

The Prescribing Pattern of Hospital Doctors

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ABSTRACT

Objective: There has been no local data on the prescribing habits of doctors over the last 25 years. This is a retrospective study done to examine the outpatient prescribing pattern of doctors at Alexandra Hospital over a one month period in 1995.

Method: Six-thousand five-hundred and three scripts were analysed. A total of 16,642 items were prescribed. The distribution of prescription scripts by departments included Accident & Emergency 39.0%; Medical 23.5%; Orthopaedics 10.3%; Surgery 18.5%; Paediatrics 4.4%, and Geriatrics 4.3%. The overall mean number of drugs prescribed was 2.6 (median = 2, mode = 2, range = 14).

Results: Analysis of the overall results by age groups showed the following means for "total number of drugs prescribed": (> 0 to 20 years) = 2.23, (> 20 to 40 years) = 2.42, (> 40 to 60 years) = 2.61 and (> 60 years) = 3.18. Analysis of variance showed highly significant results between the means of each age-group. Post-hoc analysis revealed that the oldest age group (> 60 years) accounted for most of this significant result. The top 10 drugs used by the hospital were (in descending order): NSAIDs, antacids, analgesics (other than NSAID), antibiotics, topical medications, anti-diarrhoeal agents, anti-histamines, vitamins, anti-emetics and promethazine cough syrup. There was a high usage of NSAID-antacid combination. Similarly, amoxicillin was often given with cloxacillin. There was an underuse of anti-depressants. There were very few (0.15%) illegible prescriptions. Only one prescription had an adverse combination of drugs.

Conclusion: This is the first local study of prescribing pattern of a hospital. While this data may vary from hospital to hospital, depending on the patient mix, it does provide some useful baseline data which hitherto never existed. Our findings suggested that the elderly do receive more medications.

Keywords: prevalence, drug utilisation, prescriptions, ambulatory care, age distribution

INTRODUCTION

Drug prescribing forms an important part of medical treatment. There have been many overseas studies on prescribing pattern of doctors. However, the authors could not locate any local studies on the subject

despite an extensive literature search spanning 25 years. Therefore, a retrospective study was done at Alexandra Hospital, Singapore to determine the outpatient prescribing pattern of doctors. The inpatient prescribing pattern did not form part of this study because it was more likely to be influenced by the day-to-day decisions of the doctors.

Prescriptions given at outpatient treatment and upon ward discharge were retrieved for study. For audit purposes by the Ministry of Health, the hospital pharmacy has to keep prescription slips for three years from the date of issue. The month of June 1995 was randomly chosen using a computer generated list. As Alexandra Hospital is a government hospital, prescriptions for non-standard drugs could not be studied as they are unavailable to patients at an outpatient basis. Only medications in the "Formulary of Standard Drugs" issued by the Ministry of Health, Singapore were included in this study.

METHOD

The prescription scripts were retrieved from the hospital pharmacy for scrutiny. The data was entered into Microsoft Access 2.0 database. The following information were captured:

1. Age of patient
2. Department
3. Total number of drugs prescribed
4. Number of p.r.n. ("as needed") drugs given
5. Number of drugs given for 1 week or less
6. Names of drugs
7. Any errors in drug dosage
8. Any drug combination that could result in serious adverse reactions
9. Legibility of handwriting.

It is the standard practice of the hospital pharmacy to confirm with the prescribing doctor regarding drug dosages if the stated dosages do not conform with routine clinical practice. This is then noted down in the prescription. Similarly, the pharmacist would also query the doctor when the prescribed item(s) are illegible. Bad handwriting was defined as either when the pharmacist could not read the script and had to confirm with the doctor (a note would be appended in the prescription by the pharmacist if this happened) or when the prescription could not be deciphered by the authors during data entry. The drugs were grouped into distinct classes based on the Ministry of Health

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formulary for ease of analysis. Where it was not possible to distinguish the true intention of the prescriber for the prescribed item, the drug was grouped into its most logical class. For instance, paracetamol was grouped under "analgesics (other than NSAID)" and prochlorperazine was grouped under "anti-emetics". The collated data was subsequently analysed using the SPSS 6.1 statistical package.

We had a problem in separating some prescriptions originating from ward discharges from the orthopaedic and general surgery departments because these 2 departments have a bed-sharing policy. When in doubt, the prescription was counted arbitrarily as a prescription from the general surgical department because it had more ward discharges.

RESULTS

A total of 6,503 prescription scripts were analysed. 83.1% of scripts were from outpatient clinic visits and the remainder from ward discharges. There was a total of 16,642 items prescribed. The distribution of prescription scripts by departments included Accident & Emergency 39.0%, Medical 23.5%, Orthopaedics 10.3%, Surgery 18.5%; Paediatrics 4.4%, and Geriatrics 4.3%. The overall mean number of drug items prescribed was 2.6 (median = 2, mode = 2, range = 13) (Table I). Sixty-nine outpatient scripts did not include the name of the department and these were not included in the analysis of prescriptions by departments. Similarly, 29 scripts from the anaesthesia department and 24 scripts from the radiology department were not included in the departmental

analysis because the numbers were too small. The values for the mean, mode, median and range by the respective departments are shown in Table I. The sub-categorisation of prescriptions for in-patient discharges and outpatient clinic visits by "total number of drugs prescribed", "1 week or less" medications and "as needed" items is shown in Table II.

Analysis of the overall results by age groups showed the following means for "total number of drugs prescribed": (> 0 to 20 years) = 2.23, (> 20 to 40 years) = 2.42, (> 40 to 60 years) = 2.61 and (> 60 years) = 3.18. One-way analysis of variance showed highly significant results between the means of each age-group ($p < 0.05$). Post-hoc analysis using the Bonferroni test suggested that the oldest age group (> 60 years) accounted for most of this significant result.

The top 10 drugs used by the hospital, based on the frequency of occurrence of the item in prescription scripts, were (in descending order): non-steroidal anti-inflammatory drugs (NSAIDs), antacids, analgesics (other than NSAID), antibiotics, topical medications, anti-diarrhoeal agents, antihistamines, vitamins, anti-emetics and promethazine cough syrup. This is shown in Table III. The list was different when sub-categorised by department. This is shown in Table IV where the top 10 medications for the elderly (aged 60 years and above) were also included.

There were 10 (0.15%) illegible prescriptions and only one prescription was found to have potential problem for adverse reactions. This was a prescription containing propranolol (a beta-antagonist) and salbutamol (a beta-agonist). Some drugs such as methyl dopa, chlorpropamide and colchicine were hardly prescribed. There were very few prescriptions for benzodiazepines: 62 (0.9%) scripts for diazepam and 2 (0.03%) scripts for lorazepam.

Table I – Summary of departmental data

Departments	Mean	Median	Mode	Range
Accident & Emergency	2.45	2	2	6
Medical	3.13	3	1	13
Geriatrics	3.36	3	2	9
Orthopaedics	2.04	2	2	5
Surgery	2.31	2	1	7
Paediatrics	2.05	2	1	6

DISCUSSION

The above data provides a useful profile of the prescribing habits of doctors at a local hospital. There has been no previous local data in this area. Our study is timely because doctors today are facing an increasing range of medications to prescribe for their patients. It has been noted in other studies that by increasing

Table II – Sub-categorisation of prescriptions by ward discharges and outpatient visits

	Outpatient Visits	Ward Discharges	Overall	Statistical significance between the 2 groups*
Proportion of prescriptions	83.1%	16.9%	100%	
Proportion of drug items for more than 1 week	21.7%	40.7%	25.6%	
Proportion of drug items for less than 1 week	60.5%	43.5%	57.0%	
Proportion of "as needed" drug items	17.8%	15.8%	17.4%	
Mean number of drugs per prescription	2.46	3.12	2.56	$p < 0.001$
Mean no. of drugs "of less than or equal to 1 week" per prescription	1.48	1.36	1.46	$p < 0.001$
Mean no. of 'as needed' drugs per prescription	0.44	0.49	0.45	$p < 0.001$

* Using Mann-Whitney (Wilcoxon) test

Table III – Top ten drugs used by the hospital

Rank	Item	Frequency of appearance of item in prescription scripts (%)
1	NSAIDs	29.8
2	antacids	28.9
3	analgesics*	20.6
4	antibiotics	18.3
5	topical medications**	14.8
6	anti-diarrhoeal agents***	8.8
7	anti-histamines	8.1
8	vitamins	8.0
9	anti-emetics	6.3
10	promethazine cough syrup	5.9

* mainly paracetamol and Beserol™

** includes antiseptic cream, aqueous cream, steroid creams, urea cream, anti-fungal creams, topical methyl salicylate etc.

*** includes diphenoxylate-atropine activated charcoal, kaolin, hyoscine butylbromide, probantheline

the amount of medications to patients need not necessarily improve their health and may lead to higher health care costs⁽¹⁾.

The majority of prescribed drug items (57%) were for one week or less. This suggests that the majority of patients treated as outpatient had short term or self-limiting illnesses. Patients discharged from the wards had a significantly higher proportion of drug items for more than one week compared with those attending outpatient visits. This is probably due to the discharged patients having a higher prevalence of chronic illnesses. In contrast, patients seen at outpatient clinics tend to have more drug items prescribed for a duration of one week or less.

NSAIDs and antacids were the top 2 drugs prescribed by the hospital. NSAIDs and antacids accounted for 30% and 29% of the prescribed items. These drugs were often prescribed by the accident &

emergency, orthopaedic and surgical departments, probably because they see more patients with painful conditions. We found a peculiar pattern of prescription regarding antacids. The majority (84%) of prescriptions of antacids was for a combination of an NSAID and antacid. This practice is probably not confined to Alexandra Hospital alone but appears to be widespread among other hospitals (personal observation). An informal interview with senior doctors of the hospital failed to uncover the historical reason for this strange combination of NSAID-antacid prescription surfacing in our local practice. Antacids have never ever been proven to reduce the incidence of NSAID-induced peptic ulcer: in fact, antacids may reduce the absorption of the NSAID and its efficacy when given together⁽²⁾. This potential interaction may lead to therapeutic failure and a larger dose of the NSAID have to be prescribed to achieve analgesia or the desired anti-inflammatory effect. This has been shown to increase the risk for NSAID gastropathy and gastrointestinal haemorrhage⁽³⁾. A recent study by Tho et al (unpublished) showed that patients on NSAIDs alone did not have more dyspeptic symptoms than those on the NSAID-antacid combination. Alexandra Hospital dispensed 664,451 antacid tablets for the year 1995 at a purchase cost of \$2.05 per 100 tablets. If 80% of these tablets were omitted from prescriptions, there would also be a potential cost saving of \$10,897 for the hospital. We recommend that doctors be more discerning in prescribing NSAIDs and to omit prescribing it with antacid. It is a good clinical practice not to prescribe remedies of unproven efficacy⁽⁴⁾.

The third most common item prescribed was oral analgesics (other than NSAIDs), with 20.6% of scripts for this item. The two items available in the hospital are paracetamol and Beserol™. Analgesia and antibiotics were given together for 25.2% of prescriptions containing analgesics (other than NSAIDs: this suggests that the analgesics given in these cases were probably intended for anti-pyretic purposes.

Table IV – Top ten drugs prescribed by individual departments and for the elderly

Rank	Accident & Emergency	Medical	Geriatrics	Orthopaedics	Surgery	Paediatrics	Over 60 years of age
1	antacids	nifedipine	laxatives	NSAIDs	antacids	anti-histamine	cardiac drugs
2	NSAIDs	cardiac drugs**	cardiac drugs	antacids	NSAIDs	analgesics	vitamins
3	analgesics	antibiotics	aspirin	topical medications	antibiotics	antibiotics	analgesics
4	antibiotics	steroids	diuretic	analgesics	analgesics	topical medications	nifedipine
5	anti-diarrhoeal agents	vitamins	nifedipine	vitamins	topical medications	oral salbutamol	NSAIDs
6	topical medications	aspirin	tolbutamide	antibiotics	cimetidine	vitamins	antacids
7	anti-emetics	inhalers#	analgesics	calcium	vitamins	inhalers	topical medications
8	anti-histamine	beta-blockers	vitamins	cimetidine	laxatives	ear, nose, throat medications	antibiotics
9	ear, nose, throat medications*	metformin	digoxin	diazepam	anti-diarrhoeal agents	iron	aspirin
10	promethazine cough syrup	analgesics	topical medications	anti-histamines	anti-histamines	theophylline	laxatives

* examples are glycerine-thymol gargle, dequalinium lozenges, nasal sprays

** mainly nitrates and potassium supplements

salbutamol or beclomethasone inhalers

The common antibiotics prescribed were amoxicillin, cloxacillin, erythromycin and trimethoprim-sulphamethoxazole. On several occasions (20%) amoxicillin was given together with cloxacillin. From informal interviews with junior doctors posted to this hospital, it appears that this practice of combining amoxicillin and cloxacillin is also quite common in other hospitals. This combination of antibiotics is to be discouraged especially if it was used to treat skin infections because cloxacillin alone is sufficient to eradicate the common Gram-positive organisms⁽⁵⁾. Adding amoxicillin does not confer additional benefit: it adds to the drug cost and may cause unnecessary side-effects.

Nifedipine did not make it to the top 10 drugs prescribed but it was still the most common cardiac drug in use, accounting for 5.6% of all prescribed items. This drug has only been used in hospital for over 10 years but it appears to be a popular choice among doctors probably because of its potency, non-interaction with serum lipids and relatively few side-effects. However, there have been recent concerns in the medical literature about the adverse effects of nifedipine⁽⁶⁾ and a possible link to increased mortality⁽⁷⁾. As nifedipine is likely to remain a favourite choice with doctors, we need to pay close attention to future reports concerning the long term safety of this important drug. Methyl dopa which was quite popular in the past with doctors was seldom prescribed. Only 27 (0.38%) out of 6,503 prescription scripts were for this drug. This is probably due to the availability of other classes of newer anti-hypertensive drugs which are now available i.e. ACE-inhibitors, beta-blockers and diuretics.

While oral hypoglycemic drugs did not make it to the top 10 prescribed drugs, the common drugs used were metformin (2.5% of prescriptions), tolbutamide (2.2%), and glibenclamide (1.63%). Chlorpropamide is now hardly prescribed. Only 2 (0.03%) prescriptions were made out for this drug. This is a welcoming piece of news since chlorpropamide is not an ideal oral hypoglycemic because of its long half-life.

Anti-depressants were seldom prescribed, forming only 0.46% of all prescriptions studied. This probably reflects an under-diagnosis of depression by doctors in the hospital. In fact, the only department with a high usage of anti-depressants was geriatrics, with 7.2% of departmental prescriptions for anti-depressants. This could be due to the elderly being more at risk for depression. This figure compares favourably with an American study⁽⁸⁾ which revealed that 8% of patients aged 65 years or older were prescribed anti-depressants at outpatients. However, it cannot explain the extremely low usage of anti-depressants by the other departments: Accident & Emergency 0.04%; Medical 0.45%; Surgery 0.17% and Orthopaedics 0%. It is unlikely that our local population has a much lower incidence of depression. Other studies have shown a much higher incidence of depression among primary care patients^(9,10).

Prescription of sedatives was not excessive. In fact, it was infrequently prescribed and mostly for short durations. It appears that doctors within the hospital were not inclined to give sedatives at an outpatient setting. This is a good clinical practice because long-term use of sedatives is likely to lead to dependency.

Our study confirms the clinical impression that elderly Singaporean patients do receive more outpatient medications than younger patients in a hospital setting. Analysis of the study population by age groups showed that the age group "greater than 60 years" received an average of 3.18 medications. While this trend of prescribing more medications in the elderly cannot be totally eliminated, it is important that doctors continue to prescribe only items which are absolutely necessary and avoid polypharmacy. The top 10 drugs for patients aged 60 years and older were also different when compared with the overall population. There was a greater usage of cardiac drugs in this population reflecting the increased prevalence of cardiac disease in the elderly. A British study⁽¹¹⁾ on prescribing to the elderly showed an average prescription of 2.8 drugs per elderly patient. The most widely used drugs in the British survey, were, in decreasing order of frequency: diuretics; analgesics; hypnotics; sedatives and anxiolytics; antirheumatic drugs (NSAIDs) and beta-blockers. There was an overuse of diuretics, hypnotics and dependence on sedatives and anxiolytics. Compared to the British study, it appears that our local hospital doctors are less willing to prescribe hypnotics and sedatives to the elderly population. However, there is probably an over-prescription of vitamins in our local elderly because it is unlikely that so many of them suffer from vitamin deficiency related illnesses.

Our study also showed that there were very few instances of illegible prescriptions. The perception that doctors generally have bad handwriting was not borne out by our study of prescription scripts. An interesting study in a recent issue of the British Medical Journal⁽¹²⁾ failed to support the conventional wisdom that doctors have worse handwriting than other health-care professionals. However, illegible handwriting in a prescription is hazardous and all doctors should make an effort to write clearly in all prescriptions.

CONCLUSION

This is the first local study of prescribing pattern in a hospital. While this data may vary from hospital to hospital depending on the patient mix, it does provide some useful baseline data which hitherto never existed.

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