Partnering Specialist Care with Nurse Case Management: A Pilot Project for Asthma

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- Objective: To examine long-term medical utilization and quality of life among asthma patients participating in a combined outpatient specialty care and nurse case management program.
- Design: Longitudinal population study.
- Setting and participants: 46 adult patients with severe asthma referred to a national tertiary asthma care center in Denver, CO.
- Methods: Between July and September 1996, patients were enrolled in a 5 1/2-day intensive specialty care program for asthma that included evaluation, treatment, and education. All patients received peak flow meters and a written asthma management plan. Upon discharge, patients were enrolled in a telephone-based nurse case management program. Patients were followed for 2 years.
- Outcome measures: Number of hospitalizations, emergency department (ED) visits, intensive care unit admissions, urgent physician visits, oral steroid bursts, and days missed from work or school and their associated costs. Quality of life was measured using the Adult Quality of Life Questionnaire.

- Results: Statistically significant improvements in utilization, absenteeism, and quality of life were demonstrated at 6, 12, 18, and 24 months. In particular, at 24 months unscheduled physician visits decreased 84%, ED visits 72%, and days missed from work 78%.
- Conclusion: Combining early comprehensive diagnostic and treatment interventions with long-term telephone-based nurse case management may produce long-term reductions in medical utilization and improve quality of life in patients with severe asthma.

Despite advances in asthma diagnosis and treatment, the prevalence and mortality rates of asthma have increased 75% and 56%, respectively, in the past 15 years [1,2]. As a result, medical utilization, work and school absenteeism, and asthma-related costs have increased, with costs predicted to exceed $14.5 billion in 2000 [3]. More than 17 million persons suffer from asthma [3], but a relatively small number of these patients incur a disproportionate amount of asthma-related costs. In one study, less than 4% of individuals with asthma accounted for 50% of total expenses [4]. Asthma costs accrue primarily through inadequate management of acute exacerbations at home, leading to urgent visits to the physician, hospital, or other health care facility. However, traditional acute care given to patients with asthma exacerbations does not prevent future exacerbations or excessive utilization. In fact, hospitalization in 1 year predicts further hospitalization in the succeeding year [5].

Recent programs to improve asthma management have supplemented acute care with education or intensive case management. However, sustained improvements in utilization or quality of life have not been reported. In a recent study, parents of children admitted to the hospital for asthma treatment participated in a 2-hour educational seminar within 6 months after their child was discharged; however, this single session failed to affect later hospital utilization [6].

We believe that a multifaceted approach is needed to improve asthma management in patients with severe asthma. In 1996, National Jewish Medical and Research Center (NJMRC), a tertiary, national asthma referral center located in Denver, CO, launched a pilot project that combined outpatient specialty care with an aggressive case management model. The asthma pilot project merged 2 existing programs—Time Out for Asthma (TOFA), an intensive, multiday outpatient program, and an ongoing telephone-based case management program that has had demonstrated success [7]. The project
consisted of specialist referral, patient education, case management, and efforts to foster and maintain collaboration between the patient and the health care team. Goals of the project were to reduce medical utilization and work and school absenteeism and to improve patients’ quality of life.

Methods

Participants

Forty-six patients were enrolled in the pilot project between July and September 1996. All participants had been referred from outside of the Denver metropolitan area to NJMRC for evaluation and management of their asthma, were at least 18 years of age, and were classified as having severe asthma, defined by either National Heart, Lung, and Blood Institute (NHLBI) guidelines [8] or previous excessive utilization of medical services. All patients were considered to be unstable or in need of intensive specialist observation and evaluation. None had other pulmonary disease states. Patients were followed for 2 years after entering the project. Patients agreeing to participate provided informed consent as approved by the NJMRC Institutional Review Board.

Intervention

Time Out for Asthma program. TOFA incorporates observation, diagnostic testing, therapy, and education tailored to the needs of each patient. The TOFA team is comprised of allergists, pulmonologists, psychologists, nurses, and respiratory specialists. The program operates 8 hours per day, 5 1/2 days per week, and is comprised of an evaluation and a treatment/rehabilitation phase.

Upon admission to TOFA, patients underwent testing to confirm the diagnosis of asthma and to determine the severity of the disease. Complicating comorbidities such as rhinitis or sinusitis, osteoporosis, and gastroesophageal reflux were identified and treated. Individualized treatment plans were developed by the TOFA team physicians based on NHLBI guidelines. The local physician was contacted regarding the discharge treatment plan and was able to modify the plan as needed once the patient returned home.

All patients admitted to TOFA underwent psychologic testing. When indicated, counseling for the emotional side effects of severe asthma was provided and arrangements were made for follow-up care in the home. Concerns regarding patient compliance were addressed through education and reinforcement.

TOFA enlists patients and their families as full partners in the care and management of asthma. Thus, education was a fundamental component of the program. The medical staff taught patients and their families about the inflammatory nature of asthma and the importance of compliance. Nurses met individually with patients to instruct them on issues such as environmental control, self-monitoring skills, and proper use of metered-dose inhalers and peak flow meters.

NHLBI guidelines recommend providing patients with a written asthma management plan. In the TOFA program, an Asthma Action Plan (AAP) was created for each patient using the individualized treatment plans developed earlier. AAPs were developed collaboratively by the patient’s NJMRC physicians and the local referring physician and periodically updated by the local physician. The AAP listed the medications and doses to be taken daily after discharge as well as the medications to be used when symptoms became worse and/or there was a fall in the peak flow meter readings. The AAP also described when to call the local physician and when to seek emergency care.

Before being discharged from TOFA, each patient was provided a peak flow meter to be used at home and was assigned to a case manager experienced in specialized respiratory care. The case manager met with the patient prior to discharge to assess need for further asthma education and to determine steps to be taken for home environmental control. The most convenient times for the case manager to make telephone calls to the patient were agreed upon.

Nurse case management. Through telephone interaction, nurse case managers used the individual treatment plans to guide patients in their everyday decisions regarding their asthma. As mentioned, these plans were initially developed by the TOFA physicians and later modified as needed by the local physician. In this way, the local physician retained responsibility for all treatment strategies. When not in contact with a case manager, patients used the AAP to guide their decision making. Patients were given ongoing instruction and reinforcement through proactive, regularly scheduled telephone contacts that supported the education received at NJMRC. These calls offered opportunities for the nurse case manager to educate the patient and to assess the patient’s health status; they also gave the patient the opportunity to ask questions and discuss areas of uncertainty. Additionally, patients were encouraged to call their nurse case manager whenever they became symptomatic. During these reactive calls, the nurse obtained information regarding the patient’s symptoms and peak flow readings and directed the patient through treatment steps identified in the AAP. The case manager placed follow-up calls to the patient within 24 hours after any reactive call to assess patient status and to suggest further action when necessary. Such calls provided additional teaching opportunities in cases of noncompliance. With each reactive call, a report was generated and faxed or mailed to the patient’s physician to keep him or her abreast of the patient’s symptoms, severity, and the actions taken to control the exacerbation. Patients were also encouraged to call their case manager whenever they had questions concerning their asthma.
Eight to 12 proactive calls were placed to the patient during the 2 years of the project, while patients averaged 6 calls to the case manager. Case managers found that questions most often pertained to pharmaceuticals, sufficiency of therapy, and consults between their physician/allergist and NJMRC physicians. Case managers were careful not to judge the adequacy of physician instructions; rather, they emphasized to the patient the importance of NHLBI guidelines and following the AAP.

Patients received educational literature written at the appropriate literacy level that covered topics such as understanding asthma, identifying triggers of asthma, recognizing asthma signs, peak flow monitoring, managing medication and supplies, and managing allergic reactions to animals, dust mites, mold, and pollen.

Outcomes Measurement
Indices tracked for utilization and absenteeism included hospital admissions, intensive care unit (ICU) admissions, emergency department visits, unscheduled physician visits, steroid bursts, and days missed from work or other usual activities. Baseline utilization and absenteeism data for the 6 months prior to TOFA admission were gathered through insurance and referring physician records and corroborated by patient history and self-account. Following discharge, utilization and absenteeism data were gathered by case managers with each telephone encounter. For all indices, patients were asked to recall any occurrence “since the last time I spoke with you on [date].” Data were then summed at 6-month intervals after enrollment and compared with baseline. Because of the uniqueness of this severely ill, high-utilizing population, baseline rather than a separate population of asthma patients served as the control against which follow-up data could be analyzed. Signed rank testing was used to statistically evaluate utilization data since the median response for these indices was 0.

The financial impact of the pilot project was determined using the difference between utilization and absenteeism measures at baseline and at the 6-month intervals. Dollar amounts for each utilization measure were generated through a survey of hospitals and allergist offices. An average billing amount was determined per measure and then multiplied by 0.75 to determine a reimbursement figure comparable to what would be provided by a managed care organization. This dollar amount was then multiplied by the difference between the utilization measures at baseline and the 6-month intervals. A dollar amount for days missed from work or usual activities was obtained through the Bureau of Labor Statistics [9].

The nationally recognized and validated Adult Quality of Life Questionnaire [10] was used to gather quality of life data. This asthma-specific questionnaire uses a 5-point, 0 to 4 scale (4 = poor, 0 = excellent) to evaluate a patient’s responses on 20 questions. These questions address how asthma has impacted the patient’s life during the preceding month and are combined into subsets for evaluation, including total quality of life, breathlessness and physical restriction, mood disturbance, social disruption, and concern for health. A single score for each of 5 subscales is produced, and scores are multiplied by 2.5 to create a value from 0 to 10 (0 = very good, 10 = very poor) for comparison. The baseline quality-of-life survey was administered during the patient admission process. Care was taken to ensure that no educational discussion occurred prior to this data collection. Follow-up surveys were administered for each patient by telephone by an independent agency at 6, 12, 18, and 24 months after enrollment. Data from each postenrollment date were compared with baseline data. Quality-of-life data, being normally distributed and independent with each difference, were analyzed using paired t tests.

Results
Utilization and absenteeism at 6, 12, 18, and 24 months compared with baseline are shown in the Figure; the population number fluctuated across the study due to participant dropout and loss of contact with participants. At 6 months, statistically significant decreases were achieved across all measures and were maintained at 12 months. Decreases in most utilization and absenteeism measures exceeded 65% during the first year of follow-up. At 18 months, all decreases except ICU admissions proved to be statistically significant. Although the number of ICU admissions declined by 54%, this decrease was not statistically significant due to the predominance of 0 values at both baseline and 6 months. Benefits from the project were maintained at 24 months, with most changes being statistically significant.

Financial benefits of the utilization and absenteeism reductions seen at 12 months for a population of 44 participants totaled more than $280,000 after program costs were taken into account (Table 1). Equivalent benefits were realized at 24 months.

Twenty-five participants were successfully contacted for quality-of-life surveying at 18 months. Results (Table 2) show that quality of life improved compared with baseline, with all worries and disruptions dropping by more than 2.8 points on a 0 to 10 scale. These findings proved to be statistically significant. At 24 months after enrollment, 19 patients remained in the study and provided quality-of-life data (Table 2). All subscales showed statistically significant improvements, with decreases from baseline of more than 2.3 points.

Discussion
The participants in the pilot project at NJMRC demonstrated reduced utilization and absenteeism and improved quality of life over the long term, suggesting better compliance and...
ASTHMA PILOT PROJECT

Figure. Utilization and absenteeism at 6 (n = 46), 12 (n = 44), 18 (n = 35), and 24 (n = 31) months compared with baseline. ED = emergency department; ICU = intensive care unit.
successful management of their asthma. We feel that a number of components contributed to the relative success of the project. During their stay at NJMRC, patients and physicians had the opportunity to develop a stronger alliance than that which would occur in traditional acute care settings. In addition, patients received comprehensive testing and treatment to address not only their asthma but any other complicating conditions. These activities enabled the physician to create a written asthma management plan (ie, the AAP) that addressed all identifiable components of the patient’s condition. At the end of their stay, all patients were introduced to their assigned nurse case manager. We believe that this meeting provided an opportunity to strengthen the alliance between the patient, physician, and case manager. A previous study of chronically ill patients found that a more informative and expressive relationship between the patient and physician was associated with better outcomes [11]. In addition, the NHLBI 1997 guidelines [8] identify the partnership between the patient, family, and clinicians as one of the fundamental components of a successful treatment approach.

Nurse case manager intervention provided ongoing reinforcement of the education patients received while in TOFA. Reactive calls created opportunities for early intervention, a critical mechanism for reducing utilization. Research has shown that both early response and the use of written asthma management plans are associated with reduced risk of emergency department visits [12]. During reactive calls, case managers had the opportunity to immediately guide patients through steps in their AAP, helping them regain control of their asthma and appreciate the value of early intervention. Following the completion of a reactive call, information was immediately sent to the patient’s physician and case manager. Further opportunities to educate and encourage appropriate management occurred when patients took the initiative to call their case manager on nonreactive occasions.

There are several limitations regarding this study’s data collection process that should be addressed. Baseline utilization and absenteeism data were collected through the referring physician and patient verification, whereas follow-up data were collected solely by patient account. Further, while patients were asked to verify data at admission by recalling occurrences during the 6 months “prior to coming to National Jewish,” follow-up data were collected with each telephone encounter by asking the patient to recall any incidents “since the last time I spoke with you.” Similarly, quality-of-life data were gathered at baseline by means of a questionnaire completed by the patient, while subsequent data were gathered by telephone interview. Use of telephone interview for collecting data likely had a negative impact on our ability to maintain our population number throughout the study.

The sample size differed between utilization and quality-of-life data because different methods were used to collect each type of data. Case managers gathered objective utilization data, while a data collection company gathered the more subjective quality-of-life data to minimize unwanted bias. Unfortunately, the collection firm had less success in contacting patients. We believe that the case managers were more successful due to the relationships they had built with the patients. Caller-identification devices may have added bias. Unfortunately, the collection firm had less success in contacting patients. We believe that the case managers were more successful due to the relationships they had built with the patients. Caller-identification devices may have added an obstacle for the outside firm.

Finally, the portion of the total population contacted varied somewhat within each 6-month interval due to dropouts, relocations, telephone number changes, and new working hours.

### Table 1. Estimated Cost Savings from Reduced Utilization and Absenteeism at 12 Months

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct cost savings</td>
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<tr>
<td>ED visits</td>
<td>110 @ $383</td>
</tr>
<tr>
<td>Hospitalizations</td>
<td>72 @ $6888</td>
</tr>
<tr>
<td>ICU admissions</td>
<td>13 @ $2250</td>
</tr>
<tr>
<td>Unscheduled doctor visits</td>
<td>243 @ $130</td>
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<tr>
<td><strong>Subtotal</strong></td>
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<td></td>
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<td>Indirect cost savings</td>
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<tr>
<td>Adult days missed</td>
<td>495 @ $89.08</td>
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<tr>
<td><strong>Subtotal</strong></td>
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<td><strong>Total direct and indirect savings</strong></td>
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<td>Program costs</td>
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<td>Average cost for TOFA</td>
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<tr>
<td>Average adjusted case rate</td>
<td>@ $225 per 6 mo</td>
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<td><strong>Total costs</strong></td>
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<td></td>
<td>$353,100</td>
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<tr>
<td>Net savings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$280,369</td>
</tr>
</tbody>
</table>

**ED =** emergency department; **ICU =** intensive care unit; **TOFA =** Time Out for Asthma.

† Cost based on Mushinski M. Average hospital charges for asthma treatment: United States, 1995. Stat Bull Metrop Insur Co 1997;78: 26-32. Asthma hospitalization stays were calculated using the DRG (1998 edition) geometric mean length of stay (4.2 days) for asthma hospitalizations.
‡ ICU admissions were based on a conservative $2250 estimate. Additional hospital days are not included in this index but are rather included under Hospitalizations.
§ Unscheduled physician costs were derived from a survey of allergist offices. Billing quotes from each source were averaged and then multiplied by 0.75 to acquire an estimated managed care reimbursement amount.
For example, some patients were contacted for quality-of-life surveying at 18 months but not at 12 months. Consequently, the subset of the study group that provided the 12-month results may not have included all of those that provided the 18-month results. We were therefore limited to comparing all results with baseline results rather than comparing results from 6-month intervals throughout the study period.

**Conclusion**

Finding the necessary resources to keep chronically ill patients well and avoiding unnecessary acute care services remains a challenge in health care. The project at NJMRC demonstrated that early, comprehensive diagnostic and treatment interventions combined with long-term telephone-based management and an emphasis on the patient–physician relationship can reduce utilization and absenteeism and improve quality of life in patients with severe asthma.

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**References**


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