Traumatic Falls, Comorbid Diseases, Hospital Stays and Discharge: Does a Disease Make the Difference?

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Background

- Falls lead to diminished function, causing injury, activity limitations, fear of falling and subsequent loss of mobility[1].
    - Falls ranked among leading conditions that altered life expectancy and the second leading cause of death due to unintentional injury in 2017
- Falls are responsible for a large portion of hospital trauma code activations in the United States[3-4]
    - According to the National Trauma Data Base, falls accounted for 44.18% of trauma codes nationwide in 2016[4].
    - 67% of trauma code activations are caused by falls in Macomb County, MI
- Previous studies have investigated possible associations between comorbid conditions. Various factors have been used as prognostic indicators for posttraumatic fall patient recovery, including hospital length of stay, in-hospital complications, hospital discharge assignments and mortality rates[6-11].
- Overall, the literature appears controversial with conflicting data and use of different variables, making direct comparisons between different studies difficult.
- It is conceivable that any association between comorbid conditions and posttraumatic fall outcomes are studied from an economic scope.
    - In one recent study involving diabetic patients, the median cost of care was $440.45 per fall.[12]
- In the present study, we aimed to identify hospital length of stay and discharge patterns for posttraumatic fall patients in Macomb County, Michigan, based on the presence or absence of underlying comorbid conditions, including diabetes, hypertension and smoking.

Hypothesis

We hypothesized that patients with diabetes, hypertension or smoking history recorded longer hospital length of stays as well as different discharge patterns compared to healthy patients.

Methods

- A retrospective review of all posttraumatic fall patients presenting to our institution's emergency department dating from January 2016 to December 2017 was performed.
- The hospital's electronic trauma data base was utilized to obtain the presence of comorbid disease, hospital length of stay and discharge assignment for each patient.
- At our institution, patients received discharge assignments based on a multidisciplinary medical team approach; this included physical therapy evaluations, coordination with a case manager and communication amongst physicians.
- We attempted to standardize traumatic falls for analysis by only including falls under 1 meter in height from the ground.
- The study age range was limited to 20-70 years old to provide some control over age-related confounding variables of the very young and very old.
- Diabetes, hypertension and smoking were the comorbid conditions included in the study. Patients with other comorbid diseases, such as atrial fibrillation, were not included in the study.
- Occasional incomplete values were encountered in the hospital's trauma data base (i.e. no length of stay recorded) and thus these patients had to be excluded from the study.
- Patients that were discharged to psychiatric facilities, correctional facilities, or left without medical advice were excluded as well.

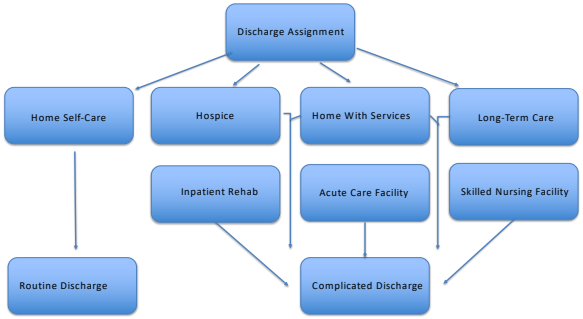

Figure 1: Discharge assignment summary. For our investigation, all patients receiving a "home, self-care" discharge assignment were considered a routine discharge as no further medical resource was utilized. Patients receiving hospice, home with services, long-term care placement, inpatient rehab, acute care facility placement or skilled nursing facility placement were considered complicated discharges as these discharge assignments involved more medical resources compared to "home, self-care" assignments.

Data Analysis

- Statistical analysis consisted of student's two sample t-tests to analyze hospital length of stay data.
- Chi-square tests were calculated to compare the discharge data in each patient cohort compared to healthy patients.
- P-values less than 0.05 were deemed significant and noted with one asterisk in the data tables (*); p-values less than 0.01 were deemed highly significant and noted with two asterisks (**).
- Our study included 6 different patient groups: healthy (no comorbid conditions); diabetes; hypertension; smoker; hypertension and smoker; hypertension and diabetes. In all, our study included 921 patient falls (Table 1).

Comorbid Conditions	N	% of Study Population
None	494	53.6
Diabetes	102	11.1
Hypertension	124	13.5
Smoker	93	10.1
Hypertension and Smoker	55	5.9
Hypertension and Diabetes	53	5.8
Total	921	100

Table 1: Study population summary, including numbers and percentages of the total population within each comorbidity group studied.

- Our first objective was to assess if there was a difference in hospital length of stay between the patient groups.
- We compared each comorbid condition group to the healthy fall group.
- The data in table 2 is presented in the format: average length of stay in days ± standard deviation (p-value).

Condition	Average Length of Stay in Days
Healthy	3.65 ± 4.79
Diabetes	4.21 ± 3.21 (0.14)
Hypertension	3.98 ± 3.4 (0.38)
Smoker	3.82 ± 4.72 (0.75)
Hypertension and Smoker	3.18 ± 2.21 (0.21)
Hypertension and Diabetes	4.34 ± 3.45 (0.19)

Table 2: Average hospital length of stay in days of each posttraumatic fall group studied.

- Our next objective was to assess if the patient groups varied in hospital discharge patterns.
- We compared each comorbid condition group to the healthy posttraumatic fall group.
- In table 3, data is presented in the format: X^2 value (p-value).

Condition	Routine Discharge	More Complicated Discharge	X^2
Healthy	235	259	
Diabetes	29	73	12.55 (<0.001**)
Hypertension	46	78	4.39 (0.04*)
Smoker	44	49	0.002 (0.96)
Hypertension and Smoker	24	31	0.307 (0.58)
Hypertension and Diabetes	15	38	7.16 (0.007**)

Table 3: Discharge summary for each comorbid condition compared to healthy patients. One asterisk (*) denotes a significant p-value of less than 0.05; Two asterisks (**) denotes a highly significant p-value of less than 0.01.

Discussion

- In analyzing the data, we found no difference in average hospital length of stay (table 2).
- Patients with diabetes, hypertension or a combination of both conditions received a higher proportion of complicated discharges after a fall compared to healthy patients (table 3).
- Smokers and smokers with hypertension displayed a similar discharge pattern compared to healthy patients (table 3).
- Prior studies have explored how comorbid conditions impact posttraumatic fall prognosis[6-11]:
    - Patients with diabetes have not demonstrated longer total hospital length of stays compared to healthy patients after a fall[6].
    - During a hospital stay, diabetic patients required longer intensive care unit treatment[6,7]
    - During a hospital stay, diabetic patients had a higher incidence of postoperative infection rates compared to healthy posttraumatic fall patient counterparts[8].
    - Other studies have used overall mortality rates as prognostic indicators of posttraumatic fall recovery. In these studies, some investigators identified an association between diabetes and higher mortality rates in posttraumatic fall patients, while other investigators have demonstrated no such association[10,11].
    - Conversely, one study identified the designated trauma level of a hospital as the factor impacting a posttraumatic fall patient's discharge assignment, not the patient's comorbid disease[9].
    - Overall, the mixed literature appears to be inconclusive regarding how comorbid conditions effect posttraumatic fall recovery.

Conclusions

- Falls are common
- Fall prevention is important
- Comorbid disease are common
- To date, the literature studying comorbid conditions and various posttraumatic fall outcomes is inconclusive.
- We found no difference in hospital length of stay between the different patient groups
- However, our results indicated that comorbidities including diabetes and hypertension are associated with complicated hospital discharge assignments in posttraumatic fall patients compared to healthy posttraumatic fall patients.
- This data suggests the importance of fall prevention and education in these particular patient populations.

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