

# Perceived barriers and facilitators for the use of external hip protectors

Tatjana Bulat MD

Medical Director, Patient Mobility Clinical Services, VISN 8 Patient Safety Center  
11605 North Nebraska Avenue, Tampa, Florida 33612, USA  
e-mail: Tatjana.Bulat@med.va.gov

Gail Powell-Cope PhD ARNP

Audrey Nelson PhD RN FAAN

VISN 8 Patient Safety Center, James A. Haley Veterans Hospital, Tampa, FL, USA

Laurence Z. Rubenstein MD MPH

Geriatric Research, Education and Clinical Center

UCLA-Greater Los Angeles VA Healthcare System, Sepulveda, CA, USA

*T. Bulat, G. Powell-Cope, A. Nelson, L.Z. Rubenstein. Perceived Barriers and Facilitators for the Use of External Hip Protectors. Gerontechnology 2004; 3(1): 5-15. **Background.** Hip protectors have been found to be effective in preventing hip fractures; unfortunately adherence with their use seems to be poor, especially long-term. We wanted to identify key barriers and facilitators influencing their use in long-term care from staff's perspective and patient-perceived barriers and facilitators among elderly outpatients. **Methods.** A series of focus groups and individual interviews were conducted with nursing home staff and outpatients seen in a falls clinic and deemed to be high risk for falls and fall-related injuries. Forty-one nursing home staff members and 38 outpatients (3 months after receiving a multidisciplinary fall evaluation during which external hip protectors were provided) participated. Using content analysis, responses were grouped into categories. **Results.** In the long-term care setting, the main perceived advantage was improvement in quality of care, particularly the prevention of hip fractures. Perceived barriers were categorized into administrative constraints (cost, availability), characteristics of hip protectors, and patient and staff concerns. Facilitators were supportive managers and administrators, families and co-workers. In the outpatient setting, adherence with hip protector use was poor (34%) at 3 months despite substantial encouragement and education from the providers. All respondents gave multiple reasons for not using protectors, most commonly related to comfort and difficulty in taking them on and off. The majority of outpatients was not willing to wear them. **Conclusion.** Important barriers to the use of hip protectors exist from both patient and provider perspectives. Knowledge of these barriers will be used to design and evaluate targeted implementation strategies to better integrate these highly effective devices into clinical practice.*

**Keywords:** hip protectors, adherence, barriers, facilitators

One of the most serious fall-related injuries is hip fracture. In most cases, the immediate cause is a lateral fall with direct impact on the greater trochanter of the proximal femur<sup>1</sup>. External hip protectors are usually consisting of an undergarment with shells made of polyurethane and

positioned over the greater trochanters, designed to shunt or absorb the energy of the impact thereby preventing hip fracture<sup>2-4</sup>. They have been found to be effective in preventing hip fractures when they are worn<sup>5</sup>, and multiple trials have reported positive results, with up to 84%

reduction of risk of hip fracture if the external hip protector was worn at the time of fall<sup>5-7</sup>. Summation of the results from six studies gave an occurrence of hip fracture of 2.4% to those allocated to hip protectors versus 6.6% in controls<sup>8</sup>. Hip protectors were found to be cost-effective for individuals over 80, institutionalized patients<sup>9-10</sup>, and community living seniors<sup>11</sup>. Women over 65 and men over 85 also gained quality adjusted life years through hip protector use<sup>11</sup>. Unfortunately, acceptance and adherence with continued use of hip protectors seem to be a problem across studies<sup>12-15</sup>. Multiple, recent randomized trials of hip protector use by institutionalized, high-risk residents<sup>16</sup> failed to find an effect mainly due to low rates of adherence with their use<sup>17-19</sup>.

In institutional settings, adherence rates reported in the literature vary between 27% and 50.3% at three months<sup>20-22</sup>. In community living elderly women<sup>23-24</sup> cost, odd appearance, discomfort, and coping strategies were identified as factors impeding adherence. Barriers to adherence have not been systematically examined among nursing home residents nor among male subjects; most research is based on elderly females and cannot be generalized to elderly male populations. Because hip protector efficacy is highly related to their consistent use<sup>9,14,25</sup>, we felt it important to first try to evaluate barriers and facilitators for their consistent use in our mainly male, elderly, veteran population.

The goal of this qualitative study was two-fold: (i) to understand the provider-perceived barriers towards the use of hip protectors among nursing home residents, and (ii) to evaluate patient-perceived barriers and facilitators to hip protector use among more cognitively intact outpatients at risk for falls. Our intent was to develop a targeted intervention for improving adherence that will be tested in

a randomized clinical trial.

## THEORETICAL FRAMEWORK

The Theory of Planned Behavior (TPB)<sup>26</sup> was selected to guide this study because empirical support is evident in the literature for a wide range of health and non-health-related behaviors, over more than two decades<sup>27-34</sup>. Until recently, much of the literature on adherence to recommended health behaviors tended to be atheoretical<sup>35-36</sup>; however, the advantage of a theoretical approach for examining adherence is the identification of testable hypotheses about the associations among variables. The TPB, therefore, provides a powerful theory on which to base behavioral interventions in the health services arena. Successful health promotion interventions have been based on the TPB as in safe sexual practices in adolescents<sup>37</sup> and breast self-examination in older women<sup>38-39</sup>. Aminzadeh and colleagues<sup>40</sup> used the TPB to understand elders' attitudes toward cane use for designing theory-based fall prevention efforts to promote the use of mobility aids. Data from the current study will be used to launch intervention research to improve adherence to hip protector use in elderly persons at risk for falls.

The TPB is an expectancy value theory for predicting behavioral intention<sup>26</sup>. Intention is predicted to directly influence conduct of the behavior under question. Intentions are a function of personal beliefs and attitudes about the behavior and of normative influences. Attitudes are a function of beliefs about the behavioral outcome and an evaluation of whether those outcomes are desirable or not. Normative influences are what individuals believe others think they should do (normative beliefs) and how much individuals feel influenced by these social referents (motivation to comply). The original theory was expanded to include

perceived behavioral control<sup>41-44</sup>, that is perceived ease or difficulty in performing a behavior. According to the TPB, attitude, behavioral control, and social norm are the most powerful predictors of intention. The predictive model does not include any background variables, such as age, marital status, or education. These demographic variables are posited to indirectly influence behavioral intention and behavior through their influence on attitudes and normative influences.

Although tested extensively, the TBP is not without limitations. Questions have been raised about the utility of the TPB to predict behaviors that depend on interpersonal interaction and cooperation<sup>45</sup>, or behaviors that depend on an individual's internalized moral rules<sup>46</sup>. Debate continues about which health promotion model is superior, the Health Belief Model, the TPB, or Prochaska & DiClement's Transtheoretical Model and Stages of Change<sup>47</sup>. The TPB was chosen for this project because of its strong and well-documented associated methodology<sup>48</sup>, its success in the prediction of a variety of health-related behaviors, and the principal investigator's experience in applying the theory<sup>49-50</sup>. Selection of the TPB does not preclude testing competing hypotheses based on other theories in subsequent studies.

## METHODS

### Design

We used focus groups with nursing home staff and individual interviews with patients. Provider focus groups were selected to understand the complex behaviors surrounding adherence given the cognitive and functional limitations of nursing home residents. Focus groups allowed for the exploration of the degree of consensus among nursing home staff about the barriers to hip protector use<sup>51</sup>. To elicit patients' views on hip protector use, a survey was conducted among outpatient

veterans evaluated in a VA interdisciplinary falls clinic. Veterans were referred for the evaluation by their primary care provider if they had a history of falls or gait abnormality. During a clinic visit, they underwent a medical/functional assessment to determine if they were at high risk for falls and fall-related injuries and, if yes, were offered hip protectors among other interventions. The medical/functional assessment used has been shown effective in reducing number of falls in outpatient veterans at risk<sup>52</sup>. Intensive patient education was performed (about 15-20 minutes) summarizing the risk factors and the need for hip protector use. One pair of appropriate size hip protectors (two if patient was incontinent), were mailed to each patient. Either 'Safehip' by Sahvatex, Inc. or Posey 'Hipster III' was given, based on patient preference. A trained interviewer telephoned patients approximately 3 months after the initial visit.

### Sample

Forty-one nursing staff (nurse practitioners, registered nurses, licensed practical nurses, and certified nursing assistants) were recruited from five units in two VA operated nursing homes. These were both restraint-free facilities, provided care to similar patient population (>90% male) and otherwise used similar fall prevention strategies. Staff in one nursing home (2 units) regularly used hip protectors with approximately 80% of residents. Staff in the other nursing home (three units) rarely used hip protectors (10-20% of residents). The 'low-use' nursing home was on the same site as a medical center, had affiliation with the medical school and was in operation for the last 25 years. The 'high-use' nursing home was on an outpatient clinic campus, without an academic affiliation and opened 3 years ago.

Thirty-eight consecutive outpatients evaluated at the falls clinic and deemed to

be at high risk for falls (based on medical/functional evaluation) and fall-related injuries (documented osteoporosis or with multiple risk factors) were recruited. The age range was 65-92; the sample included 6 females and 32 males. All participants signed an informed consent that had been approved by the institutional review board.

## Data collection instrument

A focus group guide (*Appendix A*) and a patient interview guide (*Appendix B*) were developed to explore dimensions of the TPB. *Behavioral beliefs* were elicited by asking participants to list advantages and disadvantages with the use of hip protectors. To elicit *control beliefs, or facilitators and barriers*, participants were asked to describe factors that make it easier or more difficult for them to use hip protectors. To obtain *normative beliefs*, the participants were asked to identify individuals or groups who would encourage, discourage, or influence their use of hip protectors.

## Procedures

For staff, focus groups were held at the nursing homes. An experienced facilitator/interviewer used the interview guide to elicit responses and generate discussion, and an assistant recorded the notes. The facilitator also recorded points of agreement onto a flip chart. At the close of each group, the facilitator summarized main discussion points and solicited additions or changes. The focus groups closed when all participants agreed that all key issues had been noted. Each focus group lasted approximately one hour. Participants received either lunch or breakfast for participation. Outpatients were contacted by telephone three months after the falls clinic evaluation and given a structured 15 minutes interview to obtain data on duration of use and perceived main advantages and disadvantages of hip protectors.

## Analysis

Data from flip charts and assistants' notes were content-analyzed according to the TPB constructs (*behavioral beliefs-advantages and disadvantages, control beliefs-facilitators and barriers, and normative beliefs*)<sup>53</sup>. The ideas discussed by participants were grouped by subcategory within each construct and organized hierarchically by level of importance (high to low), as indicated by focus group participants. Data from all of the focus groups were grouped for analysis because of commonalities across groups. However, since one facility used hip protectors extensively and the other did not, responses were compared across facilities. The subcategories within each construct were reviewed by the investigators for content validation. Minor discrepancies in the grouping of data into subcategories were resolved through discussion. Results were categorized as: (i) advantages of using hip protectors (e.g. positive behavioral beliefs), (ii) facilitators (e.g. positive control beliefs), (iii) barriers (e.g. negative control beliefs), and (iv) persons or groups who influence hip protector use (e.g. normative beliefs). Outpatients were asked specific questions about the protectors, and responses were recorded by hand into a database. Data were summarized using frequency counts comparing users and nonusers of hip protectors.

## RESULTS

### Long-term care providers

#### *Advantages and Facilitators of Hip Protector Use*

Advantages were subcategorized into patient, staff, family, and organizational benefits (Table 1). Staff in both nursing homes readily identified the primary patient benefit of preventing hip fractures. Staff in the 'high use' nursing home also identified improved function and increased independence as added benefits and that it gave them peace of mind to

know that their patients were protected. They also had an understanding of the long-term benefits in terms of avoiding cost, and increased work load from residents who sustained a hip fracture. These staff developed many creative strategies for insuring high adherence, such as practice controls that reminded staff when to apply and remove hip protectors. Hip protector use became routine because 'all staff have bought into using them'. Staff also credited families and residents in making it easier to use the hip protectors. When families understood the reasons, they became partners with staff in insuring that the resident wore them. Staff at the 'low use' nursing home identified very few

advantages or facilitators other than the availability and characteristics of the hip protectors. In general, most units only used one or two brands of hip protectors and were not aware of alternative models with different options.

### Barriers

Staff in both nursing homes readily identified barriers to hip protector use. The 'low use' nursing home staff identified more barriers. They tended to identify administrative, staff, and availability issues, whereas staff at the 'high use' nursing homes emphasized the characteristics of hip protectors and specific patient factors.

Table 1. Nursing Staff Perceived Advantages, Facilitators, and Barriers to the Use of Hip Protectors

1. Advantages	
Beneficiary	Positive outcome
Family	Peace of mind by knowing that loved ones are protected from hip fracture
Organization	Cost avoidance of hip fracture Hip protectors help to maintain a restraint-free environment
Patient	Prevent hip fractures and other injuries by cushioning falls Improve function, independence, and confidence
Staff	Staff peace of mind, e.g. helps staff to know that residents are protected especially because they cannot directly observe residents at all times Avoiding the heavy a care that is required by residents after having fractured a hip
2. Facilitators	
Provider	Patient or organizational factor
Practice Controls	Making hip protector use part of the routine of care, for example by checking them on rounds and assigning application to day shift after morning care and removal to evening shift at bed time care Basing hip protector use on patient risk assessment Persistence on part of providers to convince residents to use them, and vigilance to monitor their use A team approach in which all staff work together to insure hip protector use. Cognitive aids to remind staff to use hip protectors, such as noting hip protector use on daily nursing assistant assignment sheet Provider education, particularly for new and agency staff Communication among staff
Characteristics & Availability	Hip protectors with snaps along seams that allow for easy removal and toileting Availability, that is having enough in the correct sizes that are easy to find on the unit
Resident & Family Factors	Families who were involved in making sure they were on their loved ones Residents who understand the benefits and get used to them over time
3. Barriers	
Provider	Patient or organizational factor
Administration Characteristics and Availability	'We were told it was too expensive' Designs without snaps or zippers to facilitate putting them on and taking them off Velcro and materials of hip protectors that wear out after several washings When soiled it takes time to get them back from laundry Sometimes staff throw them out if they become soiled They become lost
Patient factors	There are not enough of them on units in the right sizes for the number of residents who need them Clinical status or conditions such as diarrhea, cognitive impairment, urinary catheters, aggression Discomfort, for example if the hip protectors are too tight Hip protectors look bulky under clothes Lack of understanding of the benefits of hip protectors
Staff factors	Patients removing the hip protectors Lack of education, particularly among agency nurses Lack of convenience, i.e. takes time to put hip protectors on and take them off, they are hard to get clothes over, they are difficult to put on Staff are unsure of when to use them, for what residents and how to use them with other protective devices

## Normative Beliefs

Staff in the 'low use' nursing home did not identify people or groups that supported or encouraged the use of hip protectors, whereas staff in the 'high use' nursing home identified supportive managers and administrators, families and co-workers. These staff believed that the use of hip protectors was an expectation of everyone around them.

## Outpatient data

Twenty-five of the 38 outpatients (66%) who were prescribed hip protectors were not using them at the 3-month follow-up. They provided multiple reasons (Table 2), the most common related to comfort and difficulty in taking them on and off. Twenty patients (80% of nonusers) said they did not plan to wear them ever, and they could not think of anything that would make it easier to wear them. Two said they might wear them if they were not so hot or uncomfortable, and one said he might wear them if he had more than one pair. Six patients (24% of nonusers) reported that they did not feel they were at risk for falling or fracturing a hip and thus did not

wear them. Given the small number of females in our sample we did not analyze results based on sex. The frequency of self-reported falls in the three months prior to the clinic visit compared to three months after the clinic visit was 3.8 versus 2.1. The number of veterans with no falls increased from seven (3 months pre-visit) to 24 after three months following falls clinic evaluation. At three months, 26 of the 38 veterans reported fewer falls compared to the three month time period pre-visit. Only seven reported more falls.

For those wearing hip protectors (n=13) (34%), the time per day ranged from one half hour to 12 hours; most reported wearing them 3-4 hours per day. Five reported no problems wearing them; two reported problems related to comfort; two reported that it was difficult to keep one pair laundered. All users reported that the major benefit of wearing the hip protectors was increased feeling of safety and security in knowing that they were protected from a hip fracture and they perceived no disadvantages to wearing them.

*Table 2. Frequencies and Percentages of Reasons for Not Wearing Hip Protectors at 3 months follow-up (N=19, six cases had missing data)*

Statement	n (%)	
	Agrees	Disagrees
NOT comfortable to wear	16 (84)	3 (12)
Too hot	15 (79)	4 (21)
Trouble taking the hip protectors off to go to the bathroom	14 (75)	5 (26)
Skin irritation	13 (68)	6 (15)
It makes me look fat	13 (68)	6 (15)
Too hard to put on and take off	13 (68)	6 (15)
No one to help me put the hip protectors on - off	4 (21)	15 (79)
Difficult to keep clean and laundered	4 (21)	15 (79)



## DISCUSSION

Focus group data from staff at a 'high use' nursing home and a 'low use' nursing home revealed many differences in perceptions of advantages, facilitators, and barriers for the use of hip protectors. The high use nursing home had embodied the hallmarks of a culture of safety, that is, supportive managers and administrators who provided resources, a blame-free environment, and high levels of communication and involvement among front line staff<sup>54</sup>. All administrators, managers, staff, and most residents and family members had bought into the use of hip protectors. Staff said that because hip protector use was 'a given' they developed practice controls, education programs for new staff and families, and ways to insure availability. In contrast, hip protector use at the 'low use' nursing home did not seem to be integrated into the existing culture of safety and virtually no mechanisms existed to overcome barriers to their use.

Because the Theory of Planned Behavior was used to organize the critical nurse-perceived advantages and facilitators and barriers of hip protector use, focus group results can be used to build effective theory-based interventions to support positive attitudes, alter negative attitudes, and remove barriers to their use. It is interesting to note that staff in the 'low use' nursing home did not identify normative influences that encouraged the use of hip protectors, whereas staff in the 'high use' nursing home identified supportive managers and administrators, families and co-workers. These data about the normative influence of hip protector use suggests that social marketing techniques or techniques that feature public opinion leaders may be effective in promoting adherence<sup>55</sup>. For example, well-respected clinicians could be used to convince staff, patients, and families of the benefits of hip protectors. Social marketing is another general strategy that may be useful,

whereby messages are tailored to target audiences based on what is important to that audience<sup>56</sup>. Focus group results indicate that hip protectors should be marketed to nurses conveying the obvious benefits to patients (e.g. reduced risk of hip fracture) and also emphasizing more subtle benefits such as the peace of mind they can enjoy when their patients are protected under their watches. Administrators should be reminded of the organizational benefits of cost savings and maintenance of a restraint-free environment. Families, also, should be brought into hip protector adherence programs by emphasizing the peace of mind they will receive by knowing that their loved ones are protected from hip fractures. The role of family is probably heightened when promoting hip protector use in cognitively impaired adults for whom direct social marketing techniques are not useful due to impairments in memory, judgment, and reasoning.

Of practical interest in hip protector adherence programs are the practice controls that served as facilitators to hip protector use. These practice controls could be easily integrated into policy and procedures for caring for patients in nursing homes with little effort by nursing staff and managers. In developing adherence programs, the barriers represent challenges to staff and managers. Presumably, the more barriers they can remove, the greater adherence will be. It would be advantageous to nursing home managers to work with administrators, laundry, purchasing, manufacturers, patients, and staff to overcome as many barriers as possible. For example, working out a simple plan with laundry could insure that each unit received clean hip protectors in a timely manner. Convincing administrators of the cost savings to the institution of avoiding one hip fracture by hip protector use might motivate them to approve spending for hip protectors.

Data from the outpatient survey revealed that although these outpatients were identified and educated by clinical staff as being at high risk for falls and fall-related injuries, the majority of them did not wear hip protectors. They identified numerous barriers, with the majority of non-users denying that anything could be done to increase adherence to the hip protectors. This finding is consistent with previously published reports of poor long-term compliance with hip protectors use in community living elderly women<sup>12,19</sup>. Perception of risk for fall and fracture was identified as the most crucial factor for adherence with hip protector use, since only a small number of elderly women viewed themselves at risk. In our study the majority of patients were aware of their high risk after undergoing an in depth evaluation at the falls clinic; however only 16% of the sample did not believe that they were at risk 3 months later. Perhaps they never internalized the sense of vulnerability to a hip fracture and thus were not motivated to use protective means to avoid injury.

Additionally, our data show that survey participants reported fewer falls during the three month follow-up compared to the three months before their clinic appointments and prescription of hip protectors. Perhaps a real decrease in falls, as a result of a multidisciplinary fall risk reduction interventions such as medication adjustment, provision of assistive devices and home equipment and prescription of exercise programs, translated into a decreased perception of risk and therefore a decreased willingness to wear hip protectors. Our findings suggested that elderly males at high risk for falls and fall-related injuries living in the community were not readily willing to use external hip protectors despite encouragement from the health professionals and the availability of free hip protectors. Education regarding the fall risk and the protective properties of hip

protectors did not seem to be a sufficient intervention to promote long-term adherence with hip protector use in our population. Outpatient use of hip protectors remains a challenge for clinicians<sup>57</sup>. Our data do not provide clear direction for improving adherence for outpatients but suggest that multiple sources of education and repeated reminders may be necessary as well as having more than one pair so that they can keep them laundered. In addition, our understanding of barriers and facilitators for outpatient use of hip protectors would be strengthened by incorporating views of families and significant others.

Creative strategies that incorporate social marketing techniques and perceptual change are called for. For example, our clinicians have begun to equate hip protectors with protective gear used in football, an image that may be more appealing to elderly men. Also, we developed an educational video for which the narrator is an active elderly man well known in our community. Data from other evidence-based practice implementation studies suggest that chances for success increase if more than one approach is taken<sup>58-59</sup>. Finally, it seems clear that interventions to increase adherence with hip protector use should be targeted at individuals most likely to benefit, for example persons who have both multiple intrinsic risk factors for falls and high activity levels, those who are thin rather than obese (higher risk for injury), and multiple fallers.

## Acknowledgment

The research reported here was supported by the Department of Veterans Affairs, VISN 8 Patient Safety Center and the James A. Haley VA Hospital in Tampa, FL. The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.



## References

1. Greenspan SL, Myers ER, Kiel DP, Parker RA, Hayes WC, Resnick NM. Fall direction, Bone Mineral Density, and Function: Risk Factors for Hip Fracture in Frail Nursing Home Elderly. *American Journal Medicine* 1998;104(6):539-545
2. Rubenstein LZ. Hip protectors. A breakthrough in fracture prevention. *New England Journal Medicine* 2000;343(21):1562-1563
3. Robinovitch SN, Hayes WC, McMahon TA. Energy-shunting hip padding system attenuates femoral impact force in a simulated fall. *Journal Biomechanical Engineering* 1995;117:409-413
4. Parkkari J, Kannus P, Poutala J, Vuori I. Force attenuation properties of various trochanteric padding materials under typical falling conditions of the elderly. *Journal Bone Mineral Research* 1994;9:1391-1396
5. Kannus P, Parkkari J, Niemi S, Palvanen M, Jarvinen M, Vuori I. Prevention of hip fracture in elderly people with use of a hip protector. *New England Journal Medicine* 2000;343(21):1506-1513
6. Harada A, Mizuno M, Takemura M, Tokuda H, Okuizumi H, Niino N. Hip fracture prevention trial using hip protectors in Japanese nursing homes. *Osteoporosis International* 2001;12(3):215-221
7. Jensen J, Lundin-Olson L, Nyberg L, Gustafson Y. Fall and injury prevention in older people living in residential care facilities: a cluster randomized trial. *Annals Internal Medicine* 2002;136(10):733-741
8. Parker MJ, Gillespie LD, Gillespie WJ. Hip protectors for preventing hip fractures in the elderly. *The Cochrane database of systematic reviews* 2003(3):CD001255
9. Kumar BA, Parker MJ. Are hip protectors cost-effective? *Injury* 2000;31(9):693-695
10. Colon-Emeric KS, Datta SK, Matchar DB. An economic analysis of external hip protector use in ambulatory nursing facility residents. *Age Aging* 2003;32:47-52
11. Segui-Gomez M, Keuffel E, Frick KD. Cost and effectiveness of hip protectors among the elderly. *International Journal of Technology Assessment in Health Care* 2002;18(1):55-66
12. Parkkari J, Heikkila J, Kanus P. Acceptability and compliance with wearing energy-shunting hip protectors: a 6-month prospective follow-up in a Finnish nursing home. *Age Aging* 1998;27:225-229
13. Becker C, Walter-Jung B, Nikolaus T. The other side of hip protectors. *Age Aging* 2000;29(2):186
14. Cameron, I. Hip protectors: Prevent fractures but adherence is a problem. *British Medical Journal* 2000; 324(7334):375-376
15. Schoor NM van, Deville WL, Bouter LM, Lips P. Acceptance and compliance with external hip protectors: a systematic review of literature. *Osteoporosis International* 2002;13(12):917-924
16. Cameron ID, Venman J, Kurrle SE. Hip protectors in aged-care facilities: a randomized trial of use by individual higher-risk residents. *Age Aging* 2001;30:477-481
17. Hildreth R, Campbell P, Torgerson I. A randomized controlled trial of hip protectors for the prevention of second hip fractures. *Osteoporosis International* 2001;12:S13
18. Schoor N van, Smit JH, Twisk JWR, Bouter LM, Lips P. Prevention of hip fractures by external hip protectors. A randomized controlled trial. *Journal of the American Medical Association* 2003;289:1957-1962
19. Bulat T and Quigley, P. External hip protectors and risk of hip fracture. *Journal of the American Medical Association* 2003;290(7):883
20. Thompson PW, Jones C, Villar T. Hip protectors: Rate of adherence is 42% at three months in residential homes (letter). *British Medical Journal* 2002;16:324(7334):375-376
21. Ekman A, Mallmin H, Michaelsson K,

- Ljunghall S. External hip protectors to prevent osteoporotic hip fractures. *Lancet* 1997;350(9077):563-564
22. Chan DK., Hillier G, Coore M. Effectiveness and acceptability of a newly designed hip protector: a pilot study. *Archives Gerontology Geriatrics* 2000;30:25-34
  23. Cameron ID, Quine S. External hip protector: likely non-compliance among high-risk elderly people living in the community. *Archives Gerontology Geriatrics* 1994;19:273-281
  24. Cameron ID, Stafford B, Cumming RG, Birks C, Kurrle SE, Lockwood K, Quine S, Finnega T. Hip protectors improve falls self-efficacy. *Age Aging* 2000;29(1):57-62
  25. Suzuki T, Yoshida H, Ishizaki T, Yukawa H, Watanabe S, Kumagai S, et al. Compliance in use of EHP in community elderly in Japan. *Nippon Ronen Igakkai Zasshi* 1999;36(1):40-44
  26. Ajzen I, Fishbein M. *Understanding attitudes and predicting social behavior*. Englewood Cliffs: Prentice-Hall;1980; p 5
  27. Sperber B, Fishbein M, Ajzen I. Predicting and understanding women's occupational orientations: Factors underlying choice intentions. In: Ajzen I, Fishbein M, editors, *Understanding attitudes and predicting social behavior*. Englewood Cliffs: Prentice-Hall; 1980; pp 113-129
  28. Chan D, Fishbein M. Determinants of college women's intentions to tell their partners to use condoms. *Journal Applied Social Psychology* 1993;23:1455-1470
  29. Fishbein M, O'Reilly K, Schnell D, Wood R, Beeker C, Cohn D. Factors influencing gay men's attitudes, subjective norms, and intentions with respect to performing sexual behaviors. *Journal Applied Social Psychology* 1993;23:417-438
  30. Powell-Cope G, Lierman L, Kasprzyk D, Young H, Benoliel J. Beliefs and attitudes predicting breast self-examination. *Health Care for Women International* 1991;12(1):51-61
  31. Stasson M, Fishbein M. The relationship between perceived risk and preventive action: A within-subject analysis of perceived driving risk and intentions to wear seatbelts. *Journal Applied Social Psychology* 1990;20:1541-1557
  32. Conn VS, Burks KJ, Pomeroy SH, Ulbrich SL, Cochran JE. Older women and exercise: explanatory concepts. *Womens Health Issues* 2003;13(4):158-166
  33. Dodgson JE, Henly SJ, Duckett L, Tarrant M. Theory of planned behavior-based models for breastfeeding duration among Hong Kong mothers. *Nursing Research* 2003;52(3):148-158
  34. O'Boyle CA, Henly SJ, Larson E. Understanding adherence to hand hygiene recommendations: The theory of planned behavior. *American Journal Infection Control* 2001;29(6):352-360
  35. Davidson R. Prochaska and DiClemente's model of change: a case study? *British Journal Addiction* 1992;87:821-822
  36. Prochaska JO, DiClemente CC, Velicer WF, Rossi JS. Comments on Davidson's 'Prochaska and DiClemente's model of change: A case study?' *British Journal of Addiction* 1992;87:825-835
  37. Jemmott L, Jemmott J. Applying the theory of reasoned action to AIDS risk behavior: condom use among black women. *Nursing Research* 1991;40:228-234
  38. Lierman LM, Young HM, Powell-Cope G, Georgiadou F, Benoliel JQ. Using social support to promote breast self-examination performance. *Oncology Nursing Forum* 1994;21:1051-1056
  39. Lierman LM, Young HM, Powell-Cope G, Georgiadou F, Benoliel JQ. Effects of education and support on breast self-examination in older women. *Nursing Research* 1994;43:158-163
  40. Aminzadeh F, Edwards N. Factors Associated with Cane Use Among Community Dwelling Older Adults. *Public Health Nursing* 2000;17(6):474-483
  41. Ajzen I. *The theory of planned behavior*. *Organizational behavior and human*

- decision processes 1991;50:179-211
42. Blue C. The predictive capacity of the theory of reasoned action and the theory of planned behavior in exercise research: An integrated review of the literature. *Research Nursing Health* 1995;18:105-121
  43. Madden T, Ellen P, Ajzen, I. A comparison of the theory of planned behavior and the theory of reasoned action. *Personality and Social Psychology Bulletin* 1992;18(1):3-9
  44. Netemeyer RG, Burton S, Johnson M. A comparison of two models for the prediction of volitional and goal-directed behaviors: A confirmatory analysis approach. *Social Psychology Quarterly* 1991;5:87-100
  45. Kashima Y, Gallois C, McCamish M. The theory of reasoned action and cooperative behaviour: It takes two to use a condom. *British Journal Social Psychology* 1993;32:227-239
  46. Parker D, Manstead ASR, Stradling SG. Extending the theory of planned behavior: The role of personal norm. *British Journal Social Psychology* 1995;34:127-137
  47. Rimer B. Perspectives on intrapersonal theories of health behaviors. Pp 144-159, in: Glanz K, Lewis F, Rimer B, editors, *Health behavior and health education*. San Francisco: Jossey-Bass; 2002
  48. Young HM, Lierman L, Powell-Cope G, Kasprzyk D, Benoliel J. Operationalizing the theory of planned behavior. *Research Nursing Health* 1991;14:137-144
  49. Powell-Cope G, Luther S, Neugaard B, Nelson A, Vara J. Provider Perceived Barriers and Facilitators for IHD Guideline Adherence. *Journal of Evaluation in Clinical Practice*. In press
  50. Powell-Cope G, Lierman L, Kasprzyk D, Young H, Benoliel J. The theory of reasoned action in prediction of breast self-examination: A comparison of two studies. *Health Care Women International* 1991;12:51-61
  51. Morgan DL, Kreuger RA. When to use focus groups and why. In: Morgan DL, editor, *Successful focus groups*. Newbury Park: Sage; 1993; pp 3-19
  52. Hart-Hughes S, Quigley P, Bulat T. Functional profile of veterans at risk for falls. *Journal of Rehabilitation*. In press
  53. Weber R. *Basic content analysis*. Beverly Hills: Sage; 1985
  54. Pizzi L, Goldfarb N, Nash B. Promoting a Culture of Safety. Agency for Healthcare Research and Quality: Making Health Care Safer (Evidence Report/Technology Assessment) 2001;43:451-483
  55. Thomson O'Brien MA, Oxman AD, Haynes RB, Davis, DA, Freemantle N, Harvey, EL. Local opinion leaders: effects on professional practice and health care outcomes [Review]. *The Cochrane Database of Systematic Reviews* 2002(2):CD000125
  56. Maibach EW, Rothschild ML, Novelli WD. *Social Marketing*. Pp 437-461, in: Glanz K, Lewis FB, Rimer B, editors, *Health behavior and health education*. San Francisco: Jossey-Bass; 2002
  57. Peterson EW, Howland J, Lauritzen JB. Hip protectors to prevent fall-related fractures. *Generations* 2002; 26(4):82-85
  58. Moulding N, Silagy C, Weller D. A framework for effective management of change in clinical practice: dissemination and implementation of clinical practice guidelines. *Quality Health Care* 1999;8:177-183
  59. Grol R, Grimshaw J. Evidence-based implementation of evidence-based medicine. *Journal Quality Improvement* 1999;25:503-513