inclusion of guests and students from other ERCs. In 2009 and 2010, students from the University of Cincinnati ERC participated in the tour. In order to increase the interdisciplinary experience for the program, the ERC included nursing students from Hunter College beginning in 2009. Additionally, NIOSH and NIEHS staff members have participated on the tour.

Evaluation

The tour is extremely successful in providing an interdisciplinary training approach to OSH. The evaluations of the program indicated that the students gained knowledge in OSH from each of the sites visited. Eighty percent rated the tour at 4 or 5 (on a five point scale with five the highest grade) on the amount of knowledge gained in OSH from each of the tour venues. The ratings are reduced due to the 2007 tour, in which only 64% of the participants rated the program, a 4 or 5. In 2007, where the tour was six days, six people indicated the tour was too long. All other years at least 83% of the participants rated the amount of knowledge gained a 4 or 5. Eighty-eight percent of the participants indicated that five days was an appropriate amount of time for the tour. In 2009, one person rated the tour as too long, while three reported to tour to be too short. Due to these results, and discussion with the ERC faculty, the trip was set for five days. Additionally, in the third year, it was decided not to visit another academic program. It was felt to be of limited educational value for the students to meet with faculty from other programs given the relatively short duration and goals of the tour. With these issues in mind, the tour route was redeveloped so that the mileage was less, and that we could fit the tour in five days. The highlight of one tour route would be the asbestos mine in Thetford Mines, Quebec. Other industries identified included the commercial fishing in New Bedford, MA. After mapping those two sites, granite quarrying in Vermont and the Hudson River PCB cleanup were identified as additional tour stops. The other tour would follow the industrial process of coal mining, steel manufacturing, automobile manufacturing, and hazardous waste disposal.

Because a main focus of the tour is to foster interdisciplinary approaches to safety and health issues at the workplace, the ability to interact with faculty and students from other disciplines is important. The participants reported that these goals were met, as 98% of the participants agreed to strongly agreed to the statement that there was sufficient time to interact with faculty from other disciplines, and 97% reported that there was sufficient time to interact with students from other disciplines. Another important part of the tour is the social aspect. Students and faculty are able to discuss issues related to OSH in an informal manner, with interaction between students and between students and faculty. Ninety-nine percent of the participants agreed or strongly agreed that there was sufficient social interaction on the tour.

The evaluations also asked students to identify how information learned on the tour will be used in their professional practice. Students provided the following quotes, which show how

the Historical Perspectives tour will impact these students in the professional practice. The following are direct quotes from the student evaluations:

> Being trained in interdisciplinary work and being exposed to experts in specific areas will continue to help me look outside the box to find solutions to many complex problems.
>
> - Eargonomics student, 2007
>
> These sites reminded me on how unsafe the workplace used to be and also to be very meticulous when I have to do an assessment in the future.
>
> - Industrial hygiene student, 2007
>
> Experiencing these working conditions and sites first hand will allow a much greater understanding of the work environment/stressors when evaluating patients.
>
> - Occupational medicine resident, 2007
>
> When I signed up for this program, I did not know I would get exposure to IH as well as occ. med. I did not know of these disciplines before this year and being exposed to these problems and methods of solutions will add to a well-rounded education.
>
> - Ergonomics/Biomechanics student 2006
>
> I will be using it in daily patient care and I now have a more practical view than before in regards to work place exposures.
>
> - Occupational medicine resident 2006
>
> The opportunity to interact with individuals from other disciplines was the most important aspect of this trip. I will definitely use the contacts that I have made with these people in my future professional endeavors. In, addition, the chance to actually see these historic sites was a once in a lifetime opportunity for me. I will never think about asbestos or cotton the same way again; forever, I will see faces connected with these materials and remember the struggles and sacrifices associated with each. And when I provide healthcare for employees, I will always remember to ask about their job responsibilities and hazards.
>
> - Occupational medicine resident 2006

The tour is extremely successful in providing an interdisciplinary training approach to OSH as well as giving important meaning and context to the work that each discipline performs.

Other outcomes that we have seen following the trip is that trainees from different disciplines began to socialize with their new colleagues. Cross-discipline and cross institutional research has also resulted from this interdisciplinary endeavor.

CONCLUSION

Developing solutions to workplace hazards requires an interdisciplinary approach, therefore the interdisciplinary experience is an important aspect to graduate OSH education. Bringing

students on site visits allows them to see the hazards that workers face, and think about the ways in which OSH professionals can make the work experience safer. Occupational physicians need to know the hazards workers will face to be able to provide the clearance for them to work. They must interface with the industrial hygienists to understand the workplace exposures. Safety professionals will evaluate the need for personal protective equipment. Physicians need to understand the limitations of the PPE, and how the PPE will effect the worker. Seeing the workers at the worksite or wearing the workers' PPE provides details and experience that cannot be taught in a classroom. Developing a tour of industrial facilities is an effective method to expose students to OSH risks at the workplace. Additionally, the appreciation of the need for interdisciplinary approaches and the building of such relationships early in their careers is another positive outcome of this experience. The approach taken by the faculty at the NY/NJ ERC can be replicated in other regions of the country.

REFERENCES

Department of Health and Human Services. 2010. Occupational Safety and Health Education and Research Centers (T42). http://grants.nih.gov/grants/guide/pa-files/PAR-06-485.html (Accessed December 16, 2010).

Limborg HJ. 2001. The professional working environment consultant – A new actor in the health and safety arena. Hum Factors Ergon Manuf 11:159–172.

Meyer JD, Becker PE, Stockdale T, Ducatman AM. 1999. The West Virginia occupational safety and health initiative: Practicum training for a new marketplace. Am J Prev Med 16:347–350. [PubMed: 10493294]

Rudolph L, Deitchman S, Dervin K. 2001. Integrating occupational health services and occupational prevention services. Am J Ind Med 40:307–318. [PubMed: 11598980]

U.S. Environmental Protection Agency. 2004. EPA Removes Love Canal From Superfund List. http://www.epa.gov/superfund/accomp/news/lovecanal.htm (Accessed December 15, 2010).

Vincent JH. 2005. Graduate education in occupational hygiene: A rational framework. Ann Occup Hyg 49:649–659. [PubMed: 16126759]

TABLE I.

Tour SitesVisited
Boott Cotton Mill, Lowell, MA (2006)
Brush Wellman, Elmore, OH (2009)
Corning Glass Manufacturing, Corning, NY (2006, 2008)
Edgar Thompson Steel, Pittsburgh, PA (2009)
Fishing Vessels, New Bedford, MA (2008, 2010)
Grain elevators, Buffalo, NY (2007)
Granite Quarry, Barre, VT (2008, 2010)
Homestead Steel, Pittsburgh, PA (2007)
LAB Chrysotile, Thetford Mines, QC (2006, 2008, 2010)
Lackawanna Coal Mine, Scranton, PA (2007, 2009)
Love Canal, Niagara, NY (2006, 2009)
McGill University, Montreal, QC (2006)
Michigan Truck Plant, Wayne, MI (2007)
New York Power Authority, Niagara, NY (2007)
NIOSH PPT Lab, Pittsburgh, PA (2009)
PCB Cleanup, Hudson River, Fort Edwards, NY (2008, 2010)
River Rouge, Dearborn, MI (2007, 2009)
Sakonnet Vineyards, Little Compton, RI (2008, 2010)
University of Toronto, Toronto, ON (2007)

TABLE II.

Number of Students Participating inTour EachYear by Discipline

	2006	2007	2008	2009	2010
Occupational medicine	6	8	4	5	3
Industrial hygiene	4	5	4	9	6
Occupational safety	1	1	1	4	5
Ergonomics	1	3	0	3	3
Public health	0	1	0	1	1
Occupational nursing	0	0	0	3	3
Total	12	18	9	25	21