Perioperative Risk Factors Associated With Post Anesthesia Falls

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Citation

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Abstract

Post-operative falls can result in significant morbidity and even mortality. Inpatient falls have been previously studied but there is somewhat limited data regarding perioperative risk factors associated with post-anesthesia falls. Patients that experienced anesthesia may be at increased risk for falling. The purpose of this chart review was to determine any additional specific perioperative risk factors associated with post-anesthesia falls and discuss how these potential risk factors affect anesthetic planning.

Methods

In this IRB approved, retrospective chart review, we screened the charts of 25, 353 post-anesthesia patient from January 1st, 2015 to December 31st, 2016. We included all patients age 18 or older that received anesthesia for surgical and non-surgical procedures. We excluded patients who expired during surgery. We calculated the incidence of falls and we compared two groups: an early fall group (patients who fell in the first 72 hours postoperatively) and a late fall group (patients who fell after 72 hours postoperatively). We collected data on demographics, patient, surgical and anesthesia related factors.

Results

Forty-six patients experienced post anesthesia falls. There were 17 (11 females and 6 males) patients in the early fall group and 29 patients in the late fall group (11 females and 18 males). Patients who fell early were more likely to be female (odds ratio, 2.71), had a history of previous falls (odds ratio 2.2), had a history of osteoarthritis (odd ratio, 2.79), underwent lower extremity surgery (odds ratio 4.27), were ASA class III (4.07) and underwent regional nerve blocks (15.27). The average surgical time for the early fall group was 2.1 hours compared to 3.6 hours for the late fall group.

Conclusion

There are patient, surgical and anesthesia related risks factors that may be associated with post-anesthesia falls and should be further evaluated to determine their utility in pre-anesthesia assessment and fall prevention.

BACKGROUND

There is limited data regarding postoperative falls after anesthesia and surgery. Falls in hospitalized medical patients have been extensively studied in the literature, but fall rates are highly variable across different types of patient and hospital settings.1, 2,3 A number of studies have described various risk factors for falls in both surgical and non-surgical hospitalized patients and have even compared falls across medical specialties.1, 2 Church et al described preoperative and intraoperative variables that may contribute to an increased fall risk in surgical patients.2

Inpatient falls often result in increased morbidity and mortality. The risk of hip fracture is 10 times higher in hospitalized patients compared to those in the community.1 Risk factors for falls in hospitalized patients include but are not limited to: previous history of falls, dehydration, confusion/delirium, visual impairments, frequent toileting, difficulty with transfers or ambulation, difficulty with dizziness and balance, medications, lower extremity weakness, poor tandem walking, and an increased patient-to-nurse ratio.1 Oliver et al (2004) performed a systematic review of 13 studies evaluating falls in

hospitalized patients and found that significant risk factors included gait instability, lower limb weakness, urinary frequency or incontinence, and prescription of sedatives and hypnotics.4

At least two studies in the literature characterize the incidence and risk factors of inpatient falls after anesthesia. Church et al (2011) conducted a retrospective study at the Denver Veteran's Affairs Medical Center over a 5-year period and 9,625 inpatient surgical procedures. They found 154 patients who fell, equivalent to a postoperative fall incidence of 1.6%. The etiology of postoperative falls included delirium (43%), disability (33%), fall while transferring (15%), and environmental factors (13%). Out of the 13 variables analyzed, those associated with falls included older age, functional dependence with ADL's, lower albumin level, and higher ASA physical status.2

Lam et al (2016) conducted a retrospective study at a tertiary teaching hospital in Taiwan over a 5-year period with 60,796 inpatients receiving anesthesia. They found 10 patients who fell, which was equivalent to a postoperative fall incidence of 0.016. Kronzer et al (2016) conducted a prospective cohort study in 7,982 patients to describe the characteristics of postoperative falls and determined that a history of preoperative falls predicted postoperative falls, functional decline, and in-hospital complications.6

We hope that this study will further elucidate risk factors for post-anesthesia falls among men and women in a large tertiary care center in western MA. We hope to subsequently use this information to design and implement effective fall prevention programs beginning with perioperative anesthetic plan that will minimize or eliminate falls, especially in high-risk patients, specifically tailoring the anesthetic plan to prevent falls. As such, it is essential to understand the anesthetic, surgical, patient, environmental, and hospital characteristics that may contribute to post-anesthesia falls.

METHODS

After IRB approval, we conducted a retrospective cohort study to establish the incidence of falls and potential risk factors associated with post-anesthesia falls following anesthesia. We included all inpatients and outpatients age 18 and older who received any type of anesthesia for procedures at Baystate Medical Center between January 1, 2015 through December 31, 2016. We utilized the operating room surgery database courtesy of the Department of Peri-Operative Services, and identified all surgeries meeting eligibility criteria and exported data into an Excel file. We also obtained a dataset of all medical center falls courtesy of the Department of Healthcare Quality. The Baystate Epidemiology/Biostatistics Research Core (EBRC) performed data management and analysis. Data extraction was supplemented with the anesthesiology database (Metavision) and hospital billing database (McKesson) and electronic medical record (CIS).

STATISTICAL ANALYSIS

Due to the low incidence of falls, statistical analyses were limited to standard deviations, means, medians, percentages, frequencies and odds ratios. We also grouped patients into an early fall group (patients who fell less than 72 hours post-anesthesia) and a late fall group (patients that fell greater than or equal to 72 hours post-anesthesia). We also analyzed the risk factors for post-anesthesia falls based on three categories; patient, surgical and anesthesia related risk factors.

RESULTS

We identified 25, 353 patients who underwent a procedure in which anesthesia was administered and discovered 46 (0.18%) patients that fell. There were 17 patients (11 females and 6 males) in the early fall group and 29 patients (11 females and 18 males) in the late fall group.

In terms of age, the mean, median, standard deviation (SD) and smallest to largest values for the early fall group were 59.7 years + 18.9, 62 years, and 21-88 years respectively. In terms of age, the mean, median, standard deviation (SD) and smallest to largest values for the late fall group were, 62.8 years, SD + 13.6, 63 years and 24-88 years. The mean, standard deviation, median, and smallest to largest values for BMI were 29 + 6.3, median 26, and 19-43 respectively. For the late fall group the mean, SD, median and smallest to largest BMI values were 28.4 + 8.2, 28 and (18-51) respectively. The average surgical time for the early fall group was 2.1 hours compared to 3.6 hours for the late fall group.

Table 1 represents the comparison between the early and late fall groups regarding patient related risk factors. Patients with visual impairment, previous falls, weakness, osteoarthritis, anemia and female gender were more likely to fall early (odds ratios, 1.33, 2.2, 2, 2.79, 1.03 and 2.71 respectively). When comparing surgical risk factors, patients that underwent endoscopy, head and neck surgery, lower extremity surgery and neurosurgery were more likely

to fall early (table 2), as indicated by odds ratios 1.75. 1.75, 4.27 and 1.75 respectively, when compared to the late fall group. Patients that were ASA class III (odds ratio 4.07) or had lower extremity regional anesthesia (odds ratio 15.27) were more likely to fall early, table 3.

Table 1

Patient Related Risk Factors Early vs. Late Falls

Risk Factors	Early (n) %	Late (n) %	Odds Ratio
Cognitive Deficits	(2) 11.8	(9) 31.0	0.3
Visual Impairments	(3) 17.6	(4) 13.8	**1.33**
Previous Falls	(7) 41.2	(7) 34.1	**2.2**
History of stroke	(2) 11.8	(6) 20.7	0.52
Weakness	(8) 47.1	(8) 27.6	**2.33**
Ortho. Hypotension	(1) 5.88	(3) 10.3	0.54
Osteoarthritis	(8) 47.1	(7) 24.1	**2.79**
Anemia	(6) 35.3	(10) 34.5	**1.03**
Alcohol Abuse	(4) 23.5	(9) 31.0	0.68
Substance Abuse	(3) 17.6	(7) 24.1	0.67
Females	(10) 58.8	(10) 34.5	**2.71**

For symbols noted above, (n) and %, (n) represents the number of patients with risk factors, %, the percentage of patients with the risk factors listed.

Table 2

Surgical Risk Factors Early vs. Late Falls

Surgery Type	Early (n) %	Late (n) %	Odds Ratio
Abdominal	(2) 11.8	(6) 20.7	0.45
Breast	(1) 5.9	(0)	-
Cardiac	(2) 11.8	(10) 34.5	0.25
Endoscopy	(1) 5.9	(1) 3.5	**1.75**
Head and Neck	(1) 5.9	(1) 3.5	**1.75**
Lower Extremity	(8) 47.1	(5) 17.2	**4.27**
Neurosurgery	(1) 5.9	(1) 3.5	**1.75**
Pelvic	0	(1) 3.5	-
Thoracic	0	(1) 3.5	-
Urology	0	(2) 7	-

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For symbols noted above, (n) and %, (n) represents the number of patients with risk factors, %, the percentage of patients with the risk factors listed.

Table 3

Anesthesiology Related Risk Factors Early vs. Late Falls

ASA Class	Early (n) %	Late	Odds Ratio
I	(0)	(0)	-
II	(2) 11.8	(4) 13.8	0.83
III	(11) 64.7	(9) 31	**4.07**
IV	(4) 23.5	(16) 55.2	0.25
Anesthesia Type			
General/Regional	(6) 35.3	(1) 3.5%	**15.27**
Gen	(10) 34.5	(28) 96.5	0.05
MAC	(1) 5.9	(0)	-

For symbols noted above, (n) and %, (n) represents the number of patients with risk factors, %, the percentage of patients with the risk factors listed. MAC stands for monitored anesthesia care, Gen represents general anesthesia. Patients who underwent General/Regional had a lower extremity regional anesthesia and subsequently general anesthesia.

DISCUSSION

In this retrospective study, we identified some potenial additional risk factors that should be further evaluated to screen patients who may be at increased risk for falls after undergoing anesthesia. We wanted to highlight 3 categories of risk factors; patient, surgical and anesthesia related risk factors. Elucidating these categories of risks factors may make it easier for anesthesia providers to recognize patient traits that may increase their fall risk, serve as a baseline for further investigation of these risk factors and lastly provide additional information which may modify the anesthetic plan. For instance, a provider may omit a planned lower extremity peripheral nerve block or apply post-operative fall prevention strategies when placing post anesthesia orders.

Visual impairment, previous falls; weakness, osteoarthritis, anemia and female gender were characteristics associated with early fall post-anesthesia. Some of these risk factors combined with residual anesthetic effects may increase the risk of fall for patients due to lower limb weakness, generalized weakness (anemia) or uncoordinated gait. It is unclear how female gender affects fall risk. These traits may be further studies to ascertain whether pre-operative modification may reduce post-anesthesia fall risk. Some of these factors have been previously described. 5,6 As demonstrated in this study, Lam et al also found that regional anesthesia is a risk factor for falls.6 This is to be expected since the patients had loss of motor function due to nerve blocks of the lower extremity.

One limitation of the study is the lack of consistent data available regarding sedatives as has been previously studied.1 The use of sedatives such as opioids or analgesic doses of anesthetics such as ketamine, may have affected the fall rate in this study, however, this data was not completely available. Another limitation is the design and small sample size permitting only descriptive data. Perhaps a multicenter retrospective review will allow more generalizable, inferential analysis, clearly identifying risk factors associated with post-anesthesia falls.

As the anesthesiology community contributes to enhance recovery after surgery, regional anesthesia may become more frequently performed and hence fall risk may increase. Therefore, the anesthesia provider may need to become adept at fall prevention and become part of multidisciplinary team addressing falls.

CONCLUSION

In this study, we were able to identify patient, surgical and anesthesia related risk factors, which may be associated with post-anesthesia falls. These potential risk factors should be further studied and applied to peri-anesthetic planning if found to be significant risk factors for preventing post-anesthesia falls.

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