

Hospital Magnet Status Associates With Inpatient Safety in Parkinson Disease



2.0
ANCC
Contact
Hours

Whitley W. Aamodt, Jasmine Travers, Dylan Thibault, Allison W. Willis

ABSTRACT

BACKGROUND: Persons with Parkinson disease (PD) have complex care needs that may benefit from enhanced nursing care provided in Magnet-designated hospitals. Our primary objective was to determine whether an association exists between hospital Magnet status and patient safety events for PD inpatients in the United States. **METHODS:** We conducted a retrospective cohort study using the Nationwide Inpatient Sample and Agency for Healthcare Research and Quality databases from 2000 to 2010. Parkinson disease diagnosis and demographic variables were retrieved, along with Magnet designation and other hospital characteristics. Inpatient mortality and preventable adverse events in hospitals with and without Magnet status were then compared using relevant Agency for Healthcare Research and Quality patient safety indicators. **RESULTS:** Between 2000 and 2010, 493 760 hospitalizations among PD patients were identified. Of those, 40 121 (8.1%) occurred at one of 389 Magnet hospitals. When comparing PD patients in Magnet versus non-Magnet hospitals, demographic characteristics were similar. Multivariate regression models adjusting for patient and hospital characteristics identified a 21% reduction in mortality among PD inpatients in Magnet hospitals (adjusted odds ratio [AOR], 0.79; 95% confidence interval [CI], 0.74–0.85). PD inpatients in Magnet hospitals also had a lower odds of experiencing any patient safety indicator (AOR, 0.74; 95% CI, 0.68–0.79), pressure ulcers (AOR, 0.60; 95% CI, 0.55–0.67), death from a low mortality condition (AOR, 0.74; 95% CI, 0.68–0.79), and a higher odds of postoperative bleeding (AOR, 1.45; 95% CI, 1.04–2.04). **CONCLUSIONS:** PD patients had a reduced risk of inpatient mortality and several nursing-sensitive patient safety events, highlighting the possible benefits of Magnet status on inpatient safety in PD.

Keywords: inpatient safety, Magnet recognition, outcomes research, Parkinson disease

The American Nurses Credentialing Center Magnet Recognition Program recognizes hospitals that show commitment to exceptional nursing practice.¹ Qualifying for and maintaining Magnet status requires meeting specific benchmarks for nursing training, nursing education, nursing care, and nursing leadership.¹ These quality benchmarks promote increased nurse autonomy and superior care delivery at the bedside.¹ As of August 2020, 523 facilities had an active Magnet designation, accounting for less than 10% of

all hospitals in the United States.¹ Previous studies have examined the role of nursing organizational features, including Magnet status, on outcomes experienced by persons hospitalized for cancer, or surgical or intensive medical care,^{2–7} with mixed results.⁸ Despite these data, Magnet hospitals have been associated with lower case fatality, length of stay, and likelihood of discharge to a facility among patients with ischemic stroke,⁹ suggesting that hospital Magnet status may result in improved outcomes for patients with other neurologic diseases.

Questions or comments about this article may be directed to Whitley W. Aamodt, MD MPH, at whitley.aamodt@pennmedicine.upenn.edu. W.W.A. is a Movement Disorders Fellow, Translational Center for Excellence for Neuroepidemiology and Neurological Outcomes Research, Department of Neurology, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA.

Jasmine Travers, PhD RN, is Assistant Professor of Nursing, New York University Rory Meyers College of Nursing, New York, NY.

Dylan Thibault, MS, is Biostatistician, Translational Center for Excellence for Neuroepidemiology and Neurological Outcomes Research, Department of Neurology, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA.

Allison W. Willis, MD MS, is Associate Professor of Neurology, Translational Center for Excellence for Neuroepidemiology and Neurological Outcomes Research, Department of Neurology, and Department of Biostatistics, Epidemiology, and Informatics,

University of Pennsylvania Perelman School of Medicine; and CICADA: Center for Improving Care Delivery for the Aging—A Resource Center for Minority Aging Research (RCMAR) and Leonard Davis Institute of Health Economics, University of Pennsylvania, PA.

W.W.A. received support from the Edmond J. Safra Fellowship in Movement Disorders. This work was also funded by several grants from the National Institutes of Health: NINDS T32 NS061779-12 (W.W.A.) and NINDS R01 NS099129-02 (A.W.W.).

The authors declare no conflicts of interest.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.jnnonline.com).

Copyright © 2021 American Association of Neuroscience Nurses
<https://doi.org/10.1097/JNN.0000000000000582>

Persons with Parkinson disease (PD), the second most common neurodegenerative disorder, often require hospitalization and experience higher rates of complications, potentially inappropriate medication use, and longer lengths of stay as compared with persons without PD.^{10–16} Because of their complex care needs and increased likelihood of experiencing a negative inpatient event, persons with PD can greatly benefit from the enhanced nursing care provided in Magnet-designated hospitals. Yet, there are no data on the relationships between nursing organizational features such as Magnet status and outcomes for this vulnerable population. Our study objective was to determine whether an association exists between hospital Magnet status and patient safety events for persons with PD using a population-based data set of US inpatients and Agency for Healthcare Research and Quality (AHRQ) indicators for patient safety,¹⁷ as several indicators have been studied in relation to nursing care.^{18,19} We hypothesized that all patient safety events sensitive to nursing care would occur less often for patients with PD in Magnet hospitals compared with patients with PD in non-Magnet hospitals.

Methods

Study Design

This study was approved by the human studies research office at the University of Pennsylvania Perelman School of Medicine, with a waiver for patient consent granted on the basis that the data set is a publicly available, deidentified research product accessible through a data use agreement with the Healthcare Cost and Utilization Project (HCUP).²⁰ We conducted a retrospective cohort study using data collected from the Nationwide Inpatient Sample (NIS), HCUP, and AHRQ databases from 2000 through 2010. The NIS is part of a family of databases and software tools developed for the HCUP. The NIS is the largest all-payer inpatient healthcare database in the US and the data set for the years we studied contained a 20% stratified sample of US hospitalizations, more than 7 million hospital stays. The NIS sampling design allows researchers to generate national estimates of inpatient hospital stays and has been used to examine national trends in overall patient safety as well as patient safety in specific disease populations.^{21–24}

All hospitalizations in the NIS occurring between the years 2000 and 2010 were considered. From these, we retrieved inpatient data on adults with a diagnosis of PD, identified using *International Classification of Diseases, Ninth Revision* diagnosis code 332.0. Individual characteristics available for study in the NIS include race, sex, age, and median income in the patient's resident zip code. Nationwide Inpatient Sample data before 2012 also include an individual hospital identification number, which researchers can link to organizational data from the American Hospital

Parkinson Disease patients at Nursing Magnet hospitals have a lower risk of inpatient mortality.

Association. Using this identifier, we classified each hospital in the NIS as Magnet designated or not, for each year of data. Additional hospital characteristic variables were retrieved to examine and account for differences between hospitals with and without Magnet status, including hospital teaching status (teaching, nonteaching), bed size (small, medium, large), hospital location (rural, urban), and hospital region (Northeast, Midwest, South, West).

Patient Safety Outcomes

Our primary study outcomes were inpatient mortality and preventable adverse events. These events are termed *patient safety indicators* (PSIs) in the AHRQ PSI data set where they are contained. For this analysis, we excluded obstetric and newborn care-related PSIs, because PD overwhelmingly affects adults older than 50 years. The remaining individual-level PSIs we examined are listed in Supplemental Table 1, available at <http://links.lww.com/JNN/A342>. We hypothesized that PSIs traditionally considered to be sensitive to nursing care would occur less often for patients with PD in Magnet hospitals compared with patients with PD in non-Magnet hospitals.^{18,25} Several studies have identified outcomes potentially sensitive to nursing care in PD, including medication errors, patient falls, pressure ulcers, or infection due to medical care.^{11,14,15} We also included postoperative outcomes that could be influenced by delayed nursing recognition, including bleeding and respiratory distress. These potential “nursing-sensitive” outcomes were represented in the safety indicators as PSI 2, “Death in Low-Mortality Diagnosis Related Groups” (an unexpected death based on the medical condition); PSI 3, “Pressure Ulcer”; PSI 4, “Death in Surgical Inpatients with Serious Treatable Conditions” (also known as “failure to rescue”); PSI 7, “Central Venous Catheter-related Bloodstream Infection”; PSI 9, “Postoperative Hemorrhage or Hematoma”; PSI 11, “Postoperative Respiratory Failure”; PSI 12, “Postoperative Pulmonary Embolism or Deep Vein Thrombosis”; and PSI 14, “Postoperative Wound Dehiscence.”

Statistical Methods

Patient and hospital characteristics were calculated and compared using descriptive statistics appropriate to the nature and distribution of the data (eg, *t* test, χ^2 tests). Binary variables were generated by HCUP

PSI software for each PSI. Univariate logistic regression models were created and examined to compare the odds of each PSI between PD patients cared for in hospitals with and without Magnet status. We also modeled the odds of inpatient mortality by Magnet status. Multivariable models were built adjusting for patient sociodemographic characteristics, hospital teaching status, hospital bed size, hospital location, and hospital region. We report odds ratios and 95% confidence intervals. All analyses were conducted using SAS (SAS Institute Inc).

Results

Hospital and Patient Demographics

We identified 493 760 hospitalizations of persons with a PD diagnosis from 2000 to 2010 meeting study criteria. Of those, 40 121 hospitalizations (8.1%) occurred at one of 389 Magnet hospitals. As shown in Table 1, the demographic characteristics of PD patients were similar between hospitals with and without Magnet status. Consistent with demographic risk factors for PD, hospitalized PD patients were primarily White and male, with a median age of 78 to 79 years. A much higher proportion of Magnet hospital patients resided in a neighborhood within the highest median income quartile (41.6% vs 26.3% in non-Magnet hospitals, based on the 338,614 hospitalizations with zip-code-income data). Magnet hospitals were frequently codesignated as teaching hospitals (73.2%), had a large bed size (88.9%), and were in urban (95.8%) areas of the country. Hospitals without Magnet status were also large (58.0%) and urban (84.6%) but were predominantly nonteaching (65.7%).

Patient Safety Outcomes

As shown in Table 2, death rates were low, ranging from 3.3% to 4.4%, with the lower death rate found in Magnet hospitals. Univariate logistic regression analysis identified a 26% lower mortality among PD inpatients at Magnet hospitals (odds ratio [OR], 0.74; 95% confidence interval [CI], 0.70–0.78). After adjusting for hospital and patient characteristics, the multivariate model yielded a 21% reduction in mortality at Magnet hospitals compared with those treated at non-Magnet hospitals (adjusted OR [AOR], 0.79; 95% CI, 0.74–0.85). The odds of experiencing any PSI were lower for PD patients receiving care at a Magnet hospital in both unadjusted (OR, 0.88; 95% CI, 0.83–0.94) and multivariable adjusted (AOR, 0.74; 95% CI, 0.68–0.79) logistic regression models. Individual PSIs were also associated with Magnet status. Specifically, hospitalizations of PD patients at Magnet hospitals had a lower odds of experiencing anesthetic complications (AOR, 0.74; 95% CI, 0.68–0.79), pressure ulcers of the skin (AOR, 0.60;

95% CI, 0.55–0.67), and death from a low mortality condition (AOR, 0.74; 95% CI, 0.68–0.79). In contrast, PD patients at Magnet hospitals had a higher odds of postoperative hemorrhage or hematoma (AOR, 1.45; 95% CI, 1.04–2.04). The remaining PSIs were not associated with Magnet status in adjusted models.

Discussion

Nurses play an essential role in patient care and safety. Assessments of the relationship between nursing organizational features and clinical outcomes can help guide policies that improve patient health and increase care value. Although Magnet status is primarily a hospital designation that recognizes nursing leadership, organizational structure, and quality of care, achieving and maintaining Magnet status requires commitment to continuing nursing education, clinical practice guidelines, and evidence-based practice.¹ These characteristics suggest that Magnet status may also function as a mediating process for inpatient outcomes.⁷ The combination of advancing age, motor symptoms (tremor, slowness, gait imbalance), nonmotor symptoms (cognitive decline, psychiatric symptoms, dysautonomia), and complex medication requirements place PD patients at a particular risk of care-related misadventures. For example, hospitalized PD patients are at an increased risk of developing delirium, aspiration pneumonia, and postoperative urinary tract infections when compared with non-PD patients.^{26,27} We used the AHRQ PSIs to assess for potential nursing-sensitive patient safety events among PD patients in the United States. Our primary findings were that some, but not all, patient safety events were less likely to occur among PD patients treated in Magnet hospitals and highlight the benefits of Magnet status on nursing-sensitive patient safety events for persons with PD.

With regard to safety outcomes, our data suggest a reduced risk of at least 2 nursing-sensitive indicators among PD patients in nursing Magnet hospitals: unexpected death (PSI 2) and pressure ulcers (PSI 3). Parkinson disease patients are hospitalized 1.5 times more frequently than non-PD patients and have longer lengths of stay on average,^{26,27} placing them at an increased risk of experiencing complications that could lead to unexpected death. Nursing care plays an important role in this area. Hospitals that obtain Magnet status achieve this designation in part because of improvements in nurse work environment, nurse training, and initiatives for patient-centered care.³ These improvements may also foster greater autonomy among nurse professionals and result in earlier and improved recognition of PD patient decline, further contributing to favorable health outcomes. In addition, our findings suggest a reduced risk of pressure ulcers among PD patients in Magnet hospitals. These

TABLE 1. Characteristics of Parkinson Disease Patient Hospitalizations According to Hospital Magnet Status in the United States, Nationwide Inpatient Sample, 2000–2010

	Hospital Magnet Status		
	Yes (n = 40 121 Hospitalizations)	No (n = 453 639)	<i>P</i>
Patient characteristics			
Race			
White	28 400 (70.79)	303 755 (66.96)	
Black	1583 (3.95)	21 416 (4.72)	
Hispanic	2166 (5.40)	24 050 (5.30)	
Asian/Pacific Islander	664 (1.65)	8672 (1.91)	
Native American	117 (0.29)	765 (0.17)	
Other/unknown	7191 (17.92)	94 981 (20.94)	<.0001
Age, y			
Mean (SD)	76.8 (10.1)	77.9 (9.4)	
Median	78	79	
IQR	71–85	73–84	<.0001
Sex			
Male	22 795 (56.82)	242 391 (53.45)	
Female	17 326 (43.18)	211 087 (46.55)	<.0001
ZIP income quartile			
0–25th	4637 (13.13)	71 098 (23.44)	
26th–50th	6437 (18.22)	76 572 (25.25)	
51st–75th	9542 (27.01)	75 806 (24.99)	
76th–100th	14 712 (41.64)	79 810 (26.32)	<.0001
Hospital characteristics			
Teaching hospital			
Yes	29,373 (73.21)	155,775 (34.35)	
No	10,748 (26.79)	297,703 (65.65)	<.0001
Hospital bed size			
Small	1,044 (2.60)	67,709 (14.93)	
Medium	3,425 (8.54)	122,861 (27.09)	
Large	35,652 (88.86)	262,908 (57.98)	<.0001
Hospital location			
Rural	1,701 (4.24)	69,634 (15.36)	
Urban	38,420 (95.76)	383,844 (84.64)	<.0001
Hospital region			
Northeast	14,619 (36.44)	132,261 (29.71)	
Midwest	8,354 (20.82)	85,086 (18.76)	
South	10,643 (26.53)	127,344 (28.08)	
West	6,505 (16.21)	108,787 (23.99)	<.0001

Abbreviation: IQR, interquartile range.

data are supported by a previous study that showed patient turning and skin/wound care are more often completed in Magnet hospitals,²⁸ which may be secondary to improved nursing structures (eg, staffing) and processes (eg, clinical pathways and nursing

documentation) that facilitate these safety practices.²⁹ Although Magnet status has been associated with lower rates of pressure ulcers in hospitalized patients,⁸ pressure ulcer prevention and care is especially important for PD patients because they are at an

TABLE 2. Frequency and Relative Odds of Inpatient Mortality and Patient Safety Events Experienced by Parkinson Disease Patients in US Magnet Hospitals, Nationwide Inpatient Sample, 2000–2010

Hospitalization or Patient Safety Outcome	Frequency of Patient Safety Indicator (PSI), % (n)		Odds of Hospitalization or Patient Safety Outcome in Hospitals With Magnet Status (vs Non-Magnet Status)			
	Magnet Nursing Status		OR	95% CI	AOR ^a	95% CI
	Yes	No				
Inpatient mortality	3.31 (1327)	4.43 (20 088)	0.74	0.70–0.78	0.79	0.74–0.85
PSI						
At least 1 PSI	2.59 (1040)	2.92 (13 254)	0.88	0.83–0.94	0.74	0.68–0.79
Postoperative or procedure-related PSIs						
PSI 1: Anesthetic Complications	0.21 (1040)	2.69 (13 254)	0.88	0.83–0.94	0.74	0.68–0.79
PSI 4: Surgical Death	10.39 (35)	12.91 (377)	0.78	0.54–1.13	0.97	0.64–1.48
PSI 6: Iatrogenic Pneumothorax	0.07 (28)	0.05 (202)	1.58	1.06–2.35	1.15	0.71–1.86
PSI 8: Hip Fracture	0.01 (^b)	0.08 (^b)	0.57	0.18–7.85	1.20	0.31–4.57
PSI 9: Hemorrhage or Hematoma	0.64 (58)	0.44 (308)	1.46	1.10–1.93	1.45	1.04–2.04
PSI 10: Physiologic/ Metabolic Derangement	0.01 (^b)	0.03 (^b)	1.63	0.45–5.92	3.35	0.66–16.97
PSI 11: Respiratory Failure	0.69 (24)	1.05 (196)	0.65	0.43–0.99	0.76	0.47–1.24
PSI 12: Pulmonary Embolism/Deep Vein Thrombosis	1.34 (128)	1.05 (763)	1.28	1.06–1.55	1.01	0.81–1.27
PSI 13: Sepsis	0.92 (78)	0.12 (^b)	0.77	0.40–1.49	0.81	0.39–1.68
PSI 14: Wound Dehiscence	0.01 (^b)	0.23 (^b)	0.48	0.06–3.58	1.14	0.12–11.14
Medical PSIs						
PSI 2: Death in Low-Mortality Health Conditions	0.09 (^b)	0.26 (94)	0.36	0.11–1.14	0.74	0.68–0.79
PSI 3: Pressure Ulcer of Skin	4.23 (610)	5.75 (9992)	0.72	0.66–0.79	0.60	0.55–0.67
PSI 7: Central Venous Catheter-Related Blood Infection	0.13 (36)	0.12 (387)	1.11	0.79–1.57	1.01	0.68–1.51
PSI 15: Accidental Puncture or Laceration	0.13 (51)	0.10 (451)	1.29	0.97–1.73	1.22	0.87–1.71

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

^aAdjusted for patient age, race, sex, hospital teaching status, hospital bed size, hospital location, hospital region, and ZIP income quartile. Statistically significant ORs are in bold type.^bHealthcare Cost and Utilization Project DUA prohibits cell counts less than 11.

increased risk for ulcer development due to bradykinesia, rigidity, and impaired mobility. To enhance nursing care and improve safety outcomes nationwide, non-Magnet hospitals should strive to adopt strategies used in Magnet facilities. Indeed, nurse professionals at non-Magnet hospitals can still participate in the Magnet Learning Community, an online forum that allows nurses to share best practices, resources, and quality improvement strategies that are critical for promoting inpatient safety.³⁰

One less common nursing-sensitive indicator, postoperative respiratory failure (PSI 11) that may result from delayed recognition of early respiratory distress, approached but did not reach or maintain statistical significance after full covariate adjustment. Data also suggest an increased risk of postoperative hemorrhage or hematoma (PSI 9) among PD patients in Magnet

hospitals. However, depending on bleeding severity, this finding could be explained by improved recognition among nurses at Magnet hospitals or the relative complexity of procedures performed at academic medical centers and other large urban facilities that more often achieve Magnet status. Finally, there was no significant difference between Magnet and non-Magnet hospitals with regard to the following nursing-sensitive outcomes among PD patients: death in surgical inpatients with serious treatable conditions (PSI 4), catheter-related blood stream infections (PSI 7), the development of postoperative pulmonary emboli or deep venous thrombosis (PSI 12), or postoperative wound dehiscence (PSI 14).

In addition to differences in nursing-sensitive indicators, we found lower mortality associated with care in Magnet hospitals. Several previous studies assessing

the association of nursing organizational features with mortality found mixed results, and this association was attributed to a cross-sectional design and the fact that administrative data could not account for unmeasurable variables that are correlated with nursing.⁸ Our study is constrained by similar design features as well, so these initial data should be interpreted cautiously. However, at least 1 study that examined the association between mortality and nursing organizational features on a shift-to-shift basis found higher mortality on shifts where less trained nurses were predominant or there was higher nursing turnover.⁷ For PD patients, potential causes of inpatient death are numerous but most likely relate to complications of trauma, stroke, heart disease, and community-acquired infections, as well as potentially preventable complications such as sepsis and respiratory or other monocausal infections.^{26,31} Nursing care would more likely impact the latter, whereas routine neurologic care has been associated with a lower risk of preventable infection requiring hospitalization.³² Moreover, Magnet designation places an emphasis on staffing and good work environments, and increased staffing and optimal hospital environments have been associated with decreased inpatient mortality.^{2,7}

Our study has several strengths, including its large sample size, which allowed us to study a disease that is predominantly managed in the outpatient setting and to study safety events that are relatively uncommon. Although there is no consensus between nursing professional groups on the full set of nursing-sensitive indicators,³³ the AHRQ PSI set we used is the most comprehensive set of quality indicators and contains several candidate nursing-sensitive indicators. The NIS is designed to provide national estimates of hospitalizations and related outcomes, supporting the generalizability of our findings. Despite these strengths, our study has several limitations. First, data from 2000 to 2010 were analyzed. Although the Magnet program has grown in purpose and scope since this time, NIS data were reorganized in 2012, and individual state and hospital identifiers were removed, making it difficult to link individual hospitals with more recent organizational data documenting Magnet status. In addition, all observational studies are subject to confounding from unmeasurable or incorrectly measured variables, and administrative data are limited to the care and diagnoses that are documented in the medical record. Our study design does not account for an individual hospital's resources or enable us to observe nursing care delivery on the granular level, which may be necessary to evaluate all outcomes of interest or patient-level needs in nursing care. We could not adjust for patient characteristics such as cognitive or physical function, or the presence of a "do not resuscitate" order in the case of mortality analyses. We also

do not have information on providers other than nurses who are important for patient safety, such as physicians, nurse assistants, medical assistants, technicians, transport personnel, and so forth.

Despite these limitations, we present initial data that nursing organizational features, namely, Magnet status, may improve outcomes for patients with PD. Future studies could also assess safety outcomes using updated *International Classification of Diseases, Tenth Revision* codes or explore whether hospital Magnet status associates with inpatient safety based on admission or other secondary diagnoses. Additional research is needed to understand the complex relationships between nursing structure and work processes, neurological symptoms and function, and clinical outcomes. Such data will be necessary to improve inpatient outcomes for all patients with neurologic diseases and inform the modification of payment systems that reward efforts to provide both inpatient and outpatient specialty nursing care.

References

1. ANA Enterprise, American Nurses Association. ANCC Magnet Recognition Program [online]. Available at <https://www.nursingworld.org/organizational-programs/magnet/>. Accessed August 5, 2020.
2. Márquez-Hernández VV, Belmonte-García T, Gutiérrez-Puertas L, Granados-Gámez G, Rodríguez-García MC. Original research: how magnet hospital status affects nurses, patients, and organizations: a systematic review. *Am J Nurs*. 2020;120(7):28–38.
3. Kutney-Lee A, Stimpfel AW, Sloane DM, Cimiotti JP, Quinn LW, Aiken LH. Changes in patient and nurse outcomes associated with magnet hospital recognition. *Med Care*. 2015;53(6):550–557.
4. Friese CR, Lake ET, Aiken LH, Silber JH, Sochalski J. Hospital nurse practice environments and outcomes for surgical oncology patients. *Health Serv Res*. 2008;43(4):1145–1163.
5. Ball JE, Bruyneel L, Aiken LH, et al, RN4Cast Consortium. Post-operative mortality, missed care and nurse staffing in nine countries: a cross-sectional study. *Int J Nurs Stud*. 2018;78:10–15.
6. Penoyer DA. Nurse staffing and patient outcomes in critical care: a concise review. *Crit Care Med*. 2010;38(7):1521–1528.
7. Needleman J, Buerhaus P, Pankratz VS, Leibson CL, Stevens SR, Harris M. Nurse staffing and inpatient hospital mortality. *N Engl J Med*. 2011;364(11):1037–1045.
8. Petit Dit Dariel O, Regnaud JP. Do Magnet®-accredited hospitals show improvements in nurse and patient outcomes compared to non-Magnet hospitals: a systematic review. *JBI Database System Rev Implement Rep*. 2015;13(6):168–219.
9. Bekelis K, Missios S, MacKenzie TA. Association of Magnet status with hospitalization outcomes for ischemic stroke patients. *J Am Heart Assoc*. 2017;6(4):e005880.
10. Crispo JA, Willis AW, Thibault DP, et al. Associations between anticholinergic burden and adverse health outcomes in Parkinson disease. *PLoS One*. 2016;11(3):e0150621.
11. Grissinger M. Delayed administration and contraindicated drugs place hospitalized Parkinson's disease patients at risk. *P T*. 2018;43(1):10–39.

12. Hsiue PP, Chen CJ, Villalpando C, Sanaiha Y, Khoshbin A, Stavrakis AI. Effect of Parkinson's disease on hemiarthroplasty outcomes after femoral neck fractures. *J Arthroplasty*. 2019; 34(8):1695–1699.e1.
13. Steinberger J, Gilligan J, Skovrlj B, et al. The effect of Parkinson's disease on patients undergoing lumbar spine surgery. *Parkinsons Dis*. 2018;2018:8428403.
14. Mahajan A, Balakrishnan P, Patel A, et al. Epidemiology of inpatient stay in Parkinson's disease in the United States: insights from the nationwide inpatient sample. *J Clin Neurosci*. 2016;31:162–165.
15. Jo T, Yasunaga H, Michihata N, et al. Influence of parkinsonism on outcomes of elderly pneumonia patients. *Parkinsonism Relat Disord*. 2018;54:25–29.
16. Aslam S, Simpson E, Baugh M, Shill H. Interventions to minimize complications in hospitalized patients with Parkinson disease. *Neurol Clin Pract*. 2020;10(1):23–28.
17. McDonald KM, Romano PS, Geppert J, et al. *Measures of Patient Safety Based on Hospital Administrative Data—The Patient Safety Indicators (Technical Reviews, No. 5)*. Rockville, MD: Agency for Healthcare Research and Quality (US); 2002.
18. Zrelak PA, Utter GH, Sadeghi B, Cuny J, Baron R, Romano PS. Using the Agency for Healthcare Research and Quality patient safety indicators for targeting nursing quality improvement. *J Nurs Care Qual*. 2012;27(2):99–108.
19. Goode CJ, Blegen MA, Park SH, Vaughn T, Spetz J. Comparison of patient outcomes in Magnet® and non-Magnet hospitals. *J Nurs Adm*. 2011;41(12):517–523.
20. Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality; 2011. Available at www.hcup-us.ahrq.gov/nisoverview.jsp
21. Zhan C, Miller MR. Administrative data based patient safety research: a critical review. *Qual Saf Health Care*. 2003;12(suppl 2):ii58–ii63.
22. Nuno M, Carico C, Mukherjee D, et al. Association between in-hospital adverse events and mortality for patients with brain tumors. *J Neurosurg*. 2015;123(5):1247–1255.
23. Rahman M, Neal D, Fargen KM, Hoh BL. Establishing standard performance measures for adult brain tumor patients: a Nationwide Inpatient Sample database study. *Neuro Oncol*. 2013;15(11):1580–1588.
24. Rahman M, Neal D, Fargen KM, Hoh BL. Establishing standard performance measures for adult stroke patients: a Nationwide Inpatient Sample database study. *World Neurosurg*. 2013;80(6):699–708.e2.
25. Martinez K, Battaglia R, Start R, Mastal MF, Matlock AM. Nursing-sensitive indicators in ambulatory care. *Nurs Econ*. 2015;33(1):59–63, 66.
26. Oguh O, Videnovic A. Inpatient management of Parkinson disease: current challenges and future directions. *Neurohospitalist*. 2012;2(1):28–35.
27. Gerlach OH, Winogrodzka A, Weber WE. Clinical problems in the hospitalized Parkinson's disease patient: systematic review. *Mov Disord*. 2011;26(2):197–208.
28. Kalisch BJ, Lee KH. Missed nursing care: Magnet versus non-Magnet hospitals. *Nurs Outlook*. 2010;60(5):e32–e39.
29. Heslop L, Lu S, Xu X. Nursing-sensitive indicators: a concept analysis. *J Adv Nurs*. 2014;70(11):2469–2482.
30. American Nurses Credentialing Center. Magnet learning communities [online]. Available at <https://www.magnetlearningcommunity.org/about/welcome>. Accessed August 5, 2020.
31. Gerlach OH, Broen MP, van Domburg PH, Vermeij AJ, Weber WE. Deterioration of Parkinson's disease during hospitalization: survey of 684 patients. *BMC Neurol*. 2012;12:13.
32. Willis AW, Schootman M, Tran R, et al. Neurologist-associated reduction in PD-related hospitalizations and health care expenditures. *Neurology*. 2012;79(17):1774–1780.
33. Savitz LA, Jones CB, Bernard S. Quality indicators sensitive to nurse staffing in acute care settings. In: Henriksen K, Battles JB, Marks ES, Lewin DI, eds. *Advances in Patient Safety: From Research to Implementation (Volume 4: Programs, Tools, and Products)*. Rockville, MD: Agency for Healthcare Research and Quality (US); 2005.

For more than 108 additional continuing professional development articles related to Safety topics, go to www.NursingCenter.com/ce.

Lippincott®
NursingCenter®

TEST INSTRUCTIONS

- Read the article. The test for this nursing continuing professional development (NCPD) activity is to be taken online at www.NursingCenter.com/CE/JNN. Tests can no longer be mailed or faxed.
- You'll need to create an account (it's free!) and log in to access My Planner before taking online tests. Your planner will keep track of all your Lippincott Professional Development online NCPD activities for you.
- There's only one correct answer for each question. A passing score for this test is 7 correct answers. If you pass, you can print your certificate of earned contact hours and access the answer key. If you fail, you have the option of taking the test again at no additional cost.
- For questions, contact Lippincott Professional Development: 1-800-787-8985.
- Registration deadline is June 2, 2023

NCPD Nursing Continuing Professional Development

PROVIDER ACCREDITATION

Lippincott Professional Development will award 2.0 contact hours for this nursing continuing professional development activity.

Lippincott Professional Development is accredited as a provider of nursing continuing professional development by the American Nurses Credentialing Center's Commission on Accreditation.

This activity is also provider approved by the California Board of Registered Nursing, Provider Number CEP 11749 for 2.0 contact hours. Lippincott Professional Development is also an approved provider of continuing nursing education by the District of Columbia, Georgia, and Florida, CE Broker #50-1223. Your certificate is valid in all states.

Payment: The registration fee for this test is \$21.95.

AANN members can take the test for free by logging into the secure Members Only area of <http://www.aann.org>