A Systematic Review on the Elderly in Nursing Homes: Prevalence of Medication, Inappropriateness of Medication Use and Drug-related Problems

Liew E.B\(^1\), Yap K.Z.\(^2\) and Lee J.\(^3\)

Department of Pharmacy, Faculty of Science, National University of Singapore
Block S4, 18 Science Drive 4, Singapore 117543

ABSTRACT

The elderly in the nursing home has been singled out as a major cause for concern with regards to drug safety. This is due to their advanced age, frailty and multiple-drug regimens, which can increase the risk of drug-related problems (DRPs). A review of the literature published from January 1998 to December 2008 showed that the average number of drugs used per elderly resident ranged from five to 11.9 drugs, and they were mostly prescription medicines of regular use. The most commonly used medications include laxatives, analgesics and central nervous system (CNS) agents. Three clinical instruments and the national guidelines from two European countries were used in evaluating the appropriateness of medication use in nursing homes. For studies that employed the Beers Criteria, the inappropriateness of overall drug usage ranged from 33% to 70.04%. Seven studies also identified the prevalent occurrence of DRPs in nursing homes. Two studies reported the incidence of adverse drug events (ADEs) in nursing homes. Based on the two studies, the incidence ranged from 1.89 to 9.8 ADEs per 100 resident-months. There is an urgent need for healthcare professionals to detect, resolve and prevent inappropriate drug therapy in order to bring about better healthcare outcomes.

INTRODUCTION

Many developed countries in the world are faced with the prospect of an aging population. It has been estimated that in developed countries, those aged 60 years or older account for 20% of today’s population and by 2050, that proportion is projected to reach 32% (United Nations, 2005). Singapore is no exception to the rule. By 2030, one in five Singaporeans will be 65 years or older (MCYS, 2006). In general, the elderly suffer from more chronic medical conditions which often require the use of multiple drugs to meet optimal treatment goals. The use of prescription drugs generally increases with age. Amongst the elderly, those living in nursing homes have been singled out as a particular cause for concern. This is due to their advanced age, frailty and multiple-drug regimens.

\(^1\) Student  
\(^2\) Research Assistant  
\(^3\) Assistant Professor
A previous study showed that the elderly in the nursing home were on more medications and were more likely to receive inappropriate drug therapy than the community-dwelling elderly. In Singapore, few studies are conducted on nursing homes with the most recent one conducted in 2004.

**OBJECTIVES**

This review examined the prevalence and type of medication use in nursing homes. It also examined the measured appropriateness of medication use in elderly nursing home residents using clinical instruments or guidelines. Furthermore, the incidence and types of drug-related problems and adverse drug events in nursing homes were analyzed.

**DEFINITION**

For the purposes of this review, a drug-related problem (DRP) is defined as an event or circumstance involving drug treatment that actually or potentially interferes with the patient experiencing an optimum outcome of medical care. The eight categories of DRPs have been defined to be the following: untreated indications, improper drug selection, subtherapeutic dosage, failure to receive drug, overdosage, adverse drug reactions, drug interactions and drug use without indication (Strand, 1990).

**METHODS**

An electronic literature search was conducted using Pubmed, CINAHL, International Pharmaceutical Abstracts, Scopus and The Cochrane Library. The inclusion criteria for literature were the elderly 65 years or older living in nursing homes, literature published from January 1998 to December 2008 in English, retrospective cross-sectional studies or controlled before-and-after studies (CBAs). The keywords used included, nursing home residents, polypharmacy, prevalence of medication use, adverse drug events, drug-related problems, appropriateness/inappropriateness of medication use, cross-sectional retrospective studies and CBAs. A manual search of the reference lists from identified articles, recent review articles and book chapters was also conducted to supplement the electronic search.

**RESULTS AND DISCUSSION**

A total of 25 articles were eligible for this review. All articles except for one were based on studies conducted in Western countries. The results were categorized as overall medication use, prevalence of medication use, measured inappropriateness of medication use and lastly, the incidence and types of drug-related problems/adverse drug events.

**Overall Medication Use**

The average number of drugs used per residents ranged from five to 11.9 drugs. In a Swedish study, out of the 11.9 medications taken per resident, nine were taken on a regular basis while 2.9 were taken on an ‘as needed’ basis. In a study conducted in USA,
residents of 15 Georgia nursing homes received an average of 8.7 prescription drugs and an average of 2.8 over-the-counter (OTC) drugs.

Prevalence of Medication Use

From six studies, three showed laxatives to be the most prevalent medication used among residents, while two studies indicated analgesics to be the most prevalent medication used. Vitamins were reported to be most commonly used in the remaining study. Central nervous system (CNS) agents, cardiovascular (CVS) agents, antithrombotic agents, drugs for acid-related disorders, systemic antibacterial agents or anti-infective agents, and electrolytic, caloric and water-balance agents were shown to be among the other top five most commonly used medications. The commonly used medications appear to be a reflection of the residents’ chronic medical conditions such as constipation, pain, cardiovascular diseases and neurodegenerative conditions. Having the knowledge of the drugs most commonly used in the residents can help indicate specific medications that may require more therapeutic drug monitoring.

Measured Inappropriateness of Medication Use

Five clinical instruments can be use to measure the appropriateness of medication use in nursing homes. The clinical instruments are Beers Criteria, Mcleod guidelines, Oborne guidelines, Medication Appropriateness Index (MAI), and the Assessing Care of Vulnerable Elders (ACOVE) indicators. The ACOVE indicators and the Mcleod guidelines were not used in any of the studies included in the review. Only studies that employed Beers Criteria, MAI and Oborne guidelines were included in the review.

Beers Criteria was the most commonly used clinical instrument in the studies included in this review. The 1997 Beers Criteria version was found to be the most commonly used version compared to the 1992 and 2003 versions. For the seven studies that employed the Beers Criteria, the inappropriateness of overall drug usage ranged from 33% to 70.04%. The variability was most likely to be due to different versions of Beers Criteria used and the modifications made to Beers Criteria.

While the study that used MAI identified suboptimal drug use, no comparisons could be drawn as no other studies used MAI. The two studies using the Oborne guidelines identified suboptimal drug use with respect to neuroleptics, benzodiazepines, aspirin, ulcer-healing drugs, paracetamol and short-acting beta2-agonists. Two studies utilized national guidelines in their evaluation of drug use. The Dutch study identified suboptimal therapy involving psycholeptic drugs while the Swedish study reported an overall inappropriateness rate of 73.8%.

Five studies reported the drug choices most frequently involved in inappropriate drug therapy. Out of the five studies, the most involved drug choices involved in inappropriate drug use were found to be temazepam, hydroxyzine, propoxyphene, digoxin and iron supplements which were each reported from two studies or more. This suggests that healthcare professionals may need to place greater scrutiny on residents receiving the above mentioned medications so that more appropriate drug therapy in nursing homes could be attained. Overall, the studies identified significant suboptimal medication use in nursing homes as the lowest inappropriateness rate of 33% reported translated to about one third of nursing home residents receiving at least one inappropriate medication.
Incidence and Types of Drug-related Problems/ Adverse Drug Events

Seven studies measured the incidence of drug-related problems (DRPs) in nursing homes. The most common case-finding technique used to identify DRPs was a comprehensive review of the residents’ medical charts/medication information. As the studies gave different outcome measures of the different categories of DRPs, the basis for comparison between the different studies was limited. However, the studies identified the occurrence of DRPs to be prevalent. For the two studies that measured the rate of adverse drug events (ADEs) per 100 resident-months, the higher rate reported was 9.8 ADEs per 100 resident-months. The other study reported a rate of 1.89 ADEs per 100 resident-months. This variability could be explained by the different case-finding techniques used. In the study reporting the higher rate, a computer-generated trigger system was used in addition to comprehensive chart review. In the other study, the main case-finding technique used was comprehensive chart review. This may suggest that the use of a computer-based system may aid the detection of ADEs.

For studies that reported on the drug classes or specific drugs most frequently associated with the DRPs or ADEs, four studies implicated central nervous system (CNS) agents while warfarin was implicated in two studies. CNS agents have been reported to be risk factors for causing falls among the elderly nursing home residents while warfarin is an anti-coagulant agent with a narrow therapeutic index. The types of most frequent DRPs and the drug classes most frequently implicated could be used as a trigger point for medical professionals to focus on so that the incidence of DRPs or ADEs in the nursing home setting can be decreased.

CONCLUSION

There is a lack of literature from Asian countries that focuses on nursing home residents as compared to the Western countries. Polypharmacy is prevalent in the elderly nursing home population where most of the medications are taken on a regular basis and are prescription medications. Inappropriate drug therapy, drug-related problems and adverse drug events are common in the elderly nursing home population. There is an urgent need for healthcare professionals to identify, resolve and prevent inappropriate drug therapy and drug-related problems in nursing homes in order to bring about better healthcare outcomes. The focus could be placed on medications most commonly used among the elderly residents and medications most frequently involved in inappropriate drug therapy.

REFERENCES

