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Changes in Patient and Nurse Outcomes Associated with Magnet Hospital Recognition

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Abstract

Background—Research has documented an association between Magnet hospitals and better outcomes for nurses and patients. However, little longitudinal evidence exists to support a causal link between Magnet recognition and outcomes.

Objective—To compare changes over time in surgical patient outcomes, nurse-reported quality, and nurse outcomes in a sample of hospitals that attained Magnet recognition between 1999 and 2007 with hospitals that remained non-Magnet.

Research Design—Retrospective, two-stage panel design using four secondary data sources.

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Subjects—136 Pennsylvania hospitals (11 “emerging” Magnets and 125 non-Magnets)

Measures—American Nurses Credentialing Center Magnet recognition; risk-adjusted rates of surgical 30-day mortality and failure-to-rescue, nurse-reported quality measures, and nurse outcomes; the Practice Environment Scale of the Nursing Work Index

Methods—Fixed effects difference models were used to compare changes in outcomes between emerging Magnet hospitals and hospitals that remained non-Magnet.

Results—Emerging Magnet hospitals demonstrated markedly greater improvements in their work environments than other hospitals. On average, the changes in 30-day surgical mortality and failure-to-rescue rates over the study period were more pronounced in emerging Magnet hospitals than in non-Magnet hospitals, by 2.4 fewer deaths per 1000 patients ($p<.01$) and 6.1 fewer deaths per 1000 patients ($p=0.02$), respectively. Similar differences in the changes for emerging Magnet hospitals and non-Magnet hospitals were observed in nurse-reported quality of care and nurse outcomes.

Conclusions—In general, Magnet recognition is associated with significant improvements over time in the quality of the work environment, and in patient and nurse outcomes that exceed those of non-Magnet hospitals.

Keywords

nursing; Magnet hospitals; outcomes; quality of care

Introduction

Since 1994, the American Nurses Credentialing Center (ANCC) has endorsed hospitals that provide evidence of excellence in nursing through the Magnet Recognition Program. Currently, there are nearly 400 Magnet hospitals in the United States – roughly 7% of acute care facilities.[1] The Magnet model is based on set of characteristics known as the Forces of Magnetism[2] and are broadly organized into five categories: 1) transformational leadership, 2) structural empowerment, 3) exemplary professional practice, 4) new knowledge, innovations & improvements, and 5) empirical outcomes.[3] Through recent inclusion in popular hospital rating systems, such as *U.S. News and World Report’s Best Hospitals*,[4] endorsement by the business-sponsored Leapfrog Group,[5] and mentions by media,[6] the Magnet brand is becoming increasingly well-known to the public. Despite the growth of this program over the past 20 years, and research showing better outcomes for Magnet hospitals, it is unclear whether Magnet recognition reflects an award for hospitals that are already excellent, or whether the arduous application and peer review process constitutes an intervention that results in improved nursing care and patient outcomes.

A growing body of research shows an association between Magnet recognition and better outcomes for both patients and nurses. The first study to link Magnet status to patient outcomes was published in *Medical Care* in 1994.[7] This study was replicated and expanded recently and the findings were consistent: patients treated in Magnet hospitals had lower odds of mortality following surgery compared to patients in non-Magnets.[8] Other research has documented superior patient outcomes for Magnet hospitals in terms of falls,[9] mortality

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following trauma,[10] outcomes of very low birth weight infants[11] and patient satisfaction.[12] Originally identified for their ability to attract and retain nurses, Magnets consistently demonstrate lower levels of nurse burnout, job dissatisfaction, and intentions to leave compared to non-Magnet facilities.[13–16] These better outcomes for Magnet hospitals appear to result in higher revenues that more than offset the costs of the Magnet application process.[17] The existing literature, overall, suggests a Magnet advantage, although some studies have reported null findings,[18–20] which signals the need for additional research.

To our knowledge, only one study has examined how hospitals change in terms of their work environments and outcomes as a result of undergoing the Magnet process.[21] This pre-post analysis was undertaken in England, within the first hospital to achieve Magnet status outside of the United States. Significant changes in features of the work environment and outcomes after Magnet recognition were found, including increased nurse autonomy and administrative support. The results from this case study suggest that changes in the work environment resulted from the requirements for successful Magnet recognition.

Because the pursuit of Magnet status requires a significant investment of financial and human resources,[17,22] hospital leaders need strong evidence about the link between Magnet recognition and outcomes. A major limitation of existing studies is that nearly all have employed a cross-sectional design, which limits our understanding of the degree to which the relationship between Magnet recognition and outcomes may be causal. In this study, we aimed to address this major gap in knowledge and take advantage of a unique panel dataset of hospitals in Pennsylvania to examine and compare changes in the work environment of nurses, as well as changes in rates of patient outcomes (mortality and failure-to-rescue), nurse reports of quality of care, and nurse job outcomes (burnout, dissatisfaction and intentions to leave) in a set of hospitals that attained Magnet recognition (i.e. emerging Magnets) with hospitals that remained non-Magnet.

Methods

Data Sources and Sample

We employed a retrospective, two-stage panel design using four sources of data: nurse surveys, administrative patient discharge abstracts, the American Hospital Association (AHA) Annual Survey and the ANCC Magnet database. Measures of the nurse work environment and nurse-reported quality and job outcomes were derived from the Pennsylvania Registered Nurse Survey (1999) and Multi-State Nursing Care and Patient Safety Survey (2006), which were collected by the Center for Health Outcomes and Policy Research at the University of Pennsylvania. Both surveys included identical items related to nurses' assessments of quality of care, nurse job outcomes, the work environment, workload, and demographic information. Nurse respondents provided the name of their primary employer. Large random samples of all actively licensed Pennsylvania registered nurses (RNs) were selected in each year (50% in 1999; 40% in 2006) from state licensure lists and received the survey via mail at their homes. Response rates for the survey in 1999 and 2006 were 52% and 39% respectively.[23,24] A nonresponder survey was completed in 2006 and the results showed no evidence of response bias on nurses' ratings of their environments.[25] Representativeness was assessed by comparing demographics of the survey

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respondents with Pennsylvania nurses in the National Sample Survey of Registered Nurses in 2000 and 2008.[26,27] In our sample, the average number of nurses who responded per hospital in 1999 and 2006 were 83 and 50, respectively, with the differences resulting largely from the lower response rate and a smaller fraction of nurses being sampled in 2006.

Patient data for both years were derived from Pennsylvania Health Care Cost Containment Council (PHC4) administrative discharge abstract files. Patients included in the sample were between 20 and 85 years old admitted for a general, orthopedic, or vascular surgical procedure. Patients with these diagnoses were selected as they are present in most hospitals in large numbers, and because risk adjustment methods for this sample of patients have been extensively tested and validated.[8,24,28]

The American Hospital Association (AHA) Annual Survey provided hospital structural characteristics such as number of beds, technology status, and teaching status. The ANCC Magnet database, available on the ANCC website (http://www.nursecredentialing.org/Magnet/FindaMagnetFacility), provides a list of Magnet hospitals in each state, as well as year of first recognition.

To obtain reliable estimates of our measures, we restricted our sample to hospitals with at least 10 respondents to the nurse survey and at least 100 surgical patient discharges in both 1999 and 2006. The final sample included 136 hospitals (11 emerging Magnet hospitals and 125 non-Magnet hospitals). In 1999, there were no ANCC Magnet hospitals in PA and at the end of the study period, there were 13. Two specialty hospitals recognized as Magnets were excluded because they did not treat adult general surgery patients.

Measures

Magnet Recognition—A binary variable was created for whether or not a hospital was recognized as a Magnet by 2007. Given that the Magnet application review process takes approximately 1 year to complete, we included 2 hospitals whose first recognition was in 2007 as they were likely to be performing to Magnet standards in 2006, during the time of the nurse survey.

Nurse work environment—The nurse work environment was measured using the Practice Environment Scale of the Nursing Work Index (PES-NWI), a reliable and valid instrument that has been endorsed by the National Quality Forum.[29] The 31 items contained in the PES-NWI describe a set of characteristics that are present in organizations that are supportive of professional nursing practice.[30] Nurses indicate the degree to which each item is present in their job on a 4-point Likert scale ranging from “strongly disagree” to “strongly agree”. Five subscales comprise the PES-NWI : 1) Collegial Nurse-Physician Relations, 2) Nurse Manager Ability, Leadership, and Support of Nurses, 3) Nursing Foundations for Quality of Care, and 4) Nurse Participation in Hospital Affairs, and 5) Staffing and Resource Adequacy.[30] Subscale scores were calculated by averaging individual nurse responses to each item included in the subscale. An overall score was calculated by averaging the five subscales. PES-NWI subscale and overall scores were aggregated to the hospital-level for both years.

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Patient Outcomes—The two patient outcomes of interest were 30-day surgical mortality and failure-to-rescue (FTR), or deaths involving patients who had developed at least 1 of a set of 39 potentially preventable complications.[31] Death record files were linked to the patient discharge records to capture deaths both inside and outside the hospital. Risk-adjusted 30-day mortality and FTR rates per 1,000 patients were calculated for each hospital in both study years. Adjusted rates accounted for patient age, sex, surgical DRG, emergent admission, transfer from another hospital, and the presence/absence of 27 comorbid medical conditions as defined by Elixhauser.[32]

Nurse-Reported Quality of Care—Three outcomes related to nurse-reported quality of care were derived from the nurse surveys. Overall quality was measured using a single item that asked nurses to describe the quality of nursing care delivered on their unit on a 4-point Likert scale ranging from “poor” to “excellent”. This measure has established validity in predicting patient outcomes, such as mortality, using independent data sources.[33] Consistent with other studies, the quality measure was dichotomized into “excellent” and “not excellent” (i.e. “good”, “fair”, and “poor”).[33–35] Nurses’ confidence in patients’ ability to manage their care when discharged and nurses’ confidence that management would act to resolve reported patient care problems were scored on 4-point Likert scales ranging from “very confident” to “not at all confident”. Nurses were considered “confident” if they reported being “very confident” or “confident”. Adjusted rates of the nurse-reported quality outcomes were constructed for each hospital in both years. Nurse-reported quality outcome rates, reported per 100 nurses, were adjusted for nurse age, sex, full-time status (as opposed to part-time/per diem), and unit type (e.g. medical/surgical, intensive care).

Nurse Job Outcomes—Nurse job outcomes included burnout, job dissatisfaction, and intentions to leave their current position. To measure burnout, we used the emotional exhaustion subscale of the Maslach Burnout Inventory (MBI).[36] Respondents scoring greater than 27 on the subscale were classified as having “high” burnout.[36] Job dissatisfaction was measured by a single question that asked respondents to rate how satisfied they were with their jobs on a 4-point Likert scale ranging from “very dissatisfied” to “very satisfied”. Nurses were considered to be “dissatisfied” if they reported being very or somewhat dissatisfied, and “satisfied” if they reported being somewhat or very satisfied. Intent to leave was a dichotomous variable based on an item that asked nurses to report whether they intended to leave their current employer within the next year. Hospital-level rates of nurse job outcomes were constructed for each year and are reported per 100 nurses. Adjusted rates of the three nurse job outcomes, accounted for age, sex, full-time status, and unit type following previous work.[37]

Covariates—Hospital-level measures of nurse staffing (i.e. average number of patients per nurse) and the educational composition of nurses (i.e. percentage of nurses with a baccalaureate degree or higher) were derived from the nurse surveys. Prior work has demonstrated that changes in nurse staffing and nurse education are associated with changes in the outcomes under study here.[37,38] Other hospital characteristics, such as teaching status, technology status, and bed size were also included as control variables in our modeling. Teaching status contrasted 3 categories of hospitals based on the ratio of postgraduate

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medical residents/fellows to beds: nonteaching, minor (1:4 ratio or smaller) or major (1:4 ratio or larger). Hospitals that performed open-heart surgery or major organ transplantation were considered “high-technology” facilities. Hospital size was categorized as small (≤100 beds), medium (101–250 beds), or large (>250 beds).

Analysis

We descriptively examined and compared characteristics of patients and hospitals, as well as patient and nurse outcomes, in emerging Magnet and non-Magnet hospitals at each time point (1999 and 2006). We estimated the changes in work environment occurring in emerging Magnet and non-Magnet hospitals over time using the overall and subscale scores of the PES-NWI, and tested the significance of the differences in those changes in the two groups of hospitals with t-tests. We then employed a two-period difference model that allowed us to examine whether changes in outcomes in emerging Magnet hospitals were significantly different from hospitals that remained non-Magnet. Use of the fixed effects difference model theoretically controls for all unmeasured characteristics of hospitals that did not change over the time period. We included as covariates in the model those features that changed (and for which we had empirical measures) and, following Allison,[39] a few characteristics that were largely stable but had differing effects at the two time points. Both nurse and patient outcome models were also adjusted for the baseline value of the different outcomes, and were weighted by the total number of nurse respondents in the hospital (when analyses involved nurse outcomes) or by the total number of patients in the hospital (when analyses involved patient outcomes) across the two years. While ideally we would like to assess the effects of Magnet recognition and changes in work environment concurrently on changes in outcomes, we were unable to assess these features jointly in the difference model due to collinearity of the two variables; therefore only Magnet status was included. All analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC).

Results

Selected characteristics of patients and hospitals in the samples of emerging Magnet and non-Magnet hospitals in both study years are presented in Table 1. In 1999, a number of significant differences in patient and hospital characteristics were observed between emerging Magnet and non-Magnet hospitals. By 2006, these differences remained except for the proportion of male patients. Notably, all Magnet hospitals had become teaching institutions and had obtained the capability to perform highly technical procedures by 2006. Magnet hospitals also had significantly higher percentages of baccalaureate-prepared nurses than non-Magnet hospitals (1999: 43% vs. 31%, $p<0.01$; 2006: 45% vs. 33%, $p<0.01$), and lower patient to nurse ratios (1999: 5.0 vs. 5.8, $p=0.02$; 2006: 4.9 vs. 5.8, $p<0.001$) at both time points.

Table 2 shows how the PES-NWI scores changed within the emerging Magnet and non-Magnet hospitals over time, and how the changes differed between the two sets of hospitals. Emerging Magnet hospitals demonstrated markedly greater improvements over time on the PES-NWI overall score and all five subscales compared to hospitals that remained non-Magnet. Absolute differences of change scores between Magnet and non-Magnet hospitals

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ranged from 0.15 (Collegial Nurse-Physician Relations) to 0.43 (Participation in Hospital Affairs) points higher for the emerging Magnet hospitals than for the non-Magnet hospitals. These differences were all statistically significant at $p \leq 0.05$ except for the Staffing and Resource Adequacy subscale, where the change was marginally significant ($d=0.16$, $p=0.06$).

Table 3 displays adjusted rates of nurse job outcomes, nurse-reported quality outcomes and patient outcomes in both years for each type of hospital. In 1999, outcomes in hospitals that eventually became Magnets were not significantly different from other hospitals. However, by 2006, there were sizable differences between Magnets and non-Magnets in the all but one outcome (FTR). The 30-day surgical mortality rate was significantly lower in hospitals that had attained Magnet compared to hospitals that remained non-Magnet (1.28 vs. 1.51, $p=0.05$). Nurses' ratings of excellent quality of care, confidence in patients' ability to manage their care after discharge and confidence in the administrations' ability to respond to nurses concerns about patient care were all notably higher in emerging Magnet hospitals in 2006. By the end of the study period, nurses in Magnet hospitals also had lower adjusted rates of burnout (29.7 vs. 38.4, $p<0.001$), job dissatisfaction (21.2 vs. 30.9, $p<0.001$) and intentions to leave their employer (8.9 vs. 13.4, $p<0.01$).

Results from the fixed effects difference model that examined changes in outcomes between Magnet and non-Magnet hospitals are shown in Table 4. On average, changes in 30-day surgical mortality and FTR rates in emerging Magnet hospitals were 2.4 fewer deaths per 1000 patients ($p<.01$) and 6.1 fewer deaths per 1000 patients ($p=0.02$) respectively than in non-Magnet hospitals over the study period. The proportion of nurses rating the quality of care as "excellent" in Magnet hospitals increased, on average, by over 9 percentage points ($p<.001$) more than in non-Magnet hospitals. Rates of confidence that patients could manage their care after discharge (8.7%, $p<0.001$) and confidence that management would resolve patient care problems (12.0%, $p<0.001$) both increased significantly more in emerging Magnets than in non-Magnets from 1999 to 2006. Reductions in the rates of burnout, job dissatisfaction and intent to leave were also significantly larger, on average, in Magnet hospitals. For example, job dissatisfaction in Magnets from 1999 to 2006 decreased by nearly 9 percentage points ($p <.01$) more than in non-Magnets.

Discussion

In comparison to non-Magnet hospitals, emerging Magnet hospitals experienced significantly greater improvement in patient and nurse outcomes over time. Our results provide evidence that Magnet recognition, in general, is an intervention that may result in improved nursing and better patient outcomes. Study hospitals that obtained Magnet status may have achieved these results, in part, due to significant enhancements of their nurse work environments. Improvements in specific aspects of the nurse work environment, such collaborative practice between nurses and physicians, nursing participation in hospital governance, and adequate resources, were decidedly more pronounced in Magnet hospitals as compared to non-Magnets. These findings align with previous research that has demonstrated that the better work environments provided by Magnet organizations provide a strong explanation for why outcomes are better in these institutions,[8] as well as the growing

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body of international literature that links the quality of the nurse work environment to better patient and nurse job outcomes.[24,34,37,40]

Our results provide unique evidence to hospital leaders that investment in Magnet recognition may result in improved patient outcomes and staff retention, thus offering support for the business case of pursuing Magnet status.[41] Our panel design allowed us to document greater decreases in rates of surgical mortality and FTR over time in hospitals that obtained Magnet recognition compared to non-Magnets. In addition to improvements in other quality markers, Magnet hospitals also had significantly a higher rate of nurses reporting confidence in patients' ability to manage their post-discharge care—a potential indicator of future readmission to the hospital. Other research has shown that nurses working in better work environments are more likely to report confidence in patients' ability to manage their care, and that better environments are associated with decreased odds of readmission.[42,43]

Finally, our study shows that hospitals that undergo the Magnet process demonstrate notable improvements in outcomes related to workforce stability. For example, the percentage of nurses who reported an intention to leave decreased in Magnet hospitals by about 16% over the seven year time period. In comparison, hospitals that remained non-Magnet had a decrease in intention to leave, but to a much lesser extent (about 9%). These findings have significant financial implications for hospitals. Research suggests that the ratio of costs associated with nurse turnover to a nurse's salary is between 0.31 and 1.3.[44] This can be estimated as $20,295 – $85,111 *per nurse* based on the national median salary of $65,470 for RNs.[45] The size of a hospital, complexity of services provided, and labor market all influence the cost of turnover, with larger hospitals tending to have higher costs.[44]

The findings of this study challenge the common argument that Magnet hospitals have better outcomes because they are more likely to be of higher quality prior to pursuing Magnet recognition. Our results demonstrate that this may not be the case. Across the majority of outcomes examined, rates in emerging Magnets were equivalent, or worse, than their non-Magnet counterparts in 1999, the first time point of study. This suggests that the process of Magnet recognition invokes a transformation within the institution at the patient, nurse and organizational levels. Our examination of the PES-NWI scores shows that although emerging Magnet hospitals appeared to have slightly higher scores at baseline, many of these differences were small (about one-tenth of a point, on average). By 2006, differences between Magnet and non-Magnet hospitals were substantial.

Our study was limited to a sample of hospitals in one state at 2 points in time. Despite the modest sample size of 11 emerging Magnets, we noted that these hospitals changed in significantly different ways from their peers in terms of their work environment and outcomes. Currently, there are 23 Magnet hospitals in Pennsylvania; therefore, it is possible that some hospitals in our non-Magnet sample could have been pursuing Magnet recognition at the time of the study. If so, our estimates of the effects of the Magnet process may be underestimated. We note that Magnet hospitals were more likely to be large, teaching institutions, and therefore may not be representative of rural hospitals. Similarly, outcomes associated with Magnet status may not be consistent across hospitals due to differences in

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patient and provider composition. Finally, our fixed effects models account for unmeasured covariates that did not change over time; however, other confounders may be unaccounted for such as implementation of quality improvement, palliative and transitional care programs, and changes in surgical technologies. Future research is needed that will allow for greater causal inference. Admittedly, a better understanding of these relationships would result from having data over a longer period of time.

Conclusion

Through the Magnet process, hospitals undergo a transformation that includes significant improvements in the quality of the nurse work environment. **Overall,** hospitals that obtain Magnet recognition demonstrate significant improvements in patient and nurse job outcomes over time that exceed those of their non-Magnet peers. As one of the first longitudinal studies of Magnet hospitals, our findings provide early evidence for a potential causal link between the improvement of nurse work environments and patient outcomes.

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References

1. American Hospital Association. Fast facts on US hospitals. 2014 Available at http://www.aha.org/research/rc/stat-studies/fast-facts.shtml.
2. McClure, ML.; Poulin, MA.; Sovie, MD., et al. Magnet Hospitals: Attraction and Retention of Professional Nurses. Kansas City, MO: American Nurses Association; 1983.
3. American Nurses Credentialing Center. Magnet recognition program model. 2014 Available at http://www.nursecredentialing.org/Magnet/ProgramOverview/New-Magnet-Model.
4. Olmstead MG, Geisen E, Murphy J, et al. Methodology: U.S. News & World Report Best Hospitals, 2014–15. 2014 Available at http://www.usnews.com/pubfiles/BH_2014_Methodology_Report_Final_Jul14.pdf.
5. The Leapfrog Group. Results of the 2013 Leapfrog Hospital Survey. 2013 Available at http://www.leapfroggroup.org/media/file/2013LeapfrogHospitalSurveyResults_Final071714.pdf.
6. KAC Productions LLC. What you need to know before your next hospital visit. 2014 Katie. Available at http://katiecouric.com/videos/what-you-need-to-know-before-your-next-hospital-visit/.
7. Aiken LH, Smith HL, Lake ET. Lower Medicare mortality among a set of hospitals known for good nursing care. Med Care. 1994; 32(8):771–787. [PubMed: 8057694]
8. McHugh MD, Kelly LA, Smith HL, et al. Lower mortality in magnet hospitals. Med Care. 2013; 51(5):382–388. [PubMed: 23047129]
9. Lake ET, Shang J, Klaus S, et al. Patient falls: association with hospital magnet status and nursing unit staffing. Res Nurs Health. 2010; 33(5):413–425. [PubMed: 20824686]
10. Evans T, Rittenhouse K, Horst M, et al. Magnet hospitals are a magnet for higher survival rates at adult trauma centers. J Trauma Acute Care Surg. 2014; 77(1):89–94. [PubMed: 24977761]
11. Lake ET, Staiger D, Horbar J, et al. Association between hospital recognition for nursing excellence and outcomes of very low-birth-weight infants. JAMA. 2012; 307(16):1709–1716. [PubMed: 22535856]
12. Smith SA. Magnet hospitals: Higher rates of patient satisfaction. Policy Polit Nurs Pract. 2014; 15(1–2):30–41. [PubMed: 24915864]

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13. Brady-Schwartz DC. Further evidence on the Magnet Recognition program: implications for nursing leaders. J Nurs Adm. 2005; 35(9):397–403. [PubMed: 16200007]
14. Hess R, Desroches C, Donelan K, et al. Perceptions of nurses in magnet(R) hospitals, non-magnet hospitals, and hospitals pursuing magnet status. J Nurs Adm. 2011; 41(7–8):315–323. [PubMed: 21799363]
15. Kelly LA, McHugh MD, Aiken LH. Nurse outcomes in Magnet(R) and non-Magnet hospitals. J Nurs Adm. 2012; 42(10 Suppl):S44–S49. [PubMed: 22976894]
16. Ulrich BT, Buerhaus PI, Donelan K, et al. Magnet status and registered nurse views of the work environment and nursing as a career. J Nurs Adm. 2009; 39(7–8 Suppl):S54–S62. [PubMed: 19641440]
17. Jayawardhana J, Welton JM, Lindrooth RC. Is there a business case for magnet hospitals? Estimates of the cost and revenue implications of becoming a magnet. Med Care. 2014; 52(5): 400–406. [PubMed: 24535022]
18. Goode CJ, Blegen MA, Park SH, et al. Comparison of patient outcomes in Magnet® and non-Magnet hospitals. J Nurs Adm. 2011; 41(12):517–523. [PubMed: 22094616]
19. Trinkoff AM, Johantgen M, Storr CL, et al. A comparison of working conditions among nurses in magnet (R) and non-magnet (R) hospitals. J Nurs Adm. 2010; 40(7/8):309–315. [PubMed: 20661060]
20. Mills AC, Gillespie KN. Effect of Magnet hospital recognition on 2 patient outcomes. J Nurs Care Qual. 2013; 28(1):17–23. [PubMed: 22868566]
21. Aiken LH, Buchan J, Ball J, et al. Transformative impact of Magnet designation: England case study. J Clin Nurs. 2008; 17(24):3330–3337. [PubMed: 19146592]
22. Russell J. Journey to magnet: cost vs. benefits. Nurs Econ. 2010; 28(5):340–342. [PubMed: 21158256]
23. Aiken LH, Clarke SP, Sloane DM, et al. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. JAMA. 2002; 288(16):1987–1993. [PubMed: 12387650]
24. Aiken LH, Cimiotti JP, Sloane DM, et al. Effects of nurse staffing and nurse education on patient deaths in hospitals with different nurse work environments. Med Care. 2011; 49(12):1047–1053. [PubMed: 21945978]
25. Smith, HL. A double sample to minimize bias due to non-response in a mail survey. Chapter 8. In: Tille, Y., et al., editors. Survey methods: applications to longitudinal investigations, health, electoral investigations in the developing countries. Paris: Dunod; 2008. p. 334-339.
26. Spratley, E.; Johnson, A.; Sochalski, J.; Fritz, M.; Spencer, W. Rockville MD: Health Resources and Services Administration; 2002. The registered nurse population: March 2000 findings from the National Sample Survey of Registered Nurses. Available at: http://bhpr.hrsa.gov/healthworkforce/rnsurveys/rnsurvey2000.pdf. [Accessed December 8, 2014]
27. Health Resources and Services Administration. The registered nurse population: initial findings from the 2008 National Sample Survey of Registered Nurses. Rockville MD: Author; 2010. Available at: http://bhpr.hrsa.gov/healthworkforce/rnsurveys/rnsurveyinitial2008.pdf. [Accessed December 8, 2014]
28. Volpp KG, Rosen AK, Rosenbaum PR, et al. Mortality among patients in VA hospitals in the first 2 years following ACGME resident duty hour reform. JAMA. 2007; 298(9):984–992. [PubMed: 17785643]
29. National Quality Forum. 0206: Practice Environment Scale- Nursing Work Index (PES-NWI) (composite and five subscales). 2014 Available at http://www.qualityforum.org/QPS/0206.
30. Lake ET. Development of the practice environment scale of the nursing work index. Res Nurs Health. 2002; 25:176–188. [PubMed: 12015780]
31. Silber JH, Romano PS, Rosen AK, et al. Failure-to-rescue: comparing definitions to measure quality of care. Med Care. 2007; 45(10):918–925. [PubMed: 17890988]
32. Elixhauser A, Steiner C, Harris DR, et al. Comorbidity measures for use with administrative data. Med Care. 1998; 36(1):8–27. [PubMed: 9431328]
33. McHugh MD, Stimpfel AW. Nurse reported quality of care: a measure of hospital quality. Res Nurs Health. 2012; 35(6):566–575. [PubMed: 22911102]

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34. Aiken LH, Sermeus W, Van den Heede K, et al. Patient safety, satisfaction, and quality of hospital care: cross sectional surveys of nurses and patients in 12 countries in Europe and the United States. BMJ. 2012; 344:e1717. [PubMed: 22434089]
35. Kutney-Lee A, Kelly D. The effect of hospital electronic health record adoption on nurse-assessed quality of care and patient safety. J Nurs Adm. 2011; 41(11):466–472. [PubMed: 22033316]
36. Maslach, C.; Jackson, SE.; Leiter, MP. Maslach Burnout Inventory Manual. 3rd ed. Palo Alto, CA: Consulting Psychologists Press; 1996.
37. Kutney-Lee A, Wu ES, Sloane DM, et al. Changes in hospital nurse work environments and nurse job outcomes: an analysis of panel data. nt J Nurs Stud. 2013; 50(2):195–201.
38. Kutney-Lee A, Sloane DM, Aiken LH. An increase in the number of nurses with baccalaureate degrees is linked to lower rates of postsurgery mortality. Health Aff. 2013; 32(3):579–586.
39. Allison, P. Fixed effects regression methods for longitudinal data using SAS. Cary, NC: SAS Institute, Inc.; 2005.
40. Aiken LH, Sloane DM, Bruyneel L, et al. Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. Lancet. 2014; 383(9931):1824–1830. [PubMed: 24581683]
41. Drenkard K. The business case for Magnet. J Nurs Adm. 2010; 40(6):263–271. [PubMed: 20502195]
42. McHugh MD, Ma C. Hospital nursing and 30-day readmissions among medicare patients with heart failure, acute myocardial infarction, and pneumonia. Med Care. 2013; 51(1):52–59. [PubMed: 23151591]
43. Stimpfel AW, Rosen JE, McHugh MD. Understanding the role of the professional practice environment on quality of care in Magnet® and non-Magnet hospitals. J Nurs Adm. 2014; 44(1): 10–16. [PubMed: 24316613]
44. Li Y, Jones CB. A literature review of nursing turnover costs. J Nurs Manag. 2013; 21(3):405–418. [PubMed: 23406301]
45. Bureau of Labor Statistics, U.S. Department of Labor. [Accessed December 8, 2014] Occupational Outlook Handbook, 2014–15 Edition, Registered Nurses. Available at http://www.bls.gov/ooh/healthcare/registered-nurses.htm.

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Table 1

Selected Characteristics of Patients and Study Hospitals in 1999 and 2006

	1999			2006		
Patient Characteristics	**Magnet (n=38,783)**	**Non-Magnet (n=194,868)**	**P-Value**	**Magnet (n=48,200)**	**Non-Magnet (n=209,956)**	**P-Value**
Age	59.7 (16.5)	61.4 (16.4)	<0.001	59.9 (15.9)	60.8 (16.0)	<0.001
Male	17,415 (44.9%)	83,498 (42.9%)	<0.001	20,626 (42.8%)	89,183 (42.5%)	0.21
Major Diagnostic Category (MDC), n(%)						
General surgery	16,676 (43.0%)	83787 (43.0%)		19,611 (40.7%)	84112 (40.1%)	
Orthopedic surgery	18,535 (47.8%)	96816 (49.7%)		25,466 (52.8%)	114087 (54.3%)	
Vascular surgery	3,572 (9.2%)	14265 (7.3%)	<0.001	3,123 (6.5%)	11757 (5.6%)	<0.001
Average number of comorbid conditions, mean (SD)	1.17 (1.14)	1.21 (1.17)	<0.001	1.58 (1.25)	1.55 (1.25)	<0.001
Hospital Characteristics	Magnet (n=11)	Non-Magnet (n=125)	P-Value	Magnet (n=11)	Non-Magnet (n=125)	P-Value
Size, n (%)						
<100 beds	0 (0%)	26 (20.8%)		0 (0%)	20 (16%)	
101–250 beds	3 (27.3%)	75 (60%)		2 (18.2%)	71 (56.8%)	
>250 beds	8 (72.7%)	24 (19.2%)	<0.001	9 (81.2%)	34 (27.2%)	0.001
Teaching Status, n(%)						
None	2 (18.2%)	81 (64.8%)		0 (0%)	64 (51.2%)	
Minor	5 (45.5%)	31 (24.8%)		6 (54.5%)	47 (37.6%)	
Major	4 (36.4%)	13 (10.4%)	<0.01	5 (45.5%)	14 (11.2%)	<0.001
High Technology Status, n (%)	8 (72.7%)	37 (29.6%)	<0.01	11 (100%)	50 (40%)	<0.001
Nurses with BSN or higher, mean % (SD)	43% (13%)	31% (12%)	<0.01	45% (13%)	33% (13%)	<0.01
Patients per nurse, mean (SD)	5.0 (0.7)	5.8 (1.2)	0.02	4.9 (0.6)	5.8 (1.1)	<0.001

Notes: Percentages may not add to 100 due to rounding. Chi-squares, Fisher exact tests, and t-tests were used to determine statistical significance of differences. BSN=Bachelor of Science in Nursing.

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Table 2

Changes in PES-NWI Subscales in Magnet (n=11) and Non-Magnet (n=125) Hospitals between 1999 and 2006

PES-NWISubscale	1999 Mean (SD)	2006 Mean (SD)	Change	Absolute Difference	P-Value
Collegial Nurse-Physician Relations					
Magnets	2.85 (0.08)	3.06 (0.14)	+0.21		
Non-Magnets	2.78 (0.16)	2.84 (0.19)	+0.06	0.15	0.01
Nurse Manager Ability, Leadership, and Support of Nurses					
Magnets	2.48 (0.20)	2.72 (0.18)	+0.24		0.01
Non-Magnets	2.42 (0.23)	2.41 (0.26)	−0.01	0.25	
Staffing and Resource Adequacy					
Magnets	2.31 (0.20)	2.65 (0.18)	+0.34		
Non-Magnets	2.22 (0.25)	2.40 (0.28)	+0.18	0.16	0.06
Participation in Hospital Affairs					
Magnets	2.49 (0.19)	3.01 (0.24)	+0.52		
Non-Magnets	2.34 (0.22)	2.43 (0.29)	+0.09	0.43	<0.001
Foundations for Quality of Care					
Magnets	2.98 (0.11)	3.17 (0.15)	+0.19		
Non-Magnets	2.83 (0.18)	2.82 (0.20)	−0.01	0.20	<0.01
Overall PES-NWIScore					
Magnets	2.62 (0.13)	2.92 (0.16)	+0.30		
Non-Magnets	2.51 (0.17)	2.57 (0.20)	+0.06	0.24	<0.001

Notes: PES-NWI=Practice Environment Scale- Nursing Work Index; PES-NWI subscales theoretically range from 1 to 4. P-values generated from two sample t-tests.

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Table 3

Adjusted Mean Outcome Rates in 1999 and 2006 in Emerging Magnet and Non-Magnet Hospitals (n=136 hospitals)

	1999 Adjusted Mean Outcome Rate			2006 Adjusted Mean Outcome Rate		
Outcome	***Magnet (n=11)***	***Non-Magnet (n=125)***	***P Value***	***Magnet (n=11)***	***Non-Magnet (n=125)***	***P Value***
Patient Outcomes						
30-Day Surgical Mortality (per 1,000 patients)	2.44	2.56	0.52	1.28	1.51	0.05
Failure-to-Rescue (per 1,000 patients)	6.82	6.77	0.93	4.04	4.43	0.21
Nurse-Reported Quality Outcomes						
Excellent Quality of Care on Unit	36.78	35.32	0.44	37.98	28.82	0.02
Confident in Patients' Ability to Manage Care When Discharged	36.24	34.00	0.41	59.56	48.90	<0.001
Confident that Management Will Act To Resolve Reported Problems in Patient Care	28.70	27.50	0.69	48.39	35.07	<0.001
Nurse Job Outcomes						
Burnout	39.79	43.55	0.08	29.67	38.36	<0.001
Job Dissatisfaction	38.10	40.73	0.34	21.23	30.87	<0.001
Intent to Leave	24.75	21.65	0.05	8.86	13.40	<0.01

Notes: Adjusted nurse job and nurse-reported quality outcome rates accounted for nurse age, sex, full-time status, and unit type in 1999 and 2006, and were weighted for the number of responding nurses in the hospital in each year. Outcomes reflect rate per 100 nurses. Patient outcome rates accounted for patient age, sex, emergency admission, transfer status, comorbidities and surgical DRG type. Patient outcome rates were weighted for the number of surgical patients in the hospital in each year. Two-sample t-tests were used to compare Magnet and non-Magnet hospitals in each year.

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Table 4

Regression Coefficients for Changes in Patient and Nurse Outcomes Associated with Magnet Recognition (n=136 hospitals)

	Emerging Magnet vs. Non-Magnet					
	Unadjusted			*Adjusted*		
Patient Outcomes	***Estimate (Difference of Changes)***	***Standard Error***	***P Value***	***Estimate (Difference of Changes)***	***Standard Error***	***P Value***
30-Day Surgical Mortality (per 1,000 patients)	−1.97	0.83	0.02	−2.36	0.89	<0.01
Failure-to-Rescue (per 1,000 patients)	−5.64	2.45	0.02	−6.07	2.64	0.02
Nurse-Reported Quality Outcomes						
Excellent Quality of Care on Unit	8.80	2.12	<0.001	9.29	2.28	<0.001
Confident in Patients' Ability to Manage Care When Discharged	7.55	2.18	<0.001	8.70	2.29	<0.001
Confident that Management Will Act To Resolve Reported Problems in Patient Care	12.87	2.24	<0.001	11.97	2.43	<0.001
Nurse Job Outcomes						
Burnout	−6.82	2.20	<0.01	−7.30	2.39	0.003
Job Dissatisfaction	−8.72	2.11	<0.001	−8.76	2.29	<0.001
Intent to Leave	−6.79	1.41	<0.001	−6.06	1.50	<0.001

Notes: Unadjusted nurse and patient outcome models accounted for baseline outcome rate. Adjusted nurse job and nurse-reported quality outcome rates accounted for nurse age, sex, full-time status, and unit type in 1999 and 2006. Outcomes reflect rate per 100 nurses and were weighted for total number of nurses in the hospital across both study years. Patient outcome rates accounted for patient age, sex, emergency admission, transfer status, comorbidities and surgical DRG type. Difference models controlled for baseline outcome rate, concurrent changes in nurse staffing and percent of nurses holding a BSN, and hospital characteristics (bed size, technology status, and teaching status). Patient outcome models were weighted for total number of surgical patients in the hospital across both study years.

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