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An Evaluation of a Community Fall Prevention Program to Prevent Recurrent Falls among Elder Adults

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Abstract

Background/Objectives: Falls are the leading cause of fatal traumatic injury and the most common cause of non-fatal trauma-related hospital admissions among the elderly. With the aging U.S. population, the incidence of injury from falls is increasing. Emergency Medical Service (EMS) personnel are often the first responders in assessing and treating older adults who have fallen. Some fall victims are transported to the hospital, but many do not require hospital transport, in which case prehospital personnel are the sole initial providers. While some hospitals have begun to report programs to assess and mitigate fall risk in trauma patients, fall prevention programs have not been described for patients treated only in the field. The purpose of this study is to describe our progress in creating a community fall prevention program. This program is based upon the premise that EMS personnel are in a prime position to provide interventions to prevent future falls.

Design: This is a retrospective analysis of data from the Ventura County (VC) EMS as well as from the Elderly Fall Prevention Program (EFPP). VC-EMS personnel were trained to identify fall risk patients and offer program services following a fall-related 911 call. This outcome study compared the fall rate of two groups among the elderly, one of which received EBEP. Group assignment was based on voluntary participation in the evidence-based exercise programs (EBEP). We also compared and tracked the number of fall related EMS calls during the study period to evaluate the effectiveness of the fall prevention program. The study period was from 2013 to 2016.

Results: 878 patients receiving the EBEP between 2014-2016 showed a significant decrease in falls (6% vs. 18%, $p < 0.01$) compared to patients who did not receive the EBEP. The number of fall-related EMS calls increased during the study period; however, there was a decline in the proportion of fall-related EMS calls that required hospital transportation from 77.6% in 2013 to 65.1% in 2015.

Conclusion: Volunteer participation in this evidence-based exercise program helps reduce future falls in a vulnerable population. Additionally, this study shows that EMS can successfully recruit and implement a fall prevention program.

INTRODUCTION

Among people aged ≥ 65 years, falls are a leading cause of death and the most frequent cause of emergency department (ED) visits for injury.(1,2,3,4) Prospective studies have found that more than 30% of the elderly fall at least once per year, and that proportion rises steeply with age.(4,5,6,7) It has been reported that 20 – 30% of falls by older adults cause moderate to serious injuries which can limit mobility, lead to loss of independence with diminished quality of life, and increase the risk of premature death.(8,9)

Emergency medical services (EMS) personnel are often the first on scene for older adults who have sustained falls. Some fall events require admission to the hospital for further treatment whereas many are not transported because they are uninjured, sustain only minor injuries, or refuse transport. Studies involving EMS data from various countries showed that 11 – 56% of older adults who receive emergency treatment for falls were not transported to a medical facility often because they did not sustain an injury. (2,10,11) To date, no guidelines have been established to guide EMS personnel on how to evaluate or counsel patients that sustain fall-related events that are not transported to the hospital.

One Cochrane review showed that multiple interventions have shown to significantly reduce the rate of falls and another systematic review concluded that high-intensity interventions that address risk factors (rather than simply the provision of information) may be more effective. (12, 13) However, another

finding in the Cochrane review stated that further studies were needed to show a significant reduction in fall-related events. Recent efforts to reduce fall injuries have focused upon evidence-based exercise programs (EBEP's); such programs are the mainstay of the National Health Service (NHS) fall prevention and rehabilitation strategies.(14) According to a study by the Eastern Association for the Surgery of Trauma (EAST), the effectiveness of EBEPs has been inconclusive in decreasing fall-related injuries, mostly due to small sample sizes. A conditional recommendation for EBEP for frail, elderly individuals was made, but a strong recommendation was made for risk stratification with targeted, comprehensive risk-reduction strategies tailored to high-risk groups.(4)

Therefore, the purpose of this study was to examine the effectiveness of evidence-based exercise and comprehensive multidisciplinary countywide fall treatment/prevention program in elderly individuals who are at higher risk of falling.

METHODS

A pilot program was instituted in July, 2014. The aim of the pilot study was to examine the effectiveness of the EBEP intervention in reducing falls and to determine what factors may influence voluntary participation with a secondary focus on reducing falls in our county. The effectiveness of the initial fall prevention program in decreasing falls was evaluated as follows: Individuals sustaining falls in the intervention group were compared to those who did not enroll in the EBEP's. Next, data related to patient demographics and the fall frequency was evaluated by the EMS pre-institution of the [EFPP] Elderly Fall Prevention Program; which was then compared to data post-institution of the EFPP. Measurements used to assess data were age, sex, fall risk stratification, and training program compliance/completion. An institutional review board (IRB) approved the pilot program on July 2, 2017 (IRB # 205) which began in July 2014.

Intervention Description

In 2012, a comprehensive elderly fall prevention coalition (EFPC) was developed in Ventura County, California as an injury prevention effort. The target population was ≥ 65 years old who fell at home and contacted EMS. Ventura County has a population of 846,000, 13% of which are > 65 years of age. A pilot study was conducted through the (EFPC), in which a Level II adult trauma center, EMS (all fire and paramedic branches), our local area agency on aging, and two non-trauma center hospitals participated.

Upon receiving a 911 call for a fall, EMS personnel would arrive at the scene to assess for any life-threatening injuries. Factors including age ≥ 65 and a true fall as the reason for the 911 call were assessed. If hospital transport was not needed, providers then administered a standardized fall-related questionnaire and imparted standardized fall-prevention education and literature to the patient/family member(s)/caretaker(s). The questionnaire was based on the Johns Hopkins Fall Risk Assessment Tool.(15) For consenting and accepting patients, four EBEP's were offered which were: Tai Juan Chi (TJC): Moving for Better Balance, A Matter of Balance (MOB), Stepping On (SO), and Walk with Ease (WWE). Each EBEP had a master instructor. Both English and Spanish Classes were offered, except SO which was offered primarily in English.

During the pre-pilot phase (2013 - 2014), the number of repeat ED evaluations secondary to a fall was determined for those patients transported to the three pilot hospitals. Additionally, non-transported patients were also tracked. During the first and second years of the pilot (2014 - 2015; 2015 - 2016), the number of EMS fall-related calls/field evaluations, repeat-fall related calls, and transported and non-transported patients were tracked. In addition, data acquisition was achieved by tracking patients that participated in the EBEP for both years.

Based on the criteria provided above, several factors were considered as the inclusion and exclusion criteria for the study. The overall inclusion criterion were individuals over 65 years of age who sustained a fall and reported to the local emergency services, as recorded by EMS. Another major inclusion criterion was the consent to participate in the EBEP. Patients who completed and who did not complete the EBEP were included in the study to compare program effectiveness. The exclusion criterion was individuals under 65 years of age who did not require fall-related emergency services. The fall rate of program participants was compared to fall frequency.

To determine the total rate of falling in the county, a separate review of the number of 911 calls for falls was accomplished by identifying the calls logged in by the EMS pre-institution of the pilot program, during the program, and post-institution of the pilot program. Since some of these patients were not involved in EBEP, this separate data set was evaluated to determine if a halo effect occurred from the awareness factor of the establishment of the fall prevention coalition/program (Table 1).

Statistical analysis

The current study was comparative, using archival data, and the statistical approach of the study involved two main aspects. Descriptive statistics were conducted to summarize demographic information such as age, fall counts, and the completion of the EBEP's. Comparative analyses using independent samples (frequencies, percentiles, and t-tests) were performed using SAS version 9.2 (SAS Institute, Cary NC).

RESULTS

Twelve months of data (2013-2014) was evaluated before implementing the pilot fall prevention program, to establish a baseline. The baseline data for 2013 consisted of a total number of patient encounters by EMS in 2013 was 1,094. Of those, 245 were not transported (22.4%) [117 refused transport], while 849 (77.6%) were transported to the ED to three local hospitals due to falls. The total number of patient encounters by EMS in 2014 was 1,179. Of those, 265 were not transported (22.5%) [105 refused transport], while 914 (77.5%) were transported. The total number of patient encounters by EMS in 2015 was 1,329. Of those, 464 were not transported (35%) [119 refused transport], while 865 (65%) were transported. The average transportation age of patients during those tracked years was 83 (Table 1).

On separate analysis, there was an increase in the 911 calls

for falls in the entire county comparing pre-and post-program institution. However, there was a decline in the proportion of hospital transportation from 77.6% in 2013 to 65.1% in 2015.

During FY 2014 - 2015, 195 seniors participated in the EBEPs. The total number of EBEP participants in 2015 - 2016 was 683, which is a 3.5-fold increase in the total number of EBEP's participants from one year to the next. Three additional EBEPS were started in 2015 for MOB, 76% for SO, 33% for TJC, and 75% for WWE (Table 2). Repeat fall rate of prior patients that fell and participated in EBEP's vs prior patients that fell, but declined participation in EBEP's was 6% vs. 18%, $p < 0.001$), (Figure 1).

DISCUSSION

Prehospital providers have been underutilized in fall-prevention programs, but are potentially extremely valuable. King County in Washington State utilized fire-fighter Emergency Medical technicians [EMT] and found that non-transported patients were receptive to a health education program. (2, 17, 18) Upon the point of contact in the field, examples of minor mitigation measures that the EMS can provide are as follows: a review of medications with a primary care provider and recommendations for signing up for EBEP's.

Among community-dwelling adults, the risk of falling is 3-4 times higher among people with muscle weakness or gait and balance disorders. The single most effective intervention was exercise, which overall lowered the risk of falling between 12% and 20% (Figure 2). Types of effective exercises included Tai Chi, balance and gait training, and strength building. (5) The number of EBEP's offered in Ventura County has grown exponentially since the inception of the program. Our data suggest these programs have a significant effect on reducing recurrent falls and the subsequent risk of injury.

It is prudent to note that the number of 911 calls for fall-related incidents slightly increased throughout the county when comparing the pre- to post-program implementation years. However, this was likely due to a proportionate increase in the overall population. More importantly, the number of individuals transported to hospitals post-falls declined across the entire county, indicating that the injuries sustained from falls were likely less severe when compared to the pre-program institution era, and thus treatable in the field by the EMS. It is proposed that this is indicative of the lasting benefit of combined education for participants through the EBEP and targeted fall prevention forums, the former resulting in patients having strengthened extremities and torsos, leading to less serious injuries. In addition, it supports the role of the first responders as a valuable primary key component in the treatment of non-transported older individuals that fall.

Some of the limitations of this study include the following: our initial small sample size, low compliance due to difficulty obtaining data from participating hospitals, inability to adequately compare some data across a larger set of variables (age, gender, type of fall, type of injury resulting from fall) from pre-program implementation to post-program implementation, and matching up data sets from three separate sources (EMS, hospitals, and Fall database). It was challenging to track other patients presenting to facilities in the non-pilot area due to limited manpower with a single Fall Prevention coordinator [FPC]. It is expected that this process will be achievable with the acquisition of more personnel. Another limitation was the initial hesitancy of some prehospital providers to participate, as public health interventions are not always perceived as part of the mission and duties of the EMS. (19) This limitation has been reversed by obtaining buy-in from EMS personnel. The exact compliance rate will continue to be tracked, and data provided in a future iteration. Furthermore, there could be improvements regarding the methodological approach; with the data structure and the nature of patient mortality, it was difficult to match longitudinal data. Instead, the study followed a simple comparison, which only compared the number of falls between completion and non-completion status of the patients that sustained falls. A smaller scale, but a more consistent sample, would be more ideal in future studies. With a more complete and reliable dataset, a repeated measures approach could be implemented to examine the within-subject effects to capture more information. A regression model could also be studied to determine which type of intervention in the EBEP had the greatest impact on fall prevention in the elderly population.

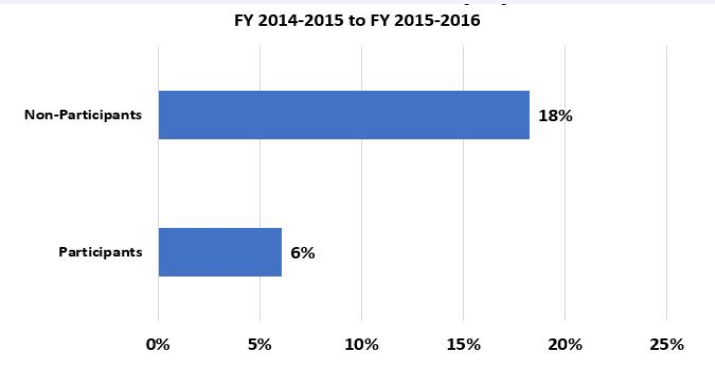

Figure 1 Repeat Fall Rate for Participants and Nonparticipants. Comparison of repeat fall rates (recurrent falls resulting in contact of EMS) of participants who participated in Evidence Based Exercise Programs vs participants who declined to participate over the years 2014-2016.

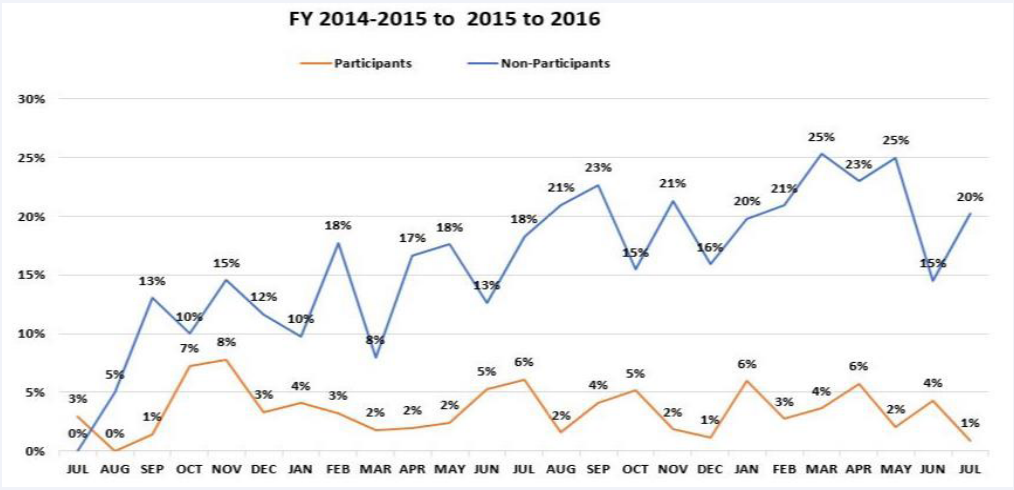

Figure 2 The monthly comparison of repeat falls during the study period comparing the EBEP participants to those who didn't participate in the EBEP.

Table 1: EMS Data Comparing Pre-Program to Post-Program Implementation.

	Years		
	2013	***2014***	***2015***
Total EMS Calls (Related to FALL)[a, b]	1094	1179	1329
No ALS/BLS Transport to Hospital	245 (117 RT)[c]	265 (105 RT)	464 (119 RT)
ALS/BLS Transport to Hospital	849	914	865
(%) Transported to Hospital	77.6%	77.5%	65.1%
Average age	83.4	82.7	82.5
Gender			
Female	61%	67%	64%
Male	39%	33%	36%

[a]Include: Seen and released; ALS/BLS transport, refused care, assist, assist Fire
[b]Exclude: No contact, DOD, NA, cancelled
[c]RT: Refused Transport

Table 2: Number of Participants and Compliances in the EBEP.

	Years	
	2014-2015	***2015-2016***
Totals		
Number of Falls in Pilot Area	1198	1337
Number of Participants in the EBEP	195	683
Number of Non-Participants	1003	654
Types of Interventions		
A Matter of Balance	195	538
Stepping On	0	38
Tai Juan Chi	0	75
Walk with Ease	0	32
Total	*195*	*683*
Compliance in Completing the Program		
A Matter of Balance	69.3%	79%
Stepping On	0	76%
Tai Juan Chi	0	33%
Walk with Ease	0	75%

CONCLUSION

Other factors that are being investigated for the future are: Reasons for incomplete participation in the EBEP's, specific number of public health/home health/home safety evaluation/ other VCAAA senior services contacts, specific injury types from patients that sustain falls (to determine if there is a pattern), the proportion of repeat falls in pilot years in comparison to baseline years, investigation of the EBEP's compliance between hospitals involved, acquisition of data on recurrent falls by a hospital or the EBEP's type, fraction of transported patients that were hospitalized and a fraction of hospitalized patients compliant with the EBEP's recommendations, and detailed descriptions of the patients in pre-and post-program institution to confirm comparability and identify factors that led to important improvement. Even though EMS is in a unique position both to assess and make recommendations for future management, (20) to date there have been no evidence-based protocols or guidelines available for onward referral for further assessment and management of fall risks, although new community-based (paramedicine) referral programs are recognized in the UK. (11, 21) Our study demonstrates that the EMS is in a prime position to provide information for patients requiring interventions that can prevent future falls. In addition, our study provides evidence that EBEP's are beneficial in the appropriate setting, serving to decrease fall risks in seniors. We believe that our unique EFPC and EFPP model can be emulated in other communities.

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