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Medical Students' Perception and Attitude Before and After Implementing Patient Safety Curriculum in Clinical Years

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Abstract

Primary care is the first contact into the health system, ineffective and unsafe care may increase morbidity and mortality. Thus, improving safety in primary care is essential when striving to ensure universal health coverage and the sustainability of health care. Medical students need to understand and demonstrate appropriate patient safety skills. The main purpose of this study was to identify knowledge, perception and attitude of medical students before and after implementing patient safety curriculum in clinical year. This is a survey using quasi-experimental (pre and post-intervention) study design. All students in sixth year were invited to participate. Data was collected on a self-filled survey questionnaire. The questionnaire assessed various elements; including students' confidence level, perception regarding safety culture, view regarding working in teams with other health professionals, insight regarding effective communication and importance and impact on patient care. Statistical analysis was performed using SPSS (IBM SPSS Statistics 24.0). A total ninety five (n-95) sixth year students have participated in the study, of which 6 (6.3%) were male and 89 (93.7%) were female. Students were asked series of question regarding their confidence level about clinical safety, hand hygiene, infection control and safe medication practice in classroom and clinical settings. A significant statistical difference was observed between pre and post teaching in classroom responses (P 0.053, 95% CI: -0.483 to 0.003). However no difference was observed in Pre and Post teaching responses in clinical settings responses (P-0.069, 95% CI: -0.449 to 0.017). Medical students need to understand and demonstrate appropriate patient safety skills early and continuously in their professional education. A significant difference is observed in pre and post teaching knowledge, perception and attitude.

Keywords

Patient Safety, Medical Students, Curriculum, Family Medicine

1. Introduction

Health care professionals must care for the patient to protect them from errors [1]. Patient safety is a challenging discipline for patient care improvement. Primary care services are at the heart of health care in many countries. They provide an entry point into the health system and directly impact on people's well-being and their use of other health care resources Health care organization, culture, diagnostic errors, and medication safety have been found to be important areas for further improvement [2-3]. Training on patient safety for medical students is mandatory as multidisciplinary and inter-professional education, as well as continuing professional development. World Health Organization has published the curriculum for medical

students working in health care institution dealing with patient care [4-5]. Strategies for patient safety in medical curriculum benefit training and research on implementing evidence-based practice. There are fewer errors and better treatment outcomes when there is good communication between patients and their health-care providers [6-7]. Developing a culture for patient safety could begin as early as medical school, if patient safety issues are taught in clinical years with hands on practice. Medical students will soon play key roles in frontline patient care; their preparedness for safe, reliable care provision is of special importance [8-9]. Teaching of patient safety and quality improvement to medical students will be best received if it is integrated into clinical education rather than solely taught in pre-clinical lectures modules [10-11]. The urgent need for patient safety education for healthcare students has been recognized by many accreditation bodies including Ministry of Health (MOH) Oman.

To strengthen and make it more effective in terms of teaching and experiential learning communication skills in Family Medicine few steps is already being done. The teaching of communication skills is embedded into the curriculum. During these sessions students seek knowledge of the implication of cultural, social contexts for patient care and develop awareness of health care needs. Students participate in tutorial, workshops, role playing in small group with simulator patient and peers. They also experience real scenarios at hospital rotation and primary health care clinics. Therefore, we wish to introduce a patient safety module in Family Medicine curriculum as a pilot program and attempted to describe and evaluate the effectiveness of a patient safety curriculum for 6^{th} and 7^{th} year medical students. Main purpose of this study was to identify knowledge, perception and attitude of medical students before and after implementing patient safety curriculum in clinical year and to examine the perceptions with regard to safety, teamwork, and error disclosure.

2. Method

2.1. Data Collection

This is a survey using quasi-experimental (pre and post-intervention) study design. All students in sixth year were invited to participate. Participants were enrolled after taking written informed consent. Data was collected on a self-filled survey questionnaire on day one of rotation (pre module in the class room) and at the end of rotation in family medicine department (post module teaching in clinical setting). Survey instrument was made after literature search reviewed by and agreed on via several brain storming sessions and understanding, so the questionnaire would maximize the response rates. The survey questionnaire assessed various elements; including students' confidence level, perception regarding safety culture, view regarding working in teams with other health professionals, insight regarding effective communication and importance and impact on patient care. Pre-workshop data-collection tool had been distributed among all clinical year students before the patient safety workshop. Post workshop data was collected after they finished Family Medicine rotation after 6 weeks. An ethical approval was obtained from institutional ethics board (College of Medicine and Health Sciences, National University Science and Technology, Oman) and an informed consent was obtained from study participants. Validity of the questionnaire was done in different dimension including apparent, face, content and construct which reflects the concepts to be measured. Validation of questionnaire on small group (pilot) was also performed. All participants after explaining the importance and objective of the study and taking informed consent, participants were requested to respond anonymously to written questions.

Patient safety course developed to teach all 6th and 7th-year medical students as part of an existing Family Medicine course. Patient Safety Module introduced in Curriculum after taking the following steps; observation, brain storming sessions with faculty, focused group discussion and literature search. We designed a two hour workshop consisting of a brief lecture once in 6 weeks rotation, on the principles of patient safety, followed by interactive activities in small groups. The effects will be evaluated by questionnaires addressing satisfaction, attitudes and self-efficacy completed before, after the session. Patient safety principles (patient engagement; respectful, transparent relations how hospitals and other health care organizations protect their patients from errors, injuries, accidents, and infections), medical error, team work and communication skills included in the presentation as well as in clinical outpatient teaching. Descriptive statistics for demographic characteristics were used and analyzed with the using Independent sample t-test to determine any pre and post teaching differences. Classroom and clinical comparisons were made using pied sample t-test; mean and standard deviation are reported. The significance level was set to $p < 0.05$. All collected data were transferred and analyzed using IBM SPSS, version 24.0 (IBM Corp, Armonk, NY, USA).

Specific Objectives of the Module covered during the session

1. To identify human factors for patient safety
2. Understanding systems and the effect of complexity of care
3. Being an effective team player
4. Learning from errors to prevent harm
5. Understanding and managing clinical risk
6. Engaging with patients and caregivers
7. Infection prevention and control
8. Patient safety and invasive procedures
9. Improving medication safety

Learning Outcomes and Core Competencies in Patient Safety Module in year 6 and 7 Family Medicine (FAMCO) primary care:

1. Acquire knowledge regarding Patient Safety in primary care
2. Recognize the scientific basis, causes and concepts of

patient safety, scope of patient harm with reference to specific morbidities and potential ways to prevent/eliminate them
3. Develop foundational competencies in patient (eg: safety environment, safety and risk management, including infection control, safe use of medicines, equipment safety, safe clinical practice and safe environment of care).
4. Recognize patient safety principles, patient engagement; respectful, transparent relations how hospitals and other health care organizations protect their patients from errors, injuries, accidents, and infections
5. Interact with patients and their caregivers in safety approach (hand hygiene; infection control)
6. Explore healthcare services for the patient safety with specific reference to Oman.

+Small Group Interactive Workshops/Tutorials; Teaching and Learning Strategy

Student tutors deliver effective and engaging teaching on patient safety composed of interactive lecture, discussion and small-group debriefing facilitated by a faculty. Supporting providers to lead by example and preparing them to discuss their own errors, discussions to review errors and near misses designed not to blame. Students discuss appropriate communication between health care providers with patients and Role playing.

Student's Assessment during and ends of rotation

1. Continuous assessment during day to day patients' consultation
2. Case assessment will include patient safety attribute
3. MCQ and SAQ on patient safety included in end of rotation exam and final MD exam
4. OSCE station will have attribute regarding patient safety

2.2. Data Analysis

Statistical analysis was performed using SPSS (IBM SPSS Statistics 24.0). Data was expressed in frequencies for questionnaire responses calculated for all variables in numbers and percentages

3. Results

A total 95 sixth year students have participated in the study, of which 6 (6.3%) were male and 89 (93.7%) were female. Students were asked series of question regarding their confidence level about clinical safety, hand hygiene, infection control and safe medication practice in classroom and clinical settings (Table 1). Participants were asked questions pre and post-teaching; Overall, significant statistical differences was observed between pre (mean score 3.77±0.81) and post teaching (mean score 4.02±0.79) in classroom responses (P 0.053, 95% CI: -0.483 to 0.003). However no difference was observed in Pre (mean score 3.83±0.72) and Post teaching (mean score 4.05±0.84) clinical settings responses (P-0.069, 95% CI: -0.449 to 0.017)

Table 1. *Students' confidence level in what they have learned about.*

	Classroom		P-value	Clinical settings		P-value
	Pre teaching Mean (SD)	Post teaching Mean (SD)		Pre teaching Mean (SD)	Post teaching Mean (SD)	
Safe clinical practice in general	3.77 (0.89)	4.13 (0.95)	0.01*	3.72 (0.99)	4.00 (0.94)	0.05*
Clinical safety	3.75 (0.92)	4.07 (0.97)	0.02*	3.73 (1.03)	3.97 (0.91)	0.11
Hand hygiene	4.15 (0.82)	4.13 (0.99)	0.85	4.11 (0.95)	4.11 (0.92)	0.99
Infection control	3.89 (0.97)	3.88 (0.94)	0.99	3.77 (1.1)	3.91 (0.89)	0.38
Safe medication practices	3.64 (0.99)	3.98 (0.93)	0.02*	3.52 (1.1)	3.97 (0.93)	0.004*

Item scores ranged from 1 (strongly disagree) to 5 (strongly agree). SD: standard deviation. Statistically significant differences between groups (two-tailed p-value) are presented with steric.

Students were asked multiple questions about perception regarding safety culture (Table 2). No significant difference (P-0.102; 95% CI: -0.354 to 0.032) was observed between pre (mean score 3.72±0.59) and post teaching (mean score 3.88±0.71) were seen in classroom. Conversely, significant statistical differences was observed between pre (mean score 3.54±0.72) and post teaching (mean score 3.77±0.72) in clinical setting responses (P 0.035, 95% CI: -0.454 to 0.017).

Table 2. *Students' perception regarding Safety Culture.*

	Classroom		P-value	Clinical settings		P-value
	Pre teaching Mean (SD)	Post teaching Mean (SD)		Pre teaching Mean (SD)	Post teaching Mean (SD)	
The ways in which health care is complex (e.g. Workplace design, staffing, technology, human limitations)	3.42 (0.81)	3.73 (0.84)	0.012*	3.35 (0.89)	3.72 (0.84)	0.006*
Importance of having a questioning attitude and speaking up when you see things that may be unsafe	3.84 (0.98)	3.99 (1.01)	0.32	3.63 (1.12)	3.77 (1.07)	0.39
Importance of a supportive environment that encourages patients and providers to speak up when they have safety concerns	4.03 (0.81)	4.01 (0.91)	0.85	3.84 (1.02)	3.88 (0.94)	0.78
The nature of systems (e.g. Aspects of the organization,	3.60 (0.86)	3.77 (0.87)	0.19	3.36 (0.96)	3.66 (0.92)	0.4

	Classroom		P-value	Clinical settings		P-value
	Pre teaching Mean (SD)	Post teaching Mean (SD)		Pre teaching Mean (SD)	Post teaching Mean (SD)	
management, or the work environment including policies, resources, communication and other processes) and system failures and their role in adverse events						

Item scores ranged from 1 (strongly disagree) to 5 (strongly agree). SD: standard deviation. Statistically significant differences between groups (two-tailed p-value) are presented with steric.

Multiple questions were asked about working in teams with other health care professionals (Table 3). Overall, significant difference was observed between pre and post educational responses of the study participants regarding in classroom (Pre teaching mean score 3.75±0.71 and Post teaching mean score 3.85±0.63; P-0.319, 95% CI: -0.301 to 0.099) and in clinical setting (Pre teaching mean score 3.64±0.68 and post teaching mean score 3.81±0.83; P-0.191, CI: -0.401 to 0.081).

Table 3. *Students' view regarding working in Teams with Other Health Professionals.*

	Classroom		P-value	Clinical settings		P-value
	Pre teaching Mean (SD)	Post teaching Mean (SD)		Pre teaching Mean (SD)	Post teaching Mean (SD)	
Team dynamics and authority/power differences	3.49 (0.95)	3.83 (0.93)	0.02*	3.57 (0.94	3.74 (0.83)	0.20
Managing inter-professional conflict	3.49 (0.96)	3.84 (0.91)	0.01*	3.25 (1.0)	3.68 (0.92)	
Debriefing and supporting team members after an adverse event or close call	3.66 (0.99)	3.74 (0.96)	0.59	3.48 (1.01)	3.60 (0.95)	0.005*
Engaging patients as a central participant in the health care team	3.94 (0.96)	3.86 (0.83)	0.54	3.84 (0.94)	3.78 (0.84)	0.43
Sharing authority, leadership, and decision-making	3.90 (0.99)	3.82 (0.94)	0.57	3.86 (0.93)	4.18 (3.4)	0.64
Encouraging team members to speak up, question, challenge, accountable as appropriate to address safety issues	3.91 (0.82)	3.96 (0.85)	069	3.85 (0.84)	3.78 (0.92)	0.41

Item scores ranged from 1 (strongly disagree) to 5 (strongly agree). SD: standard deviation. Statistically significant differences between groups (two-tailed p-value) are presented with steric.

Students were asked series of questions about their awareness regarding effective communication and safety risks management. Significant difference (p-0.007) was detected in classroom and clinical setting response about effective verbal and nonverbal communication abilities to prevent adverse events (Table 4). No significant difference was observed between pre and post educational responses of students regarding in classroom (pre teaching mean score 3.94±0.75 and post teaching mean score 3.96±0.73; P-0.808; 95% CI: -0.246 to 0.192) and in clinical setting about effective communication (pre teaching mean score 3.90±0.78 and post teaching mean score 3.82±0.72; P-0.520; 95% CI: -0.152 to 0.298). Similarly, no significant difference was observed between pre and post educational responses of students regarding in classroom (pre teaching mean score 3.70±0.80 and post teaching mean score 3.77±0.79; P-0.569; 95% CI: -0.303 to 0.167) and in clinical setting about safety risks management (pre teaching mean score 3.72±0.82 and post teaching mean score 3.66±0.86; P-0.674; 95%CI: -0.197 to 0.305).

Table 4. *Students' Insight regarding Effective Communication & Safety Risks Management.*

	Classroom		P-value	Clinical settings		P-value
	Pre teaching Mean (SD)	Post teaching Mean (SD)		Pre teaching Mean (SD)	Post teaching Mean (SD)	
Enhancing patient safety through clear and consistent communication with patients	4.0 (0.80)	4.05 (0.79)	0.66	4.02 (0.93)	3.88 (0.76)	0.26
Enhancing patient safety through effective communication with other health care providers	3.95 (0.85)	3.96 (0.84)	0.97	3.95 (0.84)	3.83 (0.81)	0.33
Effective verbal and nonverbal communication abilities to prevent adverse events	3.90 (1.0)	3.88 (0.89)	0.92	3.77 (1.05)	3.78 (0.91)	0.97
Recognizing routine situations and settings in which safety problems may arise	3.68 (0.86)	3.74 (0.83)	0.61	3.67 (0.94)	3.60 (0.97)	0.61
Identifying and implementing safety solutions	3.70 (0.92)	3.78 (0.83)	0.52	3.66 (0.94)	3.69 (0.93)	0.79
Anticipating and managing high risk situations	3.74 (0.98)	3.82 (0.94)	0.59	3.82 (1.01)	3.66 (0.99)	0.31

Item scores ranged from 1 (strongly disagree) to 5 (strongly agree). SD: standard deviation. Statistically significant differences between groups (two-tailed p-value) are presented with steric.

Students responded to multiple questions regarding their understanding of human & environmental factors and disclose adverse events &close calls. No statistical difference was observed between class room and clinical setting

responses. However, students responses regarding role of environmental factors such as work flow, ergonomics, resources, that effect patient safety was significantly different (p-<0.001) from classroom to clinical settings (Table 5). Significant statistical differences was observed between pre (mean score 3.69±0.87) and post teaching (mean score 3.93±0.82) in classroom responses (P-0.058; 95% CI: -0.504 to 0.008). However no difference was observed in Pre (mean score 3.81±0.83) and Post teaching (mean score 3.83±0.90) clinical settings responses (P-0.880; 95% CI: -0.284 to 0.244).

Table 5. *Students' understanding of Human & Environmental Factors and disclose Adverse Events &Close Calls.*

	Classroom			Clinical settings		P-value
	Pre teaching Mean (SD)	Post teaching Mean (SD)		Pre teaching Mean (SD)	Post teaching Mean (SD)	
The role of human factors such as fatigue, competence that effect patient safety	3.65 (1.0)	3.99 (0.85)	0.02*	3.84 (1.01)	3.82 (1.02)	0.89
Safe application of health technology	3.71 (0.99)	3.89 (0.96)	0.22	3.79 (1.01)	3.85 (1.0)	0.70
Role of environmental factors such as work flow, ergonomics, resources, that effect patient safety	3.59 (0.85)	3.79 (0.91)	0.13	3.64 (0.95)	3.67 (0.96)	0.85
Recognizing an adverse event or close call	3.46 (0.94)	3.72 (0.89)	0.06	3.54 (1.02)	3.5 (1.09)	0.83
Reducing harm by addressing immediate risks for patients and others involved	3.65 (0.93)	3.90 (0.84)	0.06	3.69 (0.97)	3.73 (0.90)	0.76
Disclosing the adverse event to the patient	3.56 (0.89)	3.74 (0.85)	0.18	3.56 (0.95)	3.50 (0.95)	0.69
Participating in timely event analysis, reflective practice and planning in order to prevent recurrence	3.58 (0.97)	3.66 (0.96)	0.56	3.53 (1.02)	3.61 (1.08)	0.65

Item scores ranged from 1 (strongly disagree) to 5 (strongly agree). SD: standard deviation. Statistically significant differences between groups (two-tailed p-value) are presented with steric.

Students' knowledge about broader patient safety issues are addressed in health professional education was assessed using questionnaire. Significant difference (P-0.002; 95% CI: -0.510 to 0.116) was observed between pre (mean score 3.53±0.68) and post teaching (mean score 3.84±0.67) were seen in classroom. Likewise, significant statistical differences was observed between pre (mean score 3.49±0.68) and post teaching (mean score 3.79±0.67) in clinical setting responses (P-0.004; 95% CI: -0.499 to 0.095).

Table 6. *Students' knowledge about broader patient safety issues are addressed in health professional education.*

	Classroom			Clinical settings		P-value
	Pre teaching Mean (SD)	Post teaching Mean (SD)		Pre teaching Mean (SD)	Post teaching Mean (SD)	
As a student, the scope of what was "safe" for me to do in the practice setting was very clear to me	3.42 (1.06)	3.84 (0.90)	0.004*	3.36 (1.07)	3.75 (0.96)	0.01*
There is consistency in how patient safety issues were dealt with by different preceptors in the clinical setting	3.47 (0.78)	3.65 (0.83)	0.13	3.53 (0.84)	3.59 (0.83)	0.66
I had sufficient opportunity to learn and interact with members of interdisciplinary teams	3.40 (1.02)	3.87 (0.91)	0.001*	3.40 (1.04)	3.73 (0.95)	0.03*
I gained a solid understanding that reporting adverse events and close calls can lead to change and can reduce reoccurrence of events	3.64 (0.92)	3.91 (0.85)	0.04*	3.48 (0.97)	3.83 (0.86)	0.01*
Patient safety was well integrated into the overall program	3.66 (0.97)	3.92 (0.92)	0.06	3.64 (1.0)	3.91 (0.92)	0.07
Clinical aspects of patient safety (e.g. Hand hygiene, transferring patients, medication safety were well covered in our program	3.76 (1.03)	3.96 (0.94)	0.18	3.67 (1.09)	3.90 (1.03)	0.15
"System" aspects of patient safety were well covered in our program (e.g. Aspects of the organization, management, or the work environment including policies, resources, communication and other processes)	3.32 (1.0)	3.72 (0.87)	0.004*	3.34 (0.89)	3.74 (0.89)	0.003*

Item scores ranged from 1 (strongly disagree) to 5 (strongly agree). SD: standard deviation. Statistically significant differences between groups (two-tailed p-value) are presented with steric.

Students were asked about their comfort speaking up about patient safety in class room and clinical settings (Figure 1). More than half (52.7% in classroom and 50.5% in clinical settings) of the participants feel comfortable discussing around adverse events focuses mainly on system-related issues, rather than focusing on the individual (s) most responsible for the event. 51.6% students in classroom and 42.3% in the clinical settings feel safe to approach when someone engaging in unsafe care practice in the clinical setting.

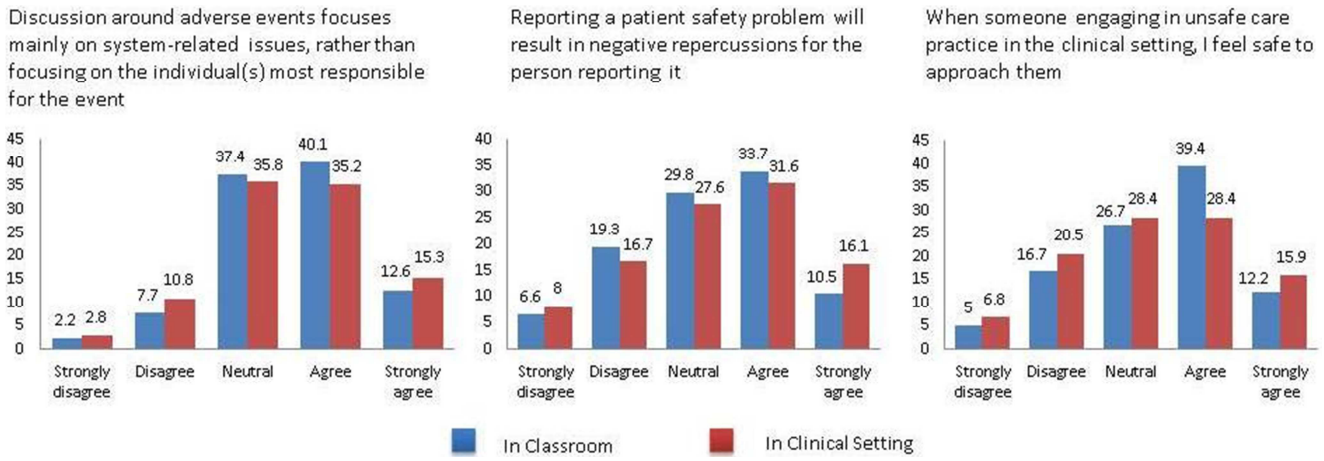

Figure 1. *Students' responses about patient safety.*

4. Discussion

Educating and training the health workforce is a key foundation for improving the patient safety in primary care. The urgent need for patient safety education for medical students has been recognized by many accreditation bodies including MOH Oman. Primary care is an entry point into the health system and directly impact on people's well-being and their use of other health care resources [12-13]. Unsafe or ineffective primary care may increase morbidity and preventable mortality and may lead to the unnecessary use of hospital and specialist resources. Thus, improving safety in primary care is essential when striving to ensure universal health coverage and the sustainability of health care [14-15].

In this study the data was collected before and after implementation of patient safety module in Family Medicine curriculum. A significant statistical difference was observed between pre and post teaching in classroom and clinical setting. Student's perception regarding safe clinical practice and clinical safety measures was shown statistical difference and improvement in practice. As reported in literature, students' knowledge and perception regarding patient safety education is not sufficient. Nabilou, reported that knowledge of students regarding patient safety indicates the inefficiency of informal education to fill the gap; therefore, it is recommended to consider patient safety in the curriculums and formulate better policies for patient safety [16-17].

In this study students have shown significant change in attitude in safe medication practice in clinical setting after the teaching module. Literature has shown that medical students are aware of medical errors which are a barrier between intended 'best care' and what was actually provided to patients. Students may not be aware of non-physician-based causes of errors, and they should learn a multidisciplinary approach to the management of incidents. Moreover there is a need of formal curriculum on patient safety [18-19].

Medical students were asked series of questions about their awareness regarding effective communication and safety risks management. Significant difference was detected in classroom and clinical setting response about effective verbal and nonverbal communication abilities to prevent adverse events. Hoo yeon reported in literature that students face difficulty speaking up about medical errors so, error disclosure guidelines should be easy to understand for them and having appropriate communication skills to explain it. Student perceptions of safety culture can enhance the educational environment and promotes patient safety [20-21]. Student's responses regarding role of environmental factors such as work flow, ergonomics, resources that effect patient safety was significantly different from classroom to clinical settings. Recognizing that communication between health care providers is a critical element of patient safety the students must learn appropriate skills in their curriculum. One study from Germany has shown the patient safety and medical error perception in medical students [22-23]. This includes providing training on patient safety for medical students, multidisciplinary and inter-professional education, as well as continuing professional development. Supporting providers to lead by example and preparing them to discuss their own errors [24-25]. In our study students' knowledge about broader patient safety issues are addressed in health professional education was assessed has shown difference in clinical setting responses. Hamdi reported the deficiency in knowledge in medical error in patient safety concept in medical students of Saudi Arabia [26-27]. Most of our study participants recognized the importance of patient safety topic and less recognition of the role of patient in preventing error, to have effective communication skills providing education about handling uncertainty (Figure 1) [28-29].

Medical students, the future doctors should learn appropriate patient safety measures and built a safety culture and quality care [30]. The education and training of health care professionals to manage and minimize potential risks and harm in patient care will be best recognize if it is taken as longitudinal theme in medical education.

5. Conclusion

We have introduced a patient safety module in Family Medicine curriculum as a pilot program and attempted to describe and evaluate the effectiveness of a patient safety

curriculum for 6 and 7th year medical students. Our study provides evidence that students have positive attitude and there is a significant improvement in knowledge and perception after teaching module. Medical students need to understand and demonstrate appropriate patient safety skills early and continuously in their professional education. Medical students' experiences during clinical rotations have an important influence on their attitudes towards patient safety and their future behaviors. There is a need to introduce patient safety education in the curricula in pre-clinical as well as in clinical years. Research in patient safety plays a key role in identifying the factors to improve safety and best practices.

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