Incidence of Venous Thromboembolic Events Among Nursing Home Residents

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Chronic care facility stay has been shown to be an independent risk factor for venous thromboembolism. Review of the literature, however, reveals a paucity of data addressing the issue of venous thromboembolism in nursing home residents. The purpose of this study was to determine the incidence of venous thromboembolic events among nursing home residents. A retrospective cohort study was derived from data compiled in the State of Kansas Minimum Data Set (MDS) for nursing home residents from July 1, 1997 to July 1, 1998. A total of 18,661 residents (median age, 85 years, 74% female, 95% white) satisfied the study criteria. The outcome measures of the primary endpoint—development of a venous thromboembolic event (VTE)—were obtained from the MDS quarterly health assessments and the Medicare ICD-9 codes. We determined the incidence of VTE among nursing home residents as 1.30 events per 100 person-years of observation.

KEY WORDS: incidence; nursing homes; venous thromboembolism.

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The medical care of elderly nursing home residents is a significant public health concern. It is estimated that by the year 2030, around 20% of the US population will be over 65 years of age (70.2 million).¹ The first baby boomer is expected to reach age 65 in 2011. It is estimated that of those who reached age 65 in 1990, 43% are expected to enter a nursing home at least once before they die, 32% for 3 months, 24% for at least a year, and 9% for at least 5 years.² The average person at the present time is estimated to live 28 years longer than their counterpart at the turn of the twentieth century.³ Consequently, the numbers of elderly residing in nursing homes is expected to further increase.

Nursing home stay or other chronic care facility stay and hospitalization have been shown to be an independent risk

factor for venous thromboembolic event (VTE) imparting an 8-fold increased risk.⁴ There exists, however, a paucity of literature addressing the issue of venous thromboembolism among elderly nursing home residents. The majority of the literature is centered in the hospital setting, mainly focusing on VTE in surgical patients^{5,6} and more recently attention is being directed to the acutely ill medical patient.⁷

The purpose of our study was to determine the incidence of venous thromboembolic events in residents of nursing homes.

METHODS

A retrospective cohort study was derived from data compiled in the State of Kansas Minimum Data Set (MDS) version 2.0 for nursing home residents and in the Medicare database from July 1, 1997 to July 1, 1998. Patient confidentiality was maintained by strict adherence to the consent criteria set up by the Kansas MDS committee. The subjects' identities remained classified via special codes set up by an independent party.

The Minimum Data Set (MDS) is a health status assessment questionnaire for nursing home residents mandated by the Health Care Financing Administration (HCFA) regulations for all Medicare and Medicaid licensed facilities. An assigned nurse completes this data set at the time of admission, at quarterly intervals, upon transfers, and at the time of discharge on every nursing home resident in Kansas and several other states. This detailed questionnaire includes health-related information over a broad field including demographic information, physical functioning, nutritional status, cognitive functioning, disease diagnoses, and even medications. Studies assessing the validity of the MDS data components of cognition, physical functioning, nutritional status, continence, diagnoses, and drug data have shown the MDS to be a reliable and valid data set.^{8–11}

All residents who were entered into the MDS database and present in a Kansas nursing home on July 1, 1997, and who subsequently had 2 consecutive quarterly assessments with no hospitalizations or readmissions met the inclusion criteria and were eligible for the study. We used the criteria of 2 quarterly assessments to achieve a minimum stay of 120 days in an attempt to capture the population of nursing home residents who were truly in long-term care rather than short-term. Residents with a recent or remote past history of VTE prior to entry into the study or residents on anticoagulation therapy were excluded from the study. A previous history of VTE was determined if a resident had an entry in the MDS database or in the Medicare

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database using the ICD-9 codes for the diagnoses as listed: deep vein thrombosis (453.8), pulmonary embolus (415.11), pulmonary embolus NOS (415.10), femoral vein thrombi (451.11), popliteal vein thrombi (451.19), iliac vein thrombi (451.81), superficial vein thrombi (451.0), lower extremity thrombus (451.2), and hypercoagulable state (289.8).

An assessment of anticoagulation therapy use was determined through an evaluation of the National Drug Codes (NDC) for anticoagulants in the MDS database. The anticoagulants assessed were coumadin, unfractionated heparin, and the low molecular weight heparins (danapararin, dalteparin, enoxaparin, and ardeparin). Patients on these medications were excluded from the study. Aspirin therapy was not an exclusion criterion, as we believed that at that age a large proportion of our studied cohort would be on this therapy.

The primary endpoint of this study was the development of a VTE during residence. This was determined by an entry into either the MDS or the Medicare database during the study period. Each resident's MDS data (demographic, etc.) were extracted at the beginning of the study period, July 1, 1997. Residents were subsequently followed through the database for their consecutive assessments up to July 1, 1998.

We used SPSS (Statistical Product and Service Solutions) 11.0 for Windows (SPSS, Inc. 1989–2001 Chicago, IL) for statistical analyses. An equal tailed 95% confidence interval for incidence of VTE was calculated using 10,000 case bootstraps of the original data, after which the 2.5% tile and the 95% tile are calculated. We generated a thrombosis-free survival curve using the Kaplan-Meier product limit function. Interpolation makes the time of occurrence of VTE midway between the last 2 times of assessment. In the cases where the last assessment is unknown, it is conservatively assumed to be 120 days before the last assessment, well within the range of quarterly assessment requirements.

The Institutional Review Board of the Kansas University School of Medicine in Wichita approved the study.

RESULTS

A total of 24,472 nursing home residents satisfied the inclusion criteria. We had to exclude 5,811 residents from the study: 628 residents were noted to have a VTE prior to entry into study, 3,094 residents were on anticoagulation therapy, and 2,089 of the remaining had only 1 quarterly assessment. The final study total of 18,661 was then followed through the database for the period of the study.

The mean follow-up period was 233 days (SD = 68.7, median = 252, skewness = -1.19, kurtosis = 1.09), with a median age of 85 years. Ninety-five percent of the study group was white, and 74% were female. Characteristics of the study population are shown in Table 1.

Table 1. Cohort Characteristics, N = 18,661

Characteristic	Frequency n, (%)
Male gender	4,802 (25.7)
Nonwhite	932 (5.0)
Physically active	16,306 (87.4)
Needing restraint	10,047 (53.8)
Dementia	9,577 (51.3)
BMI > 25	6,871 (36.8)
CHF	4,668 (25.0)
Diabetes	2,944 (15.8)
Arteriosclerosis	3,073 (16.5)
Peripheral vascular disease	1,701 (9.1)
Cancer	1,309 (7.0)
Pressure ulcer	1,142 (6.1)
Plegia	913 (4.9)
Hip fracture	630 (3.4)
Feeding tube	399 (2.1)
Renal failure	325 (1.7)

BMI, body mass index; CHF, congestive heart failure.

A total of 155 residents developed a VTE during the period of the study. This provided an incidence of VTE of 1.30 events per 100 person-years of observation (95% CI, 1.10 to 1.51 events per 100 person-years). Kaplan-Meier analysis (Fig. 1) provided a thrombosis-free survival estimate of 0.9903 (95% CI, 0.9886 to 0.9920) at the end of the study period, or a cumulative hazard rate of 0.010 (95% CI, 0.008 to 0.011). The mean age of those having a VTE was 84 years (SD = 10) and 77% were female.

DISCUSSION

Venous thromboembolic events (VTE) encompassing deep vein thrombosis (DVT) and pulmonary embolism (PE) continues to be a significant cause of mortality and morbidity in elderly patients, despite the availability of prophylactic therapy.

Silverstein et al. in a retrospective observational study found an incidence in the US of 100,000 new cases of PE per year with an increase in the incidence with age.¹² Hansson

FIGURE 1. Survival curve for venous thromboembolic events among Kansas's nursing home residents, 1997–1998 (N = 18,661).

et al. in *The Study of Men Born in 1913*, also showed that the cumulative probability of VTE increased with age (0.5% at age 50 and 10.7% by age 80).¹³ Pulmonary embolism accounts for 5% of all deaths in the American population and 10% of all hospital mortality.¹⁴ In fact, the occurrence of PE is often underdiagnosed, especially in the elderly. Gross et al.¹⁵ in a review of 234 autopsies of elderly institutionalized patients showed that the highest rate of error in ante mortem diagnosis was in the underdiagnosis of PE (39% ante mortem accuracy). Pulmonary embolism with a fatality rate of 8% was found as the fourth leading cause of death among the elderly institutionalized in the Gross study.

The clinical benefit and cost effectiveness of providing prophylactic therapy in the high-risk surgical patients has been well documented.^{5,6} The recent literature has also addressed the issue in the acutely ill medical patient.⁷ However, the elderly nursing home resident is unique; they are frail and are usually on multiple medications. Anticoagulation therapy carries the risk of bleeding complications. The risk of bleeding during oral anticoagulant therapy is mainly determined by the intensity of therapy, duration of therapy, patient characteristics, and drug interactions based on other medications. This risk of bleeding complications has to be weighed against the possible benefit of preventing a VTE.¹⁶ Alternatives to anticoagulant therapy with a less severe risk profile like aspirin or mechanical devices such as graduated elastic stockings and intermittent pneumatic compression (IPC) could be considered for prophylaxis. This deserves further study in institutionalized patients.

Our study has several strengths. We had a large sample size that made our dataset extremely powerful. The study patients were followed for an average of 233 days in the dataset—a period sufficiently long enough to expect an individual with the risk factors to develop an event. Finally, objective and valid outcome criteria were used (the MDS and ICD-9 codes) that have been used in previous studies.^{8–10}

Our study was limited by the fact that all residents were not necessarily at the same point of their nursing home (NH) stay. Previous information about how long residents were in the facility prior to commencement of the study was not collected. Being as it was a retrospective cohort study, we had to deal with the limitations of the dataset. The follow-up was based on quarterly assessments in the MDS and through ICD-9 codes, both of which have their inherent weakness.^{17,18}

In conclusion, we found the incidence of venous thromboembolic events in the nursing home setting to be 1.30 events per 100 person-years of observation. This is a pioneer study. Further studies will be necessary to validate our results, assess the predictive ability of associated variables, and determine the effectiveness of different prophylactic regimens.

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REFERENCES

1. Cornman JM. Questions for societies with "Third Age" populations. The Extension-of-Life Working Group Gerontological Society of America. *Acad Med*. 1997;72:856–62.
2. Kemper P, Murtaugh CM. Lifetime use of nursing home care. *N Engl J Med*. 1991;324:595–600.
3. Hodes RJ, Cahhan V, Pruzan M. The National Institute on Aging at its twentieth anniversary: achievements and promise of research on aging. *J Am Geriatr Soc*. 1996;44:204–6.
4. Heit JA, Silverstein MD, Mohr DN, et al. The epidemiology of venous thromboembolism in the community. *Thromb Haemost*. 2001;86:452–63.
5. Clagett GP, Reisch JS. Prevention of venous thromboembolism in general surgical patients. Results Meta-Anal. *Ann Surg*. 1988;208:227–40.
6. Spiro TE, Johnson GJ, Christie MJ, et al. Efficacy and safety of enoxaparin to prevent deep vein thrombosis after hip replacement surgery. Enoxaparin Clin Trial Group. *Ann Intern Med*. 1994;121:81–9.
7. Turpie AG. Thrombosis prophylaxis in the acutely ill medical patient: insights from the prophylaxis in MEDical patients with ENOXaparin (MEDENOX) trial. *Am J Cardiol*. 2000;86:48M–52M.
8. Gruber-Baldini AL, Zimmerman SI, Mortimore E, Magaziner J. The validity of the minimum data set in measuring the cognitive impairment of persons admitted to nursing homes. *J Am Geriatr Soc*. 2000;48:1601–6.
9. Snowden M, McCormick W, Russo J, et al. Validity and responsiveness of the minimum data set. *J Am Geriatr Soc*. 1999;47:1000–4.
10. Lawton MP, Casten R, Parmelee PA, Van Haitsma K, Corn J, Kleban MH. Psychometric characteristics of the minimum data set II. Validity *J Am Geriatr Soc*. 1998;46:736–44.
11. Gambassi G, Landi F, Peng L, et al. Validity of diagnostic and drug data in standardized nursing home resident assessments: potential for geriatric pharmacoepidemiology. SAGE Study Group. Systematic Assessment of geriatric drug use via Epidemiology. *Med Care*. 1998;36:167–79.
12. Silverstein MD, Heit JA, Mohr DN, Petterson TM, O'Fallon WM, Melton LJ III. Trends in the incidence of deep vein thrombosis and pulmonary embolism: a 25-year population-based study. *Arch Intern Med*. 1998;158:585–93.
13. Hansson PO, Welin L, Tibblin G, Eriksson H. Deep vein thrombosis and pulmonary embolism in the general population. "The Study of Men Born in 1913." *Arch Intern Med*. 1997;157:1665–70.
14. Fennerty T. Pulmonary embolism. Hospitals should develop their own strategies for diagnosis and management. *BMJ*. 1998;317:91–2.
15. Gross JS, Neufeld RR, Libow LS, Gerber I, Rodstein M. Autopsy study of the elderly institutionalized patient. Review of 234 autopsies. *Arch Intern Med*. 1988;148:173–6.
16. Landefeld CS, Beyth RJ. Anticoagulant – related bleeding: clinical epidemiology, prediction and prevention. *Am J Med*. 1993;95:315–28.
17. Stineman MG, Maislin G. Clinical, epidemiological, and policy implications of minimum data set validity. *J Am Geriatr Soc*. 2000;48:1734–6.
18. Schnelle JF, Wood S, Schnelle ER, Simmons SF. Measurement sensitivity and the Minimum Data Set depression quality indicator. *Gerontologist*. 2001;41:401–5.