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# Effect of preventive home visits by a nurse on the outcomes of frail elderly people in the community: a randomized controlled trial

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## Abstract

**Background:** Timely recognition and prevention of health problems among elderly people have been shown to improve their health. In this randomized controlled trial the authors examined the impact of preventive home visits by a nurse compared with usual care on the outcomes of frail elderly people living in the community.

**Methods:** A screening questionnaire identified eligible participants (those aged 70 years or more at risk of sudden deterioration in health). Those randomly assigned to the visiting nurse group were assessed and followed up in their homes for 14 months. The primary outcome measure was the combined rate of deaths and admissions to an institution, and the secondary outcome measure the rate of health services utilization, during the 14 months; these rates were determined through a medical chart audit by a research nurse who was blind to group allocation.

**Results:** The questionnaire was mailed to 415 elderly people, of whom 369 (88.9%) responded. Of these, 198 (53.7%) were eligible, and 142 consented to participate and were randomly assigned to either the visiting nurse group (73) or the usual care group (69). The combined rate of deaths and admissions to an institution was 10.0% in the visiting nurse group and 5.8% in the usual care group ( $p = 0.52$ ). The rate of health services utilization did not differ significantly between the 2 groups. Influenza and pneumonia vaccination rates were significantly higher in the visiting nurse group (90.1% and 81.9%) than in the usual care group (53.0% and 0%) ( $p < 0.001$ ).

**Interpretation:** The trial failed to show any effect of a visiting nurse other than vastly improved vaccination coverage.

Elderly people account for a growing portion of our population, and although many of them maintain good health, some experience long-term incurable illness and deterioration in quality of life. The 1990 Ontario Health Survey revealed that 59% of all elderly people in Hamilton reported pain and discomfort that limited their activity.<sup>1</sup> In a survey of elderly people in a large health service organization (HSO) in Burlington, Ont., loneliness and a major loss or change were identified as important psychosocial problems in 12% of the respondents.<sup>2</sup>

Timely recognition and prevention of health problems among elderly people have been shown to improve their health.<sup>3</sup> However, in order to be effective, intervention strategies should be delivered to those at increased risk for deterioration in health. Cadman and associates<sup>4</sup> suggested that screening programs, which include intervention and follow-up, should be subjected to the rigours of a randomized controlled trial before implementation. Trials of community-based screening and intervention involving frail elderly people have shown promise,<sup>5</sup> and subjects who initially rated their health as poor<sup>6</sup> and those aged 75 years or more and living alone or reporting being lonely<sup>7</sup> appeared most likely to benefit. However, limited information exists on the impact of preventive home visits in a Canadian setting.<sup>8</sup>

We conducted this randomized controlled trial to determine whether follow-up

*Research*

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care by a visiting primary care nurse could favourably affect the combined rate of deaths and admissions to an institution and the rate of health services utilization among frail elderly people living in the community.

## Methods

The study protocol was reviewed and approved by the Research Committee of St. Joseph's Hospital, Hamilton, Ont.

To determine eligibility, a survey similar to that used by Pathy and colleagues<sup>3</sup> was mailed to people 70 years of age or more on the roster of 2 physicians affiliated with an HSO in Stoney Creek, Ont. An HSO is the term used in Ontario for primary care practices in which the provision of medical services are reimbursed on a capitation basis. The methods and results of the mailed survey have been described previously.<sup>9</sup> Respondents were considered eligible if they reported functional impairment, or admission to hospital or bereavement in the previous 6 months. Those who were living in a nursing home, were involved in another research study, had previously been visited by the nurse in their home or had participated in the pretest of the survey were excluded.

Eligible participants were randomly assigned either to the visiting nurse (VN) group or the usual care (UC) group by a research assistant not affiliated with the HSO using a random numbers table. The randomization schedule was developed by another research assistant, who was not involved in the randomization process. Randomization was stratified on the basis of age (70–79 years or 80 years and older) and whether the person lived alone (yes or no). Eligible subjects in the same household were assigned to the same study group.

For participants in the VN group, the visiting nurse used the “functional consequences theory” of gerontologic nursing, the goals of which are to minimize the negative effects of age-related changes and risk factors and to promote positive functional consequences.<sup>10</sup> The nurse reviewed each person's medical record and completed a comprehensive assessment addressing physical, cognitive, emotional and social function, medication use, and the safety and suitability of the home environment. A care plan was developed together with the primary care physician, the patient, the family, caregivers and other health care professionals. Follow-up visits and phone calls were conducted as needed over the course of the 14-month trial to provide vaccinations, monitor, promote health and provide psychosocial support. The nurse served as a case manager by integrating community services and agencies, such as Home Care, into the participants' care plan.

At the end of the 14 months a research nurse conducted a detailed audit of all participants' medical records from the family practice to capture data on the primary outcome measure (combined rate of deaths and admissions to an institution) and the secondary outcome measure (rate of health services utilization).

The original sample size estimate was 128 patients per study group, which would have detected a difference of 15% in the primary outcome measure (assuming that  $\alpha = 0.05$  and  $\beta = 0.8$ ). Where appropriate, the continuity-corrected  $\chi^2$  test or Fisher's exact test was used to analyse categorical variables. For continuous variables, Student's *t*-test or the Mann-Whitney U test was used. In all analyses subjects remained in the group to which they were initially assigned.

The randomization schedule was kept within the Health Services Delivery Research Unit of St. Joseph's Community Health Centre throughout the trial. The 2 family physicians and the of-

fice nurse were aware of which patients were in the VN group. They were blinded as to the UC group members and the results of their screening questionnaire until after the trial was completed. The research nurse involved in reviewing the medical records was blinded to group allocation.

## Results

The questionnaire was mailed to 415 elderly people, of whom 369 (88.9%) responded (Fig. 1). Of these, 198 (53.7%) were eligible, and 142 (38.5%) consented to participate and were randomly assigned (73 to the VN group, 69 to the UC group). A total of 113 subjects (VN 59, UC 54) completed the trial. The number of subjects who withdrew from the study was similar in each group.

The mean age of the subjects was 79.1 (standard deviation [SD] 5.8) years in the VN group and 78.1 (SD 5.3) in the UC group; 71.2% and 62.3% respectively were women (Table 1). Similar proportions of VN and UC subjects were living alone (38.4% and 40.6% respectively). The 2 groups did not differ significantly in terms of baseline characteristics except for the proportion of subjects who had lost someone close in the 6 months before the study (VN 39.7% v. UC 20.3%;  $p = 0.02$ ).

In the VN group the nurse identified previously unreported problems in 95.9% of the participants. The most common problems were urinary tract infections (27.4%), gastroenteritis (27.4%), chest infections (24.7%), depres-

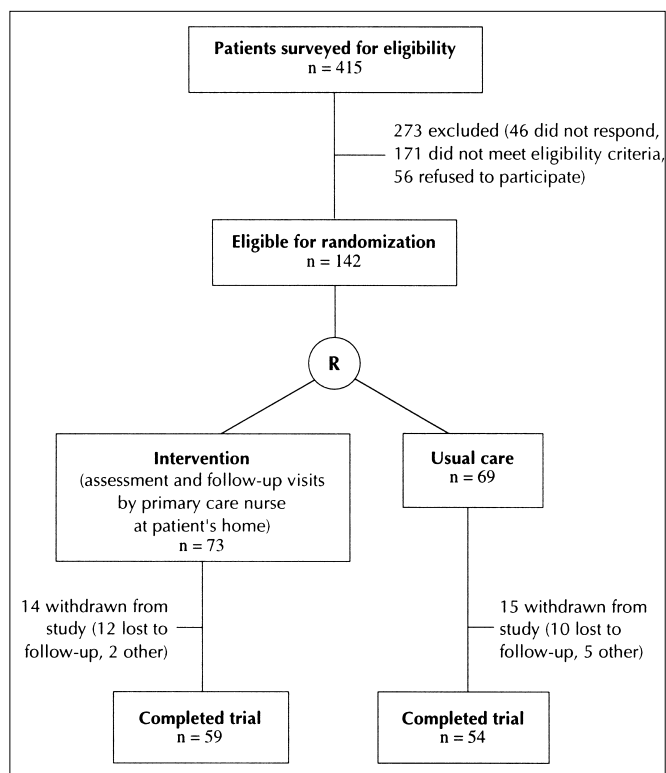


Fig. 1: Flow of study participants through selection and intervention protocols. R = randomization.

sion (15.1%) viral illnesses (15.1%), insomnia (6.8%) and hearing impairment (6.8%). On the basis of the nurse's clinical assessment, 91.0% of the group members had functional impairment, and 68.5% had a formal or informal caregiver.

During the study period 7 (10.0%) of 70 subjects in the VN group for whom outcome data were available died, as compared with 3 (4.3%) of 69 seniors in the UC group ( $p = 0.3$ ). One person (1.4%) in the UC group moved to a nursing home, as compared with no one in the VN group. The combined rate of deaths and admissions to an institution was 10.0% in the VN group and 5.8% in the UC group ( $p = 0.52$ ). Adjusting for self-reported health status at baseline, sex or bereavement had no significant impact on this finding (data not shown).

Influenza vaccine was administered by the nurse to 90.1% of the subjects in the VN group, as compared with 53.0% in the UC group ( $p < 0.001$ ). The pneumonia vaccine was administered to 81.9% in the VN group and to

no one in the UC group ( $p < 0.001$ ). At the time of the trial, both vaccines were available free of charge to all eligible patients in the HSO.

The rate of health services utilization did not differ significantly between the 2 groups (Table 2). On average, subjects in the VN group tended to make more visits to their family physician and specialists and to experience longer lengths of stay in hospital than those in the UC group.

### Interpretation

The aim of this trial was to assess whether preventive home visits to frail elderly people by a primary care nurse could have a positive effect on the combined rate of deaths and admissions to an institution and on functional status. The combined rates of deaths and admissions to an institution were similar between the 2 groups. Two other randomized controlled trials showed similar results in terms of mortality.<sup>6,11</sup> Only Hall and associates<sup>8</sup> demonstrated an im-

**Table 1: Baseline characteristics of elderly subjects in the community who either were visited at home by a primary care nurse or received usual care**

Characteristic	Group; no. (and %) of subjects*		p value
	Visiting nurse n = 73	Usual care n = 69	
Mean age (and SD), yr	79.1 (5.8)	78.1 (5.3)	0.31
Mean no. of medications (and SD)	3.1 (2.0)	2.7 (2.2)	0.42
Female	52 (71.2)	43 (62.3)	0.29
Living alone	28 (38.4)	28 (40.6)	0.97
Admitted to hospital in previous 6 mo	8 (11.0)	8 (11.6)	1.00
Health status in past month			
Very good/good	35 (47.9)	31 (44.9)	0.54
Fair	22 (30.1)	30 (43.5)	0.13
Poor/very poor	12 (16.4)	7 (10.1)	0.32
Top 3 health conditions reported			
Arthritis	37 (50.7)	35 (50.7)	1.00
Hypertension	27 (37.0)	24 (34.8)	0.92
Heart condition	22 (30.1)	19 (27.5)	0.88
Lost someone close in past 6 mo	29 (39.7)	14 (20.3)	0.02

Note: SD = standard deviation.

\*Unless otherwise stated.

**Table 2: Health services utilization during 14-month study period**

Variable	Group; mean (and SD)			p value
	Visiting nurse n = 70	Usual care n = 69	Mean difference (and 95% CI)	
Visits to family physician	5.2 (4.5)	4.0 (3.6)	-1.2 (-2.5 to 0.2)	0.09
Visits to specialists	1.8 (2.1)	1.7 (3.3)	-0.1 (-1.0 to 0.8)	0.85
Visits to emergency department	0.4 (0.6)	0.5 (1.0)	0.1 (-0.1 to 0.4)	0.33
Hospital admissions (overnight)	0.4 (0.7)	0.3 (0.8)	-0.1 (-0.3 to 0.2)	0.52
Length of stay in hospital, d	18.8 (31.9)	10.5 (10.7)	-8.3 (-25.2 to 8.6)	0.33
Outpatient procedures	0.04 (0.2)	0.01 (0.1)	-0.03 (-0.1 to 0.03)	0.32

Note: CI = confidence interval.

provement in the intervention group in the proportion of elderly subjects still living in the community after 2 years. Changes in the rates of death and admission to an institution may only occur over a longer period. The 14-month follow-up period in our trial may have been too short to demonstrate significant differences.

Because our study was targeted to elderly people at risk for health deterioration, participants would be expected to have poorer levels of health at baseline. Indeed, a higher proportion of the subjects in our study than of people 65 years and older in Hamilton–Wentworth<sup>1</sup> and across Canada<sup>12</sup> initially reported their health as poor or fair.

The visiting nurse identified new problems in virtually every subject in the VN group. It is therefore not surprising that this group had a tendency toward a higher rate of health services utilization than those receiving usual care. This finding is consistent with results from several other studies.<sup>3,6,11,13–15</sup>

One of the main limitations of our study was the lack of statistical power. Because of the small sample size, many of the differences found between the 2 groups were not statistically significant, even though clinically important differences may have existed. The original sample size estimate was 128 patients per group, which would have detected a risk reduction of 15% in the primary outcome, with a power of 80%. Unfortunately, recruitment fell short and the trial only had a power of 50% for the primary outcome.

The eligibility criteria were such that elderly people with a serious chronic debilitating condition (e.g., mental illness) or a palliative condition would not have been excluded. The response of these conditions to a nursing intervention may be difficult to demonstrate, which possibly contributed to our lack of observed differences between the groups.

Our study demonstrated a unique format for care provision to elderly people living in the community. Because the visiting nurse was affiliated with the HSO, the closer liaison with the primary care physician resulted in a team approach to care. The visiting nurse was flexible and responsive to the needs of the patients and their caregivers and provided anticipatory care that was proactive and preventive in nature. Given the current trend toward increased numbers of frail elderly people being treated in the community, this project can serve as a model for future trials of home-based interventions.

Despite our attempts to target the intervention, further narrowing of eligibility criteria may be warranted. Future studies, with an increased sample size and length of follow-up, and a detailed economic analysis, would help to provide definitive answers about the effect of home nursing services as an extension of the family practice.

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Competing interests: None declared.

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