A SURVEY ON POLYPHARMACY AND USE OF INAPPROPRIATE MEDICATION IN A GERIATRIC OUT-PATIENT CLINIC

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Summary
A study on 364 patients in a geriatric outpatient clinic showed that 115 (31.6%) of them had polypharmacy (5 or more prescribed medications) and 28 (7.7%) of them were given inappropriate medications. Medications identified to be inappropriately used in this study included propoxyphene, dipyridamole, diazepam, metformin in presence of heart failure or renal failure, and diltiazem in presence of heart failure. Chronic obstructive pulmonary disease, coronary heart disease, congestive heart failure, gout, and increasing number of medical diagnoses were found to be significant risk factors for polypharmacy. The use of inappropriate medication was significantly associated with polypharmacy.

Introduction
Polypharmacy is a common problem in elderly and it may occur in up to one third of geriatric patients. Studies have shown that use of inappropriate medications is also common in geriatric patients, ranging from 14% to 23.5% in out-patient setting, and 11.5% in hospital setting. Their occurrence may lead to increase in adverse drug reaction, noncompliance, and health care cost.

At present, there is a lack of data in local situation. Thus, it is the aim of this study to find out the prevalence and characteristics of polypharmacy and the use of inappropriate medication in a geriatric out-patient clinic in New Territories South region of Hong Kong.

Methods
This is a cross sectional survey which was conducted in a geriatric out-patient clinic in New Territories South region of Hong Kong. Three consecutive sessions of the clinic in early 1996 were arbitrarily chosen for study. All patients who attended the clinic for follow-up purpose during the study period were identified and their case records retrieved for review.

Information on age, sex, residence, number and type of medical diagnoses, number of prescribed medications, as well as number and type of inappropriate medications were collected and analyzed.

Polypharmacy was defined as the use of five or more prescribed medications. All oral, topical and injection medicines, including pro re nata medications, given on a long-term basis were counted as

Table 1. Inappropriate medications according to explicit criteria.

<table>
<thead>
<tr>
<th>Drug Category</th>
<th>Inappropriate Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedative or hypnotic agents</td>
<td>Long-acting benzodiazepines such as diazepam, chlordiazepoxide and flurazepam, Meprobamate</td>
</tr>
<tr>
<td>Antidepressant agents</td>
<td>Amitriptyline, Combination antidepressants/antipsychotics</td>
</tr>
<tr>
<td>Antihypertensive agents</td>
<td>Reserpine</td>
</tr>
<tr>
<td>Nonsteroidal anti-inflammatory agents</td>
<td>Indomethacin, Phenylbutazone</td>
</tr>
<tr>
<td>Oral hypoglycemic agents</td>
<td>Chlorpropamide, Propoxyphene, Pentazocine</td>
</tr>
<tr>
<td>Analgesic agents</td>
<td>Cycloclamide, Isosuprime, Dipyridamole, Carisprodol</td>
</tr>
<tr>
<td>Dementia treatments</td>
<td>Methocarbamol, Methocarbamol, Orphenidrate</td>
</tr>
<tr>
<td>Platelet inhibitors</td>
<td>Belladonna, Clidinium, Dicyclomine</td>
</tr>
<tr>
<td>Muscle relaxants</td>
<td>Hyoscyamine, Trimethobenzamide</td>
</tr>
<tr>
<td>Gastrointestinal antispasmodic agents</td>
<td>Belladonna, Clidinium, Dicyclomine</td>
</tr>
</tbody>
</table>

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Table 2. Patient Characteristics.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean±SD (Range)</th>
<th>Patients (N=364)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>76.35±7.3 (54-97)</td>
<td></td>
</tr>
<tr>
<td>64 or less</td>
<td></td>
<td>5 (1.4%)</td>
</tr>
<tr>
<td>65-74</td>
<td></td>
<td>163 (44.8%)</td>
</tr>
<tr>
<td>75-84</td>
<td></td>
<td>147 (40.4%)</td>
</tr>
<tr>
<td>85-94</td>
<td></td>
<td>47 (12.9%)</td>
</tr>
<tr>
<td>95 or more</td>
<td></td>
<td>2 (0.5%)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>165 (45.3%)</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>199 (54.7%)</td>
</tr>
<tr>
<td>Residence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td></td>
<td>329 (90.4%)</td>
</tr>
<tr>
<td>Institution</td>
<td></td>
<td>35 (9.6%)</td>
</tr>
<tr>
<td>Number of Medical Diagnoses</td>
<td>3.41±1.63 (0-9)</td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td></td>
<td>209 (57.4%)</td>
</tr>
<tr>
<td>4-6</td>
<td></td>
<td>142 (39.0%)</td>
</tr>
<tr>
<td>7-9</td>
<td></td>
<td>13 (3.6%)</td>
</tr>
<tr>
<td>Number of Prescribed Medications</td>
<td>3.52±1.8 (0-8)</td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td></td>
<td>249 (68.4%)</td>
</tr>
<tr>
<td>5 or more</td>
<td></td>
<td>115 (31.6%)</td>
</tr>
<tr>
<td>Number of Inappropriate Medication</td>
<td>0.08 (mean) (0-1)</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>336 (92.3%)</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>28 (7.7%)</td>
</tr>
<tr>
<td>Selected Medical Diagnoses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HT</td>
<td></td>
<td>149 (40.9%)</td>
</tr>
<tr>
<td>DM</td>
<td></td>
<td>97 (26.6%)</td>
</tr>
<tr>
<td>Gout</td>
<td></td>
<td>48 (13.2%)</td>
</tr>
<tr>
<td>CHD</td>
<td></td>
<td>95 (26.1%)</td>
</tr>
<tr>
<td>CHF</td>
<td></td>
<td>52 (14.3%)</td>
</tr>
<tr>
<td>COPD</td>
<td></td>
<td>44 (12.1%)</td>
</tr>
</tbody>
</table>

SD=standard deviation; HT=hypertension; DM=diabetes; CHD=coronary heart disease; CHF=congestive heart failure; COPD=chronic obstructive pulmonary disease.

Inappropriate medication was defined according to the explicit criteria developed by Stuck et al.\(^1\) based on a modified Delphi consensus technique, and by the use of medication in a contraindicated clinical condition as stated in British National Formulary.\(^7\) In the explicit criteria,\(^1\) drugs within eleven groups of medications were identified as “to be avoided” in community residing elderly regardless of dosage, duration of therapy, or clinical circumstances. They were summarized in Table 1.

The use of inappropriate medication and possible risk factors such as i)gender, ii)type of accommodation, and iii)certain medical diagnoses (hypertension[HT], diabetes[DM], gout, coronary heart disease(CHD), congestive heart failure(CHF) and chronic obstructive pulmonary disease(COPD)) were examined with chi-squared test \(^8\) for any association with polypharmacy. Similar testing were done between the use of inappropriate medication and the above mentioned possible risk factors. The above mentioned medical diagnoses were chosen because they occur commonly in elderly patients and are commonly associated with other medical diseases, necessitating the use of multiple medications. Pearson correlation coefficient\(^8\) on the association among increasing age, increasing number of medical diagnoses, increasing number of prescribed medications and increasing number of inappropriate medication were also calculated.
value less than 0.05 was taken as statistically significant.

Results
Three hundred and sixty four patients were collected for study. Patient characteristics were summarized in Table 2. The mean age of the sample was 76.35 years. One hundred and fifteen patients (31.6%) had 5 or more prescribed medications, the mean number of prescribed medications per patient was 3.52. Twenty eight patients (7.7%) were given inappropriate medications, none of them were prescribed more than one inappropriate medication. The inappropriate medications identified in this study included propoxyphene, dipyridamole, diazepam, metformin in presence of renal failure or heart failure and diltiazem in presence of heart failure. These were summarized in Table 3.

Polypharmacy was found to be significantly associated with gout ($X^2=8.67$, df=1, $p=0.003$), coronary heart disease ($X^2=21.32$, df=1, $p<0.001$), congestive heart failure ($X^2=19.12$, df=1, $p<0.001$), chronic obstructive pulmonary disease ($X^2=7.85$, df=1, $p=0.005$) and the use of inappropriate medication ($X^2=4.76$, df=1, $p=0.029$). The gender, type of accommodation, hypertension and diabetes were not significantly associated with polypharmacy. Apart from polypharmacy, inappropriate medication was not associated with any of the possible risk factors.

Number of medical diagnoses was positively correlated with number of prescribed medications ($r=0.3727$, $p<0.001$). Age was not significantly correlated with number of medical diagnoses, prescribed medications or inappropriate medication. The number of medical diagnoses and inappropriate medication were also not significantly correlated.

Discussion
Polypharmacy occurs in 31.6% of the patients studied and this finding is comparable to the results in other centres. The actual situation may, however, be worse than what we have observed. Since there is no comprehensive primary health care scheme in Hong Kong, many of elderly people may not have their own family doctors. They may get prescriptions from different clinics other than that of the centre studied and some may even buy over-the-counter medications for their illnesses. Thus the actual number of medications taken by elderly people may be greater than the observed prescribed medications. It would be more reliable if elderly patients are asked to bring all medications that they are taking to the clinic for inspection or if a health worker pays a domiciliary visit and counts the number of medications that they are actually taking. Several risk factors for polypharmacy were identified in this study and they were COPD, CHF, CHD, gout and increasing number of medical diagnoses. Polypharmacy as defined in the usual way may not be a reliable indicator of quality of care in elderly patients, since they are prone to multiple pathologies which may necessitate the use of multiple medications. The use of inappropriate medication, which is potentially hazardous to patients, may be a better indicator of suboptimal quality of care. Twenty eight patients (7.7%) were given inappropriate medication in this study. The result is comparable to or even better than other studies conducted in outpatient populations.

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Table 3. Pattern of Inappropriate Medication Use.

<table>
<thead>
<tr>
<th>Inappropriate Medication</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propoxyphene (Dologesic)*</td>
<td>19</td>
</tr>
<tr>
<td>Dipyridamole (Persantin)*</td>
<td>4</td>
</tr>
<tr>
<td>Diazepam (Valium)*</td>
<td>1</td>
</tr>
<tr>
<td>Metformin (in patients with renal failure or heart failure) †</td>
<td>3</td>
</tr>
<tr>
<td>Diltiazem (in patients with heart failure) †</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
</tr>
</tbody>
</table>

* according to explicit criteria †
† according to British National Formulary
Conclusion
Among the 364 geriatric out-patients studied, 115 (31.6%) had polypharmacy (5 or more prescribed medications) and 28 (7.7%) had inappropriate medications. Medications identified to be inappropriately used in this study included propoxyphene, dipyridamole, diazepam, metformin in presence of renal failure or heart failure, and diltiazem in presence of heart failure. Gout, COPD, CHD, CHF, and increasing number of medical diagnoses were found to be significant risk factors for polypharmacy. The use of inappropriate medication was significantly associated with polypharmacy.

References
3. Willcox SM, Himmelstein DU, Woolhandler S.

IN MEMORY OF PROFESSOR BERNARD ISSACS

Sadly, Professor Bernard Issacs, one of our international board of Honorary Editors, passed away in March 1995 in Jerusalem at the age of 70 after a short illness.

In the late 1950's, Professor Issacs was a senior registrar under Ferguson Anderson in Glasgow, who became the first ever Professor of Geriatric Medicine. He gained international repute for his research and promotion of the “Giants of Geriatrics”, a term he himself coined to embrace the 4 I’s of geriatrics(intellectual impairment, immobility, incontinence, instability), the “common final pathway” of the clusters of chronic diseases which frequently afflict very old people with diminished powers of recovery. He had been the Charles Hayward Chair of Geriatric Medicine at Birmingham University from 1974 to 1989. His teachings and reputations had attracted many geriatricians from around the world to spend time in his unit; among one of them was our former Society President.

He was invited to Hong Kong in 1988 as guest Honorary Professor for our annual Society Scientific Week. I can still recall vividly some of his teachings and sayings. In response to the remark of a medical student that a stroke patient was having poor motivation, he asked, “Who is poorly motivated, the patient or the staff?” When a stroke patient yelled in reaction to a student’s attempt to elicit plantar reflex, he commented, “What matters to a patient after a stroke is whether he can walk and not whether his big toe will go up when his sole is scratched, which only inflicts discomfort and pain.” He emphasized the pitfall of focusing on diagnostic techniques but ignoring functional assessment to detect disability and handicap in a stroke patient. He expressed annoyance at the common sight of restraints in a psychogeriatric ward, “It is not a prison. Who has the right to restrain these old persons?” In a research meeting on fall, I was somewhat embarrassed when asked to define “imbalance”, the meaning of which seemed to me obvious. He illustrated how the principles of physics(displacement, equilibrium, stability) could be applied to a medical subject(instability and fall). He was also a skillful actor, reflecting that he was a very observant clinician. In an evening seminar, he demonstrated how a stroke patient might struggle with the topological parts of a sweater during dressing and undressing when disabled by perceptual deficits. How many doctors will pay