

An evaluation of the undergraduate occupational health internship program at Kocaeli University's Faculty of Medicine

Cavit Işık YAVUZ, Onur HAMZAOĞLU, Çiğdem ÇAĞLAYAN, Nilay ETİLER

Aim: To evaluate the industrial occupational health internship program being used in Kocaeli University's Faculty of Medicine and determine its effect on student success.

Materials and methods: This quasi-experimental program evaluation, which uses a pre- and post-test design in order to assess the success of our workplace-based program, hopes to test the standards of achievement by senior students. These students have all been trained in the Public Health Department for 2 months during their last year in the Faculty of Medicine and spent 1 week of this period in the health units of various industrial workplaces operating in the area. All students were evaluated before and after the application.

Results: The results of 351 students, who have participated in the training program over the course of a 6-year period and who have taken the pre-test and post-test, have been assessed in the study. The average score for pre-test has been determined as 46.7 ± 10.2 and for post-test it has been determined as 72.6 ± 11.1 ($P = 0.001$). According to standards of attainment, the relative efficiency of the application evaluation has been found to be 7.6, its imputed efficiency was determined to be 75.5%, and its efficiency rate was determined to be 86.8%.

Conclusion: In the field of occupational health, doctors should not only have theoretical knowledge but should also be capable of combining their skills and education with experience. This study, which is being applied at Kocaeli University's Faculty of Medicine as an occupational health internship in undergraduate medical training, presents a unique example which increases the students' level of achievement and contributes to the multidimensional aspect of occupational health.

Key words: Workplace-based training, education, medical, undergraduate, Turkey

Kocaeli Tıp Fakültesi'nde mezuniyet öncesi işçi sağlığı stajı uygulamasının değerlendirilmesi

Amaç: Bu çalışmanın amacı, Kocaeli Üniversitesi Tıp Fakültesi'nde uygulanmakta olan endüstriyel tabanlı işyeri hekimliği staj programının öğrenci kazanımları üzerinden etkinliğinin değerlendirilmesidir.

Yöntem ve gereç: Pre-post test diazınlı yarı deneysel bir program değerlendirme araştırması olan çalışmada, işyeri tabanlı uygulama kapsamında, Tıp Fakültesi son yılında iki ay süre ile Halk Sağlığı Anabilim Dalı'nda eğitim gören ve bu sürenin bir haftalık bölümünü bölgede faaliyet sürdüren endüstri tabanlı işyeri sağlık birimlerinde sürdüren son sınıf öğrencilerinin uygulama öncesi ve sonrası bilgi düzeyleri değerlendirilmiştir.

Bulgular: Çalışmada beş yıllık sürede eğitime katılan ve ön ve son test uygulanmış 351 öğrencinin sonuçları değerlendirilmiştir. Ön test puan ortalaması $46,7 \pm 10,2$, son test ortalaması ise $72,6 \pm 11,1$ puan olarak bulunmuştur ($P = 0,001$). Başarı durumu değerlendirmesine göre uygulamanın rölatif etkililiği 7.6, atfedilen etkinliği % 75,5 ve etkililik oranı % 86,8 olarak hesaplanmıştır.

Sonuç: Meslek sağlık alanında hekim, hem teorik yeterliliğe sahip olmalı hem de bilgi ve becerilerini deneyimle birleştirebilmelidir. Kocaeli Tıp Fakültesi'nde yürütülen bu çalışma, mezuniyet öncesi tıp eğitiminde endüstriyel tabanlı

Received: 12.04.2010 – Accepted: 12.07.2010

Department of Public Health, Faculty of Medicine, Kocaeli University, Kocaeli - TURKEY

Correspondence: Onur HAMZAOĞLU, Department of Public Health, Faculty of Medicine, Kocaeli University, Kocaeli - TURKEY

E-mail: ohamzaoglu@kocaeli.edu.tr

bir uygulama olarak, öğrencilerin başarı düzeyini arttıran, mesleki sağlık eğitimi boyutuna katkı sunan özgün bir örnek oluşturmaktadır.

Anahtar sözcükler: İşyeri tabanlı eğitim, eğitim, tıp, mezuniyet öncesi, Türkiye

Introduction

The main purpose of medical training is defined as educating doctors to help their patients enjoy healthy lives (1). The environment of the workplace, which has important role in providing for the continuity of life, affect health in both direct and indirect ways. The gradually increasing importance and function of health in recent years have revealed the need to revise the medical course curriculum and new contents and forms must be created from this point of view. The issue has become so important that it is currently being discussed by top government officials, who consider undergraduate training in occupational health to be a vital issue, and state that this subject should receive more attention in medical education.

In spite of the importance of occupational health, studies have shown that medical students do not have a sufficient level of knowledge, even about subjects related to occupational exposures, such as blood-borne diseases, which are encountered during training (2). Time and student constraints are blamed for limiting the opportunities for occupational health subjects in the medical education curriculum (3). In undergraduate medical education programs, occupational health training is carried out via lessons, seminars, courses, problem-based training sessions, visits to the workplaces, projects, and study-based and clinic-based actions (3,4). In this scope, seminars and group projects contribute to learning by incorporating visits to workplaces and short-term internships in order to determine the hazards of the workplace (5-10). Occupational asthma, occupational dermatology, and occupational cancers are particularly stressed, as these conditions stand out in a number of these locations (11). The use of web-based training is being discussed as a new means of education in the field of worker's health and occupational health (12,13). What draws attention to programs which are being applied in various ways and scopes is that—both in Turkey and throughout the world—workplace-based practical internships are relatively rare. Moreover, educational sessions based on factory visits are gradually decreasing (14,15). The decline in these numbers, which may be due to a

variety of difficulties during workplace visits, is seen as a deficiency which is in urgent need of correction (15,16).

The objective of this study is to review the effect on the students' attainment levels of a structured 5-day occupational health internship which takes place at Kocaeli University's Faculty of Medicine Undergraduate training program.

The practical application in question has been conducted continuously since February 2002 and has previously been described in detail (14).

Materials and methods

Senior students in their last year at the Faculty of Medicine, who receive training at the Department of Public Health for a period of 2 months, spend one week (5 working days) of this period under the supervision of occupational physicians in the health units of industrial workplaces operating in the area (14).

A seminar is given to students prior to the launch of the application in order to introduce students to both issues of occupational health and safety and the scope of the practical application. Before the seminar, students are given a pre-test to determine their knowledge of occupational health and safety. After the 5-day apprenticeship, a post-test is administered which includes the same fields of knowledge but different questions. Both the pre-test and the post-test comprise 20 questions, weighted differently but making up 100 points in total. From this total, 16 of the questions are formed by legal arrangement questions concerning elements from the field of worker health and safety and the remaining 4 feature theoretical content.

Owing to the fact that this application has been carried out in Kocaeli, an important industrial area in Turkey, it has been possible to arrange for the internships to take place in industrial facilities. From the results of the interviews and examinations, designated industrial facilities are incorporated into the scope of the internship. One prerequisite for each

workplace's application is the employment a full-time workplace doctor in the facility. Grouped into teams of 3 or 4, students go to the health units of the factories for a 5-day period. After completing the seminar and pre-test, students work full time with occupational physicians in the specified workplace health units specified for 5 days. In the on-site health units, students are expected to participate in all routine activities, including workplace medical surveillance, process evaluation, determination of health risks, consultations, training activities, etc. In addition, they are responsible for learning about the organization of occupational health and safety services in the workplace, measurements used in occupational health, risk factors and preventive activities, and occupational injuries and diseases. During the internship a guideline containing relevant general information and a legal framework is provided, with the intention that it be used as a reference resource. Every student is also required to complete an "Occupational Health Vocational Training Portfolio" which is handed out to them before beginning the internship (14). In order to carry out the work required for this "Portfolio," students have to monitor the production process and examine both the records and statistical data and the tasks and responsibilities of the occupational physicians. Students are visited by their instructors in the work place health unit twice during the 5-day period. During these visits, the instructors conduct group discussions and, together with the supervising occupational physician, evaluate the progress of the students.

As has been discussed previously (14), the issues addressed in the pre- and post-test evaluations include the laws and practices of occupational health and safety in Turkey, health risks and hazards in the workplace, and the organization and function of workplace health units. By touching on these issues, we hope to be able to assess changes in the students' level of awareness and knowledge. In this study, the results of pre-tests and post-tests administered over a 6-year period are examined in order to provide an evaluation framework for both the program and its impact on student knowledge. It is with this purpose in mind that we have analyzed the data from students who have participated in the occupational health internship in the period between February 2002 and January 2008. In accordance with the training

schedule, 6 groups of students participate in this program every year. The number of participants in each group may vary between 10 and 15 senior students. Pre-test and post-test score averages have been compared in the analysis and Student's t-tests and paired sample tests have been used. Success rates, which were defined in accordance with the Faculty of Medicine's standard pass mark of 60%, have been compared by McNemar's chi-square test. Significance level is regarded as $P < 0.05$ in the tests. The influence of the internship on knowledge and capability about occupational health has been evaluated over relative effectiveness, imputed effectiveness, and effectiveness rate (17).

Results

The data of 384 students have been collected in the 6-year period that makes up the scope of the study. The analyses of pre-test and post-test results have been implemented on 351 students (91.4%), excluding those who for any reason (absence, illness, etc.) have not been able to take one of these tests. Student numbers for each year can be seen in Table 1. As the number of students enrolled in the Faculty of Medicine increases over the years, a certain rise in numbers can be observed; 41.1% of the 351 students who were included in this analysis represent the years 2006-2007. The pre-test and post-test average scores for all students have been found as 46.7 ± 10.2 and 72.6 ± 11.1 , respectively. The difference in between is statistically significant ($P = 0.001$, Table 2). It is also seen that when pre-test and post-test averages are compared by year, a significant difference between them is found every year (Table 3).

Table 1. The number of student participants in the occupational health internship that have been taken into our evaluation, by year.

| Years | Number | Percent |
|-------|--------|---------|
| 2002 | 24 | 6.8 |
| 2003 | 64 | 18.2 |
| 2004 | 67 | 19.1 |
| 2005 | 52 | 14.8 |
| 2006 | 76 | 21.7 |
| 2007 | 68 | 19.4 |
| TOTAL | 351 | 100.0 |

Table 2. Comparison of overall pre-test and post-test results for students who have participated in the occupational health internship.

| Test Type (n = 351) | Mean | Median | Mode | Std. Deviation | P* |
|---------------------|------|--------|------|----------------|-------|
| Pre-Test | 46.7 | 45.0 | 45 | 10.2 | 0.001 |
| Post-Test | 72.6 | 75.0 | 75 | 11.1 | |

* Paired sample t test

Table 3. Comparison of pre-test and post-test score averages of students who have participated in the occupational health internship, by year.

| Years | Pre-test Mean ± SD | Post-test Mean ± SD | P* |
|-------|--------------------|---------------------|-------|
| 2002 | 47.9 ± 9.6 | 68.6 ± 7.2 | 0.001 |
| 2003 | 46.7 ± 9.3 | 69.7 ± 9.6 | 0.001 |
| 2004 | 45.2 ± 11.3 | 69.5 ± 10.4 | 0.001 |
| 2005 | 42.5 ± 8.8 | 71.9 ± 2.9 | 0.001 |
| 2006 | 46.9 ± 9.9 | 76.3 ± 11.3 | 0.001 |
| 2007 | 50.9 ± 10.1 | 76.0 ± 10.4 | 0.001 |

* Paired sample t-test

In the comparison made of student success levels (Table 4), a statistical difference can be observed between pre-test and post-test results. According to this evaluation, the failure rate of pre-test and post-test results have been figured out as 87% and 11%, respectively (Table 5). By using these data, the relative effectiveness of the program has been determined to be 7.6, its imputed effectiveness to be 76%, and its effectiveness rate has been figured to be 87%.

Table 4. Pre-test and post-test success levels of students who have participated in the occupational health internship.

| Test Type | Successful | Unsuccessful | TOTAL |
|-----------|------------|--------------|-----------|
| | n (%) | n (%) | n (%) |
| Pre-test | 46 (13.1) | 305 (86.9) | 351 (100) |
| Post-test | 311 (88.6) | 40 (11.4) | 351 (100) |

P = 0.001, $\chi^2 = 257.18$, SD = 1, McNemar chi-square

Table 5. Rates of unsuccessful students who have participated in the occupational health internship in pre-tests and post-tests, by year.

| Academic Year | PRE-TEST Unsuccessful | | POST-TEST Unsuccessful | |
|---------------|-----------------------|------|------------------------|------|
| | n | % | n | % |
| 2002 | 20 | 83.3 | 2 | 8.3 |
| 2003 | 56 | 87.5 | 9 | 14.1 |
| 2004 | 60 | 89.6 | 9 | 13.4 |
| 2005 | 50 | 96.2 | 9 | 17.3 |
| 2006 | 66 | 86.8 | 8 | 10.5 |
| 2007 | 53 | 77.9 | 3 | 4.4 |
| TOTAL | 305 | 86.9 | 40 | 11.4 |

Discussion

Occupational health training programs in undergraduate and post-graduate institutions have long been discussed in the fields of medical education and occupational health. In fact, an examination of the issue over a 30-year period shows that these occupational health training programs are based on studies which examine the curriculum in medical departments throughout the country, both in terms of the teaching techniques in use and the contents of the curriculum, and include specialist standards regarding the field (3,4,18-21).

Wynn et al., who have have for years discussed change and the current situation in the United

Kingdom, have stated that the problem of increase, both in time and in the number of students in undergraduate medical schools, has formed pressure which has caused a decline in occupational health training (particularly with regard to workplace visits) and that this pressure does not only exist in Britain but can be seen in a number of other United Nations countries, including the USA (3). In an attempt to find a solution that would allow training programs to overcome these constraints, which particularly affect visits to industrial workplaces, it has been suggested that hospitals, the work environment in which medical students carry out their own training, may be used for this purpose and students may observe their own work environment from an occupational health point of view (22). An example of hospital environments being used as a substitute for workplace visitation was provided by Grime et al. In the study, medical students were asked to pay a visit to the kitchen, carpentry workshop, and furnace room of the hospital, to examine and report on the workplace hazards and safety precautions observed in these places, and submit their findings on a prepared form. Student evaluations were made up of a test bank consisting of various types of questions (11).

Many factors have an effect on the decline in workplace visits, but certain factors are especially emphasized, such as the difficulty of organizing visits and the logistic problems presented by excessively large groups of students (3). Our internship program, faced with the same constraints, is unique because, as explained above, it provides students the opportunity to observe occupational health procedures in industrial facilities. It also has the added benefit of being a condensed program, conducted over the course of 5 working days and given structure by the supervision of responsible academic staff and the surveillance of a workplace doctor.

During the first phase of the study, a review of literature and website research which took place in 2002, we were unable to find a similar teaching program (14). Comparing pre-test and post-test results in order to evaluate the effect of the internship on the student's level of attainment forms the last phase of the study. As explained previously, students are obligated to complete the file used

during the training experience and to carry out observations of both theoretical information and more practical occupational health applications such as determination of production flow scheme, identification of risk factors in the workplace, assessments of risk, employment examinations, and periodic examinations.

Comparisons in our study indicate a meaningful difference between the averages of pre-test and post-test results. This meaningful difference is found in both the totals and in each of the individual years examined. The increase in average scores for both tests over the course of the study may be linked with the implementation of this program which, as a result of being included in the curriculum for students in their final year in the Faculty of Medicine, has necessitated the rearrangement of theoretical lessons, including subjects of undergraduate occupational health. Accordingly, topics in occupational health have now take place in the "Theoretical Public Health Education Programs" class, which is given in the third year. Theoretical lessons, the scheduling of which is reviewed every year, form the theoretical basis of the program prior to the internship that students participate in during their final year in the Faculty of Medicine. For this reason, it is thought that the upturn seen in both pre-test and post-test averages might be linked with the re-arrangement that caused these lessons to be put into the third year curriculum. The internship itself and the theoretical background forming its base have been carefully integrated into the overall program.

In order for a doctor to acquire the correct information, skills, and attitude towards occupational health, priority should be given to occupational diseases or work accidents during medical training. Although changes in curriculum indicate an increase in the number of schools that make use of more formal programs, many of these still fall behind in providing the medical labor force the necessary knowledge and skills needed in the field of occupational health (3). The framework for evaluating a program is generally divided into 3 main categories: evaluation for accountability, evaluation for knowledge, and evaluation for development. With regards to knowledge, the purpose of evaluation is to generate insight about public problems, policies, programs,

and processes with which to develop new methods and critique old ones (23). From this perspective, the present study is focused on the effects of our occupational health internship on students' level of attainments. The results obtained from this study indicate that the internship program currently in progress in Kocaeli University's Faculty of Medicine has a positive effect on the increase in students' levels of attainment in terms of worker health and safety issues. According to our calculations, Kocaeli University's occupational health internship increases the students' standards of attainment on this subject. Had this internship not been put into action, 75.5% of the students would have remained unaware of issues concerning worker's health. It can be seen, then, that due to the internship program, student levels of attainment have increased 86.8%.

Conclusions

As determined above, medical education programs should be aware of and responsive to the relationship between health and industrial production processes. These workplaces contain many unique threats to

human health and medical departments should consider the special demands and requirements of health units in industrial facilities when developing their own curricula and skills requirements.

Quite simply, medical education must teach students about the effects of the work environment on health. Moreover, workplaces (and industrial sites such as factories, in particular) must be the places where medical training is implemented in practice.

Safe, healthy workers are the result of a team effort which is based on protective health services and doctors are important members of this team. Although the main responsibility for a worker's well-being belongs to the boss, a doctor's skill and ability to manage a medical team are essential factors for the success of a workplace health unit. In this context, doctors should not only have theoretical proficiency but also be able to combine their knowledge and skills with their experience (24). With these demands in mind, the internship program currently being run in Kocaeli University presents an authentic example to contribute to the occupational health aspect of undergraduate medical education.

References

1. Turkish Medical Association. Mezuniyet öncesi tıp eğitimi raporu 2006 (in Turkish). Türk Tabipleri Birliği (http://www.ttb.org.tr/kutuphane/mote_2006.pdf). Accessed 10 March 2008.
2. Elliott SKE, Keeton A, Holt A. Medical students' knowledge of sharps injuries. *Journal of Hospital Infection*. 2005; 60: 374-77.
3. Wynn Pa, Aw TC, Williams NR, Harrington M. Teaching of occupational medicine to undergraduates in UK schools of medicine. *Occupational Medicine* 2003; 53: 349-53.
4. Shanahan EM, Murray AM, Lillington T, Farmer EA. The teaching of occupational and environmental medicine to medical students in Australia and New Zealand. *Occupational Medicine* 2000; 50: 246-50.
5. Ribak J, Lerman Y, Froom P. Occupational health in Israel. *International Archives of Occupational and Environmental Health* 1997; 70: 73-6.
6. de la Hoz R, Parker JE. Occupational and environmental medicine in the United States. *International Archives of Occupational and Environmental Health* 1998; 71: 155-61.
7. Okubo T. The present state of occupational health in Japan. *International Archives of Occupational and Environmental Health* 1997; 70: 148-52.
8. Boillat MA, Guillemin MP, Savolainen H. The present state and practice of occupational health in Switzerland. *International Archives of Occupational and Environmental Health* 1997; 70: 361-64.
9. Netterstrom B, Grandjean P. Occupational and environmental medicine in Denmark. *International Archives of Occupational and Environmental Health* 1998; 71: 3-6.
10. Werner AF. Occupational health in Argentina. *International Archives of Occupational and Environmental Health* 2000; 73: 285-89.
11. Grime P, Williams S, Nicholson S. Medical students' evaluation of a teaching session in occupational medicine: the value of a workplace visit. *Occupational Medicine* 2006; 56: 110-14.
12. Hege I, Radon K, Dugas M, Scharrer E, Nowak D. Web-based training in occupational medicine. *International Archives of Occupational and Environmental Health* 2003; 76: 50-4.
13. Agius RM, Bagna G. Development and evaluation of the use of the Internet as an educational tool in occupational and environmental health and medicine. *Occupational Medicine* 1998; 48: 337-43.
14. Hamzaoglu O, Yavuz CI, Caglayan C, Erdogan MS, Etiler N. Undergraduate training in occupational health at Kocaeli University Medical School: a Turkish experience. *Industrial Health* 2005; 43: 677-84.

15. Wynn PA, Williams N, Snashall D, Aw TC. Undergraduate occupational health teaching in medical schools—not enough of a good thing? (Editorial) *Occupational Medicine* 2003; 53: 347-48.
16. Wynn PA, Aw TC, Williams NR, Harrington M. Teaching of occupational medicine to undergraduates in UK schools of medicine. *Medical Education* 2002; 36: 697-701.
17. Kleinbaum DG, Kupper LL, Morgenstern H. *Epidemiologic Research: Principles and Quantitative Methods*. USA: Van Nostrand Reinhold Publishing; 1982.
18. Cashman C, Slovak A. The Occupational Medicine agenda: routes and standards of specialization in Occupational Medicine in Europe. *Occupational Medicine* 2005; 55: 308-11.
19. Buranatrevedh S. 2007. A need assessment study of occupational health curriculum for Thaimedical students. *Journal of the Medical Association of Thailand* 2007; 90: 1894-1907.
20. Langley RL, Sprau DD, Dolezal JM. Assessing personal occupational safety and health training for students at U.S. medical schools. *Academic Medicine* 1992; 67: 603-05.
21. Levy BS. The teaching of occupational health in American medical schools. *Journal of Medical Education* 1980; 55: 18-22.
22. Newson-Smith MS, Nicol AG. Teaching of occupational medicine to Undergraduates (Letter to the editor). *Occupational Medicine* 2004; 54: 134-35.
23. Goldie J. AMEE Education guide No. 29: Evaluating educational programmes. *Medical Teacher* 2006; 28: 210-24.
24. DSO Avrupa Cevre ve Saglik Merkezi, Avrupa'da İş Hekimligi: Kapsam ve Yeterlilikler (In Turkish, translated from: Occupational medicine in Europe: scope and competencies. WHO). Ankara, Turkey: Turkish Medical Association publishing; 2002.