

# HipWatch: Osteoporosis Investigation and Treatment After a Hip Fracture: A 6-Month Randomized Controlled Trial

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**Objective.** We aimed to determine whether a novel Patient Empowerment and Physician Alerting (PEPA) intervention would improve the proportion of seniors who were investigated and treated for osteoporosis after hip fracture.

**Methods.** We undertook a 6-month randomized controlled trial (RCT) in 48 women and men  $\geq 60$  years old who had suffered a hip fracture and were admitted to a tertiary-care university hospital. The primary outcome measure was the proportion of participants offered one or more osteoporosis-specific 'best practices' measured using the Diagnosis and Management Questionnaire (DMQ). Participant responses were validated in part by physician report.

**Results.** In the PEPA intervention group, 19 (68%) were offered one or more components of best practice care compared with 7 (35%) in the 'usual care' group ( $p < .05$ ). In the PEPA group, 15 (54%) ( $p < .01$ ) were prescribed bisphosphonate therapy, 8 (29%) ( $p < .01$ ) had a bone mineral density scan, 11 (39%) were prescribed calcium and vitamin D ( $p = .32$ ), and 9 (32%) ( $p < .01$ ) were prescribed exercise. In the usual care group, 0 (0%) were prescribed bisphosphonate therapy, a bone mineral density assessment, or exercise and 6 (30%) were prescribed calcium and vitamin D.

**Conclusions.** This simple, inexpensive PEPA intervention resulted in far superior clinical management than did usual care in a population at high risk of future hip fracture.

HIP fracture is a well-recognized public health problem (1–4). Despite the plethora of evidence-based guidelines (5) for osteoporosis investigation and treatment (6–8), there still remains an internationally acknowledged (9,10) gap in care among individuals who sustain a fragility hip fracture (10–14). A recent U.S. randomized trial (14) showed that, 6 months after the fracture, hip fracture patients who had received a 15-minute in-hospital education session and a list of five questions to ask their primary care physician (PCP) about osteoporosis were twice as likely to receive appropriate osteoporosis assessment than were patients who had not received the information and the questions. If such an intervention could succeed without the in-hospital clinical research coordinator's education session, it would be easier to implement in clinical practice and less expensive. Therefore, we conducted a 6-month randomized controlled trial that tested a simple Patient Empowerment and Physician Alert (PEPA) intervention that did not require any in-hospital staff involvement. The intervention targeted both the patient and the PCP and aimed to increase the proportion of individuals who were investigated and treated for osteoporosis (6,7) after sustaining a hip fracture.

## METHODS

### Study Design

We used a randomized, controlled 6-month prospective study design with three measurement periods—baseline,

midpoint, and trial completion. Assessors were not blinded to participants' assignments.

### Participants

All women and men  $\geq 60$  years old residing in Vancouver who were admitted to the orthopedic trauma ward at Vancouver General Hospital (VGH) after sustaining a minimal trauma (defined as falling from a standing height or less) hip fracture. Figure 1 details the patient flow throughout the study. The institutional ethics board approved the study, and all participants provided written informed consent.

### Descriptive Variables

General health was assessed using a questionnaire relating to medical conditions, current medication use, and current supplement use. The Folstein Mini-Mental State Examination (15) assessed cognitive state.

### Primary Outcome Measure

An interviewer administered the Diagnosis and Management Questionnaire (DMQ) (11) to determine the proportion of participants who were offered one or more osteoporosis 'best practices' as recommended by the 2002 Canadian Medical Association Osteoporosis Clinical Practice Guidelines (6). Clinical outcomes were graded as: (i) investigation (dual-energy x-ray absorptiometry [DXA] scan, yes/no) and

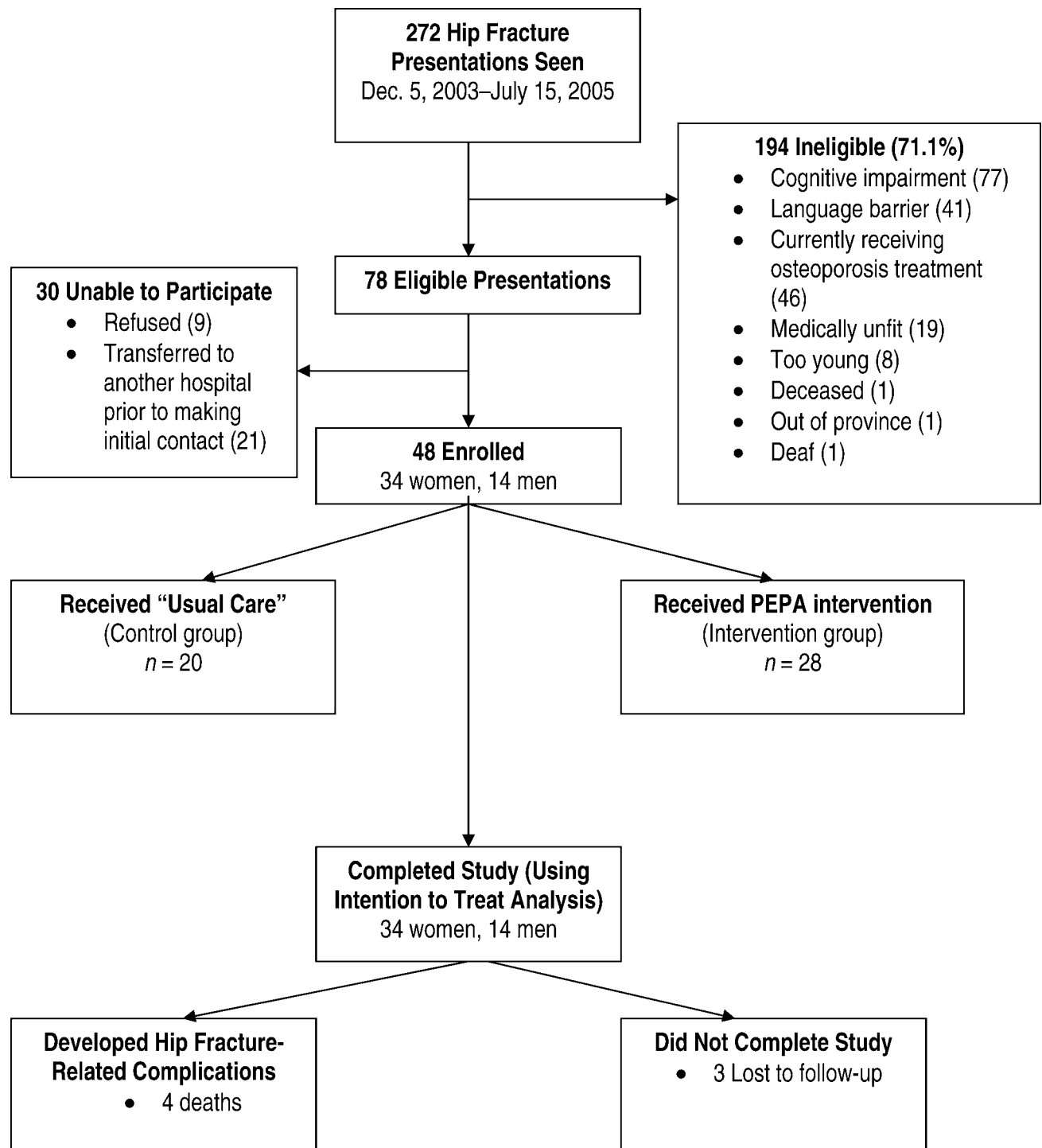


Figure 1. Study profile. PEPA = Patient Empowerment and Physician Alerting.

(ii) treatment (bisphosphonate therapy, yes/no; calcium and vitamin D, yes/no; exercise prescribed, yes/no).

#### Randomization

Participants were randomly assigned to either PEPA intervention or 'usual care' by an independent research coordinator who used a random numbers table.

#### Exclusion Criteria

Potential participants were excluded if they: (i) were already being treated for osteoporosis prior to having the fragility hip fracture, (ii) suffered from dementia and/or cognitive impairment, (iii) were unable to communicate in English, or (iv) had a severe medical pathology (e.g., cancer, chronic renal failure).

Table 1. Participant Descriptors, Medical History, and Fracture Classification

Characteristic	Usual Care (Control) No. of Yes Cases (%) or Mean (SD) (N = 20)	PEPA Intervention No. of Yes Cases (%) or Mean (SD) (N = 28)
<b>Demography</b>		
Age, y	82.6 (9.9)	80.4 (6.8)
Female	13 (65%)	21 (75%)
MMSE Score (max 30 points)	27.5 (2.6)	28.1 (1.9)
<b>Medical history</b>		
No. of medical conditions	3.9 (2.3)	3.9 (2.4)
No. of prescribed medications*	6.6 (4.2)	6.0 (3.6)
Previous fracture <sup>†</sup>	10 (50%)	10 (36%)
Total No. of fractures <sup>‡</sup>	17	21
<b>Hip fracture classification</b>		
Femoral neck	8 (40%)	13 (46%)
Intertrochanteric	7 (35%)	8 (29%)
Subtrochanteric	1 (5%)	3 (11%)
Right side	12 (60%)	12 (43%)

Notes: \*Mean number of prescription medications and doctor-recommended supplements taken by participants at the time of their hip fracture.

<sup>†</sup>Number of participants who have had a previous fracture.

<sup>‡</sup>Total number of fractures among participants.

PEPA = Patient Empowerment and Physician Alerting; MMSE = Mini-Mental State Examination; SD = standard deviation.

### Sample Size

Sample size was estimated assuming that the proportion of participants in the usual care group and the PEPA intervention group who were correctly diagnosed and managed over the 6-month period were 0.30 and 0.75, respectively. Assuming an attrition rate of 15% and using an  $\alpha$  level of  $\leq 0.05$ , 44 participants ensured a power of  $> 0.80$  to detect a significant difference between groups.

### PEPA—Intervention

The PEPA intervention consisted of usual care plus three elements, specifically: (i) usual care for the fracture including surgical treatment, (ii) osteoporosis information and a letter for participants that encouraged them to return to their PCPs for further investigation, (iii) a request for participants to take a letter from the orthopedic surgeon to the PCP alerting that physician to the hip fracture and encouraging osteoporosis investigation, and (iv) a telephone call at 3 months and 6 months to determine whether osteoporosis investigation and treatment had occurred.

### Usual Care—Control

Usual care consisted of: (i) as specified above, and (ii) a telephone call at 3 months (general health inquiry) and 6 months to determine whether osteoporosis investigation and treatment had occurred.

### Adverse Events

Questioning did not reveal any adverse events during the 6-month follow-up period.

### Statistical Analysis

Data were analyzed on an intention-to-treat (ITT) basis, using SPSS version 13.0 (SPSS Inc., Chicago, IL). In cases

Table 2. Best Practices Offered to Usual Care and PEPA Intervention Participants at 6-Month Follow-Up (N = 48): Intention-to-Treat Analysis

Element of Guideline Care Offered	Usual Care N (%) <sup>*</sup> (N = 20)	PEPA Intervention N (%) <sup>*</sup> (N = 28)	p Value
Osteoporosis diagnosis <sup>†</sup>	4 (20%)	11 (39%)	.22
Participants offered best practice care <sup>‡</sup>	7 (35%)	19 (68%)	<.02
Bisphosphonate therapy <sup>§</sup>	0 (0%)	15 (54%)	<.01
Dual-energy x-ray absorptiometry (DXA) <sup>  </sup>	0 (0%)	8 (29%)	<.01
Calcium/Vitamin D <sup>¶</sup>	6 (30%)	11 (39%)	.32
Exercise prescription <sup>#</sup>	0 (0%)	9 (32%)	<.01
Other**	0 (0%)	1 (4%)	.58

Notes: \*N = Number of “Yes” cases within each group; % = percentage of “Yes” cases within each group.

<sup>†</sup>Number of participants who reported having an osteoporosis diagnosis by their doctor.

<sup>‡</sup>Number of participants offered one or more components of best practice care for osteoporosis.

<sup>§</sup>Number of participants who were receiving bisphosphonate therapy at the time of their follow-up phone call.

<sup>||</sup>Number of participants who received a bone density scan (DXA) within 6-months of their hip fracture.

<sup>¶</sup>Number of participants who were taking calcium/vitamin D at the time of their follow-up phone call.

<sup>#</sup>Number of participants who were recommended some type of exercise program.

\*\*Number of participants who were offered other treatment related to their hip fracture (i.e., a referral for a falls prevention program).

PEPA = Patient Empowerment and Physician Alerting.

where there were missing data, the most conservative estimate for each outcome measure was used. For missing data, individuals were assumed to have not been investigated. Data were examined for outliers ( $\pm 3$  standard deviations above and below the mean) and were assessed for normality (Kolmogorov–Smirnov test) and skewness. The difference between the two experimental groups in the proportion of individuals who received one or more elements of osteoporosis-specific best practice care within 6 months after their hip fracture was compared using the chi-square test. The  $\alpha$  level was set at  $p < .05$ .

## RESULTS

### Descriptive Variables

Baseline characteristics of the 48 participants are presented in Table 1. The mean time between the participant's hip fracture admission and the baseline interview was 7 ( $\pm 5$ ) days. All patients were interviewed postoperatively during their inpatient stay at a time when they could participate comfortably.

### Osteoporosis-Specific Best Practice Care

We found a significant difference between the intervention ( $n = 28$ ) and the control group ( $n = 20$ ) in the number of individuals who received one or more osteoporosis best practices after their hip fracture ( $p < .01$ ). Table 2 details osteoporosis-specific best practice care results. Specifically,

in the PEPA group, 15 (54%) ( $p < .01$ ) were prescribed bisphosphonate therapy, 8 (29%) ( $p < .01$ ) had a bone mineral density scan, 11 (39%) were prescribed calcium and vitamin D ( $p = .32$ ), and 9 (32%) ( $p < .01$ ) were prescribed exercise. In the usual care group, 0 (0%) were prescribed bisphosphonate therapy, 0 (0%) had a bone mineral density assessment, 6 (30%) were prescribed calcium and vitamin D, and 0 (0%) were prescribed exercise. In a subset of 12 (25%) patients, a blinded physician validated the patients' self-report of medication status with the PCPs and found complete corroboration.

## DISCUSSION

Despite literature and clinical education campaigns underscoring the importance of osteoporosis management after a hip fracture, individuals who receive usual care have traditionally been underinvestigated and undertreated (10–14). Undertreatment refers to the lack of fall risk assessment and management, as well as the lack of therapy with appropriate medication. Our control group data suggest that substantial undertreatment remained in 2005–2006. To address this problem (16) we trialed a very inexpensive intervention that doubled the proportion of patients who were offered one or more components of osteoporosis-specific best practice care.

Not only did the HipWatch intervention engage the patient, it also engaged the PCP. Over time, the doctor-patient relationships have changed, and currently patients are encouraged to play a more active role with regard to their health care (14,17). The PEPA intervention may have bridged this gap by empowering the patient and encouraging the patient to discuss osteoporosis investigation and subsequent treatment with his or her physician.

This study has certain limitations. First, as with any study of the frail population of hip fracture patients, exclusion criteria affect the generalizability of the results. Second, although the investigator was not blinded to treatment allocation, the interview questions were administered from a standard script, and responses were entered verbatim. Supporting the veracity of these results was the 100% validation of a subset of these responses by a blinded research physician.

In an older population of women and men, HipWatch was an effective novel educational intervention that targeted both patients' awareness of osteoporosis and encouraged the condition to be made a priority for treatment. Also, as falling remains the strongest predictor of hip fracture, future work should also seek to ameliorate the gap in assessment and management of fall risk, not only osteoporosis management.

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All authors were responsible for study concept and design. J.C.D. was responsible for data acquisition. J.C.D. and T.L.A. were responsible for data analyses. All authors were responsible for data interpretation and critical review of the manuscript. J.C.D. wrote the first draft of the manuscript. P.G. and K.M.K. were cosponsors and principal investigators of this study.

## CORRESPONDENCE

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