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Assessment of Potential Drug Interactions in Geriatric Patients in Rural Teaching Hospital

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ABSTRACT

In elderly, concomitant use of several drugs is very common, and carries a high risk of drug-drug interaction. The aim of the study was to assess the potential drug–drug interaction in hospitalized geriatric patients in rural teaching hospital. This prospective observational study was carried out in Medicine Department of Rajah Muthiah Medical College Hospital, Annamalai University, Tamil Nadu. We have collected 520 cases of hospitalized geriatric patients at age of 60 and above with both gender. Based on the profile of medications prescribed, the drug interactions were assessed by the help of various tools like Meds cape drug interaction online checker, books and clinical journals. In our total study population 342(65.76%) cases were males and 178(34.23%) were females. The total geriatric populations were classified into four age groups and patient in each group were recorded. The data from our study represent that; 60-64 years 38.84% (n=202), 65-69 years 29.23% (n=152), 70-74 years 19.80% (n=103), 75 and above years 12.11% (n=63). The collected geriatric prescriptions were classified to various therapeutic categories according with disease associated system. Out of the total prescriptions Cardiovascular (n=147), Respiratory (n=103) and Hepatic system (n=97) accounted for major geriatric cases. 294 patients (56.53%) were prescribed (6-7) drugs for their treatment. More than 12 drugs were used in a single prescription for 41 patients that may lead more number of drug interactions. The overall analysis of total prescriptions (n = 520) that 63.84% having drug interactions and 36.15 % having no drug interactions. The 120 patients (36.14%) have two drug interactions in their prescription and 12 patients have 5 and more drug interactions. The total number of drug interactions was 729 among that 423(58.02%) potential drug – drug interactions were moderate category, 9.05% potential drug- drug interactions were major category. The study concluded that incidence of potential drug- drug interaction in hospitalized geriatric patients in rural teaching hospital was substantial. The concomitant administration of drugs should possibly be avoided. Prudent use of medications and vigilant drug monitoring are essential to avoid drug-drug interactions.

INTRODUCTION

Two or more drugs administered at the same time may interact with each other. The interactions may be potentiation or antagonism of one drug by another or occasionally some other effect. Drug interactions may be of pharmacokinetic or pharmacodynamic type. The pharmacokinetic interactions can be because of absorption mechanism, competition of two drugs at the protein binding sites, metabolizing enzyme system or excretion. When two or more drugs are concomitantly administered there is always a possibility of pharmacokinetic or pharmacodynamic interaction. The pharmacodynamic interactions can be at the receptor level for competition at same drug target (enzyme/receptor) acting synergistically or antagonizing the effect of each other. The drugs which have narrow therapeutic window have greater potential to cause unexpected adverse effect when their pharmacokinetics or pharmacodynamic is altered[1].

Drug–drug interactions are more likely in the elderly because they tend to use multiple medications. Most studies of community-dwelling elderly suggest that the average older person uses between two and six prescribed medications and one and three nonprescription medications on a routine basis[2].The elderly consume a disproportionate amount of prescription and nonprescription medications. Alterations in physiology, polypharmacy, multiple prescribers, and other factors place the elderly population at risk of developing clinically significant drug-drug interactions. The incidence of potential drug-drug interactions increases with increased drug use and are responsible for numerous emergency room and physician visits. Drug interactions have been shown to cause a decline in functional abilities in older people. Drug interactions are often clinically unrecognized and responsible for increased morbidity in elderly patients[3].

In elderly, concomitant use of several drugs (polypharmacy) is very common, and carries a high risk of both drug-drug interactions and drug-disease interactions[4, 5]. In nursing home resident, the prevalence of potential DDIs was 25 %[6]. Previous study found relationship between number of medication and potentially severe DDIs[7]. Multiple diseases prompt multiple drug use in the elderly, raising the risk of drug interactions. Several type of drug interactions exist: drug-drug, drug-disease, drug-food, drug-alcohol, drug-herbal products and drug-nutritional status. The outcome is an amplification or decrease in the therapeutic effects or side–effects of a specific

drug [8]. Some hospital admissions of elderly patients for drug toxicity occur after administration of a drug known to cause drug-drug interactions such as hypoglycemia after patients receiving glyburide concurrent with co-trimoxazole, digoxin toxicity (digoxin with clarithromycin), and hyperkalemia after being treated with ACE inhibitors and potassium sparing diuretic [9]. A study reported that 13% of preventable prescribing errors detected in ambulatory patients involved drug interactions [10-13]. The aim of the study was assessment of potential drug interactions in geriatric patients in rural teaching hospital.

MATERIALS AND METHODS

This prospective observational study was carried out for the period of one year from February 2013 to January 2014 in Medicine Department of Rajah Muthiah Medical College Hospital, Annamalai University, Tamil Nadu. The Ethical Committee approval was obtained from the relevant Institutional Human Ethics committee. The Medicine Department was selected for the study because the combination of disorders, which compels the physician to prescribe more categories of drugs that, leads to possibility of drug interaction.

We have collected 520 cases of hospitalized geriatric patients at age of 60 and above with both gender. A separate data entry format for incorporating details was designed. The format contains the details such as Name, Age, Gender, Date of admission, reason for admission, Educational status, Diagnosis, and medication progress report etc.

Based on the profile of medications prescribed, the drug interactions were assessed by the help of various tools like Meds cape drug interaction online checker, books and clinical journals.

Frequencies were expressed as percentages were used to summarize gender, number of drugs prescribed frequency of potential DDIs, drug involved in the DDIs and severity of DDIs. All collected data regarding medications prescribed were included in the analysis. The descriptive analysis included absolute and relative frequencies of categorical variables. SPSS v17.0 was used to run statistical analysis.

RESULTS AND DISCUSSION

A total of 520 geriatric cases were collected from Medicine Department of the Rajah Muthiah Medical College and Hospital. In our total study population 342(65.76%) cases were males and 178(34.23%) were females. The total geriatric populations were classified into four age groups and patient in each group were recorded. The data from our study represent that; 60-64 years 38.84% (n=202), 65-69 years 29.23% (n=152), 70-74 years 19.80% (n=103), 75 and above years 12.11% (n=63). Tabulated data of age distribution in the study population is given in Table-1.

The collected geriatric prescriptions were classified to various therapeutic categories according with disease associated system. Out of the total prescriptions Cardiovascular (n=147), Respiratory (n=103) and Hepatic system (n=97) accounted for major geriatric cases. 294 patients (56.53%) were prescribed (6-7) drugs for their treatment. More than 12 drugs were used in a single prescription for 41 patients that may lead more number of drug interactions. A report from more and Romsdal Prescription Study (MRPS) in Norwegian county mentioned the cardiovascular diagnoses were the highest incidence in their study[11]

Table 1: characteristics of hospitalized geriatric patients

Characters	Number of Patients	Percentage (%)
Gender		
Male	342	65.76
Female	178	34.23
Age Groups		
60 - 64	202	38.84
65 – 69	152	29.23
70 – 74	103	19.80
≥ 75	63	12.11
Therapeutic Category		
Cardiovascular System	147	28.26
Respiratory System	103	19.80
Hepatic System	97	18.65
Endocrine system	73	14.03
Nervous System	41	7.85
Gastrointestinal System	36	6.92
Others	23	4.42
Number of drugs Prescribed		
≤ 5	61	11.73
6 - 8	294	56.53
9 – 12	124	23.84
> 12	41	7.88

In order to predict the possible consequences of the administration of two or more drugs it is essential that the health professional has a practical knowledge of the pharmacological mechanism involved in drug interactions, an awareness of the drugs associated with great risk, and the most susceptible patient group [12]. Elderly patients are the population at the highest risk of potential DDIs [14].

Table-2: Prescriptions with Drug Interactions

Prescriptions	Number of Patients	Percentages (%)
Prescriptions with Drug Interactions	332	63.84
Prescriptions with No Drug Interactions	188	36.15

The overall analysis of total prescriptions (n = 520) show (table-2) that 63.84% having drug interactions and 36.15 % having no drug interactions. A recent study showed a strong relationship between number of drug and the potential of DDIs [6,7].

Table-3: Number of potential drug-drug interactions per patients

Number of Interactions	No. of patients	Percentages %
1	106	31.92
2	120	36.14
3	61	18.37
4	33	9.93
5 ≥	12	3.61

The findings of this study showed (table- 3) that 120 patients (36.14%) have two drug interactions in their prescription and 12 patients have 5 and more drug interactions.

Table-4: Drug Interaction Classification

Drug Interaction Classification	No. of drug interactions	Percentages %
Minor	240	32.92
Moderate	423	58.02
Major	66	9.05

It is difficult to determine the relevance of a particular drug interaction to any individual given the large number of variables.

Major	Highly clinically significant. Avoid combinations; the risk of the interaction outweighs the benefit.
Moderate	Moderately clinically significant. Usually avoid combinations; use it only under special circumstances.
Minor	Minimally clinically significant. Minimize risk; assess risk and consider an alternative drug, take steps to circumvent the interaction risk and/or institute a monitoring plan.

Table-4 reveals that total number of drug interactions were 729 among that 423 (58.02%) potential drug – drug interactions were moderate category, 9.05% potential drug- drug interactions were major category.

Frequently occurred drug interactions

We identified a total 729 potential drug interactions. The common drug combinations of major, moderate, minor drug interactions were given below

Drug interactions (Minor)

Drug interactions	Effects
Aspirin + ibuprofen	Aspirin will increase the level or effect of ibuprofen by acidic (anionic) drug competition for renal tubular clearance
Prednisolone + aspirin	Prednisolone decreases levels of aspirin by increasing renal clearance
Ranitidine + phenytoin	Ranitidine increases levels of phenytoin by decreasing metabolism
Aspirin + insulin regular human	Aspirin increases effects of insulin regular human by pharmacodynamic synergism. Large dose of salicylate
Metronidazole + acetaminophen	Metronidazole will increase the level or effect of acetaminophen by affecting hepatic enzyme cyp2e1 metabolism
Metronidazole + diclofenac	Metronidazole will increase the level or effect of diclofenac by affecting hepatic enzyme cyp2c9/10 metabolism.
Hydrocortisone + montelukast	Hydrocortisone will decrease the level or effect of montelukast by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Methylprednisolone + montelukast	Methylprednisolone will decrease the level or effect of montelukast by affecting hepatic/intestinal enzyme cyp3a4 metabolism

Theophylline + levocetirizine	Theophylline increases levels of levocetirizine by decreasing elimination
Dexamethasone + amlodipine	Dexamethasone will decrease the level or effect of amlodipine by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Aspirin + furosemide	Aspirin decreases effects of furosemide by pharmacodynamic antagonism. Nsaids decrease prostaglandin synthesis
Dexamethasone + furosemide	Dexamethasone, furosemide. Mechanism: pharmacodynamic synergism. Risk of hypokalemia, especially with strong glucocorticoid activity
Dexamethasone + aspirin	Dexamethasone decreases levels of aspirin by increasing renal clearance
Nifedipine + metformin	Nifedipine increases levels of metformin by enhancing GI absorption. Applies only to oral form of both agents
Metformin + ofloxacin	Metformin will increase the level or effect of ofloxacin by basic (cationic) drug competition for renal tubular clearance
Ofloxacin + ranitidine	Ofloxacin will increase the level or effect of ranitidine by basic (cationic) drug competition for renal tubular clearance
Metformin + furosemide	Metformin decreases levels of furosemide by unspecified interaction mechanism
Furosemide + metformin	Furosemide increases levels of metformin by unspecified interaction mechanism
Ofloxacin + insulin regular human	Ofloxacin, insulin regular human. Mechanism: unspecified interaction mechanism. Potential dysglycemia
Ofloxacin + glimepiride	Ofloxacin, glimepiride. Mechanism: unspecified interaction mechanism. Potential dysglycemia.
Ofloxacin + metformin	Ofloxacin, metformin. Mechanism: unspecified interaction mechanism. Potential dysglycemia
Haloperidol + promethazine	Haloperidol will increase the level or effect of promethazine by affecting hepatic enzyme cyp2d6 metabolism
Ranitidine + verapamil	Ranitidine will increase the level or effect of verapamil by basic (cationic) drug competition for renal tubular clearance
Phenobarbital + furosemide	Phenobarbital decreases levels of furosemide by inhibition of gi absorption. Applies only to oral form of both agents
Ceftriaxone + furosemide	Ceftriaxone increases toxcity of furosemide by pharmacodynamic synergism. Increased risk of nephrotoxicity

Nitroglycerin iv + heparin	Nitroglycerin iv decreases effects of heparin by unspecified interaction mechanism
Carbamazepine + acetaminophen	Carbamazepine decreases levels of acetaminophen by increasing metabolism
Dobutamine + furosemide	Dobutamine, furosemide. Mechanism: pharmacodynamic synergism. Hypokalemia
Budesonide + furosemide	Budesonide, furosemide. Mechanism: pharmacodynamic synergism. Risk of hypokalemia, especially with strong glucocorticoid activity
Metformin + ranitidine	Metformin will increase the level or effect of ranitidine by basic (cationic) drug competition for renal tubular clearance
Clarithromycin + amoxicillin	Clarithromycin decreases effects of amoxicillin by pharmacodynamic antagonism

Drug interactions (Moderate)

Drug interactions	**Effects**
Amoxicillin + aspirin	Amoxicillin, aspirin. Either increases levels of the other by plasma protein binding competition
Enalapril + insulin regular human	Enalapril increases effects of insulin regular human by pharmacodynamic synergism
Aspirin + metoprolol	Aspirin decreases effects of metoprolol by pharmacodynamic antagonism. Long term (>1 wk) nsaid use. Nsaids decrease prostaglandin synthesis
Aspirin + clopidogrel	Aspirin, clopidogrel. Either increases toxcity of the other by pharmacodynamic synergism. The need for simultaneous use of low-dose aspirin and anticoagulant or antiplatelet agents are common for patients with cardiovascular disease; monitor closely.
Enalapril + aspirin	Enalapril, aspirin. Either increases toxcity of the other by other (see comment). May result in renal function deterioration, particularly in elderly or volume depleted individuals
Aspirin + enalapril	Aspirin decreases effects of enalapril by pharmacodynamic antagonism. Nsaids decrease synthesis of vasodilating renal prostaglandins, and thus affect fluid homeostasis and may diminish antihypertensive effect
Metoprolol + aspirin	Metoprolol and aspirin both increase serum potassium
Spironolactone + furosemide	Spironolactone increases and furosemide decreases serum potassium. Effect of interaction is not clear, use caution
Ibuprofen + dexamethasone	Ibuprofen, dexamethasone. Either increases toxcity of the other by pharmacodynamic synergism. Increased risk of gi ulceration
Nifedipine + atorvastatin	Nifedipine will increase the level or effect of atorvastatin by

	affecting hepatic/intestinal enzyme CYP3A4 metabolism
Nifedipine + atorvastatin	Nifedipine will decrease the level or effect of atorvastatin by p-glycoprotein (mdr1) efflux transporter
Hydrocortisone + methylprednisolone	Hydrocortisone will decrease the level or effect of methylprednisolone by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Hydrocortisone + theophylline	Hydrocortisone will decrease the level or effect of theophylline by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Methylprednisolone + theophylline	Methylprednisolone will decrease the level or effect of theophylline by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Hydrocortisone + ofloxacin	Hydrocortisone and ofloxacin both increase.coadministration of quinolone antibiotics and corticosteroids may increase risk of tendon rupture
Methylprednisolone + ofloxacin	Methylprednisolone and ofloxacin both increase other. Coadministration of quinolone antibiotics and corticosteroids may increase risk of tendon rupture
Dexamethasone + atorvastatin	Dexamethasone will decrease the level or effect of atorvastatin by affecting hepatic/intestinal enzyme CYP3A4 metabolism
Atorvastatin + dexamethasone	Atorvastatin will increase the level or effect of dexamethasone by p-glycoprotein (mdr1) efflux transporter
Aspirin + dexamethasone	Aspirin, dexamethasone. Either increases toxcity of the other by pharmacodynamic synergism. Increased risk of GI ulceration
Dexamethasone + ciprofloxacin	Dexamethasone and ciprofloxacin both increase other. Coadministration of quinolone antibiotics and corticosteroids may increase risk of tendon rupture
Aspirin + furosemide	Aspirin increases and furosemide decreases serum potassium. Effect of interaction is not clear, use caution
Aspirin + ciprofloxacin	Aspirin decreases levels of ciprofloxacin by other. Comment: buffered aspirin may decrease absorption of quinolones. Consider administering 2 hr before or 6 hr after, buffered aspirin administration.
Enalapril + glimepiride	Enalapril increases effects of glimepiride by pharmacodynamic synergism
Phenytoin + atorvastatin	Phenytoin will decrease the level or effect of atorvastatin by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Enoxaparin + aspirin	Enoxaparin and aspirin both increase anticoagulation. Significant - monitor closely. Additive effects are intended when both drugs are prescribed as indicated for unstable angina,
Enoxaparin + phenytoin	Enoxaparin increases levels of phenytoin by unknown mechanism

Phenytoin + enoxaparin	Phenytoin, enoxaparin. Comment: hydantoin anticonvulsants increase anticoagulant effects at first, then decrease those effects with continued use (2+ wks). There are multiple mechanisms involved, including enzyme induction, plasma protein binding site competition, and additive effects on prothrombin time
Aspirin + enoxaparin	Aspirin, enoxaparin. Either increases toxcity of the other by pharmacodynamic synergism. The need for simultaneous use of low-dose aspirin and anticoagulant or antiplatelet agents are common for patients with cardiovascular disease; monitor closely
Atorvastatin + loperamide	Atorvastatin will increase the level or effect of loperamide by p-glycoprotein (mdr1) efflux transporter
Levofloxacin + glimepiride	Levofloxacin increases effects of glimepiride by pharmacodynamic synergism. Quinolone antibiotic administration may result in hyper- or hypoglycemia. Gatifloxacin is most likely to produce dysglycemia; moxifloxacin is least likely
Levofloxacin + insulin regular human	Levofloxacin increases effects of insulin regular human by pharmacodynamic synergism. Quinolone antibiotic administration may result in hyper- or hypoglycemia. Gatifloxacin is most likely to produce dysglycemia; moxifloxacin is least likely
Levofloxacin + metformin	Levofloxacin increases effects of metformin by pharmacodynamic synergism. Quinolone antibiotic administration may result in hyper- or hypoglycemia. Gatifloxacin is most likely to produce dysglycemia; moxifloxacin is least likely
Ofloxacin + glimepiride	Ofloxacin increases effects of glimepiride by pharmacodynamic synergism. Quinolone antibiotic administration may result in hyper- or hypoglycemia. Gatifloxacin is most likely to produce dysglycemia; moxifloxacin is least likely
Ofloxacin + insulin regular human	Ofloxacin increases effects of insulin regular human by pharmacodynamic synergism. Quinolone antibiotic administration may result in hyper- or hypoglycemia. Gatifloxacin is most likely to produce dysglycemia; moxifloxacin is least likely
Ofloxacin + metformin	Ofloxacin increases effects of metformin by pharmacodynamic synergism. Quinolone antibiotic administration may result in hyper- or hypoglycemia. Gatifloxacin is most likely to produce dysglycemia; moxifloxacin is least likely
Furosemide + gentamicin	Furosemide and gentamicin both decrease serum potassium
Levofloxacin + ofloxacin	Levofloxacin and ofloxacin both increase qtc interval

Budesonide + hydrocortisone	Budesonide will decrease the level or effect of hydrocortisone by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Hydrocortisone + levofloxacin	Hydrocortisone and levofloxacin both increase. Coadministration of quinolone antibiotics and corticosteroids may increase risk of tendon rupture
Haloperidol + olanzapine	Haloperidol and olanzapine both increase antidopaminergic effects, including extrapyramidal symptoms and neuroleptic malignant syndrome
Haloperidol + promethazine	Haloperidol and promethazine both increase antidopaminergic effects, including extrapyramidal symptoms and neuroleptic malignant syndrome
Promethazine + lorazepam	Promethazine and lorazepam both increase sedation
Promethazine + haloperidol	Promethazine and haloperidol both increase sedation
Promethazine + olanzapine	Promethazine and olanzapine both increase sedation.
Lorazepam + haloperidol	Lorazepam and haloperidol both increase sedation
Lorazepam + olanzapine	Lorazepam and olanzapine both increase sedation
Verapamil + atorvastatin	Verapamil will increase the level or effect of atorvastatin by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Verapamil + atorvastatin	Verapamil will increase the level or effect of atorvastatin by p-glycoprotein (mdr1) efflux transporter
Ranitidine + ferrous sulfate	Ranitidine will decrease the level or effect of ferrous sulfate by increasing gastric ph. Applies only to oral form of both agents
Aspirin + atenolol	Aspirin decreases effects of atenolol by pharmacodynamic antagonism. Long term (>1 wk) nsaid use. Nsaids decrease prostaglandin synthesis
Aspirin + heparin	Aspirin, heparin. Either increases toxcity of the other by anticoagulation. The need for simultaneous use of low-dose aspirin and anticoagulant or antiplatelet agents are common for patients with cardiovascular disease; monitor closely
Heparin + aspirin	Heparin and aspirin both increase anticoagulation
Atenolol + aspirin	Atenolol and aspirin both increase serum potassium

Furosemide + digoxin	Furosemide increases effects of digoxin by pharmacodynamic synergism. Hypokalemia increases digoxin effects
Digoxin + dobutamine	Digoxin increases and dobutamine decreases serum potassium. Effect of interaction is not clear, use caution
Digoxin + furosemide	Digoxin increases and furosemide decreases serum potassium. Effect of interaction is not clear, use caution
Dobutamine + furosemide	Dobutamine and furosemide both decrease serum potassium
Ciprofloxacin + insulin regular human	Ciprofloxacin increases effects of insulin regular human by pharmacodynamic synergism. Significant - monitor closely. Hyper and hypoglycemia have been reported in patients treated concomitantly with quinolones and antidiabetic agents. Careful monitoring of blood glucose is recommended
Ciprofloxacin + metformin	Ciprofloxacin increases effects of metformin by pharmacodynamic synergism. Significant - monitor closely. Hyper and hypoglycemia have been reported in patients treated concomitantly with quinolones and antidiabetic agents. Careful monitoring of blood glucose is recommended
Ranitidine + ampicillin	Ranitidine will decrease the level or effect of ampicillin by increasing gastric ph. Applies only to oral form of both agents
Phenobarbital + midazolam	Phenobarbital will decrease the level or effect of midazolam by affecting hepatic/intestinal enzyme cyp3a4 metabolism.
Midazolam + amikacin	Midazolam will decrease the level or effect of amikacin by p-glycoprotein (mdr1) efflux transporter
Phenobarbital + amikacin	Phenobarbital will decrease the level or effect of amikacin by p-glycoprotein (mdr1) efflux transporter
Phenobarbital + midazolam	Phenobarbital and midazolam both increase sedation
Penicillin g aqueous + aspirin	Penicillin g aqueous, aspirin. Either increases levels of the other by decreasing renal clearance
Aspirin + prednisolone	Aspirin, prednisolone. Either increases toxcity of the other by pharmacodynamic synergism. Increased risk of gi ulceration
Ibuprofen + prednisolone	Ibuprofen, prednisolone. Either increases toxcity of the other by pharmacodynamic synergism. Increased risk of gi ulceration
Enalapril + furosemide	Enalapril, furosemide. Mechanism: pharmacodynamic synergism. Risk of acute hypotension, renal insufficiency

Enalapril + spironolactone	Enalapril, spironolactone. Mechanism: pharmacodynamic synergism. Risk of hyperkalemia
Phenytoin + diazepam	Phenytoin will decrease the level or effect of diazepam by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Vitamin d + calcium carbonate	Vitamin d, calcium carbonate. Comment: the concurrent use of vitamin d with calcium salts is generally beneficial; in some patients this combination may result in hypercalcemia.
Atorvastatin + azithromycin	Atorvastatin will increase the level or effect of azithromycin by p-glycoprotein (mdr1) efflux transporter
Aspirin + ibuprofen	Aspirin and ibuprofen both increase anticoagulation

Drug interactions (Major)

Drug interactions	Effects
Furosemide + gentamicin	Furosemide, gentamicin. Either increases toxcity of the other by mechanism: pharmacodynamic synergism. Increased risk of ototoxicity and nephrotoxicity
Promethazine + haloperidol	Promethazine and haloperidol both increase qtc interval
Carbamazepine + atorvastatin	Carbamazepine will decrease the level or effect of atorvastatin by affecting hepatic/intestinal enzyme cyp3a4 metabolism
Ciprofloxacin + ondansetron	Ciprofloxacin and ondansetron both increase qtc interval. Avoid with congenital long qt syndrome; ecg monitoring recommended with concomitant medications that prolong qt interval, electrolyte abnormalities, chf, or bradyarrhythmias
Furosemide + amikacin	Furosemide, amikacin. Either increases toxcity of the other by mechanism: pharmacodynamic synergism. Increased risk of ototoxicity and nephrotoxicity
Ibuprofen + aspirin	Ibuprofen decreases effects of aspirin. Comment: ibuprofen decreases the antiplatelet effects of aspirin by blocking the active site of platelet cyclooxygenase. The effect of other nsaids on aspirin is not established
Furosemide + gentamicin	Furosemide, gentamicin. Either increases toxcity of the other by mechanism: pharmacodynamic synergism. Increased risk of ototoxicity and nephrotoxicity

These findings suggest that the identified potential drug- drug interactions have potential to deteriorate patient's clinical condition or alter therapeutic response. We recommend careful monitoring in order to avoid the negative outcomes of theses potential drug-drug interactions.

CONCLUSION

Incidence of potential drug- drug interaction in hospitalized geriatric patients in rural teaching hospital was substantial. The concomitant administration of drugs should possibly be avoided. The following drug categories are considered as drugs of narrow therapeutic window: antiepileptic, anticoagulants, anticancer, xanthenes, antidepressants, antiarrhythmics etc. Prudent use of medications and vigilant drug monitoring are essential to avoid drug-drug interactions .In routine, it is technically difficult to have a complete control over all the prescribed drugs and their possible interactions. Nevertheless, the health care professional, including pharmacist, should be concerned about the medication that are most commonly used and have potential of drug interaction.

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