International Journal of Health Research and Innovation, vol.7. no.1, 2019, 1-11
ISSN: 2051-5057 (print version), 2051-5065 (online)
Scientific Press International Limited

Trends in Medical Malpractice in the Private Health Sector in Jeddah, Saudi Arabia

Mohammad Saad Alghamdi[1], Ghada N. Farhat[2] ,Yasser Alharbi[1] , Mohammad Ghaforri[1]

Abstract

PURPOSE: About 10% of patients around the world are affected by medical malpractice. Understanding the causes of medical malpractice and its distribution over different medical specialties in Saudi Arabia's private health sector is important for policy makers to institute control measures as the country undergoes privatization of its health sector. This study assessed the trend in medical malpractice in the private health sector in Jeddah, Saudi Arabia during a five-year period, 2011—2015, and its distribution by medical specialties and health professional-related characteristics.
METHODS: A descriptive secondary data analysis was performed on medical practice cases occurring in the private health sector and reported by the Medical Jurisprudence Committee (MJC) in Jeddah, Saudi Arabia, during 2011—2015.
RESULTS: 368 medical malpractice cases were reported to the MJC from 2011—2015.The trend of medical errors fluctuated during this period.13.6 % of cases resulted in deaths. Obstetrics and gynecology contributed the highest number of cases. Based on a larger presence in the workforce, a larger percentage of defendants were male (70%).The average duration of the lawsuit in the MJC was 15.2 months.
CONCLUSION: This study provides a characterization of the pattern of malpractice cases and their distribution by medical specialty, health facility and health professional-related characteristics in the private health sector. This data may be useful for policy makers to institute appropriate control measures that ensure a high-quality delivery of health care.

Keywords: Medical Malpractice, Lawsuit, Plaintiff, Medico-legal Committee, Medical Jurisprudence Committee, Verdict.

1 Introduction

Medical malpractice is an act or omission by a health professional during provision of care that digresses from standard norms and practices in the medical field, resulting in patient harm. [1] Adverse effects that stem from malpractice include unintended injuries or complications that result in death, disability or elongated hospital stay. [2]

[1] Directorate of Health Affairs, Medico-legal Department, Jeddah, Saudi Arabia
[2] Emory University, Rollins School of Public Health, Hubert Department of Global Health

The foremost principle in treating patients and delivery of health care is to avoid causing harm and injury. While physicians and other health professionals uphold this principle, errors can happen unintentionally resulting in patient harm. [3,4] Although many medical errors occur, with some being unreported, many of them can be avoided and prevented. [5]

About 10% of the patients around the world are affected by medical malpractice based on World Health Organization (WHO) information. [6] The incidence of medical errors varies widely from one country to another. In the United States, it was estimated to be about 3% of hospitalized patients, whereas in Australia it was about 16.5 %. [7]

Most medical errors occur when the physicians are not experienced or when a new procedure or technique is introduced. [8] Medical errors also may result from other different causes including lack of attention and care, insufficient and/or lack of knowledge, and negligence. [9] Additionally, poor communication among the medical team may result in the occurrence of medical errors. [5] Up to 60% of medical malpractice cases result from surgical errors. These can occur as a result of lack of surgical experience, lack of competence and skills, high workload, fatigue, and lack of the proper technology. [10-12]

Another common source of medical errors is medication errors, which may occur as a result of mistakes during ordering, administration, transportation or distribution of medications. [13] Most of the prescription errors occurred as a result of the wrong dosage or the wrong frequency. [14] A review of the Canadian literature indicated that adverse drug reactions accounted for 10-20% of hospitalizations of people over the age of 50 years. [15] Another study in Brazil observed that adverse drug reactions occurred during hospitalization in 46% of hospitalized elderly patients, and were the reason for admission for another 11%; a quarter of these adverse drug reactions were due to the use of an inappropriate medication. [16] Laboratory errors can occur at the pre-analytic, analytic or post analytic stage; most occur at the pre-analytic stage, such as mislabeling samples and wrong data entry. [17]

Organizational factors contributing to medical errors include inappropriate work policy and procedures, lack of continuous training and education of health professionals, lack of organizational management, low quality of equipment and lack of their availability, and shortage in skill level and number of health professionals. [18-19]

Potential results of harmful health care practices are lifelong injury, increased duration of hospital admission, increased hospital costs, or death. [18-19] Overall, any deficiencies associated with the delivery of health services introduce a risk of medical errors and adverse events. [20]

Every country around the world has its own medical malpractice system. The United States, for example, adopts a "tort liability system" where the patient is compensated only when the injury is proven to be a result of medical malpractice. Many countries of the Organization for Economic Cooperation and Development (OECD) have adopted a "no-fault system" where the patient is compensated whether or not the injury is proven to be a result of medical malpractice. [21]

Saudi Arabia has shown remarkable progress over the last 20 years regarding the delivery of health services in both the public and private sectors, which has been attributed to the well-trained health professionals and the introduction of new medical equipment in health facilities. In parallel to this progress, the annual trend of medical practice lawsuits in Saudi Arabia has been increasing as a result of the increase in population size and the increase in patient awareness of their rights. [22] The total number of claims in 1999 was 440, whereas in 2008, the number of claims increased to a total of 1,356 across all health care providers in Saudi Arabia. [8] Most

medical errors in Saudi Arabia have been reported to occur in obstetrics and general surgery. [22-23]

The medical litigation process in Saudi Arabia starts when a patient or his/her legal guardian makes a complaint of medical malpractice to the Ministry of Health's Directorate of Health Affairs (DHA) in their city/region. The DHA then refers the complaint to the regional medico-legal committee for investigation. If the primary investigation committee decides that there is a medical error, the investigators write their report to the Medical Jurisprudence Committee. [23] The Medical Jurisprudence Committee issues the final verdict by a majority vote and the verdict can be appealed within 60 days of issuance. [9]

In 2006, Saudi Arabia adopted a new regulation for medical practice entitled "executive forms and procedures". The main items of this act are: 1) every health professional should have a valid practicing license from the Saudi Commission for Health Specialties, 2) the health professional should compensate the patient if he/she harmed or injured that patient, and 3) a health professional practicing without a license would be subject to imprisonment or financial penalty. [24] Since 2009, all health professionals have been obligated to have medical liability insurance. [25]

The purpose of this study was to examine the total number and the trend of medical malpractice cases in the private health sector in Jeddah, Saudi Arabia during a five-year period from 2011-2015. Specifically, we 1) estimated the distribution of medical malpractice cases by health facility type (hospital verses clinic) and over the different medical specialties, 2) analyzed the distribution by health professional-related characteristics including profession, gender, and nationality., 3) assessed the proportion of cases resulting in sever patient outcomes (death and disability), and 4) we estimated the duration of medical litigation from its initiation to the issuance of the final verdict.

Saudi Arabia is undergoing privatization of the health sector. This evaluation study of medical malpractice in the private health sector can help policy makers in the healthcare system to improve the delivery of health services by minimizing the medical errors and the duration of medical litigation in order to make the right decisions toward improving the health care in Saudi Arabia.

2 Materials and Methods

2.1 Study Design

We performed a descriptive secondary data analysis on medical practice cases reported in Jeddah, Saudi Arabia, in the private sector during the period of 2011—2015; 368 cases were reported during this period.

2.2 Data Sources

The medical malpractice data was obtained from the Ministry of Health's medico-legal department, Directorate of Health Affairs in the city of Jeddah, Saudi Arabia. The data received comprised aggregate figures of the final verdicts issued for medical malpractice cases reported in the private health sector in Jeddah during 2011—2015.The data included a breakdown of the verdicts by medical specialty and characteristics of the health care professional including profession, gender and nationality. Data on the heath workforce in the private health sector in Jeddah were retrieved from the 2011 Statistical Yearbook of Ministry of Health, Saudi Arabia. [26]

2.3 Study Variables

The study variables included the year and health facility (hospital/ clinic) in which the medical error occurred, medical specialty (obstetrics and gynecology, general surgery, orthopedics, neurosurgery, urology, otorhinolaryngology, ophthalmology, other surgical specialties, internal medicine, pediatrics, dentistry, other specialties), and characteristics of the defendant including profession (physician, pharmacist, nurse or technician), gender (male/ female), and nationality (Saudi/ non-Saudi).Other variables included severity of outcome (defined as death or disability versus not) and verdict issuance (yes/ no).

2.4 Statistical Analysis

A descriptive analysis of the medical malpractice cases during 2011—2015 was conducted. The distribution (N, %)of cases was examined by year of occurrence, place of occurrence, medical specialty, and characteristics of the health care professional (profession, gender and nationality). The proportion of cases resulting in severe outcomes was estimated. Verdict issuance was also examined. Because this study was able to obtain denominator data (the number of health care professionals in Jeddah by gender and nationality), the rates of occurrence of medical errors by gender and nationality subgroups for each health care profession were calculated. The gender- and nationality-specific occurrence rates were calculated by dividing the number of cases within a specific gender and nationality category by the total number of health care professionals within that same category. Occurrence rate ratios, confidence interval and p-values were obtained for comparison. SAS version 9.4 (SAS Institute, Cary, NC) was used for statistical analyses.

2.5 Ethics

The analysis involved a secondary data analysis on a de-identified aggregate dataset that did not include personal identifiers. Thus, it did not meet the definition of human subject research and was classified as exempt from review by the Emory University Institutional Review Board.

3 Results

3.1 Description of Medical Malpractice Cases

The review of medico-legal records showed that the total number of litigations between 2011 and 2015 was 368 cases. The mean of the litigations number was 73.6 cases annually. The Medical Jurisprudence Committee issued 282 verdicts with penalties against healthcare professionals, representing 76.6 % of the lawsuits filed, and in 86 lawsuits (23.4 %) the defendant was not found guilty.

Medical errors in the private health sector in Jeddah during this period resulted in severe outcomes in 90 cases (24.5 % of the total). Disabilities were reported in 40 cases (10.9%) and death occurred in 50 cases (13.6%). Hospitals were responsible for the larger share of medical malpractices (77.7%), whereas clinics accounted for 22.3% of the cases [Table 1].

Table 1: Distribution of medical malpractice cases in the private health sector in Jeddah, Saudi Arabia, 2011—2015

Variables	Medical Malpractice Cases (N= 368) N (%)
Year	
2011	61 (16.6)
2012	53 (14.4)
2013	79 (21.5)
2014	99 (26.9)
2015	76 (20.7)
Patient Outcome	
Death	50 (13.6)
Disability	40 (10.9)
Health Facility	
Hospital	286 (77.7)
Clinic	82 (22.3)
Verdict of accusation	
Yes	282 (76.6)
No	86 (23.4)

3.2 Distribution of medical Malpractice Cases by Medical Specialty

The distribution of litigations over the different medical specialties varied, with the highest claims reported against obstetrics and gynecology practitioners (17.9% of the total litigations, N= 66), followed by general surgery (12.8%, N= 47), Fewer claims were reported against ophthalmologists (2.9%, N=11) and urologists (2.7%, N=10) [Table 2].

Table 2: Distribution of medical malpractice cases by medical specialty in the private health sector in Jeddah, Saudi Arabia,2011—2015

Medical Specialty	Medical Malpractice Cases (N= 368) N (%
Obstetrics & Gynecology	66(17.9)
General Surgery	47 (12.8)
Orthopedics	42(11.4)
Neurosurgery	20 (5.4)
Urology	10 (2.7)
Otorhinolaryngology	17 (4.6)
Ophthalmology	11 (2.9)
Other Surgical Specialties	30 (8.2)
Internal Medicine	17 (4.6)
Pediatrics	37 (10.1)
Dentistry	35 (9.5)
Other Specialties	36 (9.8)

3.3 Distribution of Medical Malpractice Cases by Characteristics of the Healthcare Professional

Analysis of the distribution of medical malpractice cases by characteristics of healthcare professionals revealed that physicians were responsible for most of the medical errors that occurred (92.8%), followed by nurses (5.6%) and technicians (1.6%). There were no claims reported against pharmacists.

Seventy percent (N= 263) of accused health care professionals were male and30% (N= 113) were female. Saudi health care professionals represented 12% (N= 45) and non-Saudis represented 88% (N=331) [Table3].

Table 3: Characteristics of health care professionals involved in medical malpractice cases in the private health sector in Jeddah, Saudi Arabia, 2011—2015

Characteristics	Involved Health Professionals (N=376) N (%)
Occupations	
Physicians	349 (92.8)
Pharmacists	0 (0)
Nurses	21(5.6)
Technicians	6 (1.6)
Gender	
Male	263 (69.9)
Female	113 (30.1)
Nationality	
Saudi	45 (12)
Non-Saudi	333 (88)

Based on Saudi MoH statistics for 2011 (1431 Hijri), there were 2,508 physicians in the private health sector in Jeddah (1,752 males and 756 females; 159 Saudi and 2,349 non-Saudi), 1,853 nurses (103 males and 1,750 females; 57 Saudi and 1,796 non-Saudi), and 820 allied health personals (342 males and 478 females; 78 Saudi and 742 non-Saudi). [26] The gender- and nationality-specific rate of occurrence of medical errors was calculated for each health care profession. Occurrence rate ratios were calculated for gender as male to female and for nationality as Saudi to Non-Saudi. Occurrence rate ratios showed that male and female physicians were equally responsible for medical errors (Rate Ratio= 1.00;95% CI0.81-1.24; p-value =0.98). Also, the occurrence rate of medical errors in Saudi physicians compared to non-Saudi physicians was found to be 2 times higher (Rate Ratio= 2.02;95% CI 1.53-2.67; p-value <0.001). Among nurses, males were found to have a 4-fold higher rate of occurrence of medical errors than females (Rate Ratio= 4.3; 95% CI 1.5-12.5; p-value= 0.04), but nationality differences were not statistically significant (Rate Ratio= 1.66; 95% CI= 0.23-12.2; p-value= 0.59). Occurrence rate ratio among technicians either by nationality (Rate Ratio=1.59;95% CI= 0.19-13; p-value= 0.64) or gender (Rate Ratio= 3.49; 95% CI= 0.68-17.9; p-value= 0.14) were not statistically significant [Table 4].

Table 4: Occurrence rate of medical malpractice by gender and nationality of health professionals in Jeddah, Saudi Arabia, 2011—2015

Health Professionals	Occurrence Rate* (95% Confidence Interval)	Occurrence Rate Ratio (95% Confidence Interval)	P-value
Physicians			
Gender		1.00 (0.8, 1.2)	0.99
Male	13.9 (12.4, 15.6)		
Female	13.9 (11.6, 16.5)		
Nationality		2.02 (1.53, 2.7)	< 0.001
Saudi	26.4 (20.2, 33.8)		
Non-Saudi	13.1 (11.8, 14.5)		
Nurses			
Gender		4.25 (1.5, 12.5)	0.04
Male	3.9 (1.2, 9.9)		
Female	0.9 (0.55, 1.5)		
Nationality		1.66 (0.23, 12.2)	0.59
Saudi	1.8 (0.0, 10.3)		
Non-Saudi	1.1 (0.67, 1.5)		
Technicians			
Gender		3.49 (0.68, 17.9)	0.14
Male	1.5 (0.53, 3.5)		
Female	0.4 (0.01, 1.6)		
Nationality		1.59 (0.19, 13)	0.64
Saudi	1.3 (0.0, 7.6)		
Non-Saudi	0.8 (0.33, 1.8)		

3.4 Duration and process of lawsuits

The average duration of the first court session in the Medical Jurisprudence Committee was 5.3 months, and the average duration till the issuance of the verdict was 15.2 months. The mean number of court sessions was 3.8 for each case.

4 Discussion

This study aimed to examine the trend of medical malpractice and its distribution over the different medical specialties and by characteristics of the health professionals involved in the private health sector in Jeddah, Saudi Arabia during 2011—2015.

The results of the study showed that over a 5-year period, there were 368 medical lawsuits filed against private health sector professionals in Jeddah city. The trend of these litigations fluctuated, with the lowest number reported in 2012 (53 cases, 14.4%) and the highest number reported in 2014 (99 cases, 26.9 %). The practice of obstetrics and gynecology ranked

first in terms of its contribution to medical errors. This study also observed that 70% of medical errors were contributed by males and 30% by females, and about 88% were reported against non-Saudis and12% against Saudis. When occurrence rates were estimated, taking in account the workforce size within gender and nationality groups, men and women physicians were found to contribute equally to medical errors, whereas the contribution of Saudi physicians was 2-fold higher than non-Saudis. Among nurses, males were found to have a 4-fold higher rate of occurrence of medical errors than females, but nationality differences were not statistically significant.

Globally, there is a deficiency in studies on medical errors, and the majority of existing studies were conducted in hospitalized patients. In the United States, the medical malpractice rate among hospitalized patients was about 3.7%, based on a study conducted by Harvard University in1984. In 1995, a study conducted in Australia showed that medical errors occurred in about 16.5% of hospitalized patients. [8] In the UK, a study conducted in 1999—2000, showed that medical errors were estimated to occur about 11.7% of hospitalized patients; in Denmark it was estimated to be 9%. [27]

Discussing medical errors in Saudi Arabia is a very sensitive issue for both the healthcare professionals and the healthcare stakeholders. There is a lack of transparency and disclosure among health professionals in reporting the medical errors unless the error resulted in severe injury to the patient. A few studies were conducted about medical errors in Saudi Arabia and all of them reported the number and percentage of medical errors for each specialty and none of the previous studies estimated the rate of hospitalized or followed-up patients. [5,18,28]

Jeddah city is located on the Red Sea coast in the western region of Saudi Arabia. About 4.3 million people live in Jeddah based on the last census. [29] The city has 33 private hospitals with 3,109 beds and 398 polyclinics based on the latest statistics in 2016 (1436 Hijri). [30] The results of the study showed that there were 368 medical lawsuits filed against private health sector professionals in Jeddah and received by the Medical Jurisprudence Committee during 2011—2015. The mean number of litigations observed, 73.6 cases annually, was higher than previously reported estimates, and is reflective of an increasing trend in medical errors in Saudi Arabia. [3,17-18]

In this study, medical malpractice was found to result in severe outcomes in 24.5% of the total litigations;10.9 % of those outcomes were disabilities and 13.6 % were deaths. These estimates are considerably lower than those reported in a study conducted in 2007—2008, where medical errors reported in both the public and private sectors resulted in death in 28% of the cases and in disabilities in another 30%. [23]

Results in this study indicated that most of the medical errors occurred in the hospitals (77.7 % of the cases) compared to only 22.3 % that occurred in the clinics. This finding is reasonable because invasive procedures that pose a higher risk for medical errors, like surgical operations and emergency interventions, take place in hospitals rather than clinics.

Similar to reports from three previous studies about medical errors in Saudi Arabia, the practice of obstetrics and gynecology was leading in terms of its contribution to medical errors (17.9% of cases). [5,10,22] The occurrence of medical errors in obstetrics can be attributed to the overload and the high turnover of patients in this specialty, absence of close observation of high-risk patients and lack of communication between the physicians and the patients. [5]

Consistent with results of earlier studies [5,10,22], general surgery came second after obstetrics and gynecology, contributing to 12.8 % of the cases. Because surgery involves invasive procedures, many factors contribute to the occurrence of medical errors like the

inexperience of surgeons, lack of competence and skills, high workload, fatigue, lack of the proper technology and weak hospital systems. [10-12] The fewest medical malpractices occurred in neurosurgery, otorhinolaryngology, internal medicine, ophthalmology, urology and other specialties. This could be explained by the low volume of patients treated in a specialty like neurosurgery and the limited use of invasive procedures in a specialty like internal medicine. This type of count data may give a misleading picture when there is an interest in identifying high-risk specialties for medical errors. This study's data did not allow an adjustment for patient volume across the specialties, a factor that should be taken in account in comparisons of the occurrence of medical errors across specialties.

The finding that physicians were responsible for most of the medical errors is plausible as physicians are responsible for diagnosing and treating the patients as well as leading patient management and giving directions to the other medical staff like nurses and technicians.

In this study, the average duration of a lawsuit in the Medical Jurisprudence Committee from receipt till the issuance of the final verdict was found to be15.2 months, which is a long period that can result in a delay of providing justice and taking necessary corrective action to prevent additional errors. This study did not have data about the duration of the lawsuit from its initiation till reaching the Medical Jurisprudence Committee and this is one of this study's limitations. The length of time could be attributed to multiple factors, including that members of the Medical Jurisprudence Committee work part-time on their role on this Committee. It can also be explained by the increased awareness among patients of their rights resulting in an increase in the number of medical litigations in Saudi Arabia.

It is likely that the number of cases reported is underestimated. For example, not all the medical litigations may have reached the Medical Jurisprudence Committee as many of the plaintiffs may have reconciled with the defendants when they were financially compensated, and some may have waived the lawsuit as they believed the health event was due to destiny, especially in the case of death litigations; this is one of the limitations of our study.

Another important limitation is that this study could not calculate the rate of medical errors by patient volume due to the lack of denominator data (number of hospitalized or followed-up patients); this was also observed in all of the previous studies in Saudi Arabia. This study also did not allow for an identification of medical specialties that were responsible for the majority of cases of disabilities and deaths. Furthermore, we did not have data about the duration of the lawsuit from its initiation until it reaches the Medical Jurisprudence Committee to estimate the exact total duration of the litigation from its initiation till the issuance of the final verdict. Lastly, the number of Saudi physicians was very low (6.3%) compared to non-Saudis, which may have affected the estimate of medical errors by nationality.

The main strengths of the current study are that it was the first study conducted about medical malpractice in the private health sector in Saudi Arabia. Moreover, this study was able to estimate the occurrence rate and ratio of medical malpractice cases by gender and nationality of health care professionals.

Based on findings from this study, a set of recommendations for policy makers in the Saudi Ministry of Health is proposed. First, data quality and access should be improved to enable a more accurate enumeration of the magnitude of medical practice. For example, the total number of patients followed-up by each health facility should be accessible in order to estimate the rate of occurrence within individual facilities. Also the number of patients followed-up by each specialty should be accessible to estimate the rate of medical errors for each specialty and to compare it among different specialties. Because there are high-volume and low-volume

specialties, comparing counts exclusively may not identify the high-risk specialties for malpractice. Second, high-risk specialties, once identified, should be targeted with policies and interventions to reduce medical errors and their consequences. Third, continuous on-the-job training for health professionals in preventing and managing medical errors should be implemented in all specialties and health facilities. Fourth, in order to expedite the process of medical litigations, members of the Medical Jurisprudence Committee should be full-time employees who can devote their full attention to reviewing incoming cases.

5 Conclusion

Saudi Arabia is currently adopting a new strategy called "Vision 2030 " in order to diversify the country recourses and not merely depend on the oil for its economy, and one of these diversifications is the privatization of many sectors, including the health sector. [30] This is the first study to be conducted on medical errors with a focus on the private health sector. This study described the pattern of malpractice cases by medical specialty, health facility and health care professional-related characteristics, and the duration of medical litigation. This data may be useful for policy makers to institute appropriate control measures.

ACKNOWLDGEMENT

We acknowledge with gratitude the efforts of the Medico-Legal department staff - Directorate of Health Affairs - Jeddah who provided us with the data to conduct this study.

References

[1] Bal, B. S. (2009). An Introduction to Medical Malpractice in the United States. Clinical Orthopedics and Related Research, 467(2), 339–347. http://doi.org/10.1007/s11999-008-0636-2

[2] Baker, G. R., Norton, P. G., Flintoft, V., Blais, R., Brown, A., Cox, J., … Tamblyn, R. (2004). The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada. CMAJ: Canadian Medical Association Journal, 170(11), 1678–1686. http://doi.org/10.1503/cmaj.1040498

[3] Al-Saeed, A. H. (2010). Medical liability litigation in Saudi Arabia. Saudi Journal of Anaesthesia, 4(3), 122–126. http://doi.org/10.4103/1658-354X.71133 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2980654/

[4] Swaminath G, Raguram R. Medical errors - I: The problem. Indian J Psychiatry. 2010;52(2):110-2.

[5] Henary BY, Al-yahia OA, Al-gabbany SA, Al-kharaz SM. Epidemiology of medico-legal litigations and related medical errors in Central and Northern Saudi Arabia. A retrospective prevalence study. Saudi Med J. 2012;33(7):768-75.

[6] Available at: http://www.jebmh.com/latest-articles.php?at_id=93757. Accessed February 22, 2017.

[7] Thomas EJ, Studdert DM, Runciman WB, et al. A comparison of iatrogenic injury studies in Australia and the USA. I: Context, methods, casemix, population, patient and hospital characteristics. Int J Qual Health Care. 2000;12(5):371-8.

[8] Weingart, S. N., Wilson, R. M., Gibberd, R. W., & Harrison, B. (2000). Epidemiology of medical error. BMJ: British Medical Journal, 320(7237), 774–777.
[9] Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.110.1822&rep=rep1&type=pdf. Accessed April 10, 2017.
[10] Rogers SO, Gawande AA, Kwaan M, et al. Analysis of surgical errors in closed malpractice claims at 4 liability insurers. Surgery. 2006;140(1):25-33.
[11] Begg CB, Cramer LD, Hoskins WJ, Brennan MF. Impact of hospital volume on operative mortality for major cancer surgery. JAMA. 1998;280(20):1747-51.
[12] Landrigan CP, Rothschild JM, Cronin JW, et al. Effect of reducing interns' work hours on serious medical errors in intensive care units. N EnglJMed2004; 351:1838-48.
[13] Available at: http://patientsafetyresearch.org/journal articles/Original 021. Accessed April 7, 2017.
[14] https://link.springer.com/article/10.1007/s00228-012-1435-y
[15] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2145131/?page=1
[16] https://www.ncbi.nlm.nih.gov/pubmed/16156680
[17] https://www.ncbi.nlm.nih.gov/pubmed/?term=reducing+the+occurrence+of+errors+in+laboratory+specimen+receiving+and+processing+departement.
[18] Schrappe M. [Patient safety and risk management]. Med Klin (Munich). 2005;100(8):478-85.
[19] http://www.who.int/patientsafety/information_centre/documents/who_ps_curriculum_summary. Accessed February 22, 2017.
[20] Taylor BB, Marcantonio ER, Pagovich O, et al. Do medical inpatients who report poor service quality experience more adverse events and medical errors? Med Care. 2008;46(2):224-8.
[21] Available at: http://siteresources.worldbank.org/INTRUSSIANFEDERATION/Resources/Malpractice_Systems_eng. Accessed April 10, 2017.
[22] Samarkandi A. Status of medical liability claims in Saudi Arabia. Ann Saudi Med. 2006; 26:87–91.
[23] AlJarallah, J. S., &AlRowaiss, N. (2013). The pattern of medical errors and litigation against doctors in Saudi Arabia. Journal of Family &Community Medicine, 20(2), 98–105. http://doi.org/10.4103/2230-8229.114771
[24] Available at: http://www.moh.gov/ministry/forms/licenses/Executive/Pages/default.aspx. Accessed April 10, 2017.
[25] Available at: http://www.scfhs.org/en/Pages/default.aspx. Accessed April 10, 2017.
[26] http://www.moh.gov.sa/en/ministry/statistics/book/pages/default.aspx
[27] Available at: http://www.who.int/patientsafety/en/brochure_final. Accessed April 10, 2017.
[28] http://www.emro.who.int/emhj-volume-21-2015/volume-21-issue-9/physicians-knowledge-and-practice-towards-medical-error-reporting-a-cross-sectional-hospital-based-study-in-saudi-arabia.html
[29] https://www.stats.gov.sa/sites/default/files/ar-makkah.pdf
[30] Available at: http://www.moh.gov/Ministry/Statistics/book/Documents/ الكتاب الإحصائي السنوي لعام 1436هـ. Accessed April 5, 2017.
[31] Available at: http://vision2030.gov/en/node/68. Accessed April 5, 2017.