



Improving Pediatric Patient Outcomes

Comparing Two Case Management Models

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ABSTRACT

Purpose of the Study: Case management (CM) is a growing and evolving profession. Outcomes-based research that identifies the role of CM is needed in health care today. Case management has been recognized as a way to help patients experience high-quality and cost-effective care. The purpose of this nonexperimental, retrospective research study was to examine two CM models and their effect on patient outcomes, including length of hospital stay and readmission to the hospital within 30 days of discharge with the same diagnosis.

Primary Practice Setting: The study was completed at two acute care pediatric hospitals in separate geographical regions of the country.

Methodology and Sample: Two CM models were compared by conducting a retrospective patient chart review. Seven hundred pediatric patient charts were reviewed to determine whether the patient outcomes met patient outcomes of interest. All patients were diagnosed with asthma and were between the ages of 2 and 18 years.

Results: Analysis of data indicated that the length of hospital stay at Hospital A was significantly shorter than the length of hospital stay for patients admitted to Hospital B. However, hospital readmission rates within 30 days of discharge at Hospital A versus Hospital B indicated no significant difference.

Implications for Case Management Practice: Further research that examines different CM models must account for variables such as complexity of disease process, age of patient on admission to the hospital, and relevance of discharge teaching.

Key words: case management models, hospital readmission, length of stay

Every health care setting in the country is searching for ways to bring cost-effective changes to the industry. Research has demonstrated that the implementation of various case management (CM) models have had an important influence on cost savings and quality care, as well as enhanced patient satisfaction (Huber, 2006; Lu, Su, Tsay, Lin, & Lee, 2007). The purpose of this article was to discuss a comparison of two CM models and their effect on patient outcomes: length of acute care hospital stay and hospital readmission rates. Given that CM has the ability to positively impact patient care, it is important to compare the effects of CM models on patient outcomes.

There are many types of CM models. The research describing specific CM models contributes to our understanding of CM within a designated area of health care. Unfortunately, when it comes to CM programs, there is no universal reference model (Huber, 2002; Urden, 2003). This has led to role confusion and potential conflict for CM (Daniels & Ramey, 2005; Huber, 2006; McGeehan and Applebaum, 2007; Smith, 2011).

Rideout (2007) completed a study comparing CM models with hospitalized, adolescents with cystic fibrosis. The comparison was made between an older CM model, which includes a hospital case manager who reviews patient discharge needs upon the request of the hospitalist and a more comprehensive model that implemented a unit-based, pediatric nurse practitioner care coordinator. The primary focus was to understand the effects of the comprehensive model. The assumption was made that the newer model would show that children would have better experiences and more positive outcomes than under the old model. A chart audit was completed that collected patient outcome data from the patient's previous and current hospital records. A pre-test post-test design

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included all children in a 6-month period admitted for pulmonary exacerbation. Each child's experience was measured against previous admits with particular outcomes that included timeliness of inpatient consultation, changes in pulmonary function tests, weight gain, length of hospital stay (LOS), and patient/parent and nursing/medical staff satisfaction. A total of 21 patients completed the study. Compared with a patient's previous admissions, there was a reduction in the time to complete consultation by ancillary services for the group that had a pediatric nurse practitioner as a case manager. The difference between expected LOS and actual LOS was reduced by 2.47 days ($p = .06$). Actual LOS was decreased by 1.35 days. Parent/patient satisfaction was high as was health care provider satisfaction. The results indicated that inpatient pediatric nurse practitioner care coordinators for cystic fibrosis patients admitted to the hospital could reduce the time for ancillary service consultation, reduce LOS, and improve patient and health care provider satisfaction. Strengths of the study included increased patient and provider satisfaction as well as decreased LOS.

In a retrospective, causal comparative study completed by Thomas (2009), two models were compared and contrasted to identify a relationship between specific structure, role definitions, and role functions in CM delivery that led to organization success. The traditional care model was defined as one where the case manager's primary responsibilities were discharge planning and utilization review. The comparison model (a full immersion model) included daily chart review, electronic documentation, and communication with a multidisciplinary team. The study included 39,017 medical, surgical, and cardiology inpatients who received care on general, intermediate, and intensive care units. Researchers looked at the relationship between application of utilization principles, defined case manager role, electronic documentation, and LOS by unit of care with the traditional versus full immersion models.

In examining the LOS in the traditional and full immersion models, patient care for the full immersion model had a lower LOS by 1.57 days overall. In the traditional model, the mean LOS was 8.7 days and the median was 5.9 days. With the full immersion model, the mean LOS was 7.12 days and the median was 5.0 days. Statistically significant differences were

found on all clinical specialty units ($p = .001$) at the 95% confidence level. Statistically significant results were noted, leading to the recommendation of the full immersion model.

Steele, Hamilton, and Arnaout (2007) describe outpatient dialysis patient care as difficult to manage. The authors proposed that CM would improve patient outcomes in the hemodialysis setting. The newly developed case manager's role included several activities: admitting new patients, reviewing monthly labs including renal clearance, educating and assisting nurses with the clinical pathways, reviewing access flow charts and daily weights and taking measures to prevent unnecessary hospitalizations. The nurse case manager followed 111 patients in three outpatient units. The patients were in a cohort seen by three MDs and two dialysis nurses. Data were collected between the first quarter of 2003 and the fourth quarter of 2005. The authors compared data within the 12-month period of January through December 2003 before the case manager practice was introduced. Overall, the results on patient outcomes were positive. Patient deaths decreased. The renal clearance rate of the dialysis treatment increased. Hospital days for 2003–2004 patient days increased to 19.44 the first year, but decreased to 14.39 days the second year. The authors concluded that the introduction of the nurse case manager led to positive patient outcomes such as decreased hospital LOS, more effective dialysis, and fewer patient deaths.

In a randomized controlled trial of elementary students who had been diagnosed with asthma, researchers wanted to know whether a nursing CM intervention significantly improved outcomes related to school attendance and hospital utilization in an urban school district. The 14 elementary schools were randomized according to CM intervention or control (usual care). The schools were selected on the basis of zip codes known to have a high incidence of emergency department admissions or hospitalization. Eight schools were randomized to a CM approach and six to usual care (UC) conditions. In CM schools, nurse case managers met with students and parents weekly from October to May to teach and coach students on asthma knowledge and treatments. Routine school nursing services were provided in UC schools.

The results showed that students in CM schools had fewer school absences than students in the UC schools. Case management students also evidenced significantly fewer emergency visits than students in the UC schools. In Year 2, the original eight CM Schools became "booster schools," where returning students received educational sessions once each semester and answered an average of 70% of the knowledge questions correctly. Strengths of the study included the rapport the project staff developed with

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the school staff. The project staff helped the educators understand the benefits of a positive outcome for the asthma education project (Levy, Heffner, Stewart, & Beeman, 2006).

Case managers have the ability to significantly affect quality patient outcomes and the viability of the health care system by educating providers and patients. However, there is a lack of empirical research on specific CM models. The following section describes the methodology and design of a study that examines two CM models.

METHODOLOGY

A nonexperimental retrospective review of inpatient hospital charts to evaluate two CM models was completed with respect to patient outcomes, LOS, and frequency of hospital readmission within 30 days of discharge using the diagnosis asthma. The study allowed the researcher to examine the correlation between actual numbers of inpatient hospital days and hospital readmissions while particular CM models were in practice. The research study was designed to fill the gaps in the literature. Two questions were examined:

1. To what extent does the length of hospitalization for patients managed under Hospital A CM model differ from the length of hospitalization for patients who are managed under Hospital B CM model?
2. Does hospital readmission rate within 30 days of discharge differ between patients managed under Hospital A CM model and patients with the same medical diagnosis who are managed under Hospital B CM model?

A purposive, nonprobability, convenience sampling was selected for the study. Data were extracted from the electronic medical records of 350 patients hospitalized at a Midwestern pediatric acute care hospital (Hospital A) and 350 patients at a Western pediatric acute care hospital (Hospital B). Cohen's power table was used to determine sample size for sufficient statistical power. The independent *t* test was used to study the LOS patient outcome. The χ^2 test of independence was used to examine differences in hospital readmission frequencies.

Both hospitals are members of the Child Health Care Corporation of America, whose goal is to network with 43 of the nation's leading, noncompeting children's hospitals for continuous improvement (Child Health Care Corporation of America, 2009). Both hospitals have gained magnet recognition and accreditation by the Joint Commission on the Accreditation of Healthcare Organizations (2010). The two hospitals were also selected on the basis of relative

size (Hospital A = 250 inpatient hospital beds, Hospital B = 284 inpatient hospital beds), approximately the same number of medical specialties that serve patients in the community, and approximately the same number of patients admitted each year with asthma. Both hospitals are not-for-profit teaching hospitals affiliated with state universities that enroll nursing and medical students. Both institutions have been ranked in *US News and World Report's* Top 10 Children's Hospitals for the last 7 years. Each facility conducts similar orientation programs; the nurse CM orients the new case managers to the policies and procedures for their first 2 weeks of employment as case managers. All case managers are required to have 3 years of pediatric nursing experience. All case managers must be registered nurses. Typically, each case manager has an assigned caseload of 25 patients to follow each day.

The first model of interest in the study is one that guides CM practice at a pediatric acute care facility in the Midwestern United States. For purposes of this research study, the model is titled "Hospital A case management model." Within this Hospital A model, the first responsibility of the case manager is that of utilization management. The case manager reviews each patient's medical chart in accordance with the utilization management procedures to determine appropriateness of admission and continued stay under the InterQual criteria (InterQual, 2010). Using the information gained from reviewing the medical records, he or she communicates clinical information to payers such as private insurers for health care reimbursement. Authorization or certification is obtained for continued stay within payer guidelines. The case manager documents certification of the hospital stay, outcomes, and level of care. Level of care refers to whether the patient qualifies for inpatient or observation status (St. Louis Children's Hospital, 2010).

Case managers who practice under the Hospital A CM model are also responsible for discharge planning. When the hospital physician or provider identifies a need for ongoing health care for the patient after discharge, he or she contacts case management. The case manager assesses, plans, implements, and evaluates the patient's plan of care to facilitate a safe transition to the outpatient setting, usually back home. The case manager coordinates the referral process by providing families with information about home care services. Most private insurers have a list of preferred home care agencies that will be covered under the patient insurance policy. If the home care services are outside of the metropolitan area, then the case manager arranges the home care (St. Louis Children's Hospital, 2010).

The utilization and discharge planning are then evaluated to assess their impact on patient outcomes.

The Hospital A CM model is similar to the CM role in many health care settings (Huber, 2006; Rossi, 2003). Case managers are assigned to patients according to hospital inpatient units and document data in electronic records. Patient caseload for case managers at Hospital A varied, depending on requested need. Fewer full-time case managers were employed at Hospital A, during the time of the study. Case managers participate in the planning, implementing, and evaluation of CM goals and the hospital strategic plan.

The Hospital B CM model guides the CM practice at an acute care pediatric hospital in the Western United States. The case manager completes utilization management by reviewing the medical records of each pediatric patient. The review includes assessment to ensure that medical necessity is evident for the level of care according to InterQual criteria (Mitus, 2008). This is communicated to the payer. In addition, the case manager utilizes knowledge of resources outside the hospital to provide efficient and effective coordination, collaboration, and management of resources so that care can be provided postdischarge for the patient and family consistent with their insurance benefits. Case managers utilize their knowledge of clinical care for their patients to implement a plan for care that is timely while hospitalized and effective to meet their postdischarge needs. They are also responsible for coordinating the plan for discharge, ensuring that the patient receives the teaching and training they need for their transition to home. The case manager leads the interdisciplinary team process in this model through continual ongoing communication and collaboration to streamline patient care. Case management coordinates patient specific care coordination rounds and high-risk meetings to foster interdisciplinary coordination and communication for a timely discharge.

(The Children's Hospital, 2010). The outcomes for this research are indicated in both models as patient outcomes and include hospital length of stay and readmission within 30 days of hospital discharge with the same diagnosis. Table 1 illustrates the comparison between the Hospital A CM model and the Hospital B CM model.

Inclusion criteria for subjects included inpatient admission at one of the hospitals between September 2007 and August 2009 and whether they were readmitted within 30 days of discharge with the same diagnosis. Only patient aged 2–18 years old were included and all were diagnosed with asthma on admission. The Institutional Review Board at both hospitals and the University of Northern Colorado granted exempt certification before the study began.

FINDINGS

Analysis of data suggested that there was a statistically significant difference in length of stay for patients admitted to Hospital A versus patients admitted to Hospital B; there may or may not be a clinically significant difference. In clock hours, the difference between the mean length of stay for Hospital A and the mean length of stay at Hospital B was approximately 8 hours.

Patients admitted with asthma to Hospital A had an average length of stay of between 1.900 and 2.1911 days and a mean length of stay ($M = 2.05$, $SD = 1.38$). Patients with asthma admitted to Hospital B had an average length of stay between 2.1882 and 2.4804 days, with a mean length of stay ($M = 2.33$, $SD = 1.39$). A t test calculated with the means of the two separate groups suggested that there was a statistical difference, but not necessarily a clinically significant difference, between the length of stay between

TABLE 1

Comparison Between Hospital A Case Management Model and Hospital B Case Management Model

Hospital A	Hospital B
Discharge planning for patients when a referral is made	Discharge planning is completed for each patient admitted to the hospital Discharge teaching with family and patients completed or supervised by case management
Utilization review completed when payer source contacts the hospital	Utilization review completed on each patient admitted to the hospital
No rounds	Interdisciplinary rounds coordinated and led by case management Interdisciplinary rounds on each patient daily
No high-risk meetings	Case managers retrieve data about high-risk patients Patients are discussed at high-risk meetings if they have a stay of 1 week or longer in the hospital
Patient outcomes: hospital readmission within 30 days of discharge with the same diagnosis	Patient outcomes: hospital readmission within 30 days of discharge with the same diagnosis
Patient outcomes: length of hospital stay	Patient outcomes: length of hospital stay

Hospital A and Hospital B. The p value was .006 with a calculated t of -2.75 .

The t test for effect size for differences between the length of stay and the two models yielded a minimal effect size of 0.01. The statistical measure suggested that the strength of the observed differences between the two hospitals was low (Gall, Gall, & Borg, 2007). One of the variables included in this research study was patient age. No recently published research studies compared age, length of stay, and CM models. In this study, the minimum age in the samples was 2.1 years and the maximum age was 18 years. Mean age at admission for Hospital A was 8.2 years with an SD of 4.38; for Hospital B, the mean age was 6.8 years with an SD of 3.8. Using the t test to compare the difference in age on admission, t was calculated at 4.39 with $p < .0001$. This suggested that there was a statistical significant difference in age of admission between Hospital A and Hospital B. Ages of children admitted to Hospital A ($M = 8.16$, $SD = 4.38$) were more than children admitted to Hospital B ($M = 6.8$, $SD = 3.79$, $t = 4.39$ $p < .0001$, $df = 698$), while length of stay was found to be shorter in Hospital A ($M = 2.05$, $SD = 1.38$) compared with Hospital B ($M = 2.33$, $SD = 1.39$).

In this research study, χ^2 test was used to determine differences between hospital readmission rates with the same diagnosis within 30 days of discharge. The patients in this study were either readmitted or not to the hospital within 30 days of discharge with asthma. The data were categorized on the basis of this information. A zero indicated a response of no, meaning patients were not readmitted to the hospital within 30 days of discharge with the same diagnosis of asthma. Number 1 in the column indicated yes: the patient was readmitted within 30 days of discharge with the diagnosis of asthma. The χ^2 number of readmitted patients to either hospital was small:

six patients were readmitted to Hospital A with asthma within 30 days of discharge and five patients were readmitted to Hospital B with asthma within 30 days of hospital discharge. The calculated χ^2 was not significant in showing a difference in readmission rates between the two facilities. The logistic regression analysis did not enable the researcher to predict hospital readmission within 30 days of discharge between Hospital A and Hospital B. No significant relationship existed between readmission and CM type. Table 2 illustrates the comparison of the differences in LOS and readmission rates for each hospital.

Factors that might have influenced hospital readmission within 30 days of discharge was the quality and comprehension of the discharge teaching. If case managers completed the discharge teaching with families, this would be directly related to the study. Other variables would need to be considered, such as patient and family understanding of the disease process, resources available to patients that help prevent exacerbations, and patient compliance. The sample size of patients readmitted to either hospital was small, which might be considered a limitation.

Even though efforts were made to include hospitals that were comparable with one another, hospitals might differ in the variety of services offered. If there are more complex services available to patients, providers may include these services and this can affect the length of stay, both positively and negatively. In this study, the researcher could not identify whether the rate of asthma and severity of the disease were higher in one area of the country than another area. Limiting factors related to the health care team's understanding of the role of CM could have affected length of stay. If the health care team requested CM for patients, it is hoped that patients would be provided with resources to help them in the outpatient

TABLE 2
Comparing Differences in LOS and Readmission Rates for Each Model

	Hospital A	Hospital B
Total number of patients in study	350	350
LOS		
Mean	2.0457 days	2.3343 days
Minimum	1.0 days	1.0 days
Maximum	11.0 days	10.0 days
Readmission		
No readmission with 30 days of discharge	344/350 patients	345/350 patients
Readmission within 30 days of discharge with same diagnosis	6/350 patients	5/350 patients

Note. LOS = length of hospital stay.

setting. Identifying which patients in Hospital A had case managers was not possible.

IMPLICATIONS FOR NURSING CASE MANAGEMENT

Knowledge gained from this study advances the body of knowledge for nurses and nurse case managers. The knowledge gained is distinctive to nursing CM practice. Nurse case managers are seeking frameworks to guide their practice. The two models of interest in this study have not been previously studied and this study identifies ways for replicable research in the area of CM. Thus, the knowledge gained may lead to further inquiries that may help to identify a standard CM model for the future (Fain, 2009; Fero, Herrick, & Hu, 2011).

Both hospitals included in this study have obtained magnet status. To maintain this magnet status, nurse case managers will need to continue outcomes-based research, such as this research study (American Nurses Credentialing Center, 2010). Case management research remains in its initial stages. This research study identified models of CM practice that nursing case managers can present to nurse leaders, health care providers, and allied health care disciplines about CM, evidenced-based practice. The need for clinical research is growing because the demand for reporting outcome data will undoubtedly be linked to third party reimbursements to a greater extent in the future (Goode, 2005; Houser & Oman, 2011).

According to the published literature, health care administrators do not adequately understand the role of case managers (Hopkins & Ramsundar, 2006; Mullahy, 2009). Sharing study findings will lead to discussion of the role of CM and the influence that CM may have on hospital and agency policy (Mullahy, 2009). This research and other outcomes measurement research should be shared with nursing and hospital administrators on a regular basis to identify best nursing CM value (Fero et al., 2011; Hendren, 2010). This activity will enhance the visibility of CM in health care and help administrators to understand the value case manager's offer to quality patient care.

Effectiveness cannot exist without quality; likewise, quality cannot exist without positive outcomes. Further CM research is needed to delineate causal relationships between structure, process, and outcomes specific to controlling health care costs. Research that helps nurse case manager's measure, evaluate, and validate what they do and how their services affect the nation's health care is necessary. Reducing hospital readmission is one way to reduce the cost of health care. Examining the effects of discharge teaching, patient compliance, and adequate

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resources controlled by the actions of case managers will be insight.

At the onset of the study, the researcher thought Hospital B CM model would lead to shorter patient stays and fewer hospital readmission rates. The findings did not indicate that this was true. Patients admitted to the hospital with a more comprehensive plan, Hospital B, had the longer length of stay and there was no statistical significance in readmission rates between the two hospitals. The author continues to recommend that CM aim for an interdisciplinary, comprehensive approach exhibited in Hospital B CM model.

The study findings also suggested that there was a statistical significant difference in age at admission between Hospital A and Hospital B. Case management research should focus on age at the time of hospital admission, because this study suggested that patients who were younger had a longer length of stay. Is there a difference in length of stay between different aged children? Examining variables such as age at time of diagnosis might reveal valuable information about patient outcomes. Questions to ask include the following: Do patients, who are older on admission to the hospital, understand how to treat their disease more effectively? Does age have an effect on readmission rates? What signifies a clinically significant difference in length of stay between two different hospitals?

Additional CM research should include the study of patients with comorbidities, their length of stay, and CM activities. Patients with complex medical problems may benefit from longer length of stays. It may be more cost-effective than discharging the patient, just to have them readmit within 30 days of hospital discharge. Measuring the effects of CM in complex patient outcomes may help to understand how CM activities make a difference in patient outcomes. Questions to consider asking in future studies include the following: What is the relationship between discharge planning/teaching and hospital readmission rates? Is there a difference in patient outcomes related to discharge teaching? How can case

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managers know whether the readmission outcome is related to CM discharge teaching or patient compliance? Nurse case managers should study barriers that prevent patients from following patient teaching and discharge planning. Their study should also include ways to prevent exacerbation of illness and hospital readmission.

Identifying characteristics of patients in the group that was readmitted to the hospital within 30 days of hospital discharge and comparing them with the group of patients who are not readmitted shortly after hospital discharge may shine light on the effects of CM on patient outcomes. Multiple linear regression equation statistics may be helpful in examining extraneous variables that can affect outcomes in future studies.

Additional CM research could focus on age at the time of hospital admission. This study suggested that patients who were younger had a longer length of stay. Is there a difference in length of stay between children of different ages? Examining variables such as age at time of diagnosis might reveal valuable information about patient outcomes. Questions to ask include the following: Do patients, who are older on admission to the hospital, understand how to treat their disease more effectively? Does age have an effect on readmission rates? What signifies a clinically significant difference in length of stay between two different hospitals?

More research is needed to provide evidence on the value of CM in health care. There is often conflict between doing what is best for the patient and meeting the needs of the health care agency's cost-effective measures. Research that identifies ways to assign value to health promotion teaching for which CM is responsible is going to be important in the age of health care reform.

Although this study examined two CM models and their association to patient outcomes, additional research needs to include ways to identify how case managers themselves can influence patient outcomes and patient experiences. The relationship that case managers develop with patients and families has an effect on patient satisfaction and outcomes. What role does CM play in the patient experience? What can CM control and what is the result of other variables

such as patient compliance or inadequate health care resources?

Are there differences in demographics that can affect length of stay? Do certain ethnic groups experience more severe disease that leads to longer hospital stays or more frequent readmissions that may benefit from quality CM practice? These are questions to consider in further research studies.

Although we do not yet know the effects of health care reform, we do know that changes will be occurring and CM research could lead to positive changes to patient outcomes because of evidence-based practice measures instituted through CM.

This study is significant for the nursing profession because it provides an example of outcomes-based research that is directly influenced by nursing practice, particularly because all of the case managers who implemented the CM models of interest were registered nurses. Increasing the nursing CM knowledge base through empirical research will enhance the quality of CM.

Case managers should continue to serve as leaders in identifying quality improvement indicators and conduct research to illustrate the role that CM has in sustained quality improvement. This research will serve as a catalyst for future research to examine ways to enhance patient outcomes through quality CM interventions.

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