pregnancy. *In* Teenage sexuality, pregnancy and childbearing. University of Pennsylvania Press, Philadelphia, 1981, pp. 350–354.
21. Zabin, L. S., Kater, J. F., and Zelnik, M.: The risk of adolescent pregnancy in the first months of intercourse. *In* Teenage sexuality, pregnancy and childbearing, edited by F. Furstenberg, R. Lincoln, and J. Menken. University of Pennsylvania Press, Philadelphia, 1981, pp. 136–148.
22. Lattimer, A. D., and Lewis, M. C.: Proposal for a partnership-in-health. Cook County Hospital, Chicago, September 1984, pp. 1–61.
23. Lattimer, A. D., Smith, R., and Lewis, M. C.: Grant proposal for funding of the partnership-in-health program. Cook County Hospital, Chicago, pp. 1–22.
24. Bienvenu, M. J.: Parent-teenager communication: bridging the generation gap. Public Affairs Pamphlet No. 438, Ross Laboratories, 1971, pp. 1–4.
25. Tepper, S. S.: So you don't want to be a sex object. Rocky Mountain Planned Parenthood, Denver, CO, 1978, pp. 1–27.
26. Bellamy, C.: Preventing adolescent pregnancy: the role of the family [keynote address]. Center for Population and Family Health, Columbia University Colloquium, New York, June 19, 1981.
27. Teenage pregnancy: the problem that hasn't gone away. Alan Guttmacher Institute, New York, 1981.

# Minimizing Drug Misuse Among Elders: a Proposal

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The authors are students at the University of Michigan's School of Public Health. Their proposal won second prize in the competition for the 1986 Secretary's Award for Innovations in Health Promotion and Disease Prevention. The contest is sponsored by the Department of Health and Human Services.

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**Synopsis**

*This proposal is aimed at reducing the risk of adverse drug interactions that may occur when over-the-counter (OTC) preparations are taken in conjunction with prescription drugs in an unsupervised regimen. Such polymedicating is practiced widely among the elderly.*

*A pilot program would be implemented over 12 months at three drugstores of a major retail chain. A barcode-based computer system would be used to identify potential adverse drug interactions for elderly customers. All volunteers admitted to the study, controls and subjects, would agree to buy all their medications, prescriptions and OTC, at the participating pharmacies. In return, the volunteers would receive discounts of 25 percent on prescription and OTC drugs and 10 percent on vitamins.*

*Study subjects (N = 375) would carry barcoded identification (BID) cards that would activate the computerized program to assess each purchase for compatibility with their other medications; controls (N = 375) would carry "dummy" BID cards that would prompt the computer to approve all drug purchases. A final comparison of the subjects with the controls, as well as with a sample of elderly residents selected randomly from the community, would determine whether such a computerized, commercially based drug use review system could reduce the potential for adverse interactions between OTC and prescription drugs among the elderly.*

OLD AGE AND CHRONIC AILMENTS go hand in hand. Of Americans ages 65 years and older, 20 percent have at least two chronic conditions, and 33 percent of those persons have three or more (*1*). Frequently, the medical therapy for treating multiple chronic conditions entails ingesting prescribed medicines and over-the-counter preparations concurrently—a form of polymedication that poses the threat of harmful drug interactions.

The conclusion that the elderly are at high risk of suffering adverse drug interactions from polymedication derives from data such as these:

- Over-the-counter (OTC) preparations constitute nearly two-thirds of all drugs consumed by sufferers of chronic conditions (*2*).
- The potential for adverse reactions becomes greater as the number of drugs ingested increases.

For example, there is an estimated 27–33 percent chance of adverse interactions among persons who consume two or more drugs (*3*). The mechanisms involved can be interference, enhanced toxicity, or synergism and can create outcomes ranging from mild to fatal.

- Even though the elderly account for only 11 percent of the U.S. population, they are responsible for one-fourth of all drug expenditures (*4*).
- One recent survey found that 21 percent of the elderly kept 13 or more drugs at home, an average of 8.4 drugs per household (*5*). In another extensive study, nearly one-half of all elderly respondents indicated they used OTC drugs concurrently with prescription medicines (*6*).
- The elderly are at risk of adverse drug interactions as the result of a decreased tolerance to some medicines caused by physiological changes associated with aging. Of all hospital admissions, 2–8 percent are directly related to drug-induced states. Of those, admissions among the elderly are 1.5 times higher than among younger persons (*6*). Further, typical symptoms of undesirable drug interactions—confusion, weakness, tremor, lethargy, depression, forgetfulness, loss of appetite, and constipation—frequently are misinterpreted as "normal" signs of old age.

## Problem

Little has been done to address the risk to health posed by unsupervised polymedication. Even conscientious physicians and pharmacists tend to ignore the OTC component of polymedicine in the treatment of chronic conditions. One study found that physicians were aware of only 64 percent of the drugs their patients were taking (*7*). A survey of 354 elderly showed that about 41.3 percent never and 29.7 percent only occasionally consulted their physician when taking OTC drugs along with prescription drugs (*6*). Another study revealed that 80 percent of elders almost never asked their pharmacist about the possible effects of OTC drugs (*5*).

Although there are many computer-based drug review systems used presently (for example, Stanford University's MEDIPHOR), only one intervention, the Drug Caution Program that is used in several Canadian provinces, addresses OTC drug use. The effectiveness of that program is limited, however, because it relies on the consumer's self-initiated response to written health education materials. None of the computerized systems we reviewed had taken advantage of the barcode-based technology now available. Although barcoded prescriptions have proven to be economically feasible and effective in reducing dispensing errors in a large-volume hospital (*8*), such a system has not been used to warn customers about possible adverse interactions between their prescribed medicines and OTC drugs when they purchase OTCs in commercial pharmacies.

## Proposal Objective

This proposal is aimed at reducing the potential for adverse drug interactions that may occur when OTC drugs are taken in conjunction with prescription medications without a physician's supervision. To attain that goal, a pilot program has been devised for implementation over 12 months at three branches of a major chain of retail pharmacies. The program would use the computer system that exists (one with a local video display terminal and a printer linked to a central processor) in each pharmacy, along with the barcode system of merchandising used throughout the stores.

By integrating the store's computer and barcode systems, pharmaceutical barcode labels would be generated and affixed to all OTC and prescription items. Each specially coded item purchased by a customer carrying a barcoded identification (BID) card would activate the computer program linked to his or her drug use profile. The computer would then scan for all possible adverse drug interactions between the purchased item and other medicines recorded as being used by that customer. In this way the computer would act as a gatekeeper to minimize consumption of incompatible drugs.

Let it be clear that this program has not been designed to eliminate the use of OTC drugs. When used wisely they can be an important and cost-effective component of health care. Rather, the goal is to refocus the pattern of OTC drug use among consumers, particularly persons ages 65 years and older, who take prescription drugs as well.

## Preliminary Activities

Following are the activities that would have to be completed before the pilot program could be implemented.

**Marketing the plan.** Three outlets of a major chain of pharmacies would be selected, and the proposal explained to the store managers. During the marketing presentation the economic and publicity

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benefits would be emphasized, such as the increase in sales that would result from participants' agreeing to purchase all prescription and OTC drugs at that store.

The stores should be proximate to large populations of noninstitutionalized persons age 65 years or older who live in their homes or in complexes for semi-independent senior citizens. For study participants living in complexes, a van service would be established through a local social service agency to provide direct transportation three times weekly to the pilot pharmacies—a service that is offered presently in many metropolitan areas.

**Selecting the sample.** Interviews would be conducted among the residents of a selected complex after obtaining permission from the administrators. Patrons of a participating drugstore who live in their own homes and who are ages 65 and older also would be asked to participate. All persons interviewed who agreed to purchase all their OTC and prescription drugs at the participating drugstore would be admitted to the program.

The initial recruitment would be aimed at obtaining 1,000 participants. That number allows for a 25 percent dropout rate and would ensure a minimum of 375 participants in each of the groups, subject and control. Given an average consumption rate of 4.5 drugs per month among elderly drug users (*5*), we estimate that each participant will purchase, on the average, four medications, prescribed and OTC, per month. Further, we estimate that 2.0 harmful interactions per 100 drugs purchased will occur when OTC drugs are included among the purchases. That estimate is based on the Puget Sound Group Health Cooperative's finding of 1.3 adverse drug interactions per 100 prescriptions filled (*9*). By extrapolation we calculate that at least 30 adverse interactions per month could be expected among the 375 subjects when OTC drugs are included.

The age, sex, self-reported health status, and OTC drug usage would be recorded for each participant. Then the participant would be assigned randomly to one of two groups: subjects to be issued BID cards or controls to be issued dummy BID cards. All card carriers, subjects and controls, would be eligible for the 25 percent discount on all purchases of prescription drugs (oral) and OTC preparations except for vitamins, which would be offered at 10 percent discount. (This design allows for large purchases of vitamins, which are often made by elders, without the store's suffering excessive financial losses yet allowing the computer to track purchases of oil-based and potentially toxic vitamins such as A, D, and E.)

**Equipping the sites.** This is the equipment that would have to be purchased for the pilot program: barcode scanning wands, plastic identification cards, barcode labels for cards and drug packages, and the computer program.

A microcomputer program has been created by a team of British physicians and engineers that is capable of analyzing up to 18 different drugs simultaneously for all possible permutations (*10*). Although that program was established to monitor drugs that are used often for intensive-care patients, it can be modified or updated easily, its designers claim. For this study a baseline would be established to include prescription and OTC drugs used frequently by elders (examples of such OTC drugs are analgesics, antacids, cough and cold remedies, laxatives, and vitamins).

As mentioned earlier, a video display terminal and printer are needed in each participating pharmacy. However, such equipment is already available in most drugstores of major retail chains. On-site orientation for clerks and pharmacists could be accomplished with minimal training, and attachment of the pharmaceutical barcode labels to OTC and prescription drug packages could be incorporated into the staff's weekly routine without increasing the workload much.

## Procedures

Once these preliminary activities had been completed, the transactions made at the participating drugstores by everyone in the study would be monitored for 12 months. What follows is the sequence of events that would unfold during a

typical transaction when an elderly customer purchases an OTC preparation.

1. The customer selects the OTC preparation and presents the clerk at the sales register with the BID card.

2. The clerk scans the BID card with the wand to call up the customer's drug profile on the computer. The clerk then scans the barcoded OTC item.

3. The computer scans information about the OTC preparation and the customer's drug profile. If the customer is assigned to the control group, the purchase will be entered into the profile as "transaction completed" and the discount applied.

If the customer is a member of the subject group, the purchase will be assessed by the computer for potential adverse drug interactions between the purchased item and prescription drugs on record as being used currently by that customer. If no serious interactions are noted, the purchase is entered into the profile as "transaction completed" and the discount applied.

If a potential adverse reaction is detected by the computer, the transaction is listed on the profile as "hold," and the cash register is put on pause. At this point the clerk notifies the pharmacist. The pharmacist assesses the information given on the video display terminal, counsels the customer on the potential dangers, and then advises the customer either to visit a physician or to purchase an alternative product, or to do both.

4. If the customer decides against buying the OTC product, the event is recorded as "transaction aborted." But if the patient buys the product against the pharmacist's advice, the discount is applied to the purchase, and the sale is entered into the profile as "hold override—transaction completed."

## Costs

The total estimated cost (maximum) of this pilot program is $64,350.

| *Item* | *Estimated cost* |
|---|---|
| Computer program | $ 5,000 |
| Scanning wands (3) | 1,650 |
| Embossed plastic cards (1,200) | 1,300 |
| Barcode labels (300,000) | 6,000 |
| Consultation with programmer about initial set-up | 400 |
| Part-time employees (2 graduate research assistants for 18 months) | 40,000 |
| Office expenses (telephone, travel, supplies, computer) | 10,000 |
| Total | $64,350 |

*'Improved surveillance of drug use among the elderly could reduce emergency room use and physician visits for treatment of symptoms associated with drug misuse. Those reductions would save the patients, taxpayers, and third party agents $70–$315 million a year.'*

The discounts on purchased drugs and the employee labor costs associated with the program, estimated to be $0.06 per prescription filled (*9*), would be absorbed by the pharmacy's budget. That cost could be offset by increased sales of OTC and prescription drugs at each site.

## Assessment

Assessment of the program's effectiveness would be carried out as follows:

- Hard copies of the drug profiles of all persons in the subject group would be generated from the computer to enumerate the number of attempted purchases, holds, aborted transactions, and overrides. For the control group, profiles would be analyzed by the computer after the trial period, and all potential adverse reactions would be noted. These data on both groups would then be compared to see whether a significant number of potentially dangerous reactions had been avoided among members of the subject group.
- A followup telephone interview would be conducted with each participant to ascertain the degree of compliance with the agreed upon terms, that is, whether the participant had purchased OTC drugs at other than program drugstores and, if so, how many and what kinds.
- Telephone interviews would be conducted throughout the program's 12-month period with the use of random digit dialing to obtain a sampling of community residents ages 65 years and older. From that sample, data would be gathered on age, sex, self-reported health status, and prescription and OTC drugs used during the previous month. The influence of seasonal fluctuations in drug purchases, such as purchases of cold and cough remedies, would be avoided by conducting those interviews over 12 months. The data collected would be used to determine whether the

program participants were representative of the area's population ages 65 years and older.

• All data generated from the pilot program would be analyzed for statistical significance. In addition, a multivariate regression analysis would be done on the demographic factors (age, sex, and self-reported health status) to learn whether any of these variables can predict potential drug misuse among the elderly.

## Discussion

Reducing the potential among older Americans for adverse interactions between OTC and prescription drugs would improve the quality of health care and, ultimately, lower the costs of health care as well. Improved surveillance of drug use among the elderly could reduce emergency room use and physician visits for treatment of symptoms associated with drug misuse. Those reductions would save the patients, taxpayers, and third party agents $70–$315 million a year (*11*).

This program would be attractive also to major chains of retail pharmacies. At minimal expenditures and labor, such a system could be expanded to all drugstores in the chain and their patrons. And, because all local terminals would be linked to the chain's central computer, customers purchasing drugs would be assured of such quality checks at any drugstore in the chain. Therefore, the chain would profit from increased goodwill with customers, increased OTC drug sales, and decreased numbers of drugs returned because of adverse side effects. Further, this program could achieve a major public health goal at no expense to the government: improved health care to many Americans.

## References


1. Hickey, T.: Health and aging. Wadsworth, Inc., Monterey, CA, 1980, p. 102.
2. Lamy, P.: Over-the-counter medications: the drug interactions we overlook. J Am Geriatr Soc 30: 69–75, November 1982.
3. Kirking, D. M., Thomas, J. W., Ascione, F. J., and Boyd, E. L.: Detecting and preventing adverse drug interactions: the potential contributions of computers in pharmacies. Soc Sci Med 22: 1–8 (1986).
4. Klein, L. E., German, P. S., and Levine, D. M.: Adverse drug reactions among the elderly: a reassessment. J Am Geriatr Soc 29: 525–530, November 1981.
5. Ostrom, J. R., et al.: Medication usage in an elderly population. Med Care 23: 157–164, February 1985.
6. Landress, H. J., and Morck, M. A.: Prevalence and risk of medication mismanagement by the elderly. J Fla Med Assoc 71: 261–266, April 1984.
7. Peach, H.: Trends in self-prescribing and attitudes to self-medication. The Practitioner 227: 1609–1615, October 1983.
8. Hokanson, J. A., et al.: The feasibility of barcode-based dispensing quality assurance programs. Drug Intell Clin Pharm 18: 76–78, January 1984.
9. Christensen, D. B., et al.: Documenting outpatient problem intervention activities of pharmacists in an HMO. Med Care 19: 104–117, January 1981.
10. Kenyon, N. G., et al.: A microcomputer system for the identification of drug interaction. J Med Eng Technol 7: 243–246, September-October 1983.
11. Morrell, J., Podlone, M., and Cohen, S. N.: Receptivity of physicians in a teaching hospital to a computerized drug interaction monitoring and reporting system. Med Care 15: 68–78, January 1977.


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# Smokeless Tobacco Reduction Program


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The authors were students at California State University, Chico, when they submitted this paper, which won third place in the 1986 Secretary's Award for Innovations in Health Promotion and Disease Prevention. The contest is sponsored by the Department of Health and Human Services.

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## Synopsis


*To reduce the incidence and prevalence of oral cancer, the Smokeless Tobacco Reduction Program will consist of a mass media campaign, public oral screening, and a week-long school health program for 350 students in the seventh, eighth, and ninth grades in Willows, Glenn County, CA. Mass media will include radio, television, newspapers, posters, and literature.*