ORIGINAL ARTICLE

Assessing the compatibility of the Radiology Technology Curriculum with Professional Requirements: Viewpoints of Radiology Technology Employee in Mashhad University of Medical Sciences

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Background: Radiology technology is one major of medical sciences. The graduates are a member of health care system that are responsible for medical cares. The graduates' viewpoints about the compatibility of the education and professional expectations can be helpful for detecting the defects and making changes in the curriculum.

Methods: This descriptive-cross sectional study has been done with 104 radiology technology employee in Mashhad University of Medical Sciences on 2018. The data were collected by a questionnaire, designed by the researcher, and its validity and reliability was confirmed. The questionnaire was filled by the participants and analyzed by SPSS software.

Results: The results of this study showed that 36.6% of the participants believe that the practical courses are enough. The major and the expecting occupation were matched 80.6%, 61.4% of the experts were satisfied with the curriculum, and 70.3% of them strongly believed in making changes in the current curriculum.

Conclusion: Although the current curriculum is matched with the professional duties, it is not appropriate for achieving the educational goals. Also an increase in the practical courses is necessary. Therefore, revising and making changes in the curriculum, is recommended.

Keywords: Curriculum, Radiology technology employee, Requirement, Professional duties

دراسة مدى توافق دروس تكنولوجيا الأشعة مع المتطلبات الوظيفية من وجهة نظر العاملين في هذه المهنة في جامعة مشهد للعلوم الطبية

الأرضية والهدف: يعد فرع تكنولوجيا الأشعة أحد برامج التعليم الطبي ، كما أن خريج هذا المجال يعمل كعضو في الفريق الصحي المتعهد بتوفير الخدمات الصحية للمرضى ، يستفاد من وجهات نظر الخريجين حول مدى نفع البرنامج التعليمي لهذا الفرع للاحتياجات المهنية وذلك لسد القصور وتحسين البرنامج التعليمي .

الطريقة: أجريت هذه الدراسة الوصفية التحليلية على ١٠٤ أشخاص عاملين في مجال تكنولوجيا الأشعة في مراكز تابعة لجامعة مشهد للعلوم الطبية في عام ٢٠١٨. تم جمع البيانات من خلال استبيان قام به الباحث وتم تأكيد صحة وموثوقية الاستبيان وتم تكميل الاستبيان من قبل المشاركين و تم تحليل النتائج باستخدام برنامج SPSS.

النتائج: أظهرت النتائج أن ٣٦/٦ فقط من المشاركين في الدراسة يعتقدون أن الدروس التدريبية المقدمة كافية لإكتساب مهاراتهم المهنية . بلغت درجة تلائم مجال الدراسة مع المهنة المتوقعة ٨٠.٦ ، وكان ٦١.٤ من المشاركين قد أعطوا درجة متوسطة من الرضا عن المناهج الدراسية وكانت الحاجة إلى التغيير في المنهج لدى ٧٠.٣ من المشاركين ، وكانت درجة الحاجة للتغيير عالية وعالية جداً.

الإستنتاج: أظهرت النتائج أنه على الرغم من أن منهج تكنولوجيا الأشعة يتوافق مع وصف الواجبات الوظيفية بمستوى متوسط وعالي ولكن ميزان تحقيق الأهداف التعليمية بمستوى متوسط. يمكن أيضاً استنتاج أن الزيادة الكمية والنوعية في توفيرالدروس التدريبية ضروري. لذلك ، يوصى بمراجعة وتصحيح عناوين الدورات التدريبية.

الكلمات المفتاحية: البرنامج التعليمي ، العاملين بمجال تكنولوجيا الأشعة ، الحاجة ، المهام المهنية

بررسی تطابق دروس رشته تکنولوژی رادیولوژی با نیازهای شغلی از دید شاغلین این حرفه در دانشگاه علوم پزشکی مشهد

زمینه و هدف: رشته تکنولوژی رادیولوژی یکی از برنامه های آموزشی گروه پزشکی است وفارغ التحصیل این رشته به عنوان عضوی از تیم سلامت ارائه خدمات به بیماران را به عهده دارد . نظرات فارغ التحصیلان در خصوص این که برنامه آموزشی این رشته تا چه حد پاسخگوی نیازهای شغلی این حرفه است،در شناسایی نواقص واصلاح برنامه آموزشی کمک کننده است.

روش: این مطالعه از نوع توصیفی- تحلیلی بوده و بر روی ۱۰۴تن از شاغلین حرفه تکنولوژی رادیولوژی در مراکز تابعه دانشگاه علوم پزشکی مشهد در سال ۱۳۹۶ انجام گردید. ابزارگرد آوری اطلاعات پرسشنامه محقق ساخته بود که روایی و پایایی پرسشنامه مورد تائید قرار گرفت .پرسشنامه توسط افراد شرکت کننده تکمیل گردید و نتایج با استفاده از نرم افزارSPSS مورد تجزیه و تحلیل قرار گرفت.

یافته ها: نتایج نشان داد فقط ۳۶/۶ شرکت کنندگان درمطالعه معتقدند که واحد های کار آموزی ارائه شده برای کسب مهارت های حرفه ای آنها کافی است . میزان تناسب رشته تحصیلی و شغل مورد انتظار افراد به میزان ۸۰/۶ درصد بود.۶۱/۴ درصد افراد درحد متوسط از برنامه آموزشی رشته رضایت کلی داشتند و لزوم تغییر در برنامه آموزشی براساس نظر ۷۰/۳ ٪ افراد زیاد و خیلی زیاد بود.

نتیجه گیری: نتایج نشان داد علیرغم اینکه برنامه درسی رشته تکنولوژی رادیولوژی تا حد متوسط و زیاد بر شرح وظایف شغلی منطبق است ولی میزان دستیابی به اهداف آموزشی درحد متوسط است. همچنین می توان نتیجه گرفت که افزایش کمی و کیفی در ارائه واحدهای کار آموزی ضروری است . لذا بازنگری و اصلاح سر فصل های دوره آموزشی توصیه می شود.

واژه های کلیدی: برنامه آموزشی، شاغلین حرفه تکنولوژی رادیولوژی، نیاز، وظایف شغلی

ریڈیالوجی کی ٹکنالوجی کے نصاب کا مشہد یونیورسٹی آف میڈیکل سائنسس میں ریڈیالوجسٹ کے کام کی ضرورتوں سے مطابقت کرنا

بیک گراونڈ: ریڈیالوجی کی ٹکنالوجی سے آشنائی اور اس میں مہارت طبی عملی کی تعلیم کا ایک حصہ ہے۔ اس موضوع میں فارغ التحصیل ہونے والے طلباء مریضوں کی بنیادی طبی ضروریات کو پورا کرتے ہیں۔ اس تحقیق کا مقصد یہ دیکھنا ہے کہ ریڈیالوجی کانصاب کس حد تک ریڈیالوجسٹ کی پیشہ ورانہ ضرورتوں کو پورا کرتا ہے اور اس سے ریڈیالوجی کے نواقص کی اصلاح کی جاسکتی ہے یا نہیں ؟

روش: اس تحقیق میں ایک سوچار افراد نے شرکت کی جو مشہدیونیورسٹی آف میڈیکل سائنسس تحت آنے والے طبی مراکز میں ملازمت کرتے ہیں۔یہ تحقیق دوپزار سترہ اور دوپزارائھارہ میں انجام دی گئی۔ تحقیق کا ڈیٹا سوالنامے سے حاصل کیا گیا۔ سوالنامے کے جوابوں کا تجزیہ ایس پی ایس ایس سافٹ ویر سے کیا گیا۔

نتیجی: تحقیق میں شرکت کرنے والے چھتیس اعشاریہ چھے فیصد افراد کا کہنا تھا کہ موجودہ نصاب ان کی پیشہ ورانہ ضرورتوں کو پورا کرتا ہے۔ جبکہ ستر فیصد افراد کا کہنا تھا کہ ان کے نصاب کو اپ ڈیٹ کیا جانا چاہیے۔

سفارش: اس تحقیق سے اگرچہ معلوم ہوتا ہےکہ ریڈیالوجی کا موجودہ نصاب متوسط حد تک اس موضوع کے طلباء کی پیشہ ورانہ ضرورتوں کو پورا کرتا ہے لیکن اس بات کی بھی احساس ہوتا ہے کہ کمی اور کیفی لحاظ سے موجودہ نصاب پرنظر ثانی کرنے کی ضرورت ہے، اسی بناپر سفارش کی جاتی ہےکہ ریڈیالوجی کے نصاب کو اپ ڈیٹ کیا جائے۔

کلیدی الفاظ: ریڈیالوجی، ٹکنالوجی،ضرورت ، پیشہ ورانہ ضرورتیں۔

INTRODUCTION

Rontgen discovered the X ray on November 8, 1895 which led to the advanced imaging systems. Nowadays, radiology has become a necessary instrument for the correct diagnosis and early detection of many diseases (1). The first radiology curriculum was established in the USA on 1917 (2). Seyf believed that education is a process in which teachers plan to facilitate learning. There is a reaction between the teacher and the students. In other words, education is a planned activity with the purpose of facilitating the learning process (3). The main elements of a curriculum include: purpose, content, teaching, learning and evaluating methods. These methods have interaction and influence each other. Correction and improvement of the curriculum needs changes in all of its elements (4). Curriculum is an educational program. According to the modern medical education, the curriculum should be compatible with the needs of that region. In other words, the purposes of a curriculum should improve the health services. Therefore, the purposes and expectations of the education determine the continuity of a curriculum (5). Determining the necessary requirements of the country is an important element in curriculum and the logical basis of any program is the existence of requirements. Incompatibility and defect in determining the requirements can make problems in other parts of educational designing (6). The advancements in technology have led to changes in the skills and knowledge. Education is also affected by this process and it is considered as a respond to the educational requirements of the organizations. The process of information transmission, attitudes and skills from one person to another person with the goal of making changes in cognitive and proficiency structures is called education (7). Training skillful health professionals who have enough knowledge, attitude and skill for preserving and improving the health is the main goal of mission of the medical education. In comparison to other majors, teaching and learning has a crucial role for developing the skills of the students of medical sciences. Students and professors of the health professions should learn the professional behaviors. Most scientists believe that medical educations should be done with a different approach because developing the knowledge in medical sciences influence the professor's knowledge and educational experiences (8). Determining educational requirements and the priorities, is the first step of the educational programing which facilitates developing educational process. The education can be effective when it includes particular requirements and leads to achieving goals (9). According to the definition of education, the education should make changes in developing knowledge and skills. Educational requirements can be personal, social or professional (10). Requirement has different definitions in science including: comparing the current status and the optimal, the passion to reach the goals, standards, criteria, and indices (11). Requirement is lack of knowledge, skill, ability, attitude or inaccessibility of the tools that result in problems in optimal functions (4). Regardless of personal information and environmental conditions, the optimal function of a person relies on the knowledge, attitude and skills. These requirements depend on people and their jobs (7). Comparing the curriculum with the latest changes is one of the most important items of determining the requirements. As the human society changes, new requirements arise or become reformed. Accordingly, determining requirements help the educational programmers to detect the alternating requirements and match the curriculum. Determining the requirements should be done because of making changes or improving the curriculum. In this case, determining the requirements overlaps with the evaluation and actually will be a kind of evaluation by itself (12). Hence, the appropriate determination of requirements should be done for an effective curriculum. In the conditions that there is the lack of ability, skill or attitude and the existence of some disadvantages, it shows how requirement can be beneficial (13). Radiology technology is a paramedic major that has a crucial role in medical sciences. During this curriculum, the students learn different imaging methods while using the systems (14). At first, this curriculum had been designed to train technicians. Then it was improved to dissolute bachelors. In 2007, a new curriculum was designed for this curriculum and the students were accepted for the bachelor degree at the same time. Since then, the curriculum has not been reformed. Moreover, the evaluation of the educational departments of this major has been started for the first time. The curriculum should be able to improve the clinical skills and abilities of the graduates. In this paper, we studied the opinions of the employed experts of radiology technology about the compatibility of radiology technology curriculum with the requirements and their occupational duties in Mashhad University of Medical Sciences.

METHODS

This descriptive-analytic study has been done with the cooperation of 104 employed experts of the radiology technology in the hospitals of Mashhad University of Medical Sciences in 2018. In this study a questionnaire was designed. Notably, the last version of curriculum for radiology technology was used (15). The questionnaire included a demographic section, basic sciences, exclusive courses and skill questions, as well as the effect of them in problem solving during work. In order to confirm the validity, Lawshe technic was used (1975). Also 11 experts revised and confirmed the validity of this study. In order to repeat the test, it was administered to the same participants 7days after filling the questionnaire. After refilling the questionnaire by the same persons, repeatability method and ICC index were used along with the SPSS 11.5. The ICC index was 0.58. To assess the validity of the questionnaire, as well as to evaluate the compatibility of the content of the questionnaire, alpha Cronbach coefficient was used. The alpha Cronbach coefficient of this study was 0.73. Therefore, the validity of this questionnaire was acceptable. The latest manuscript of the questionnaire had 23 demographic questions, 40 of them about the compatibility of the courses in radiology technology curriculum and the professional requirements and 14 questions about the

important elements of the curriculum. After referring to the medical imaging centers of the hospitals of Mashhad University of Medical Sciences, the radiology experts who filled the satisfaction form were included. After collecting the questionnaires, they were revised and the information were entered to the SPSS software and analyzed.

RESULTS

The included experts were between 23 and 29 (mean age 25.77 and standard deviation 1.56). 23.3% of the participants were male and 76.7% of them were female. 67.6% of the cases were married and 32.4% of them were single. 64.29% of the

Figure 1. Comparison between the experts according to the universities

experts were graduated from Mashhad University of Medical Sciences, while 21.43% of them were graduated from Birjand University of Medical Sciences and 14.29% of the experts were graduated from other Medical Sciences universities (Figure 1). The inclusion criterion was at least one-year work experience. The included experts were divided based on their work experience into 4 groups: 1) experts with 12-24 month work experience 2) experts with 25-36 month work experience 3) experts with 37-48 months and 4) more than 48 months. Most of the participating experts were included in the first group (54.4%) and group 4 had the least number of the experts (7.8%). The answers to the questions designed to study the compatibility of the radiology technology major and the professional requirements demonstrated that the compatibility was very high. (80.6%) (Figure 2). Notably, the satisfaction rate of 10% of the participants was lower than the normal rate (Figure 3). As mentioned before, the questions about the efficacy of the theory were subjected during the program. Most of the cases (77.8%) believed that these subjects have normal or lower than normal usage in their profession.

Studying the relationship between achieving the goals and the gender of the participants:

In order to study the type of variable distribution of the mean score, the Kolmogorov–Smirnov test (K-S test) was performed in both groups (males and females). The results of the test showed the normal distribution of the variable (P>0.05). Accordingly, independent T-test was used to compare mean score of the answers about achieving the educational goals between males and females. The mean score of this question was 124.54±22.52 in males and 121.07±27.89 in females. Due to the T independent test, the difference between these groups was not significant (t=0.5, P=0.58).
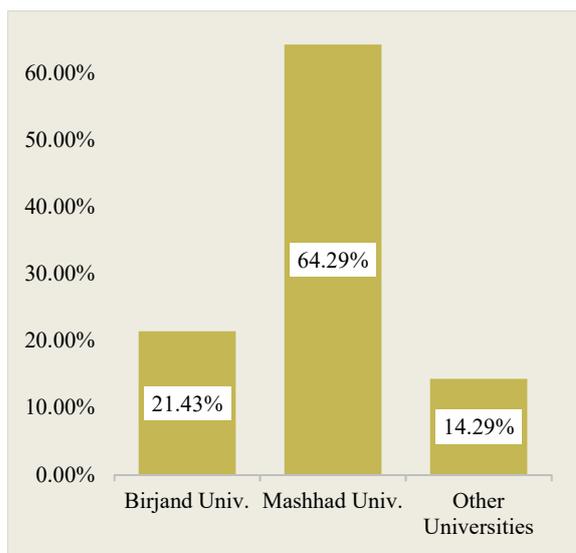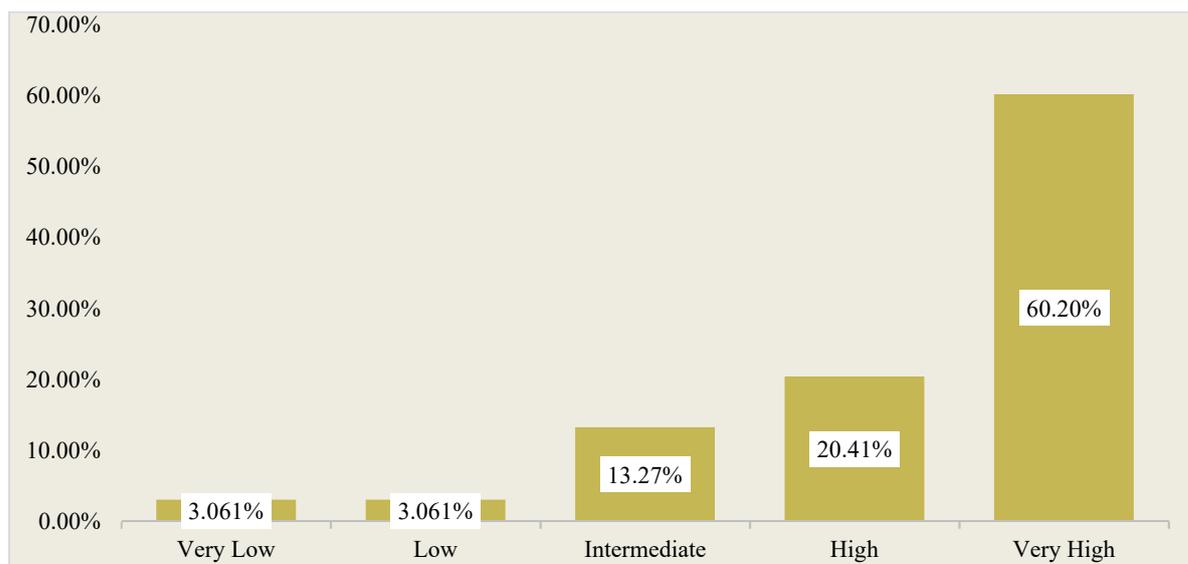

Figure 2. Comparison according to the compatibility between major and occupation

Studying the relationship between achieving the educational goals of the radiology technology major and the university:

In order to study the type of variable distribution of the mean score, the K-S test was performed in three groups (Mashhad University of Medical Sciences, Birjand University of Medical Sciences, and other Medical Sciences Universities). Results of the test showed the normal distribution of the variable in all of the groups (P=0.2). Hence, the ANOVA test was used to compare the mean score of the questions about achieving the educational goals and the universities. According to the results of this test, there was no significant difference between these groups (P=0.19, f=1.68) (Table1).

Studying the relationship between achieving the goals and the work experience of the participants:

In order to study the type of variable distribution of the mean score, the K-S test was performed in all four groups which demonstrated the normal distribution of variable in four groups (P=0.2). Considering this, the ANOVA test was used to compare the mean score of the questions about achieving the educational goals and the work experience. The results of the test demonstrated that no significant difference was observed (f=0.18, P=0.9).
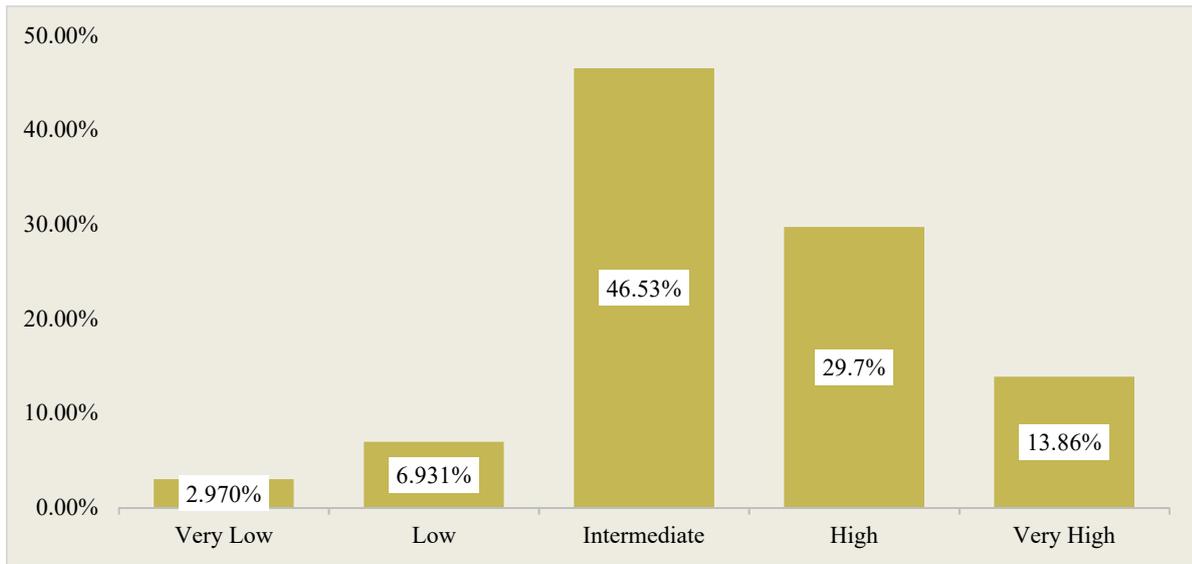
The results of this study showed that 63.3% of the

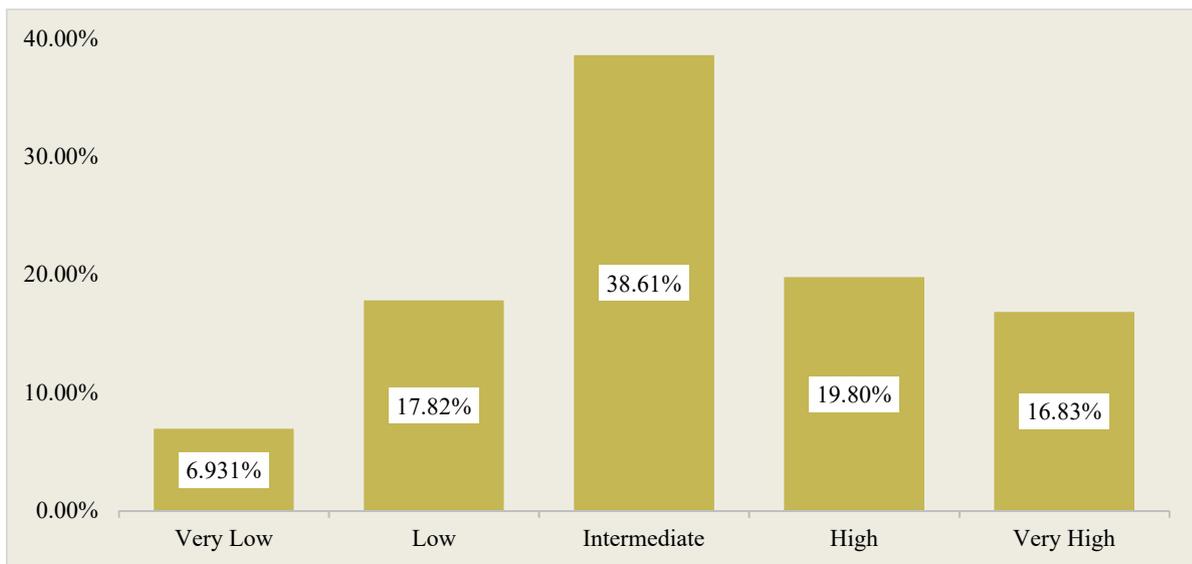**Figure 3. The satisfaction rate of the occupation**

Figure 4. The percentage of the answers to each of the choices of the questions about the efficacy of the practical courses for achieving professional skills

participants believed the practical courses were not efficient while 36.6% of them believed that the courses were efficient. Figure 4 shows the percentage of the people who answered to each of the choices of the questions about the efficacy of the curriculum.

61.4% of the participants were satisfied with the current curriculum though, 13.9% of them were highly satisfied. Figure 5 shows the percentage of participants who answered to every choice of the questions about the general satisfaction of the curriculum.

Although 29.7% of the cases believed that making changes in the current curriculum was not necessary, 70% of them agreed strongly with the changes. Figure 6 shows the percentage of those who answered to every choice of the questions about the necessity of making changes in the current curriculum.

DISCUSSION

In all medical centers using different methods of imaging leads to correct diagnosis and early detection of the diseases. Moreover, the rapid and significant advancements of the technologies used in imaging, highlights the key role of imaging in medical cares. The efficacy of the curriculum of the universities has a key role in training the skillful experts for the health system. Therefore, in this paper we studied the viewpoints of the employed experts of radiology technology. The results of this study showed that the mean score of the questions about the usefulness of the basic science subjects was lower than the normal. Hosseini and colleagues (2015) assessed the compatibility of the courses of Medical Emergency curriculum and professional requirements in Mashhad University of Medical Sciences. Their results showed that the mean score of questions about the usefulness of the basic science subjects was lower than the normal score (16). Shirjang and colleagues (2012) evaluated the compatibility of the curriculum of general health bachelor curriculum, the professional duties, and health system expectations. Their results showed the basic sciences subjects had the least usage (7). Hannani and colleagues (2014) designed a descriptive-cross sectional study on the 56 bachelor graduates of occupational health in Kashan. Their results demonstrated that the usage of basic sciences subjects was normal (17). In the Hosseini and colleagues study (2015) the mean scores of the utilizations of the exclusive courses for doing profession in bachelors and graduates were 3.94 ± 0.48 and 4.11 ± 0.5 respectively. This showed that the participants agree or strongly agree with the key role of exclusive courses in their professional. According to

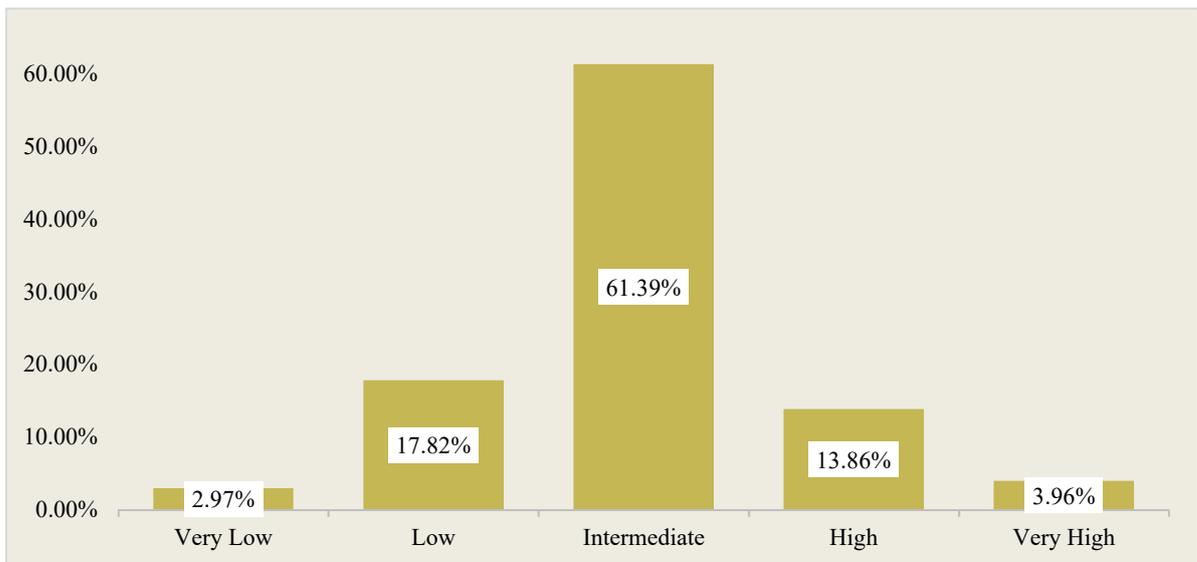| Table1. Comparing the scores of the questions about reaching the educational goals of radiology technology between the graduates of different universities			
University	Number	Mean	Standard deviation
Mashhad	63	118.36	3.62
Birjand	21	130.19	5.1
Other universities	14	125.5	5.6
P-value = 0.19 based on ANOVA Test			

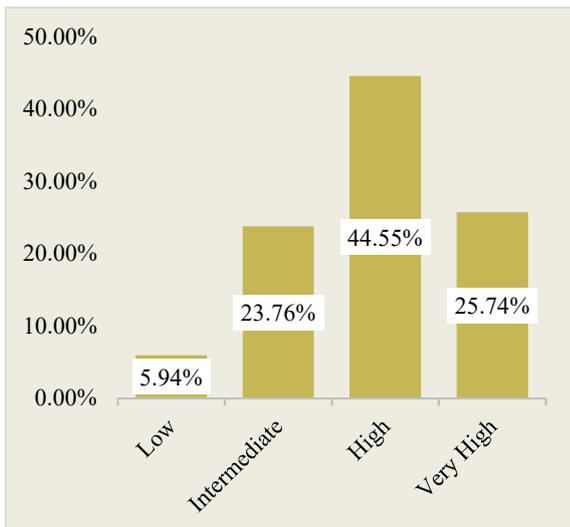Figure 5. The general satisfaction rate from the curriculum

Figure 6. The percentage of the answers to every choice of the questions about the necessity of making changes in the current curriculum

analytic tests, the difference between the mean scores of the questions about the usage of exclusive courses in the profession was not significant between bachelors and graduates (P=0.17) (16). In our study, the mean score of questions about the usage of exclusive courses in the profession was 63.44±15.84. The result of the present study showed that the participants of agreed or strongly agreed with the utilizations of these courses in their profession. The similar results of these two studies confirmed an appropriate approach for exclusive courses in Mashhad University of Medical Sciences. The Hannani and colleagues' study (2014) also showed that the exclusive courses of occupational health were highly used in profession (17). Shirjang and colleagues (2012) evaluated the compatibility of the curriculum of general health bachelor curriculum, the professional duties, and health system expectations. Their result was the same with the Hosseini and colleagues' study (2015). The results of Shirjang and colleagues demonstrated that the courses of general health bachelor have normal usage in professional activities of the graduates. Generally, the graduates were satisfied with the curriculum, though, according to the results of this study, the subject content and curriculum of general health was not completely compatible with the professional requirements (16,18). In the present research, the mean score of the questions about achieving the goals (question 24-63) which evaluates the compatibility of the curriculum and professional requirements, was 121.88±26.69, which is a little bit higher than the normal rate (120). In Hosseini and colleague's study (2015) the bachelors and the graduates agreed and strongly agreed respectively with the question "Were the skills you achieved during the curriculum, compatible with your professional requirements?". However, the difference in answers between bachelors and graduates was not significant (16). In this study, in response to the question "How much of the skills which you achieved during the program, was compatible with your professional requirements?" 64% of the participants evaluated the compatibility normal or lower

than normal. In this study, 29.7% of the participants agreed or disagreed with changes in the curriculum, while 70% of them agreed or strongly agreed with this. Although 61.4% of the participants were generally satisfied with the curriculum, 13.9% of them were highly satisfied. According to the results, although the general satisfaction rate of the curriculum was high, most of the participants believed that there was necessity for making change in the curriculum. Probably the reason for this necessity of changes is due to the current curriculum which makes the persons ready for working in professional environments. However, when participants referred to their requirements and their professional expectations they realized the necessity of changes in the curriculum. In Hosseini and colleagues study (2015) the general satisfaction rate was high (56.8%) in bachelor graduates. However, 67.6% of the graduates strongly believed in making changes in the curriculum (16). In a similar study, Hajavi and colleagues (1999) studied the viewpoint of employee in medical documentary of some hospitals about the relationship between the curriculum, working in hospital, the effect of education on mastering at work, and the importance of different courses. Their results showed that according to the research goals, the results of the analytic tests and the importance of some courses were as a necessity for making changes in the courses. The educational content needs some changes and the changes should be in the way that it would be compatible with the efficacy and the expectations of the hospital medical documentaries (19). Moreover, the results of Toulabi and colleagues' study (2008) showed that the midwives and nurses' professional requirements were not fully covered by the curriculum, so there was a necessity for making changes to reach the educational goals and train the skillful experts (20). The results of Ghasemi and colleagues' study (2004) showed the efficacy of training nurses in the hospital. It can be deducted that achieving skills during the curriculum is not enough for the professional expectations (21). Hajavi and colleagues (1999) showed that educational content of medical documentary major needed some changes and the changes should be compatible with the efficacy, and the professional expectations (19). In order to match the courses with the clinical expectations, Yousefi and colleagues (2015) suggested a revision in the current curriculum (22). Hannani and colleagues (2004) suggested regular changes in the curriculum of occupational health according to the professional requirements (17). Zarghani and colleagues (2016) studied the compatibility of the educational content of radiology technology with the professional requirements in Birjand University of Medical Sciences. Their results showed that the educational content was not completely matched with the professional requirements of the graduates. It can be concluded that the curriculum should be revised to achieve the educational and professional goals (23). Fattahi asl and colleagues (2010) evaluated the skills of radiology experts in Ahvaz hospitals. Their results showed that the skills of the experts were originated from their exclusive courses and were acceptable (24). Farajollahi and colleagues (2010-2012) studied the relationship between education and skills of some radiology experts in Tabriz. The Pearson Coefficient revealed a poor significant relation

between the education and the skills of radiology experts (25). This study showed that the curriculum of radiology technology is compatible with the professional expectations but it needs some changes. The main reasons for these changes include: the low efficacy of theory courses, insufficiency of the practical courses for achieving professional skills, the incompatibility of the achieved skills and professional requirements, inappropriate equipment, lack of equipment, and the incompatibility of the equipment used for training. An increase in practical courses can make the students be more familiar with the professional environments, so it will lead to achieving more skills.

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