Knowledge of New Entrant Medical Students About Medical Errors in Selçuk University: An Educational Perspective

Selçuk Üniversitesinde Tıp Fakültesine Yeni Başlayan Öğrencilerin Tıbbi Hatalar Konusunda Bilgi Düzeyleri: Eğitimsel Bir Perspektif

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ABSTRACT Objective: In the recent years, medical errors and patient safety have held a great emphasis especially since the report of the Institute of Medicine was published in 1999. Medical students witness and sometimes are involved in unsafe situations, errors, adverse events etc. The first years of medical education is a chance to teach students medical errors and patient safety. The aim of this cross-sectional descriptive study was to asses the knowledge of medical students on medical errors and the effect of education on knowledge. **Material and Methods:** This study was conducted in Meram Medical Faculty of Selçuk University. We prepared a questionnaire including the definition of, attitudes towards and reporting of medical errors according to the literature on this subject. This questionnaire was given to first and second year students by the authors during a lesson in November 2007. **Results:** Study population consisted of 119 male and 123 female students. In the error definition questions although the first year students received 11.24 ± 4.64 points, second year students had 9.34 ± 5.38 points. Females had 11.30 ± 4.67 points and males had 9.14 ± 5.36 points. The most unrecognized medical error was on prophylaxis (54.4% in the first year, 60.5% in the second year). Misdiagnosis was the most recognized error in both groups. **Conclusion:** We suggest that patient safety culture can be established properly, easily and correctly if students are equipped with the required knowledge on medical errors starting from the first years of medical education. This may then improve the quality of medical staffs and institutes.

Key Words: Education, medical; medical errors; patients; safety

ÖZET Amaç: Son yıllarda, özellikle Tıp Enstitüsü'nün 1999'da yayınlanan raporundan sonra tıbbi hatalar ve hasta güvenliği büyük önem kazanmıştır. Tıp fakültesi öğrencileri, tıbbi hatalara, tehlikeli durumlara şahit olur ve bazen de bunların içinde yer alır. Tıp eğitiminin ilk yılları tıbbi hatalar ve hasta güvenliği konusunda eğitim vermek için bir şanstır. Bu tanımlayıcı, kesitsel çalışmanın amacı tıp fakültesi öğrencilerinin tıbbi hatalar konusunda bilgi düzeyini ölçmek ve bu bilgi düzeyine eğitimin etkisini araştırmaktır. **Gereç ve Yöntemler:** Bu çalışma Selçuk Üniversitesi Meram Tıp Fakültesi'nde gerçekleştirildi. Literatürdeki çalışmalardan yola çıkarak tıbbi hata tanımı, bu konudaki tutum ve tıbbi hatayı bildirme hakkında bir anket formu hazırladık. Bu anket 2007 Kasım ayında yazarlar tarafından bir ders sırasında birinci ve ikinci sınıf öğrencilerine uygulandı. **Bulgular:** Çalışma grubu 119 erkek ve 123 kız öğrenciden oluştu. Tıbbi hata tanımı ile ilgili sorularda birinci sınıf öğrencileri ortalama 11.24 ± 4.64 puan alırken, ikinci sınıf öğrencileri 9.34 ± 5.38 puan aldı. Kız öğrencilerin ortalama bilgi puanı 11.30 ± 4.67 iken, erkek öğrencilerinki 9.14 ± 5.36 puandı. Profilaksi hakkındaki soru en yüksek oranda bilinmeyen tıbbi hataydı (birinci sınıflarda %54.4, ikinci sınıflarda %60.5). Her iki sınıfta da yanlış tanı en çok bilinen tıbbi hataydı. **Sonuç:** İnanıyoruz ki, tıp eğitiminin ilk yıllarından itibaren tıbbi hatalar konusundaki bilgi düzeyini artırabilirsek, hasta güvenliği kültürü gereği gibi, kolayca ve düzgün bir şekilde yerleştirebilir. Buna bağlı olarak da sağlık çalışanlarının ve sağlık kurumlarının kalitesi artar.

Anahtar Kelimeler: Tıp eğitimi; tıbbi hatalar; hasta; güvenliği

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Apparently, while the main principle of health care is 'primum non nocere', or 'first do no harm', adverse events of many kinds is sine qua non of healthcare in reality.[1-5] Owing to the report of the Institute of Medicine "To Err is Human; Building a Safer Health System" in 1999, patient safety and medical errors have gained a key place in discussions of clinical practice and to a lesser extent, medical education.[6,7] Medical errors and their impact on patient safety have motivated leaders of health service organizations and health service researchers to seek more innovative and effective solutions to eliminate this problem.[1,4,8-13]

Even though more or less involved as Madigosky et al pointed out before, once medical students set foot into the clinical setting-short white coat or not-they join the front line of care.[14] Medical students witness and sometimes are directly involved in unsafe situations, errors, adverse events, and incomplete, excessive, or inconsistent care. In other words, patient safety is a major priority for all healthcare providers and it is a reasonable expectation that all undergraduate medical students should have the necessary competence to ensure that harm to patients is minimized in their future career as a doctor.[10] Education and training have a key role to play in achieving this goal that a more fundamental change is required within healthcare curricular: a clear acknowledgement of the importance of a systems approach in creating a patient safety culture and the inclusion of aspects of human factors theory from the outset of healthcare educational programs.[8,15-18] 'To change the culture of healthcare organizations, the new generation of health care professionals should be taught about adverse events and how to trap and mitigate errors.[7,11,18,19]

Academic health centers can enhance transparency in health care by preparing new physicians for the challenges of recognizing and disclosing errors.[7,14,16,17,19-21] This, in fact, requires implementing education about patient safety and medical errors in undergraduate medical education and assessing the knowledge, perception and experience of medical students.

The literature on preventing medical errors in general is rapidly evolving. However, there has been less attention to the perception of errors by medical students and to the role they could have in error prevention.[18,22,23] All members of the health care team, including medical students, should be able to recognize unsafe conditions, systematically report errors and near misses, investigate and improve such systems with a thorough understanding of human fallibility, and disclose errors to patients.[14,24]

Few studies have been published about the attitudes of undergraduate medical students towards reporting and handling adverse events and none of them was from Turkey. With this study, we aimed to assess the effect of a very limited education on knowledge of medical errors in undergraduate medical students.

MATERIAL AND METHODS

This is a descriptive and cross-sectional study. In early 2007-2008, although not in the curriculum, one hour was reserved in the medical ethic lessons to medical errors and patient safety to raise awareness about this issue. During the first term of 2008, there were 164 first and 186 second-year medical students in Selçuk University Meram Medical Faculty. They were required to complete an anonymous questionnaire about medical errors in their classroom settings during a lesson. The study population consisted of all students who were present in the classroom at that specific hour (114 first year and 128 second year students). This questionnaire was designed by the authors because there is no validated scale in the literature. Participants were informed about the objectives of the study and informed consent was obtained from each participant. This questionnaire aimed to ascertain medical undergraduate students' definition of medical errors and attitudes towards medical errors when they make or witness an error. It was pilot-tested on a sample of third year medical students and was revised accordingly. Privacy of the students was guaranteed by the implementing author throughout the study who was monitoring and providing

assistance during the answering stage of the questionnaire.

Participants also provided demographic information. Demographic questions consisted of respondents' age and gender. To assess the bias about medical errors, questions were asked on the knowledge on medical education and working conditions, being a prior patient, general feelings about the doctors, general feelings about the health institutions and medical faculty preference in the final exam of high school for career selection as well as the presence of another doctor member in their family. Sixteen sentences about the definition of medical errors were designed by the authors according to different studies in the literature. The students were asked to select the sentences that they thought would be a medical error. We calculated the correct and wrong answers of 16 sentences and divided the students into two groups according to the number of correct answers. Eight correct answers were determined as the cut-off point for knowledge level. We classified the groups as inadequate knowledge with 0 to 8 correct answers and adequate knowledge with more than 8 correct answers. To determine prejudice, questions such as preference for being a doctor, presence of a doctor in their family, being a prior patient, positive or negative feelings about doctors and health care institutions, receiving information on medical education and social conditions before coming to the medical faculty were asked. A correlation was seeked between knowledge level and these factors. Multi-choice questions about attitudes after a mistake were also designed by the authors. In those questions, students were asked to indicate what they would do if they made an error or they witnessed an error.

Data were analyzed across demographic variables, definition of errors and attitudes to errors according to training and gender using chi-square analyses. Students were divided into two groups for the level of training based on participating in a one-hour session. Descriptive statistics included means and standard deviations for continuous variables and percentages for categorical variables. Categorical variables were compared using Pearson chi square, chi square for linear trend, and Fisher exact tests as appropriate. All tests were two tailed, and a p value less than .05 was considered significant. The data from the surveys were tabulated and analyzed using SPSS Package program.

RESULTS

The study population represents 69.9% (242/350) of the classes of first two years and is similar for the first- (69.5%, 114/164) and second-year (68.8%, 128/186) students. All the students who were present in class during the lesson in which the questionnaire was handed out answered the questionnaire. The mean age of the students was 18.9 ± 1.2 years. Approximately half of the study group was male (49.2%, n= 119). Demographic characteristics of the students are listed in Table 1.

The overall mean definition of medical error score was 10.23 ± 5.12 points. In the error definition questions, first year students received 11.24 ± 4.64 points and the second year students received 9.34 ± 5.38 points; this difference was significant ($p< 0.001$). Females had 11.30 ± 4.67 points males had 9.14 ± 5.36 points. Knowledge level of females was significantly higher than the level of males ($p< 0.002$). Table 2 presents the comparison of first and second year students and genders regarding the definition of medical errors.

Presence of a doctor in their family, positive or negative feelings to doctors ($p= 0.764$) and health care institute ($p= 0.332$) they received their medication from had no effect on the level of knowledge on errors. Students who listed the medicine faculty in the first three choices of the career exam were not different from those who did not ($p= 0.275$) in the knowledge levels except for knowledge on errors during invasive interventions or operations ($p= 0.02$).

When asked if they made a medical error what they would do, 60.7% (n= 147) stated that they would report it to the hospital committee and 68.6% (n= 166) of the students stated that they would report to the hospital committee if they witnessed a medical error. Knowledge level made a statistical difference in reporting ratios ($p= 0.026$).

TABLO 1: Demographic characteristics of medical students.

	First year students		Second year students		Total	
	n	%	n	%	n	%
Age						
Mean	18.47 ± 1.08		19.39 ± 1.01		18.94 ± 1.14	
Gender						
Male	48	42.1	71	55.5	119	49.2
Female	66	57.9	57	44.5	123	50.8
Doctor in own family						
Yes	27	23.7	34	26.6	61	25.2
No	87	76.3	94	73.4	181	74.8
Knowledge about medical education						
Yes	73	64.0	72	56.3	145	59.9
No	41	36.0	56	43.8	97	40.1
Knowledge about working conditions						
Yes	72	63.2	73	57.0	145	59.9
No	42	36.8	55	43.0	97	40.1
Being a patient before						
Yes	112	98.2	125	97.7	237	97.9
No	2	1.8	3	2.3	5	2.1
General feeling about the doctors*						
Positive	87	76.3	97	75.8	184	76.0
Negative	25	21.9	28	21.9	53	21.9
General feeling about the health institutions*						
Positive	72	63.2	68	53.1	140	57.9
Negative	40	35.1	57	44.5	97	40.1
Ideal after graduating faculty						
Being a general practitioner	7	6.1	3	2.3	10	4.1
Working in basic medical sciences	7	6.1	-	-	7	2.9
Being a physician	81	71.1	102	79.7	183	75.6
Academic career	17	14.9	21	16.4	38	15.7
Not decided yet	2	1.8	2	1.6	2	0.8

* Except five students (2.1%) who did not become ill.

Table 3 shows the comparison of reporting ratios and knowledge level.

DISCUSSION

Cook et al pointed out that an considerable number of physicians considered "delays in treatment, the use of outmoded treatments, the failure to employ needed tests, the failure to act on the results of testing, errors in administration of treatment, and the failure to communicate with staff and patients not as errors but as 'practice variances', 'suboptimal outcomes' or examples of differences in 'clinical judgment'.[24] Thus we think that the results of this study is important. This way of thinking can be formed unconsciously in the clinic years. The literature suggests that young physicians often receive mixed messages about errors as they progress in their training. Most physicians encounter medical errors for the first time as students. These experiences, combined with their consequences, can influence long-term attitudes and behaviors with regard to errors.[25] In a study by Garbutt et al although seventy-six percent of pediatricians agreed that medical errors were among the most serious problems in health care, only 56% agreed that "medical errors were usually caused by failures of systems, not failures of individuals".[11] Equipping medical students with the skills of assessing, defining, and knowing as well as educating and changing their wrong beliefs, mistakes and attitudes before they take steps into clinics is the main idea

TABLO 2: Comparison of first and second year students and genders about definition of medical errors.

Definition of Errors*	First year n	First year %	Second year n	Second year %	p	Male n	Male %	Female n	Female %	p
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Communication failures with staff and patient										
Not knows	44	18.2	45	18.6	0.580	46	19.0	43	17.8	0.551
Knows	70	28.9	83	34.3		73	30.2	80	33.1	
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Delays in treatment										
Not knows	30	12.4	45	18.6	0.138	49	20.2	26	10.7	**0.001**
Knows	84	34.7	83	34.3		70	28.9	97	40.1	
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
False diagnose										
Not knows	16	6.6	23	9.5	0.406	26	10.7	13	5.4	**0.017**
Knows	98	40.5	105	43.4		93	38.4	110	45.5	
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Use of outmoded treatments										
Not knows	35	14.4	62	25.6	**0.005**	55	22.7	42	17.4	0.055
Knows	79	32.6	66	27.3		64	26.4	81	33.5	
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Deficient monitoring										
Not knows	35	14.5	51	21.1	0.138	48	19.8	38	15.7	0.125
Knows	79	32.6	77	31.8		71	29.3	85	35.1	
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Errors during application of procedures/operations										
Not knows	29	12.0	41	16.9	0.259	46	19.0	24	9.9	**0.001**
Knows	85	35.1	87	36.0		73	30.2	99	40.9	
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Inappropriate treatment										
Not knows	28	11.6	48	19.8	**0.030**	43	17.8	33	13.6	0.119
Knows	86	35.5	80	33.1		76	31.4	90	37.2	
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Errors during application of tests										
Not knows	36	14.9	65	26.9	**0.002**	59	24.4	42	17.4	**0.015**
Knows	78	32.2	63	26.0		60	24.8	81	33.5	
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Total point of knowledge	11.24 ± 4.64		9.34 ± 5.38			9.14 ± 5.36		11.30 ± 4.67		

* Definition of medical errors part of the questionnaire contains 16 sentences about medical errors.

** Not knows means selecting 0 to 8 correct sentences from 16 sentences about definition of medical errors.

*** Knows means selecting more than 8 sentences from 16 sentences about definition of medical errors.

TABLO 3: Comparison of reporting ratios and knowledge level.

	Knowledge level*						
	Not Knows		Knows			Total	
	n**	%**	n **	%**	p	n**	% **
If you made an medical error;							
Report to the hospital committee	56	23.1	91	37.6	0.026	147	60.7
Tell to a close friend	16	6.6	21	8.7	0.941	37	15.3
Tell to the patient	28	11.6	41	16.9	0.523	9	28.5
Tell to the chief	28	11.6	71	29.3	0.000	99	40.9
Tell to nobody	15	6.2	21	8.7	0.780	36	14.9
Other	7	2.9	5	2.1	0.298	12	5.0
If you witnessed a medical error;							
Report to the hospital committee	66	27.3	100	41.3	0.061	166	68.6
Tell to a close friend	7	2.9	22	9.1	0.023	29	12.0
Tell to the patient	16	6.6	30	12.4	0.171	46	19.0
Tell to the chief	28	11.6	71	29.3	0.000	99	40.9
Tell to nobody	9	3.7	13	5.4	0.774	22	9.1
Other	15	6.2	6	2.5	0.008	21	8.7

* Knowledge level was determined according to number of correct answers in 16 medical error definition sentences. Correct answers ≤ 8 named as not knowing, correct answers >8 named as knowing.

** Answers of reporting a medical error were calculated from a multi-choice question. Because of it number of the students and the percentages seems to be higher than the study population and 100%.

of this study. Medical students do witness medical errors, with one study reporting that 76% of medical students had observed a medical error.[14] By the fourth year of medical school, 79% of students reported involvement in errors.[17] Our study population consisted of students in the preclinical years as to make the first step for future training years.

Sandars et al noted that in a symposium on patient safety education at AMEE (2006) all of 86 international participants stated that education on patient safety was important in undergraduate medial education.[10] However, only 7% stated that they thought it was adequately covered in their curriculum. We did not place this issue in our curriculum yet but we think that this study will open a road with its results.

The first step in the disclosure of a medical error is recognizing that an error has occurred.[17] Moskowitz et al pointed that the most common responses involved students' uncertainty about what defines an error.[25] Müller et al reported overall mean definition score as 13.8 ± 5.7 and there were no significant differences between genders and pre-clinical and post-clinical training years.[7] Conversely, in our study, the overall mean definition of medical error score was 10.23 ± 5.12 points and there was significant difference between genders and first and second year students. Although we could not explain the gender difference, we attributed the difference in two education years by the effect of one-hour session about medical errors and patient safety they participated in. Similarly, Moskowitz et al reported the positive effect of education.[25] In a study by Madigosky et al from the University of Missouri-Columbia, results suggested that a patient safety and medical fallibility curriculum could affect the knowledge, comfort with skills, and attitudes of second-year medical students.[14] Health professionals undergo relatively little education in harm reduction and error management techniques and organizational cultures, often leading to even simple measures (like hand washing) being unsatisfactory.[1] Similarly, our results showed that only a one-hour session could affect knowledge and attitudes.

It is essential to understand why information on errors is not reported if error reduction efforts

are to succeed and if patients' confidence in the integrity of the health care system is to be restored.[11] To improve the frequency and content of error disclosure as well as to maintain public trust, the next generation of physicians must be prepared to properly disclose medical errors.[17] For physicians, there are particular barriers to pass over and honest communication is essential for reporting errors.[11] Some authors emphasize the severity of the error as a barrier to reporting; namely less serious errors were less likely to be reported.[11,21] The more challenging situation arises when an error is made but there is no current harm.[2] In our study, we did not classify the questions on attitudes towards reporting according to the severity of errors. This study showed that knowledge level significantly improved the reporting ratios of errors to the hospital committee and to the chief of the department when medical students either made or witnessed a medical error. Garbutt et al reported that colleagues were important in discussing errors and getting information about errors.[11] Forty eight percent of respondents had discussed all types of errors with their colleagues, including serious errors. However, in this study we found that only 15.3% of students who made an error and 12.0% of students who witnessed an error told it to a colleague. In a study with students who had received formal training in patient safety, only about half reported the errors to a resident or attendant, and only 7% reported using an electronic error reporting system.[14] When practitioners witness errors made by other health care providers, they have an ethical, if not legal, obligation to act on that information. Depending on the circumstances and the magnitude of the error, options range from encouraging disclosure by the erring practitioner to discuss the situation with the hospital unit director, the department chief, risk management, or a representative from a provincial professional association.[2] Similarly, in this study, although increase in knowledge level resulted in an increase in reporting individual mistakes to the hospital committee (p= 0.026) and to the chief (p= 0.000), this increase also augmented disclosure to a close friend (p= 0.023) and to the chief (p= 0.000) when error was witnessed. However, the significance in choosing the 'I do another thing' option may also indirectly reflect that lack of knowledge puts the students in doubt when they witness an error. Milch et al noted that among 49.341 patient events reported by electronic error reporting system, 67% caused no harm, 0.8% had life threatening or permanent harm and 0.4% contributed to patient deaths.[4]

To maximize patient safety considerations the medical hierarchy needs to be balanced in favor of teaching and learning rather than the exercise of power discussing and learning from errors is still underdeveloped, with many health professionals unable to shift from the "who did it" to "what happened".[9]

Medical training must continue with real patients to improve the skills. However, there is also an obligation to provide optimal treatment and to ensure patients' safety and well-being. Balancing these two needs represents a fundamental ethical tension in medical education.[1,26,27]

When medical students set foot into the clinical setting errors in judgment, teamwork breakdowns and lack of technical competence were the most prevalent contributing factors in errors of trainees.[28] As mentioned in the General Medical Council's document, Tomorrow's Doctors: Recommendations of Undergraduate Medical Education, students should be equipped with issues of patient safety. A medical student should know how errors can happen in practice and how to manage and follow risks after errors. He/she should be aware of current developments and guiding principles for risk assessment and management strategies for health care professionals. He/she should be able to perform clinical skills safely and should know and understand the principles of treatment including the effective and safe use of medicines.[29] Malpractice claims, which are attaining importance day by day, are the other face of this important issue.[30]

Clearly, there is a need to decrease the emotional and cultural barriers in medicine, to address the "hidden curriculum" in medicine, and to facilitate a change in the culture.[16] Some authors claim

that a mutual vision in which patient safety is a priority will spur interdisciplinary education. They note that without such training, providers' beliefs and practices may not reflect "best practices" as far as patient safety is concerned. Ideally, interdisciplinary training should begin during professional education and continue throughout practice.[24,31] In conclusion, this study underlines the importance of education and the need for implementing patient safety and medical errors in the medical curriculum.

Indeed this study has several limitations. The results of this study represents only the first two years of medical education, so it should not be generalized. Future studies should assess the knowledge level and attitudes of students in the clinic years also. Self-reporting questionnaire should also call to bias.

REFERENCES

1. Wakefield A, Attree M, Braidman I, Carlisle C, Johnson M, Cooke H. Patient safety: do nursing and medical curricula address this theme? Nurse Educ Today 2005;25:333-40.
2. Hébert PC, Levin AV, Robertson G. Bioethics for clinicians: 23. Disclosure of medical error. CMAJ 2001;164:509-13.
3. Rosser W, Dovey S, Bordman R, White D, Crighton E, Drummond N. Medical errors in primary care: results of an international study of family practice. Can Fam Physician 2005; 51:386-7.
4. Milch CE, Salem DN, Pauker SG, Lundquist TG, Kumar S, Chen J. Voluntary electronic reporting of medical errors and adverse events. An analysis of 92,547 reports from 26 acute care hospitals. J Gen Intern Med 2006;21:165-70.
5. Ferner RE, McDowell SE. Doctors charged with manslaughter in the course of medical practice, 1795-2005: a literature review. J R Soc Med 2006;99:309-14.
6. Kohn LT, Corrigan JM, Donaldson MS. To Err is Human: Building a Safer Health System. 1st ed. Washington, DC: National Academy Press; 1999. p.17-188.
7. Muller D, Ornstein K. Perceptions of and attitudes towards medical errors among medical trainees. Med Educ 2007;41:645-52.
8. Roberts V, Perryman MM. Creating a culture for health care quality and safety. Health Care Manag (Frederick) 2007;26:155-8.
9. Walton MM. Hierarchies: the Berlin Wall of patient safety. Qual Saf Health Care 2006;15: 229-30.
10. Sandars J, Bax N, Mayer D, Wass V, Vickers R. Educating undergraduate medical students about patient safety: priority areas for curriculum development. Med Teach 2007; 29:60-1.
11. Garbutt J, Brownstein DR, Klein EJ, Waterman A, Krauss MJ, Marcuse EK, et al. Reporting and disclosing medical errors: pediatricians' attitudes and behaviors. Arch Pediatr Adolesc Med 2007;161:179-85.
12. Ilan R, Fowler R. Brief history of patient safety culture and science. J Crit Care 2005; 20:2-5.
13. Demiris G, Patrick TB, Austin Boren S. Assessing patient safety awareness and needs in rural hospitals in one US state. Inform Prim Care 2004;12:157-62.
14. Madigosky WS, Headrick LA, Nelson K, Cox KR, Anderson T. Changing and sustaining medical students' knowledge, skills, and attitudes about patient safety and medical fallibility. Acad Med 2006;81:94-101.
15. Milligan FJ. Establishing a culture for patient safety - the role of education. Nurse Educ Today 2007;27:95-102.
16. Halbach JL, Sullivan LL. Teaching medical students about medical errors and patient safety: evaluation of a required curriculum. Acad Med 2005;80:600-6.
17. White AA, Gallagher TH, Krauss MJ, Garbutt J, Waterman AD, Dunagan WC, et al. The attitudes and experiences of trainees regarding disclosing medical errors to patients. Acad Med 2008;83:250-6.
18. Seiden SC, Galvan C, Lamm R. Role of medical students in preventing patient harm and enhancing patient safety. Qual Saf Health Care 2006;15:272-6.
19. Patey R, Flin R, Cuthbertson BH, MacDonald L, Mearns K, Cleland J, et al. Patient safety: helping medical students understand error in healthcare. Qual Saf Health Care 2007;16: 256-9.
20. Ziv A, Ben-David S, Ziv M. Simulation based medical education: an opportunity to learn from errors. Med Teach 2005;27: 193-9.
21. Elder NC, Graham D, Brandt E, Hickner J. Barriers and motivators for making error reports from family medicine offices: a report from the American Academy of Family Physicians National Research Network (AAFP NRN). J Am Board Fam Med 2007;20: 115-23.
22. Kaldjian LC, Jones EW, Wu BJ, Forman-Hoffman VL, Levi BH, Rosenthal GE. Disclosing medical errors to patients: attitudes and practices of physicians and trainees. J Gen Intern Med 2007;22:988-96.
23. Kerfoot BP, Conlin PR, Travison T, McMahon GT. Patient safety knowledge and its determinants in medical trainees. J Gen Intern Med 2007;22:1150-4.
24. Cook AF, Hoas H, Guttmannova K, Joyner JC. An error by any other name. Am J Nurs 2004;104:32-43.
25. Moskowitz E, Veloski JJ, Fields SK, Nash DB. Development and evaluation of a 1-day interclerkship program for medical students on medical errors and patient safety. Am J Med Qual 2007;22:13-7.
26. Fischer MA, Mazor KM, Baril J, Alper E, DeMarco D, Pugnaire M. Learning from mistakes. Factors that influence how students and residents learn from medical errors. J Gen Intern Med 2006;21:419-23.
27. Ziv A, Wolpe PR, Small SD, Glick S. Simulation-based medical education: an ethical imperative. Acad Med 2003;78:783-8.

28. Singh H, Thomas EJ, Petersen LA, Studdert DM. Medical errors involving trainees: a study of closed malpractice claims from 5 insurers. Arch Intern Med 2007;167:2030-6.

29. General Medical Council. Tomorrow's doctors recommendations of undergraduate medical education. The General Medical Council, 2003, London.

30. Pakiş I, Yaycı N, Karapirli M, Polat O. [The role of legal autopsy in the investigation of death cases due to medical malpractaice].Turkiye Klinikleri J Med Sci 2008;28:30-9.

31. Uzun S, Arslan F. [Medication Errors: Scientific Letter]. Turkiye Klinikleri J Med Sci 2008; 28:217-22.