

MEDICATION RELATED PROBLEMS AND CLINICAL PHARMACIST INTERCESSION TO RESOLVE THOSE AS DIRECT PATIENT CARE PROCESS

Sushanta Kumar Das* and Rajesh Maheshwari

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Abstract

Medication related problems (MRPs) are ‘any preventable event that may cause or lead to an inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer’. Whereas prescribing error is an error in the choice or administration of drugs for patients including; incorrect dose or medicine, duplicate therapy, incorrect route of administration or even wrong patient. These conditions are frequent in general practice and in hospitals setup and can result in grim patient harm. Clinical Pharmacists can play a significant role by identification and modification of these errors. Thorough prescription review, timely intercession, patient interview and follow-up can reduce the quantity of MRPs. Here we discussed about five cases where definite MRPs was identified by the clinical pharmacist during medication chart review and those were thoroughly cross matched with standard reference to established as developed due to prescription error. Same were reported to the visiting doctor and subsequent modifications were suggested to resolve those issues. This case series analysis concludes that MRPs are appearing due to prescription error and that need to be addressed with proper management strategy. Support by clinical pharmacist intercession as a direct patient care process in optimizing drug therapy by providing proper medication information was highly accepted and appreciated by various doctors and has achieved enhanced therapeutic outcome.

Keywords: Medication related problems, clinical pharmacist intercession, direct patient care, therapeutic outcome

Introduction

Medication related problems (MRPs) are defined 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 health care professional, patient or consumer. Such events may be related to professional practice, health care products, procedures and systems, including

prescribing and order communication (WHO, 2016). Prescribing error definition and description varies in the clinician and also in the researcher, an adopted definition states that ‘A clinically meaningful prescribing error occurs when, as a result of a prescribing decision or prescription writing process, there is an unintentional significant (1)

Department of Pharmacy, Sumandeep Vidyapeeth Deemed to be University, Piparia, Vadodara, Gujarat State, India - 391760.

E-mail: sushanta.das47@gmail.com; rajpharma2007@gmail.com.

*Corresponding author

reduction in the probability of treatment being timely and effective or (2) increase in the risk of harm when compared with generally accepted practice' (Dean *et al.*, 2000). Included is incorrect dose or medicine, duplicate therapy, incorrect route of administration or patient. Medication errors are common in general practice and in hospitals. Both errors i.e. prescription errors (in the act of writing) and prescribing faults develop due to erroneous medical decisions which can result in patient harm. Any step in the prescribing process can generate errors. Slips, lapses or mistakes are sources of errors, as in unintended omissions in the transcription of drugs. Faults in dose selection, omitted transcription and poor handwriting are common. Inadequate knowledge or competence and incomplete information about clinical characteristics and previous treatment of individual patients can result in prescribing faults, including the use of potentially inappropriate medications. An unsafe working environment, complex or undefined procedures and inadequate communication among health-care personnel particularly between doctors and nurses have been identified as important underlying factors that contribute to prescription errors and prescribing faults (Velo and Minuz, 2009). Prescription errors encompass those related to the act of writing a prescription, whereas prescribing faults encompass irrational prescribing, inappropriate prescribing, under prescribing, overprescribing, and ineffective prescribing arising from erroneous medical judgment or decisions concerning treatment or treatment monitoring (Lesar *et al.*, 1997; Dean *et al.*, 2005). Appropriate prescribing results when errors are minimized and when the prescriber actively endeavors to achieve better prescribing; both actions are required. Active intercessions by drugs expert aimed at reducing prescription errors and prescribing faults are strongly recommended. These should be focused on the education and training of prescribers and the use of on-line aids. The complexity of the prescribing procedure should be reduced by introducing automated systems or uniform prescribing charts, in order to avoid transcription and omission errors. Feedback control systems and immediate review of prescriptions, which can be performed with the assistance of a hospital pharmacist, are also helpful. Audits should be performed periodically (Velo and Minuz, 2009). Clinical Pharmacists can play a significant role in identification and modification of such prescribing error by constant prescription review, in time pharmacist intervention based on medication review, patient interview and follow-up. This practice can reduce the number of readmissions and emergency department visits also (Ravn-Nielsen *et al.*, 2018). Studies conducted earlier in abroad have shown that clinical pharmacist led medication chart review enhances the therapeutic outcome by identifying and

resolve these errors by providing suitable therapeutic solutions (Lee *et al.*, 2016; Pfister *et al.*, 2017). Similarly in India clinical pharmacist activities including MRPs identification and reporting is well established but subsequent clinical pharmacist lead intercession of such MRPs are not reported yet as the modification of those entirely lying in the hand of doctors only. Therefore we have aimed to provide suitable and referred alternative to identified MRPs so as to resolve them and to get involve in direct patient care process. Here we have discussed about five (05) different cases which were admitted in Gandhi hospital, (a tertiary care multi super-specialty government medical college and hospital at Secunderabad, India) where MRPs were identified by the clinical pharmacist during medication chart review and those MRPs were thoroughly cross matched with standard reference to establish as 'developed due to prescription error'. Same were reported to the visiting doctor and subsequent modifications were suggested to resolve those errors as a clinical pharmacist intercession. This process was highly accepted and appreciated by various doctors and has achieved enhanced therapeutic outcome. While conducting the intercessions for confirmed MRPs, we realized that even doctors were keen to identify and resolve such issues but due to their time constrain and huge patient burden they were unable to work in this particular domain even if they want to. In this circumstance our participation in this particular arena has enhanced the overall patient outcome as doctors were able to correlate their thought process with our direct action. Furthermore this type of direct intercession by clinical pharmacist is very rare in Indian healthcare scenario. This in almost nil in government run hospital setup, there for our involvement in direct patient care by identifying and altering the MRP and getting accepted by the doctors and making it happen in the actual case sheet shows a tectonic shift in the healthcare system. Here everybody involved in the patient care process think about enhanced care but situation may bar them from doing so. Therefore role of clinical pharmacist will certainly improve the overall healthcare scenario of India and the same is coming forward also.

Literature Review

A new pharmacist-led service model pharm2pharm was conducted with main objective to identify and categorize potentially preventable medication-related hospital admissions and to describe how it was used to improve a pharmacist intervention focused on reducing medication-related readmissions. They reported that, 26% re-admissions were potentially

preventable and medication related and concluded that, this systematic and actionable approach to reviewing and categorizing potentially preventable medication-related admissions can facilitate improvement in the patient care and document their role (Pelligrin *et al.*, 2017).

An Investigational study with main objective was to investigate the prevalence and type of drug related problem and associated factors. Their result shows that, 29% were drug interactions, 8% adverse drug reactions, 5% unnecessary drug therapy and 35% discontinuation of drug therapy. They concluded that clinical pharmacist as a part of a ward team resulted in several interventions to improve patient drug treatment (Peterson and Gustafsson, 2017).

A cohort study was conducted to measure the effect of poly-pharmacy on elderly patients. They reported that a huge number of drug related problems and also highlighted the role of clinical pharmacist intervention which proved to be useful and further suggested to enhance a strong bond between healthcare professionals to increase patient safety in the vulnerable institutionalized elderly population (Da Costa *et al.*, 2016).

A prospective cross sectional study was conducted during November 2012 to March 2013 with main aim to assess the role of clinical pharmacist in detecting and managing medication related problems. Their report shows drug choice problems were most common and clinical pharmacist intervention has moderate rate of acceptance from physicians (41.91%). Study revealed that clinical pharmacist services could contribute to rationalize drug therapy and may essentially lead to more medication safety (Foroughinia *et al.*, 2016).

A study was conducted to detect drug therapy problems in critically ill patients and shows that inclusion of clinical pharmacist in intensive care unit reduces mortality and adverse events thereby improving clinical outcomes. Moreover prevalence of drug therapy problems demonstrates that for each

patient case sheet reviewed by clinical pharmacist found at least 2 drug therapy problems are liable to intervention (Verdoorn *et al.*, 2015).

Case Reports

Case 1 - a 55 years old female patient was admitted in the department of general medicine female unit-III on 22-11-2019 with the complains of cough, chest pain, shortness of breath for last 12 days. On examination patient was found to be conscious and coherent, per abdomen soft, blood pressure was 120/80 mmHg with a pulse rate of 110 beats per minute, normal heart sound with both S1 and S2 heard. Patient's past medical history revealed that she is hypertensive for past 10 years and on irregular medication. On the same day patient was sent for various diagnostic test. Test result showed decreased hemoglobin (7 gms %), increased serum creatinine and urea (4.4 mg/dl and 65 mg/dl respectively), her liver function test and electrolyte level were normal. She underwent ultra sound scan and result was 'right moderate pleural effusion with underlying lung collapse and left mild pleural effusion'. Based on clinical feature, past history and diagnostic test results, she was diagnosed as 'Synpneumonic effusion with acute deterioration of CKD'. On the day of admission patient was prescribed with following medication:

Rx

1. Inj. Augmentin 1.2 gm IV TID
2. Tab. Azee 500 mg OD
3. Tab. Nodosis 500 mg BID
4. Tab. Nicardia retard 20 mg BID
5. Tab. Dytor 10 mg BID
6. Tab. Atorvas 20 mg OD HS
7. Tab. Thyroxin 50 mcg OD

Also her input and output chart was advised to monitor.

Table 1. Shows detail medication prescription of the patient throughout the hospital stay

Sl No.	Drug	Generic	Dose	Route	Frequency
1.	Inj. Augmentin	Amoxicillin+ Clavulanic acid	1.2 gm	IV	1-1-1
2.	Tab. Azee	Azithromycin	500 mg	P/O	1-0-0
3.	Tab. Nodosis	Sodium bicarbonate	500 mg	P/O	1-0-1
4.	Tab. Nicardia retard	Nifedipine	20 mg	P/O	1-0-1
5.	Tab. Dytor plus	Furosemide+Torsemide	10 mg	P/O	1-1-0
6.	Tab. Atorvas	Atorvastatin	20 mg	P/O	0-0-1
7.	Tab. Thyronorm	Thyroxine	50 mcg	P/O	1-0-0
8.	Tab. Enam	Enampril	2.5 mg	P/O	1-0-1
9.	Tab. Revlamer	Sevelamer carbonate	400 mg	P/O	1-1-1
10.	Neb. Budecort	Budesonide	0.5 mg	Inhalation	1-1-1
11.	Neb. Duolin	Ipratropium & Levalbutamol	1.25 mg+ 500 mcg	Inhalation	1-1-1
12.	Tab. Vit C	Ascorbic acid	200 mg	P/O	0-1-0
13.	Tab. IFA	Iron and Folic acid	60 mg+400 mcg	P/O	0-1-0
14.	Syp. Kcit	Potassium citrate	15 ml	P/O	1-1-1
15.	Tab. PCM	Paracetamol	500 mg	P/O	SOS

Table 2. Shows detail medication prescription of the patient throughout the hospital stay

Sl No	Drug	Generic	Dose	Route	Frequency
1.	Inj. Levipril	Levitiracetam	500 mg	IV	1-0-1
2.	Inj. Pantop	Pantoprazole	40 mg	IV	1-0-0
3.	Inj. Zofer	Ondansetron	4 mg	IV	1-0-0
4.	Tab. CPM	Chlorpheniramine maleate	4 mg	P/O	0-0-1
5.	Tab. PCM	Paracetamol	500 mg	P/O	1-1-1
6.	Syp. Potchlor	Potassium chloride	20 mEq/ml	P/O	1-1-1
7.	Normal saline	Sodium chloride	0.9%	IV	1-0-0

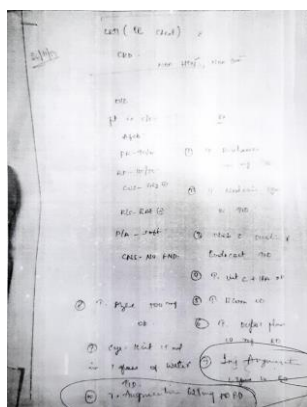


Figure 1. Shows very high dose of Augmentin (Amoxicillin+ Clavulanic acid) prescribed in a single day of prescription, which was identified and discussed with the doctor to modify as per the standard guidelines

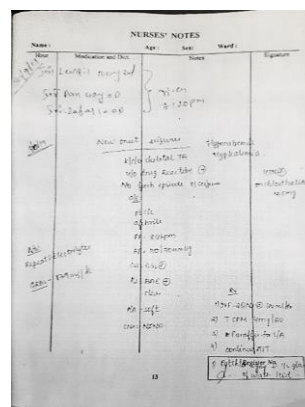


Figure 2. Shows the inclusion of Potassium chloride in the prescription after intercession by the clinical pharmacist as the patient was diagnosed as Hypokalemia

Patient was admitted for 7 days and was discharged on 20-11-2010. Her medication throughout the hospital period is mentioned in Table 1.

On 26-11-2019 patient was continued with Inj. Augmentin 1.2 gm but the frequency was decreased to BID instead of TID than the previous day prescription along with that on the same day prescription; Tab. Augmentin 625 mg was additionally added in to the existing medication list (Figure 1). Upon prescription review the same was identified and was brought to the notice of the visiting doctor. It was further discussed that writing same medication as two different formulations is considered as drug duplication under prescription error. This error was rectified immediately by discontinuing the Tab. Augmentin and inj. Augmentin was continued.

Case 2 - a 75 years old female patient was admitted in the department of general medicine female unit-I on 31-10-2019 with the complains of fever for last three days along with loss of consciousness, 2 episodes of vomiting and seizures for last one month. On examination patient was found to be conscious and altered sensorium, afebrile, per abdomen soft, blood pressure was 120/80 mmHg with a pulse rate of 81 beats per minute, normal heart sound with both S1 and S2 heard, bilateral air entry was positive. Patient's past

medical history revealed that she is a skeletal muscle TB patient and on regular anti Tuberculin therapy along with hypertension. On the same day patient was sent for various diagnostic test. Test result showed decreased Serum potassium level (2.8 mmol/L) and sodium level (125 mEq/L). On the next day also few more diagnostic tests were performed and it was found that her hematological parameters slightly reduced than normal values. Based on clinical feature, past history and diagnostic test results, she was diagnosed as 'New onset seizures and ATT induced Hyponatremia and Hypokalemia). On the day of admission patient was prescribed with following medication:

Rx

1. Inj. Levipril 500mg IV BID
2. Inj. Pantop 40mg IV OD
3. Inj. Zofer 4mg IV OD
4. Tab. Chlorpheniramine Maleate 4mg OD
5. Tab. Paracetamol 500mg TID

Patient was hospitalized for a period of 5 days and was discharged on 05-10-2019. During her hospitalization following medications were prescribed as mentioned in the Table 2.

On 3-10-2019 it was identified that, even though the patient was diagnosed as Hypokalemia, for last three days, no potassium supplement was

Table 3. Shows detail medication prescription of the patient throughout the hospital stay

Sl No	Drug	Generic	Dose	Route	Frequency
1.	Inj. Lasix	Furosemide	20 mg	IV	1-0-0
2.	Tab. BC	Vitamin B complex with Vitamin C		P/O	0-1-0
3.	Tab. Pantop	Pantoprazole	40 mg	P/O	1-0-0
4.	Tab. Vit C	Ascorbic acid	200 mg	P/O	0-1-0
5.	Tab. IFA	Iron and Folic acid	60 mg + 400 mcg	P/O	0-1-0
6.	Tab. PCM	Paracetamol	500 mg	P/O	SOS
7.	Inj. Zofer	Ondansetron	8 mg	IV	1-0-1
8.	Inj. Metrogyl	Metronidazole	100 ml	IV	1-1-1
9.	Tab. Buscopan	Hyoscine butyl bromide	10 mg	P/O	1-1-1

prescribed. Once it was identified, the same was brought to the notice of the doctor with a suggestion to inclusion of Syp. Potklor (potassium chloride). It was accepted by the doctor and included in the prescription (Figure 2). As this case was a confirmed hypokalemic, still Non-inclusion of potassium supplement will be considered as untreated indication as a prescription error.

Case 3 - a 35 years old female patient was admitted in the department of general medicine female unit-I on 07-11-2019 with the complains of yellowish discoloration of eyes and abdominal pain for last one month. She had 6 episodes of vomiting yesterday. She also complained about dry cough and pedal edema. On examination patient was found to be conscious and coherent, severe pallor, icterus, per abdomen tenderness, edema. No cyanosis and central nervous system was NFND. Blood pressure was 110/70 mmHg with a pulse rate of 110 beats per minute, normal heart sound with both S1 and S2 heard, bi lateral air entry revealed crepitation. She had no significant past medical or social history. She also had a history of herbal medication usage. Various diagnostic tests were performed on 07-11, 08-11, and 09-11. Test result showed decreased hemoglobin and RBC level (6.5 gms % and 1.37 respectively), serum electrolyte level as decreased potassium and chloride level. She underwent ultra sound scan and result was 'mild splenomegaly, mild ascites and sluggish peristalses'. Based on clinical feature and diagnostic test results, she was diagnosed as 'Vitamin B12 deficiency anemia with menorrhagia'. On the day of admission patient was prescribed with following medication:

Rx

1. Oxygen inhalation @4 lit per minute
2. Inj. Lasix (Furosemide) 20 mg IV OD
3. Tab. Iron Folic acid OD
4. Tab. Vitamin B Complex OD
5. Tab. Pan (Pantoprazole) 40 mg IV OD
6. Inj. Zofer (Ondansetron) 8 mg BID
7. Inj. Metrogyl (Metronidazole) 100 ml IV TID
8. Tab. Vitamin C OD

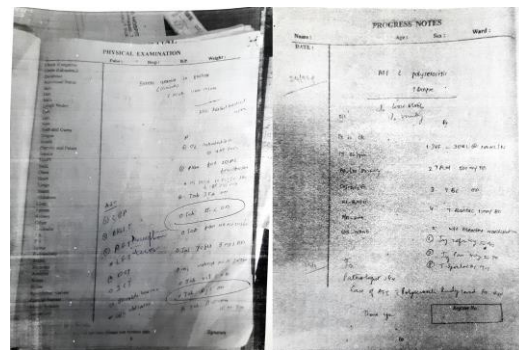


Figure 3. Shows the double prescription of Vitamin B complex with Vitamin C in a same day prescription. Same was changed to only one time prescription

9. Tab. Vitamin B Complex OD

Patient was further planned for 2pint packed cell transfusion.

Patient was hospitalized for a period of 10 days and was discharged on 16-11-2019. During her hospitalization following medications were prescribed as shown in the Table 3.

In this case Tab. Vitamin B complex with Vitamin C was prescribed twice in a same day prescription (Figure 3). This error was brought to the notice of the visiting doctor and was informed that writing same medicine twice in a single day prescription is not justified as double administration of same medication may lead to overdose. Hence the prescription was modified by removing one Vitamin B complex from the prescription.

Case 4 - a 76 years old female patient was admitted in the department of general medicine female unit-I on 18-11-2019 with the complains of shortness of breath for last 2 months and abdominal distension since last 15 days. On examination patient was found to be irritable, conscious and coherent with shortness of breath grade-II to III along with orthopnea, blood pressure was 150/100 mmHg with a pulse rate of 84 beats per minute, per abdomen was distended, normal heart sound

Table 4. Shows detail medication prescription of the patient throughout the hospital stay

Sl No	Drug	Generic	Dose	Route	Frequency
1.	Inj. Lasix	Furosemide	40 mg	IV	1-0-1
2.	Tab. Aspirin	Acetyl salicylic acid	75 mg	P/O	0-1-0
3.	Tab. Cardivas	Carvedilol	6.125 mg	P/O	0-1-0
4.	Tab. BC	Vitamin B complex	--	P/O	0-1-0
5.	Tab. Pantop	Pantoprazole	40 mg	P/O	1-0-0
6.	Tab. Shelcal	Calcium	500 mg	P/O	0-1-0
7.	Tab. IFA	Iron and Folic acid	60 mg + 400 mcg	P/O	0-1-0
8.	Inj. Udiliv	Ursodeoxycholic acid	300 mg	P/O	1-1-1
9.	Tab. Nodosis	Sodium bicarbonate	500 mg	P/O	1-1-1
10.	Tab. Atorvas	Atorvastatin	40 mg	P/O	0-0-1
11.	Tab. Aldactone	Spirolactone	25 mg	P/O	1-0-1
	Tab. Buscopan	Hyoscine butylbromide	10 mg	P/O	1-0-1
12.	Tab. Amlo	Amlodipine	5 mg	P/O	1-0-0
13.	Human Albumin	Albumin	20% in 100 ml	IV	1-0-0
14.	Inj. Vit K	Phytonadione	10 mg/ml	IV	1-0-0
15.	Tab. Rifagut	Rifaxime	550 mg	P/O	1-0-1
16.	Syp. Lactulose	Lactulose	0 ml	P/O	1-0-1

with both S1 and S2 heard, bilateral air entry was positive and basal crepitation was positive. CNS evaluation shows Glasgow coma scale value - E4V5M5. Her oxygen saturation was 96% and random blood sugar was 63 mg/dl, pH was 7.4. ECG shows LAD with left bundle branch block. Past medical history of patient revealed that she is a known hypertensive and on Tab. Atenolol 25 mg OD for last 10 years, she was also prescribed with Enema for her constipation and had adequate sleep and decreased appetite. Further social history found that, she has a mixed diet pattern without any known addiction. On the same day patient was sent for various diagnostic test and her test report indicates; decreased RBC (3.38 millions/ul), platelet ($87,000 \times 10^9/\text{lit}$) and Serum Sodium (127 milli equivalents per liter). Whereas Serum Creatinine (3.02 mg/dl), Blood Urea Nitrogen (122.11 mg/dl), Total Serum Bilirubin (9.32 mg/dl) and ALP (237.6 IU/L) value were increased than the normal value. Her USG report indicates cirrhosis of liver with decreased portal vein, gross ascites and suspected chronic cholecystitis. Based on clinical feature, past history and diagnostic test results, she was diagnosed as 'decompensate chronic liver parenchymal disease with ascites, hepatic encephalopathy and acute kidney injury'. On the day of admission patient was prescribed with following medication:

Rx

1. Inj. Lasix (Furosemide) 40 mg IV BID
2. Tab. Cardian 6.125 g OD
3. Tab. Aspirin 75 mg PO OD
4. Tab. Atorvas (Atorvastatin) 40 mg PO OD
5. Tab. Iron Folic acid 325 mg PO OD
6. Tab. Nodosis 500 mg TID
7. Tab. Shelcal (Calcium) 500 mg OD
8. Tab. Aldactone BID
9. Tab. Buscopan BID
10. Inj. Pan (Pantoprazole) 40mg IV BID

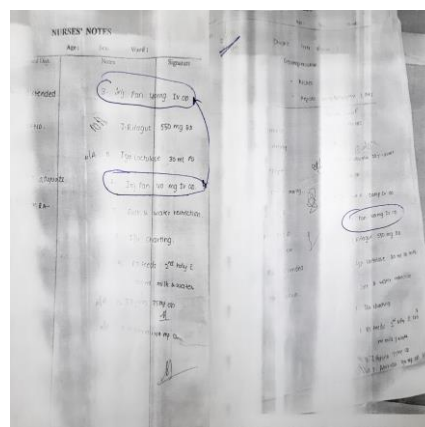


Figure 4. Shows prescription of Pantoprazole twice in a single day prescription and subsequent modification by prescribing only one after clinical pharmacist intercession

Patient was hospitalized for a period of 12 days and was discharged on 29-11-2019. During her hospitalization following medications were prescribed as mentioned in the Table 4.

On 20-11-2019 patient was prescribed with a different prescription regimen and it was found that Inj. Pantoprazole 40 mg IV OD was prescribed two times in the same day's prescription (Figure 4). This error was identified and brought to the notice of the visiting doctor and was informed that writing same medicine twice in a single day prescription is not appropriate as it may lead to confusion while administration by the nurses. It was also discussed that if required 40 mg BD can be prescribed. This discussion was fruitful as the prescription was modified by striking out one Pantoprazole from the prescription.

Table 5. Shows detail medication prescription of the patient throughout the hospital stay

Sl No	Drug	Generic	Dose	Route	Frequency
1.	Tab. Ca	Calcium	500 mg	P/O	0-1-0
2.	Tab. MVT	Multi vitamin	--	P/O	0-1-0
3.	Inj. Taxim	Cefotaxim	1 gm	IV	1-0-1
4.	Inj. Metrogyl	Metronidazole	100 ml	IV	1-1-1
5.	Tab. Vit C	Acorbic acid	200 mg	P/O	0-1-0
6.	Inj. Rantac	Ranitidine	150 mg	IV	1-0-1
7.	Tab. Fe	Ferrous sulphate	200 mg	P/O	1-0-1
8.	Inj. Tranexa	Tranexamic acid	1 gm	IV	1-0-1

Case 5 - a 16 years old female patient was admitted in the department of obstetrics and gynecology unit-I on 20-1-2020 with the complains of heavy menstrual bleeding for last 15 days. On examination patient was found to be conscious and coherent, afebrile, per abdomen soft, Blood pressure was 120/80 mmHg with a pulse rate of 102 beats per minute, normal heart sound with both S1 and S2 heard, bi lateral air entry was clear, with no active bleeding. She had a history of dysmenorrhoea and no other significant past medical or social history. Her diagnostic test revealed a very low hemoglobin value (4.2 gm/dl). Based on clinical feature and diagnostic test results, she was diagnosed as 'Menorrhagia with severe anemia'. On the day of admission patient was prescribed with following medication:

Rx

1. Oxygen inhalation with popped up position
2. Inj. Tranexamic acid 500mg IV BID
3. Inj. Taxim 1gm IV BID
4. Inj. Metrogyl 100ml IV TID
5. Inj. Ranitidine 2cc IV BID
6. Tab. Ferrous Sulfate BID
7. Tab. Vitamin C + Calcium + Multivitamin OD
8. Inj. Tranexamic acid 1gm IV TID

Patient was further advised to watch for signs and symptoms of congestive cardiac failure.

Patient was hospitalized for a period of 4 days and was discharged on 23-01-2020. During her hospitalization following medications were prescribed as shown in the Table 5.

In her prescription on admission medicine; Tranexamic acid was prescribed two times with two different dose regimens as Inj. 500 mg IV BID and Inj. 1 gm IV TID (Figure 5). This prescription order is not only an error even it may lead to serious consequences. It was discussed with the doctor whether they had a plan of loading dose or not? Further dose calculation revealed that the dose is even higher than the maximum daily recommended dose. With all the referred justification and discussion this prescription was modified as Inj. Tranexa 1gm IV TID.

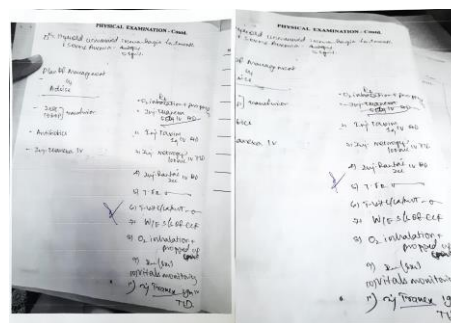


Figure 5. Shows prescription of Tranexamic acid in very high dose than recommended. Upon discussion with reference support same was modified accordingly

Discussions

A prescribing error is a failure in the prescribing (decision making) process. It leads to, or has the potential to lead to injury to the patient. 'balanced prescribing' is the use of a medicine that is appropriate to the patient's condition and within the limits created by the uncertainty that attends therapeutic decisions, in a dosage regimen that optimizes the balance of benefit to harm (Aronson, 2009). Medication error develops predominantly during the medication prescription by the physician. Dispensing, administration or errors at the patient level are also seen in multiple occasions but overall it begins with the prescription process only.

In case 1; Inj. Augmentin (Amoxycillin with Clavulanate) was prescribed as 1.2 gm IV BID and simultaneously on the same day prescription Tab. Augmentin 625 mg was additionally added in to the existing medication list. The way it was prescribed was not only wrong but also will certainly lead to confusion during administration ultimately leading to either under or over dosing. Identification of the same and reporting with appropriate dose calculation was initiated by clinical pharmacist to avoid wrong administration.

On 2nd case; patient developed hypokalemia but no potassium supplement was added. Hypokalemia leads to bradycardia including cardiovascular collapse (Lewis III JL, 2021). There for inclusion of potassium supplement was very much essential in this case and doctor also accepted the suggestion.

Case 3; exhibit a classic example of prescription error where Vitamin B complex was prescribed twice in a same day prescription. Even though Vitamin B complex considered as a safe medicine, if it is administered excess may raise few overdose complications, not serious but unquestionably an error. Similar error was identified in case 4, in which Inj. Pantoprazole 40 mg IV OD was prescribed two times on a same day prescription. Generally the dose of Pantoprazole IS 40 mg OD, in some specific condition the dose can be enhanced up to 80 mg per day in divided dose. Once it was identified, brought to the notice of the doctor for further confirmation as the diagnosis was not such that 80 mg Pantoprazole will be required for. After discussion doctor it well confirmed with 40 mg OD dose only and discontinued one.

In case 5; Tranexamic acid was prescribed as Inj. Tranexamic acid 500 mg ID BID again in the same day prescription it was ordered as Inj. Tranexamic acid 1 gm IV TID. Both the way of prescribing and the daily maximum dose was found be inappropriate in this case. Upon identification issue was informed to the doctor and Inj. Tranexamic acid 1 gm IV TID was only continued and that is a standard dose also. Such high dose than daily dose limit may lead to serious complications also (Tranexamic Acid, 2021).

Due to careful scrutiny of individual prescription order by clinical pharmacist such prescription error can be identified early and well avoided with suitable modifications to enhance better therapeutic outcome and to reduce drug related harm. Clinical pharmacists should be watchful for monitoring the doses and doctor should take the help of clinical pharmacists to avoid such errors. In the treatment approach, we have discussed with the doctors for every single identified MRP and also provided sufficient and justified support obtained from either textbook or from standard medical reference resources. Based on our discussion; all the errors were accepted, modified accordingly and furthermore our service was appreciated. This is new trend setting in our practice setup to enhance clinical pharmacist's role as a member of direct health care for the patient management. Initially few hiccups were also encountered for this intercession as it was felt like mistake identification but with proper justification and reference support we were able to turn the table.

Conclusions

Clinical pharmacists are uniquely trained to review prescription medicine and also to intervention with a main motto as better patient care.

From our case series analysis we can conclude that medication related problems are frequently appearing due to prescription error by the doctor and those need to be addressed with proper management strategy. It also established that necessitate of clinical pharmacist intercession in optimizing drug therapy by providing proper medication information is accepted and appreciated by various doctors and has achieved enhanced therapeutic outcome by involving in direct patient care process.

Limitations and future scope: We found that even though in few cases we delivered justified and rational information to alter the therapy still modifications were not reflected in the case sheet. Certain circumstances contributed to this and some of them as, prescription by senior professor were not able to change by the Post Graduate Trainee without prior permission, doctors were not confident enough about the suggestions made by clinical pharmacist or doctors may have different and better judgment. To continue and to enhance this process in future, closer collaboration between healthcare professionals is needed to improve the acceptability of pharmacist interventions and consequently the proportion of problems solved. Moreover, it seems that, to be successful, the pharmacist should be more selective in the recommendations made.

Ethical Clearance: Obtained

Conflict of Interest: Nil

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