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Prevalence of medication errors – A systematic review and meta-analysis

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Abstract

Background: Medication errors are a matter of serious concern in healthcare. The National Coordinating Council for Medication Error Reporting and Prevention defines ‘Medication error’ as ‘any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer’. Medication errors can occur at any point between prescribing and the patient taking the drug. Based on this, they can be of different types including prescription error, transcription error, dispensing error, administration error and monitoring error. Despite there are numerous barriers in place, existing flaws in these barriers enable these errors to reach the patient. Though often trivial, the consequences of medication errors could also lead to prolonged hospital stay, untoward adverse effects, increased mortality, life threatening events and increased patient dissatisfaction. If proper vigilance is followed at the very basic levels, it can ensure that such errors do not occur. Hence this meta-analysis was done with the following aim.

Aim: This study aims to estimate the prevalence of prescribing error vs. transcribing errors.

Methods: Observational studies (available as full free text) which included prescribing errors and transcribing errors in the title of the study were retrieved from electronic databases viz. PubMed and Google scholar, with the following search terms:

1. Prescribing errors AND transcribing errors

2. Prescription errors AND transcription errors

After assessing for inclusion criteria, 10 studies were included for review and analysis using Rev Man 5.3 software. Outcome measures were prevalence of the different types of medication errors.

Results: In the ten observational studies included, a total of 16771 prescriptions were analysed and monitored for errors. Of the prescriptions analyzed a total of 13169 (78.52%) medication errors were identified, of which prescription errors were seen in 43.02% of the prescriptions, 18.23% of transcription errors were identified. Three of the ten studies reported dispensing errors in 34.57% of the prescriptions. And six of the ten studies reported administration errors in 5.24% of the prescriptions that were analyzed.

Conclusion: The present study shows that prescription errors were high when compared to other types of medication errors. Adequate training to junior doctors, proper vigilance and monitoring can prevent the occurrence of prescription errors.

Keywords: Healthcare, Medication Errors,

Introduction

Medication errors are most prevalent; sometimes they are an underrated negligence that happens day in and day out in clinical practice. The well-known fact behind its occurrence is multifactorial in most cases as suggested by the prevailing literature and they are preventable. This provides the scope of exploring and framing policies or norms that would help in modifying the behavior of the health care personnel's perception of this issue and thus help in prevention of this negligence. Even though various measures have been employed to scrutinize and reduce the incidence of this problem, still the results are quite uncertain and not up to the mark. There are various studies that have assessed the prevalence of this problem. This problem of medication error can be either prescription error or transcription error or administration error. In the context of health care setup errors can be isolated as either one of the above mentioned may occur or a combination of two or even all three might occur in the same patient. Administration error that involves route or time of administration are both of them is commonly associated with chronic medications whereas transcribing errors are common with medications that require stringent dose titration and monitoring.[1] This can be potentially dangerous as well depending upon the magnitude of the problem.

Prevailing literature also reveals an astonishing yet an unfortunate and true fact that almost every prescription had an error which further quotes the care free attitude existing towards rectifying this issue.[2] Prescription errors which forms the most common part are surprisingly high that literature suggests only 4% of the prescriptions mentioned mg/kg body weight in places where it is required the most.[3] A study done in middle east says that prescription errors are the most common followed by transcribing errors in case of pregnant women and the most common cause being human error (39.7%) which can be almost always prevented. Among this most commonly prone to error are the antibiotics that require good caution while prescribing which is important for control of resistance.[4] In case of Intensive care units, administration errors were the most common which leads to deleterious effects in those patients.[5] In a south Indian study done at regional cancer centre almost 55% of the prescriptions had prescription errors that further led to transcribing errors in 25% of the prescriptions.[6] These figures suggest that the awareness regarding this problem and its mere existence has to be brought out which hopefully could be done by such a meta-analysis that incorporates required literature to extract the data to estimate the prevalence. By this study the magnitude of the problem could be brought to light and measures to prevent this simple but significant issue that could improve the health care standards of the system and community.

Objective: This study aims to estimate the prevalence of prescribing error vs. transcribing errors.

Methods:

Search strategy and study selection: We conducted electronic searches in PubMed and Google scholar to identify relevant articles. Observational studies (available as full free text) with no restriction regarding to language, publication period, were included in this study. The search term that was used were

Search terms:

1) Prescribing errors AND transcribing errors

2) Prescription errors AND transcription errors

Two independent reviewers (AN and RS) performed initial scrutiny of primary titles and abstracts (when available) to select potential full text articles for further scrutiny. When the title and abstract cannot be rejected by any reviewer, the full text of the article was obtained. Inclusion or exclusion of each study was determined by discussion and consensus between the two reviewers.

Inclusion criteria:

Observational studies that included:

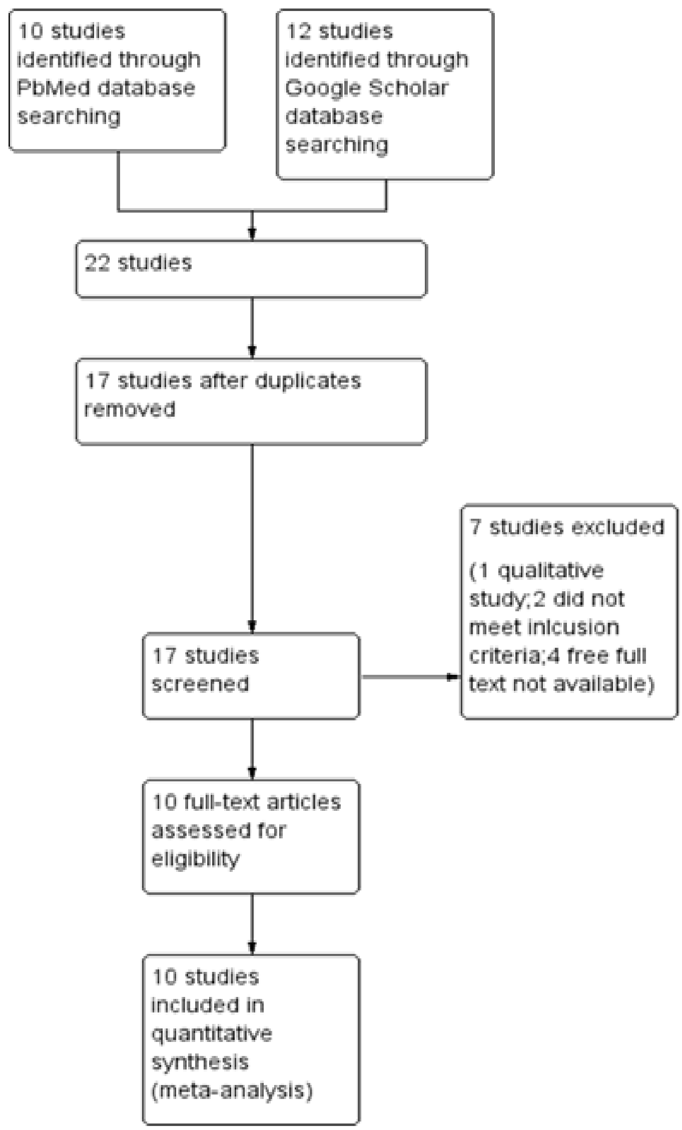
(i) Prescribing errors and transcribing errors in hospital setting

(ii) Studies that estimated the frequency of prescribing errors and transcribing errors in hospital setting

Data collection

Quality and risk of bias of the observational studies were assessed using Rev Man. Risk of bias assessment of all the included studies was done based on Quality assessment checklist for prevalence studies by Hoy et al.[7] Quantitative data was extracted from papers included in the review using the standardized data extraction tool from Rev Man. The data extracted includes specific details about the medication errors, number of prescriptions analyzed to the review question and specific objectives.

Figure 1



Statistical analysis

Quantitative data were pooled in statistical meta-analysis using Review Manager 5.3. Effect sizes were expressed as events, the risk ratio and their 95% confidence intervals were calculated. Heterogeneity was assessed statistically using the Chi-square test. $p < 0.05$ – considered significant.

Results

The results of the study are as follows

Figure 2: Study Sites.

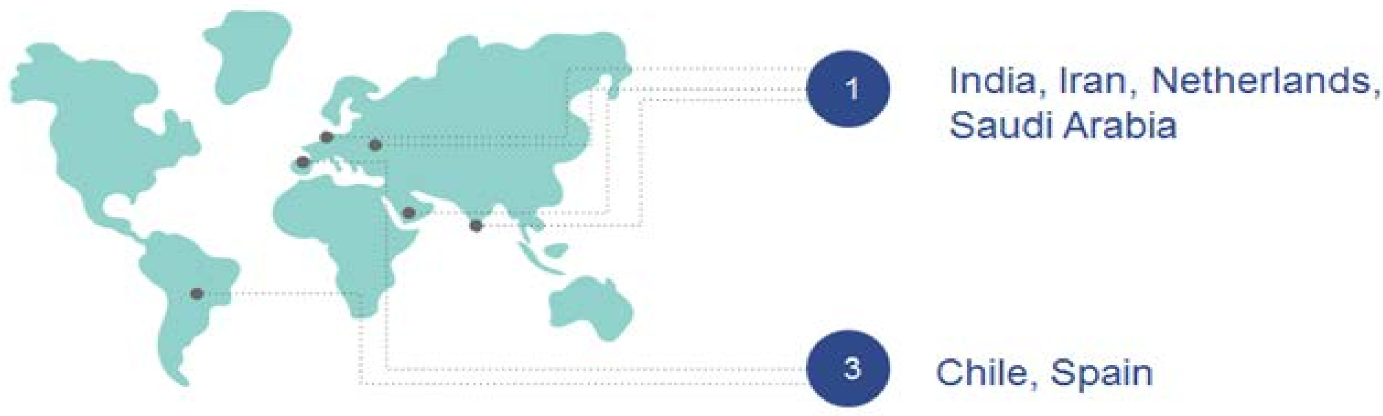


Figure 2 shows the sites of the ten studies that are included in this review. One study each from India, Iran, Netherlands and Saudi Arabia and three studies each from Chile and Spain.

Table 1: Baseline data of the studies.

Study	Number of patients (n)	Number of prescriptions (n)	Medication errors (n)	Prescription errors (%)	Transcription errors (%)	Dispensing errors (%)	Administration errors (%)
AB 2019	757	5578	5578	4.79	14.6		9.32
Pasto-Cardona 2009	300	1500	418	16	27	48	9
Herrera 2006	122	122	69	35.2	21.3		
Al-Munawarah 2021	404	330	358	63.62	11.7		
Salazar 2011	52	194	66	9.7	4	3.2	25.8
Mathaiyan 2016	500	500	208	54.8	24.5		20.7
Van Doormaal 2009	558	7286	5725	78.95	21		
Rivas 2010	-	500	395	69	10		
Vazin 2012	27	307	214	24.10	2.61		42.99
Smith 2014	225	454	138	5.1	0.4	2.7	23.6
Total	**2945**	**16771**	**13169**	**43.02%**	**18.23%**	**34.57%**	**5.24%**

Table 1: Shows the baseline data of the ten included studies. A total of 16771 prescriptions were given to 2945 patients included in the ten studies. Of the 16771 prescriptions scrutinized, 13169 medication errors had been identified.

Prescription errors accounts for 43.02% of the medication errors followed by 18.23% of transcription errors, 34.57% of dispensing errors and 5.24% of administration errors.

Figure 3: Risk of bias assessment.

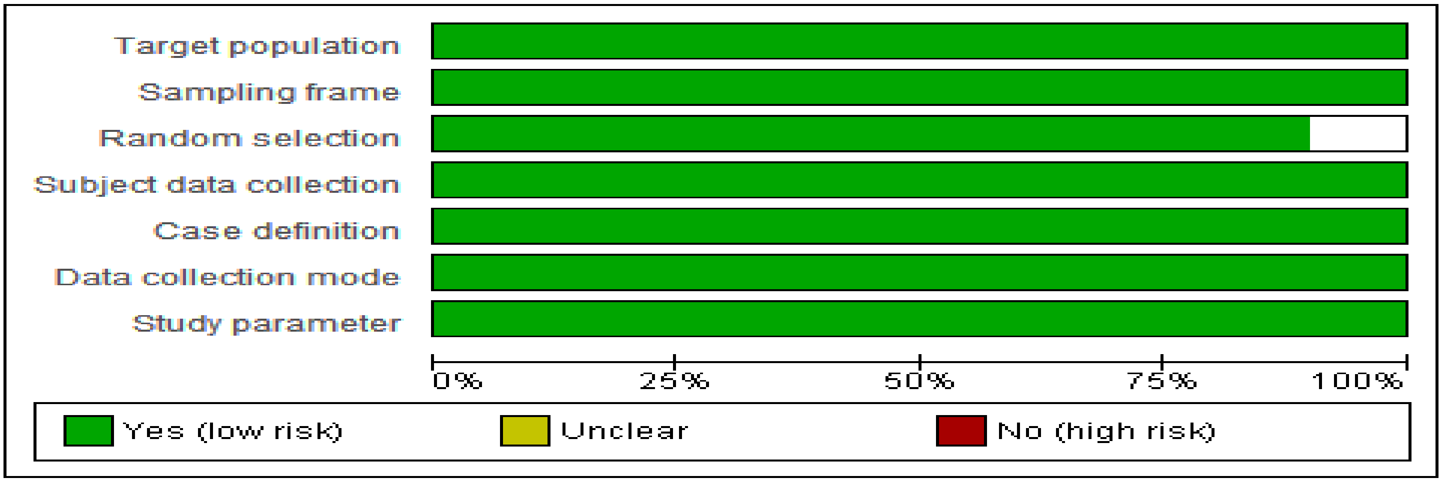
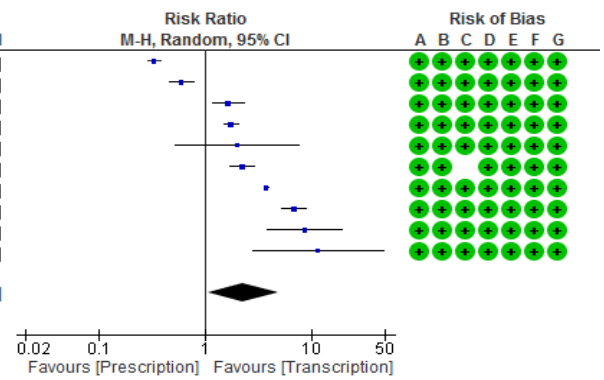


Figure 3 shows the risk of bias assessment of the 10 studies that are included in this review. Risk of bias item presented as percentages across all included studies based on Quality assessment checklist for prevalence studies by Hoy et al

Figure 4: Frequency of Prescription errors vs. Transcription errors.



Study or Subgroup	Prescription errors Events	Prescription errors Total	Transcription errors Events	Transcription errors Total	Weight	Risk Ratio M-H, Random, 95% CI
AB 2019	267	5578	815	5578	10.7%	0.33 [0.29, 0.37]
Pasto-Cardona 2009	67	418	113	418	10.6%	0.59 [0.45, 0.78]
Herrera L 2006	43	69	26	69	10.5%	1.65 [1.16, 2.36]
Al-Munawarah 2021	228	358	130	358	10.7%	1.75 [1.50, 2.05]
Salazar L 2011	6	66	3	66	8.1%	2.00 [0.52, 7.66]
Mathaiyan 2016	114	208	51	208	10.6%	2.24 [1.71, 2.92]
Van Doormaal 2009	4520	5725	1205	5725	10.7%	3.75 [3.56, 3.95]
Rivas 2010	345	395	50	395	10.6%	6.90 [5.31, 8.96]
Vazin 2012	52	214	6	214	9.6%	8.67 [3.80, 19.75]
Smith 2014	23	138	2	138	7.8%	11.50 [2.76, 47.84]
Total (95% CI)		**13169**		**13169**	**100.0%**	**2.28 [1.06, 4.91]**
Total events	5665		2401			

Heterogeneity: Tau² = 1.42; Chi² = 1348.13, df = 9 (P < 0.00001); I² = 99%
Test for overall effect: Z = 2.11 (P = 0.04)

Risk of bias legend
(A) Target population
(B) Sampling frame
(C) Random selection
(D) Subject data collection
(E) Case definition
(F) Data collection mode
(G) Study parameter

P=0.04, figure 4 shows the frequency of prescription errors vs. transcription errors. This shows that there was a statistically significant increase in the occurrence of prescription errors when compared to transcription errors as seen from the forest plot.

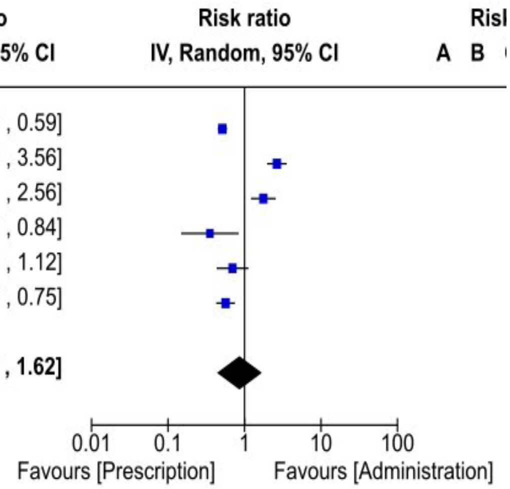
Figure 5: Frequency of Prescription errors vs. Administration errors.

Study or Subgroup	Prescription errors Events	Prescription errors Total	Administration errors Events	Administration errors Total	Weight	Risk ratio IV, Random, 95% CI
✓ AB 2019	267	5578	520	5578	18.0%	0.51 [0.45 , 0.59]
✓ Mathaiyan 2016	114	208	43	208	17.5%	2.65 [1.98 , 3.56]
✓ Pasto-Cardona 2009	67	418	38	418	17.1%	1.76 [1.21 , 2.56]
✓ Salazar 2011	6	66	17	66	13.6%	0.35 [0.15 , 0.84]
✓ Smith 2014	23	138	33	138	16.4%	0.70 [0.43 , 1.12]
✓ Vazin 2012	52	214	92	214	17.5%	0.57 [0.43 , 0.75]
Total (95% CI)		**6622**		**6622**	**100.0%**	**0.86 [0.45 , 1.62]**
Total events:	529		743			

Heterogeneity: Tau² = 0.58; Chi² = 124.75, df = 5 (P < 0.00001); I² = 96%

Test for overall effect: Z = 0.47 (P = 0.64)

Test for subgroup differences: Not applicable



P<0.00001, figure 4 shows the forest plot of frequency of prescription errors vs. administration errors. This shows that there was a statistically significant increase in the occurrence of administration errors when compared to prescription errors.

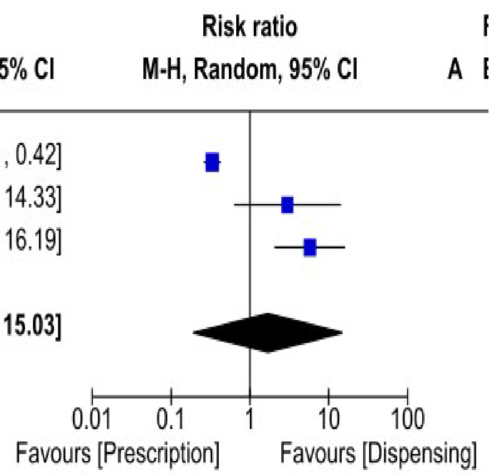
Figure 6: Frequency of Prescription errors vs. Dispensing errors.

Study or Subgroup	Prescription errors Events	Prescription errors Total	Dispensing errors Events	Dispensing errors Total	Weight	Risk ratio M-H, Random, 95% CI
✓ Pasto-Cardona 2009	67	418	201	418	36.0%	0.33 [0.26 , 0.42]
✓ Salazar 2011	6	66	2	66	30.5%	3.00 [0.63 , 14.33]
✓ Smith 2014	23	138	4	138	33.5%	5.75 [2.04 , 16.19]
Total (95% CI)		**622**		**622**	**100.0%**	**1.69 [0.19 , 15.03]**
Total events:	96		207			

Heterogeneity: Tau² = 3.44; Chi² = 35.41, df = 2 (P < 0.00001); I² = 94%

Test for overall effect: Z = 0.47 (P = 0.64)

Test for subgroup differences: Not applicable



P<0.00001, figure 4 shows the forest plot of frequency of prescription errors vs. dispensing errors. This shows that there was a statistically significant increase in the occurrence of prescription errors when compared to dispensing errors.

Discussion

Medication errors remain inseparable from current practice which is a matter of concern.[8] This fact is once again reinforced by the results yielded by our meta-analyses. Prescription errors being the predominant one in case of most of the studies suggest the massive prevalence of such errors.[2-4,6] This warrants action plans that would project the magnitude of the problem and realize the need for careful writing and cross verification that would help in reducing the errors to a significant extent. Most of the studies that emphasis on the occurrence of transcription errors were focused towards the pediatric population and this can be understood by the fact that most of the pediatric dosage forms.[5,10,11]

This require stringent dose calculations and this requires a decent expertise which sometimes lack in poor socioeconomic countries. The unfortunate fact about its prevalence associated with potentially dangerous medications is further cause of concern that has to be prevented by formulating strategic plans.

Administration errors are found to be highly prevalent in some studies.[1,11] This mostly occurs in the setting of chronic medications. The usual manifestation here is in the form of skipping doses and incorrect times of drug administration. Sometimes overzealous adherence seen with some people might also lead to undesirable effects of the same drug which again emphasis on framing policies for preventing the occurrence of these errors. The study done in regional cancer center in south India stated that prescription errors to be high and these errors were identified by the study team and intervened in the midst of them getting converted to transcription or administration errors that could deleterious in case of chemotherapeutic agents which have high toxicity potential.[6] This study could have yielded a differing prevalence of other errors without this intervention by the study team. Another study from the middle east done via pharmacy has not intervened to correct the errors they found in prescription and also found the prescription errors to be significantly high when compared to other errors.[4] So, these studies even though seem to be contradictory to a little extent the intervention by the study team might not have created a substantial difference could be inferred. This meta-analysis also adds on and to the existing evidence through separate studies stating a higher prevalence of prescription errors. Thereby this meta-analysis has established a higher prevalence of medication errors in case of tertiary healthcare setup and warrants policy makers in formulating effective methods in prevention of its occurrence. The reduction in prescription errors can also reduce other errors that follow an illegible or incorrect prescription which accounts for the strengths of this analysis. The limitations even though are not too many the existing one is worth mentioning. All of these studies are done in tertiary healthcare setup and the same prevalence whether could be applicable for primary and secondary healthcare setup is inconclusive and this requires further studies and analysis for generating such evidence to help policy makers in framing appropriate guidelines for prevention of such errors.

Conclusion

The present study shows that prescription errors were high when compared to other types of medication errors. Prevention of occurrence of prescription errors - majority of untoward consequences could be safely prevented. Adequate training to junior doctors, proper vigilance and monitoring can prevent the occurrence of prescription errors

References

1. Ana Belén Jiménez Muñoz, Belén Martínez Mondéjar, Antonio Muiño Miguez, Dulce Romero Ayuso, Gema Maria Saiz Ladera, Juan José Criado Álvarez. Errors of prescription, transcription and administration according to pharmacological group at hospital. Rev Esp Salud Pública 2019;93(31):1-14.

2. Lourdes Pastó-Cardonaa, C. Masuet-Aumatellb, B. Bara-Oliváncc, I. Castro-Celsd, A. Clopés-Estelae, F. Pàez-Vivesf, J.A. Schönenberger-Arnaizg, M.Q. Gorgas-Tornerh y C. Codina-Janéh. Incident study of medication errors in drug use processes: prescription, transcription, validation, preparation, dispensing and administering in the hospital environment. Farmacia Hospital aria 2009;33(5):257-68.

3. A. Campino Villegas, M.C. López Herrera, M. García Franco,I. López de Heredia y Goya y A. Valls i Soler. Prescription and transcription errors in a neonatal unit. An Pediatr (Barc) 2006; 64:330-5.
4. Sultan Othman alolayan, Mansour Adam Mahmoud, Yaser Alahmadi, Sultan Al Thaqfan, Raneem Masoud, Amani Jamel Alharbi, Badr Ahmed A. Taher, Alaa Omer M. Abdullaal & Syed WAJID. The Prevalence, Severity and Potential Causes of Prescribing and Transcribing Errors among Hospitalized Pediatrics and Pregnant Women in Al-Madinah Al-Muna warah, Saudi Arabia. Latin American Journal of Pharmacy 2021;40(2):420-4.
5. Nicole Salazar l., Marcela jirón a., Leslie Escobar o., Eduardo Tobar, Carlos Romero. Prospective assessment of medication errors in critically ill patients in a university hospital. Rev Med Chile 2011; 139:1458-64.
6. Jayanthi Mathai Yan, Tanvi Jain, Biswajit Dubashi, Gitanjali Batman bane. Prescription, Transcription and Administration Errors in Out-Patient Day Care Unit of a Regional Cancer Centre in South India. Asian Pacific Journal of Cancer Prevention 2016;17(5):2611-7.
7. Hoy D, Brooks P, Woolf A, Blyth F, March L, Bain C, et al. Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. J Clin Epidemiol. 2012;65: 934-9
8. Ann-loren smith m., inés ruiz a., marcela jirón A. Monitoring medication errors in an internal medicine service. Rev Med Chile 2014;142(1):40-7.
9. E van Door Maal, P M L A van den Bemt, P G M Mol, R J Zaal, A C G Egberts, F M Haaijer-Ruskamp, J G W Kosterink. Medication errors: the impact of prescribing and transcribing errors on preventable harm in; hospitalized patients. Quality & Safety in Health Care 2009;18(1):22-7.
10. Edith Rivas R., Angélica Rivas L., Luis Bustos M. Frequency of prescription and transcription errors for intravenous medications in four pediatric services. Rev Med Chile 2010; 138:1524-9.
11. Afsaneh Vazin, Mitra Fereidooni. Determining Frequency of Prescription, Administration and Transcription Errors in Internal Intensive Care Unit of Shahid Faghihi Hospital in Shiraz with Direct Observation Approach. Iranian Journal of Pharmaceutical Sciences 2012;8(3):189-94.