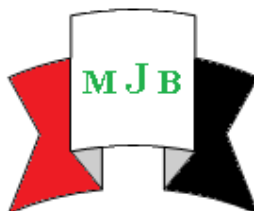


Perceptions of Seniors Toward Nosocomial Infections at College of Medicine Babylon

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Abstract

Background: This study assessed knowledge, attitudes and behaviors of medical students toward nosocomial infections, in addition to, evaluation Curriculum through advising information of some items regarding HCAs(Healthcare-associated infections) from which the medical students received their knowledge during college's study.

Methods: This is a cross-sectional study that was carried out on the final year medical students from College of Medicine, which included (106) students, at University of Babylon (Babil -Iraq) in 2013. An anonymous questionnaire consisted of four sections, with 30 items. Students' knowledge section was designed to explore students' knowledge toward nosocomial infections, while another section was designed to gather information about student's behavior, to explore student attitudes toward precautionary guidelines and perception of the risk of acquiring healthcare-associated infections by multiples questions and to evaluate advising information of some items on healthcare-associated infections for students. The Chi-square test was used for significance, a P-value (<0.05) is considered statistically significant and $p < 0.01$ is considered highly significant.

Results: The study showed the overall average of the medical students' knowledge was (68.34%) about healthcare-associated infections, however, the knowledge regarding specific areas was weak, particularly concerning the risk of transmission of infection to the hospital personnel (41.5%) and stethoscopes as a potential source of infections (43.86%). In general, their behaviors were adequate (69.38%) to reduce the risk of infections, whereas, wearing protective materials when contact with patient sometimes were only (49.06%) of them do that. Generally the attitudes were positive (68.68%). Females had (48.87%) better attitudes than males (19.81%). Advising information about some items of healthcare-associated infections are generally acceptable (50, 65%), however, about (39.62 %) of the students sometimes have been advised toward safety intravenous inserted devices and only (22.16 %) of them have been advised about stethoscope cleaning.

Conclusions: The students have adequate knowledge, positive attitudes and adequate behaviors to reduce nosocomial infections; however, advising information about some items of healthcare-associated infections was generally acceptable. These findings emphasize the need of stressing on education about this sort of infections in the health care curricula.

Keywords: Nosocomial Infection, Medical Education .

الخلاصة

أسس البحث: أجريت هذه الدراسة لتقييم المعرفة، المواقف وتصرفات طلاب المرحلة المنتهية لكلية طب بابل تجاه عدوى المستشفيات، بالإضافة إلى تقييم المنهاج الدراسي من خلال ما قدم إليهم من نصائح بخصوص هذا النوع من العدوى خلال الفصول الدراسية في الكلية.

طرق البحث: كانت هذه الدراسة مرحلية وصفية، و قد أجريت على طلاب المرحلة المنتهية لكلية الطب / جامعة بابل (في محافظة بابل/العراق) عام ٢٠١٣، مشتملة على (١٠٦) طالب. باستخدام استبيان مكون من أربعة أقسام و ٣٠ بنداً، خصص الجزء الأول منها لاستقصاء المعرفة المعلوماتية للطلاب حول موضوع عدوى المستشفيات، في حين صمم قسم آخر لجمع المعلومات حول تصرف الطلاب حيال هذه العدوى، و لتقصي مواقفهم تجاه إرشادات السلامة و مفهوم خطر الإصابة بعدوى المستشفيات من خلال أسئلة متعددة، و لتقييم النصائح المقدمة إليهم بخصوص هذا الموضوع. لقد تم

استخدام اختبار Chi – square لاستخراج الأهمية، حيث تعتبر القيمة الاحتمالية (P- value) مهمة إحصائياً إذا كانت (0.05) بينما تعتبر القيمة الاحتمالية (0.01) عالية الأهمية.

النتائج: أظهرت هذه الدراسة أن المعدل العام للمعرفة المعلوماتية حيال موضوع عدوى المستشفيات لدى طلاب الطب هو (68.34%) ، و مع ذلك فقد كانت هذه المعرفة ضعيفة في مجالات معينة ، و على وجه الخصوص خطر انتقال العدوى إلى طاقم المستشفيات (41.5%) و كذلك كون السماعات الطبية مصدراً فاعلاً لنقل العدوى (43.86%) . و بشكل عام كانت تصرفات الطلاب العملية متوسطة (69.38%) للحد من خطر انتقال العدوى ، في حين أن ارتداء المواد الواقية أثناء الاتصال بالمرضى لا يقوم به سوى (49.06%) منهم . بوجه عام كانت مواقف الطلاب إيجابية (68.68%) ، تتفوق في ذلك الإناث (48.87%) على الذكور (19.81%) . أما بالنسبة لمصادر المعرفة المعلوماتية المقدمة للطلاب بخصوص بعض بنود موضوع عدوى المستشفيات فقد كانت مقبولة (50.65%) ، حيث تلقى (39.62%) منهم النصح حول الطرق الآمنة لوضع أجهزة الإعطاء الوريدي و ما شابه ، في حين أن (22.16%) منهم فقط نصحو بتنظيف سماعاتهم الطبية.

الاستنتاجات: إن المعرفة المعلوماتية للطلاب متوسطة، مواقفهم إيجابية و تصرفاتهم العملية للحد من انتقال العدوى متوسطة، ومهما يكن فقد كانت مصادر معلوماتهم عن بعض بنود موضوع عدوى المستشفيات مقبولة بشكل عام. و تؤكد هذه النتائج الحاجة الماسة للتشديد على تعليم ما يخص هذا النوع من العدوى في المناهج الطبية الدراسية.

Introduction

Health care-associated infections have long been recognized as crucial factors bothering the quality and outcomes of health care delivery, "An infection is considered nosocomial if it becomes evident 48 hours or more after hospital admission or within 30 days of discharge following inpatient care"^[1].

Healthcare-associated infections (HAIs) or nosocomial infections were not present or incubating at the time of admission, comprise a significant burden of illness^[2].

HAIs are cause of a major and increasing morbidity and mortality in around the World as well as US. The mortality rates of healthcare-associated infections (HAIs) are varying from (5 to 35%) that making HAIs is among the ten top leading cause of death. Nosocomial infection is an identified public health problem world-wide with a prevalence rate of (3.0-20.7%) and an incidence rate of (5-10 %)^[3, 4].

About (5 to 10%) of all admissions are complicated by HAIs in both the US and Western Europe. Annually, In the US alone 1.7 million infections resulting in approximately 99,000 deaths occur and more than 177 000 infections in Australia^[5, 6].

The World Health Organization (WHO) estimates an average of 9 million individuals are affected by nosocomial infections and approximately 1 million patients die each year because of these diseases^[7].

Developing countries were reported to have up to 20 times the risk of contracting a nosocomial

infection compared with developed countries^[8]. The prevalence rate in Africa of nosocomial infections stills high. The reported rates in Tunisia (9.4%) Algeria (16.2%), Gabon (11%) and Mali (9.6%)^[7].

The economic cost of nosocomial is highly increasing in the world due to increased rates of infections; long stay in hospitals and by multiple drug-resistant organisms (MDROs) increases, only in USA according to health economist at the CDC has recently estimated hospital costs of HAIs costs \$28–45 billion annually^[9].

The most important types of HAIs are central line-associated bloodstream infections (15%), catheter-associated urinary tract infections (35%) and surgical site infections (20%) (Specifically those following abdominal hysterectomies or colon surgeries) during hospitalization. These account for a large proportion of illnesses and deaths associated with healthcare^[10].

Although infections occur in patients upon admission, healthcare workers among them medical students play a significant role as potential factors for pathogenic agents' transmission pathway for spread of infections.

In one survey, (27%) of participating health care students reported insufficient teaching about infection control in their training study^[11]. According to documentations the level of compliance with the use of proven HAIs measures by healthcare workers has been disappointing, for example, compliance with

hand hygiene among health care providers is as low as less than 40% [11,12].

This scenario should alert clinical teachers and supervisors to pay more attention to give their students throughout period of their study enough knowledge about measures to reduce nosocomial infections [13].

Methodology

The study design is a cross-sectional study to assess knowledge, behavior, attitudes of medical students and to demonstrate sources of information from which they received about HCAs.

The study was conducted during the period from January to October 2013 at teaching hospitals; (Al Hilla Teaching Hospital), (Maternity&Children Hospital) and (Marjan Teaching Hospital), located at Babil province-Iraq.

The study carried out on the final year of medical students at College of Medicine, University of Babylon, located at Babil, which included (106) of them. Prior to the study, participants were given a brief introduction to the purpose of the study, after which their consent was sought and obtained.

The questionnaire prepared by researcher according to international guidelines and another questionnaire on same aspect was used in this study

[14, 15, 16,17, 18,19].

The questionnaire consisted of four main domains, with 30 items. Students' knowledge section was designed to explore student's knowledge related to HCAs. For each statements are whether student agree, uncertain or disagree.it consisted of (10 items).Response to each item was coded and scored as a correct answer (2), uncertain (1), incorrect answer (0).

The second section was behaviors section which consisted of (10 items).This section is designed to gather information about student's behaviors. For each statement check whether student always, sometimes, never adopt each of the practices to reduce the risk of HCAs. Responsive scored was (2), (1), and (0) consequently.

The third part was Attitude's section (5 items) of the questionnaire, was designed to explore student attitudes toward precautionary

guidelines and perception of the risk of acquiring HCAs by multiples questions. Each item was scored (2) for correct answer and (0) for incorrect answer. The last information's section (5 items) was designed to ask questions about sources of student's information on nosocomial. For each statement check whether student always sometimes never learned about HCAs during curricula implementation through their study. Response to each item was coded and scored (2), (1), and (0) consequently.

The equation $(NO \times 0 + NO \times 1 + NO \times 2) / 2 \times 106 \times 100\%$, (NO=number) was used to estimate the mean percentage of any question in the research that needs to assess results of the questionnaire.

The Iraqi grading rate system was used to interpret any grading scale anywhere in the study as following: Excellent...100-90%, Very good..80-89%, Good..70-79%, Adequate...60-69%, Acceptable..50-59%, Weak. 0-49%^[20].The content of the questionnaire was validated after interviews and discussions with three experts in the field of medical education, and it was modified where necessary.

Ethical consideration

The study protocol as well as the questionnaire was authorized by Ethical Committee of the Al kindy College of Medicine, Baghdad University

Statistical Analysis

Data was analyzed by Minitab 13.1 software. Calculation of the Chi-square and for significance was used. P-value of less than (0.05) is considered statistically significant, and less than 0.01 is considered highly significant.Variables data presented as tables and figures in the study.

Results

The sample is composed of (106)students from final year. The number of males is 37 (34.91%) and females 69 (65.09%).

Answers concerning the knowledge of HCAs are shown in table1. The students correct answering about hand hygiene measures were205(96.69%), duration of intubation 194(91.50%), and the risk of invasive procedures 190(89.62%) respectively. But only 83 (41.5%) recognized the risk oftransmission infection.

Furthermore, just 93 (43.86%) knew that stethoscope is a potential source of infections. The overall average of the medical students' knowledge is adequate (68.34%) about HCAs. Table (3) shows behaviors of the students' practices to reduce the risk of HCAs.

It demonstrated that respondents sometimes were wearing protective eyewear & mask when contact with patient (49.06%).

Hands washing after hands move from infected body site to clean site (59.43%), before and after wearing gloves was (54.72%), but hand washing after dressing changes and any contact with the surgical site was (78.30%).

The respondents sometimes stayed home when they have infectious diseases such as respiratory illnesses or diarrhea (48.11%).

They sometimes took (62.26%) vaccination against hepatitis B, however, they reacted just (51.89%) toward respiratory hygiene/cough etiquette during period of increased prevalence respiratory infections in the community.

They sometimes played (48.11%) as a role modeling to health care providers, clients and families with regard to infection prevention and control strategies; in contrast, they played an educator role always (74.53%) to encourage patients to report to their health-care provider any changes in their catheter site or any new discomfort.

Table (3) shows the overall perceived of medical students was (68.68%) about risk of acquiring a HCAs.

Their attitudes were (83.02%) when they act as hospital manager to organize financially supported courses with training to support behaviors fighting infections and when they are in the surgical emergency unit attendance

(83.96%) to be always wearing gloves and mask whatever the case, however, they showed moderately weak perceived (52.83%) toward hands washing with alcohol hand gel after any events of examination despite of overcrowding and also they demonstrated weak perceived (51.89%) regarding disposing medical waste always making sure of disposing by themselves.

In general females had more correct answers (48.87%) than males (19.81%) in all questions. The table (4) revealed that the females students have been advised always (33.96%) about

standard hand-washing measures while males were (9.43%). Advising toward precautions standard was that females sometimes were advised (33.96%), whereas, males (25.47%).

The figure shows the percentage of advising that the medical students got their information's about HCAs during graduation both clinical and classroom sessions. Only 46 (43.40%) of students have been advised about the standard hand-washing while sometimes heard 63 (59.43%) about standard precautions.

They sometimes have been advised just 42 (39.62 %) toward safe intravenous (IV) cannulation or inserted devices. The students have never been advised 68 (64.15 %) about stethoscope cleaning during courses of their study; furthermore, they sometimes have been informed 58 (54.72%) of contact precaution measures.

Discussion

Medical students need to learn how to convey safer care due to the growing identification of the harms caused by health care^[21].

In this survey participants' knowledge concerning the various aspects of HCAs was generally adequate (68.34%), however, there are many areas where the knowledge was excellent and, in contrast, there are other areas where the knowledge was weak.

According to another studies conducted in same field they found high (very good) (86.3%) knowledge of medical students about HCAs, for instance, in Italy^[14].

While another studies found good knowledge (70.5%) of nosocomial infections among medical students at the College of Health Sciences, University of Ghana and also at Qazvin University of medical science in Iran revealed the students' knowledge good (79.9%) on nosocomial infections^[1, 22], in contrast, a study carried out at Shantou University Medical College (SUMC) in China demonstrated limited (acceptable) knowledge (52.5 %)^[23], moreover, another studies achieved at Rouen University (Rouen, France) found the knowledge of nursing students was better than medical students which the same results found in Italy^[14, 15].

Results from this study indicated that in general, respondents revealed adequately (69.38%) practices to perform preventive and controls measures of HCAs in many areas while in others was acceptable.

The students responded to take vaccination against hepatitis B revealed good (73.11%). The Hepatitis B Virus (HBV) is the most common occupational viral infections, however, it can be prevented by vaccination, for instance, in 1990, the HBV infection rate among unvaccinated US healthcare personnel was three to five times greater than in the US general population while the rate was reversed in 2010 five times less than in the US general population due to the introduction of routine HBV immunization and comprehensive occupational health and safety policies [24].

The students reacted good (72.16%) to hands washing after hands move from infected body site to clean site and adequately (66.98%) before and after wearing gloves. But actually not all students or health care workers are disposed to it, for instance, a study carried out in Tikrit, Iraq in 2004-2005 revealed (75%) of medical staff and employees had contaminated hands [25].

According to Sulaiha S A, *et al*, that most of students either fail to wash their hands or fail to follow the correct steps in effective hand washing during clinical practice, the overall frequency of hand washing before and after contact with patients were (6.7%) and (23.7%) respectively which are mostly very poor [26].

Another study conducted in Qassim College of Medicine, Saudi Arabia had revealed the average awareness regarding the positive indications of hand hygiene was (56%) while the (44%) of students were either not sure or unaware of the indications of hygiene [12].

In a recent systematic review by Mukerji A, *et al*, of 96 studies (with 65 studies in intensive care settings) on hand hygiene (HH) compliance of health care providers (HCPs) from developed nations, it was found that compliance rates were as low as (30–40%) in intensive care settings compared with (50–60%) in other settings [27].

In this study the students reacted weakly (46.22%) toward wearing protective eyewear

and/or mask when they were at direct contact with a patient.

The awareness was acceptable (53.3%) regarding staying home when they have infectious diseases such as febrile respiratory illnesses, Cold sores or diarrhea so that they will be a potential source of causing iatrogenic nosocomial infection for their colleagues and patients in clinical settings. According to the British General Medical Council (GMC) states that “You must consider how any infection you have may put patients or colleagues at risk” [28].

Several researches demonstrated there were weak practices and adherence regarding HCAs prevention measures among medical students, for instance, in Iran, and China practices toward standard isolation precautions were weak (33.3%) , (44.5%) respectively and also in Austria adherence is limited (weak)

(49%) and requires improvement due to only (43%) performed hygienic hand disinfection according to WHO guidelines [23, 22, 29].

The attitudes of students toward nosocomial infection in this study were adequate (68.68%), since there were significant trended very good (83.02%) to support training of medical providers to fight infection when they are at the top of administration pyramid during their career.

Students showed in present study positively perceived very good (83.96%) through compliance using of protective materials to control infections transmission in the surgical emergency unit.

In another hand, they were acceptable tendency toward hand washing with alcohol gel after any event of examination during overcrowding situations (52.83%) and also they exhibited acceptable attitudes (51.89%) about disposing medicals waste by their self, whereas, the medical students must take responsibility as early as possible in controlling infections because they are tomorrow doctors. Females were statistically significant differences ($P = 0.000$) than males gender in some aspects; for e.g. females were noted highly significant attitudes in hand washing with alcohol hand gel and cleaning spoiled floor ($p=0.000$).

This outcome seems to be nearly the same with findings by Barikani A, *et al*, who reported that

medical students had positive attitudes toward standard isolation precautions(73.7%)^[22].

In contrast, a study was done at University of Sri Jayewardenepura revealed that participants had weak attitudes(<50%),the study showed the need for further improvement of the existing hand hygiene training programs to address the gaps in knowledge, attitudes and practices^[30].

The outcome of this study exhibited that sources of students' knowledge about HCAs were generally very low, since, there is high percentage of them sometime were or not been advise about difference aspects of preventive measures on HCAs. The problem seems due to defect in curriculum which may be not properly covered or neglected this topic. In another hand, the students have not self-direct learning about this important topic.

The results of advising information of this study followed with findings by other researches, for instance,Yuanchun Huang *et al*,demonstrated that medical students have limited knowledge and practice regarding HCAs due to substantial deficiencies in their learning resources^[23].

The outcome of this study exhibited that advising information of students' knowledge about HCAs were generally acceptable (50.65%), since, majority of them were where just only (22.16%) advised to clean their stethoscope.

In addition to, they sometimes had been advised about safety (IV) cannulation or inserted devices (52.84%), whereas,Batool A. Al-Shawii, *et al* found all neonates (100%) who had invasive procedures (cannula or intravenous set) or received oxygen therapy (O₂) had bacterial infection in the Neonatal Intensive Care Unit (NICU) of the Baghdad Teaching Hospital, Iraq^[31].

In present study also approximately half of students had not been informed regarding contact precaution measures (53.77%), whereas, these subjects are considered crucial foundations in preventive measures and control of HCAs.

The results of advising information during college courses of this study followed with findings by other researches, for instance,Yuanchun Huang *et al*demonstrated

that medical students have limited knowledge and practice (52.54%) regarding HCAs due to substantial deficiencies in their learning resources^[23].

Barikani A, *et al*, clarified the necessity of standard isolation in prevention of disease in patients in all duration of education must be emphasized and facilities should be improved^[22].

Herbert VG, *et al* found (79%) of the respondents asked to an obligatory course on hygiene standards in medical education and the demand for an optimum education in hygiene is high^[29].

WHO emphasizes on continuing medical benefits in the hospital environment require continuing educational input^[21].

Conclusion

The consequences of the present study demonstrated that medical students' knowledge about nosocomial infections was adequate. They had adequate practices and positive attitudes to reduce the risk of nosocomial infection.

The overall advising information of medical students to some items of HCAs was acceptable; however, majority of them had not been advised to clean their stethoscope.

Recommendations

1. Encouraging an adherence regarding HCAs among students in order to reduce the prevalence of infections and compliance with intervention are mandatory.
2. For final year (senior) students it is best to do extra courses on nosocomial infection prevention and control measures during clinical training to stick the information in their mind for long period.
3. Encouraging and inducing clinical teachers to act a role model for students to comply on HCAs prevention and control measures.
4. Other researches in different medical schools in Iraq prefer to be done to explore knowledge and awareness toward HCAs among students to give us clear view of our educational system.
5. A review of health care curricula would need to pave the way for more practice of infection controlling teaching in all our educational system.

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Appendix

Table (1) Knowledge about health care-associated infections and control measures

Question	Disagree		Uncertain		Agree		NO (CA) & %	
	No	%	No	%	No	%	No	%
1.Hand hygiene measures before and after dressing	0	0	7	6.60	99	93.40	205	96.69
2. Your stethoscope is a potential source of infections.	36	33.96	47	44.34	23	21.70	93	43.86
3.Healthcare workers caring of patient with MRSA	29	27.36	47	44.34	30	28.30	107	50.47
4.Changes in antibiotics use lead to antibiotics resistance	14	13.21	17	16.04	75	70.75	167	78.77
5. The risk of transmission infection to the hospital personnel.	59	55.66	11	10.38	36	33.96	83	41.50
6.The environment is source nosocomial infection.	25	23.58	11	10.38	70	66.04	151	71.22
7.Prevalence of Nosocomial infection in the world	8	7.55	65	61.32	33	31.13	131	61.79
8.The risk of Invasive procedures on nosocomial infection	4	3.77	14	13.21	88	83.02	190	89.62
9.Duration of intubation and mechanical ventilation related to Ventilator Associated Pneumonia.	2	1.89	14	13.21	90	84.91	194	91.50
10. Gloves do not obviate the need for hand hygiene.	35	33.02	14	13.21	57	53.77	128	60.37
Average	212	10	247	11.65	581	27.4	1449	68.34

CA; Correct answers No; number MRSA; methicillin resistance staff aurous

Table (2) Behaviors distribution of the students practices to reduce the risk of HCAs

Question	Never		Sometimes		Always		NO of (CA) & %	
	NO	%	No	%	NO	%	No	%
1.Wearing protective materials/eyewear & mask	31	29.25	52	49.06	23	21.7	98	46.22
2.Handwashing when hand moving from infected to clean site	16	15.09	27	25.47	63	59.43	153	72.16
3.Handwashing/before &after gloves wearing	22	20.75	26	24.53	58	54.72	142	66.98
4.Proper disposal materials; needle or sharp	12	11.32	24	22.64	70	66.04	164	77.35
5.Staying home when infectious illness have	24	22.64	51	48.11	31	29.25	113	53.3
6.Vaccination against hepatitis B virus	17	16.04	23	21.70	66	62.26	155	73.11
7.Act role model to health care providers, clients of preventive measures	14	13.21	51	48.11	41	38.68	133	62.73
8.Handwashing/before &after dressing	6	5.66	17	16.04	83	78.30	183	86.32
9.Role educator to clients	7	6.60	20	18.78	79	74.53	178	83.96
10.Respiratory hygiene by cough etiquette	9	8.49	42	39.62	55	51.89	152	71.69

CA; Correct answers

Table (3) Attitudes distribution toward precautionary guidelines and perceptions of the risk of acquiring HCAs and what do you to reduce infections

Question	Female (CA)		male (CA)		Total (CA)		p-value
	NO	%	NO	%	NO	%	
1.When you are hospital manager and have extra budget	55	51.89	33	31.13	88	83.02	0.215
2.Handwashing with alcohol hand gel, during a lot of patients examination	47	44.34	9	8.49	56	52.83	0.000
3. Cleaningspoiled the wardfloor. Even you are not in the duty time	58	54.72	18	16.98	76	71.7	0.000
4.Disposing medicals materials and when are the General Supervisor Campaign	40	37.74	15	14.15	55	51.89	0.087
5. Using protective materials when you are in the surgical emergency unite	59	55.66	30	28.3	89	83.96	0.554
		48.87		19.81		68.68	

CA ;(correct answer)

Table (4) Curriculum evaluation through advising information of some items of HCAs which is given to students to reduce infections

Question ;have you been advised about;	Never		Sometimes		Always		Total Answering No &%
	Female No, %	Male no,%	Female no,%	Male no, %	Female no,%	Male no,%	
1.standardhand-washing	6 (5.66%)	11(10.38%)	27(25.47%)	16(15.09%)	36(33.96%)	10(9.43%)	153(63.67%)
2.standard precautions	6 (5.66%)	4(3.77%)	36(33.96%)	27(25.47%)	27(25.47%)	6(5.66%)	129(60.84%)
3. safe (IV) or inserted devices	17(16.04%)	12(11.32%)	27(25.47%)	15(14.15%)	25(23.58%)	10(9.43%)	112(52.84%)
4.stethoscope cleaning	43(40.57%)	25(23.58%)	20(18.87%)	9(8.49%)	6(5.66%)	3(2.83%)	47(22.16%)
5. contact precaution	12(11.32%)	8(7.55%)	36(33.96%)	22(20.75%)	21(19.81%)	7(6.60%)	114(53.77%)

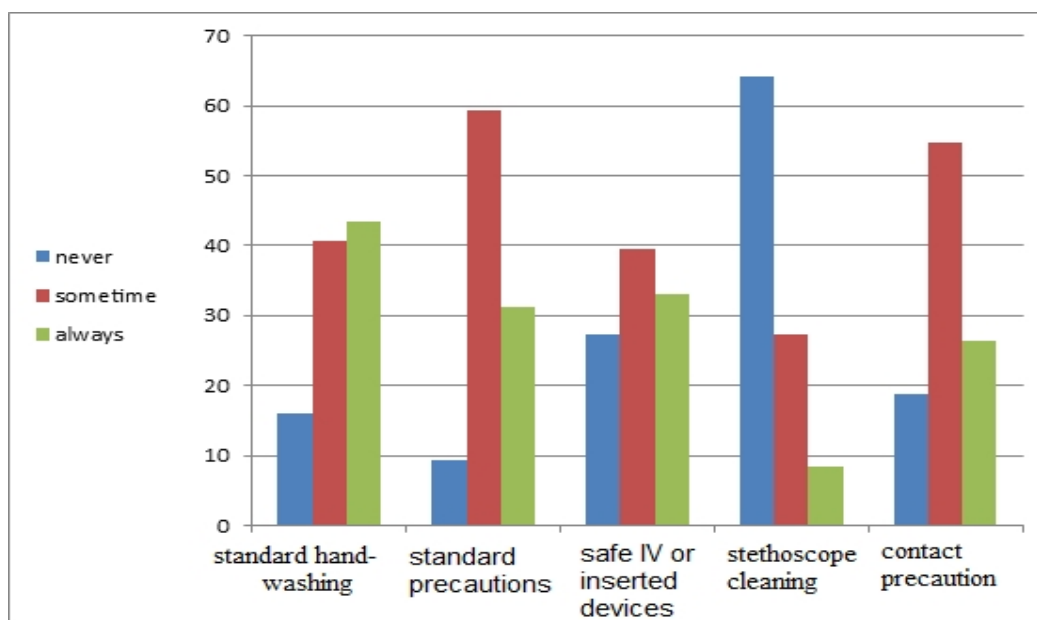


Figure shows the percentage of advising Information that is received on HCAs during college courses through lectures & clinical teaching.