



## Case Study

# Quality Improvements, Cost Savings, and Efficiency Gains In A Sleep Apnea/Sleep Disorders Clinic Through Application of Automated Patient Screening and Assessment

**Abstract:** Significant savings to the Kaiser Permanente health plan and dramatic increases in physician productivity have been realized in the Rocky Mountain Region Sleep Apnea/Sleep Disorders Clinic through improvements in the collection and application of comprehensive and consistent patient data. Cost savings are calculated at \$0.02 PMPM due to reduced intra-Kaiser referrals and Pulmonologist productivity increases. Pulmonologist productivity gains are estimated by the involved physicians at 300 percent. Quality of care improvements include more rapid diagnosis, reduced data gaps, reduced referrals, and faster initiation of treatment plans. These direct benefits were obtained through 1) automating and systematizing patient data collection with a simple tablet computer, and 2) the use of group medical appointments conducted by respiratory therapists. Several additional benefits unrelated to the data collection process changes were also realized. These additional benefits derived from other modifications to the Clinic's approach to sleep disorder diagnosis and treatment.

**Setting:** The Rocky Mountain Region of Kaiser Permanente (KP) as of November, 2003 totals approximately 432,000 members. The majority of sleep disorder and suspected sleep apnea referrals from primary care Permanente Medical Group (PMG) physicians in the region are made to Pulmonologists, with occasional referrals to ENT surgeons when the need for surgical correction is obvious. The Department of Pulmonary, Critical Care, and Sleep Medicine is located at the 20th Avenue Medical Center in Denver and sees patients referred from the Denver/Boulder area.

**Pre-Modification:** Prior to initiating the new intake methodology described below, the capacity of the Sleep Apnea/Sleep Disorders Clinic was 60 patients per month. Prior to implementing the new data collection model, patients referred to a specialist for sleep disorders or suspected sleep apnea were seen by a Pulmonology or Otorhinolaryngology (ENT) physician, depending on the referrals initiated by the primary care provider. Most patients were referred to Pulmonology. Some patients were referred to both specialists by the primary care physician, creating duplication, delays, and additional cost.

**Modification Implemented:** In 1997, several Kaiser Permanente (KP) clinics were utilizing an automated (rather than paper) form of the Quick Psycho-Diagnostic Screening Panel as supplied by Patient Tools, Inc. (PTI), Denver, Colorado. KP quality improvement and Innovations Center personnel shared details of PTI's automated data collection system with the Sleep Disorders/Sleep Apnea program Medical Director. The Medical Director saw applications for automating data collection in the Sleep Disorders Program and worked with PTI to develop an automated patient intake and data collection process specific to sleep disorders.

Patient Tools, Inc. worked with the Sleep Disorders Program to automate the Clinic's paper intake questionnaire and implement two automated lifestyle and sleep assessment surveys. The total automation process resulted in a survey of over 100 questions answered by the patient on a simplified tablet computer.

Upon completing the automated questionnaire, the tablet device is “docked” to a data-transfer base linked via personal computer (PC) to off site calculation software and a database that stores all patient data. Calculated values and summary information is transmitted back to the Clinic PC in the form of a one-page document for the physician’s use at the first appointment.

**Group  
Medical Ap-  
pointments:**

The process for intake interviews was significantly improved according to the participating physicians. The data collection tablets provided complete and consistent data – the questionnaires are the same for every patient and the questionnaire logic prohibits question skipping.

With the tablets collecting complete and consistent data for every sleep disorder/sleep apnea patient, the Pulmonologists felt comfortable in allowing an experienced Respiratory Therapist (RT) to conduct the first patient visit. This first visit consists of data collection, a video on sleep disorders, patient education, and a group discussion.

To increase clinic throughput, reduce appointment backlogs, and increase patient satisfaction, the physicians determined that group medical appointments (GMAs) were feasible. Following implementation of the new data collection methodology, up to four patients were scheduled for the same group appointment. This 4-person GMA has worked successfully for the past six years. According to Dr. Stelzner, the Medical Director, savings derived from the RT-led GMA would have been impossible without the data consistency and completeness provided by the automated tablet-based tool.

**Sleep Study  
and Other  
Process  
Modifications:**

In addition to implementing the new, streamlined data collection process, Pulmonologists changed the method of obtaining sleep studies. In place of hospital outpatient sleep studies (estimated to cost KP approximately \$2,000 each), home sleep studies were instituted. Patients for these studies were instructed and equipped for the home sleep study by KP respiratory therapists at the time of the group medical appointment. According to the Clinic Medical Director, high sleep disorder scores on the automated assessment help support the validity of the home sleep study.

A second process change implemented as part of the modifications concerned the trial of Continuous Positive Airway Pressure (CPAP) during sleep to attempt to alleviate symptoms. CPAP treatment is now initiated the same day as the first Pulmonologist appointment. Patients are tried on CPAP first, before considering surgery. According to Dr. Stelzner, “When we send a patient to ENT now, they know it is for surgery, and all the up front evaluation is done, the patient has had their sleep study, and they failed CPAP. Our modified approach saves the ENT physicians time too.”

**Post-  
Intervention  
Financial  
Results:**

The direct savings to Kaiser Permanente Rocky Mountain Region due to the computerized intake and assessment data services accrued from two sources. First, the referral process was streamlined by eliminating dual referrals to both Pulmonology and ENT. With better data, Pulmonologists reduced ENT referrals to only those patients clearly in need of surgical intervention, for example, for grossly enlarged tonsils. When referrals to ENT were necessary, the ENT physicians benefited from the extensive workup and sleep data obtained in Pulmonology. The need for an ENT physician available on call to the Sleep Disorders/Sleep Apnea clinic for patient evaluation was also reduced.

The second area of direct savings accrued from the higher productivity of the Pulmonologists who were, with better patient data in hand, able to see approximately four times as many patients in the same clinic hours per week. The length of the initial patient visit conducted by the Pulmonologists dropped from an average of 60 minutes to an average of 15 minutes, thus yield-

ing a 300 percent increase in physician productivity.

Combined, these two savings are estimated to have saved KP over \$100,000 in 2003, or the equivalent of \$0.02 per member per month (PMPM). Savings for the entire project totaled \$5,000,000 over the first five years.

Savings to patients referred for sleep evaluation include both time and money from reduced waiting times for evaluation appointments, faster diagnosis, and more rapid implementation of treatment. These savings were not quantified.

**Post-  
Intervention  
Quality  
Results:**

According to the Medical Director of the Sleep Disorders/Sleep Apnea Program, the collection of patient data in a systematized and automated manner has had several benefits to quality of care:

1. Patient data is collected consistently. Each patient answers the same 100+ questions and completes the same diagnostic assessment questionnaires.
2. Patient data is complete. The logic within the tablet does not allow for skipping questions. The Program's Medical Director states, "Key data elements in the intake process are never missed now due to the programmed question sequence of the data tablet."
3. Patient data from assessment questionnaires can be trended for a single patient longitudinally.
4. Questionnaire and assessment data from all patients can be manipulated, graphed, analyzed, and even exported to other software.
5. All patient data is maintained in a single relational database for research and analysis purposes.
6. Referred patients are assessed, tested, and begun on treatment more rapidly than before due to the faster throughput of the Clinic.
7. The automated intake questionnaire provides more detailed patient data that paper-based systems resulting from computed metrics and scores.
8. Standardization of patient sleep data collected with the automated system allows for comparisons of data across practices within an organization or across organizations to foster development of national comparative data.

Revisions to other aspects of the patient care process have yielded additional quality of care benefits. One example concerns the implementation of CPAP treatment. Under the previous system, an outside vendor was used to initiate in-home CPAP. Under the current system, CPAP masks are fitted in the Sleep Clinic by trained respiratory therapists, resulting in a higher rate of patient success. CPAP treatment is now initiated the same day as the initial physician visit.

**Post-  
Intervention  
Physician  
Benefits:**

Physicians utilizing the tablet-based data collection system report several benefits. First, productivity is greater due to the use of group medical appointments and the efficiency of having a comprehensive assessment completed prior to meeting the patient in the exam room. Second, physicians report increased job satisfaction with the elimination of repetitive questioning of patients (now handled by the computerized intake and assessment).

Dictation time has been significantly reduced with the one-page assessment report provided by the Patient Tools system now in physicians' hands. Third, outcomes management and treatment protocol reviews can be based on large quantities of reliable data.

**Data  
Dashboard:**

Please refer to the illustration for a sample summary report of the data provided to the Pulmonologist by the tablet-based system. The results of the home sleep study accompany this report, providing the Pulmonologist with a comprehensive picture of the patient's sleep data at the time of the first physician contact. A shorter and more focused individual medical appointment with the Pulmonologist takes place. Referrals to ENT surgery are reduced, but extremely efficient when they do occur.

**Master  
Patient  
Database:**

As of early December, 2003, the Sleep Disorders/Sleep Apnea Clinic of the Kaiser Rocky Mountain Region has collected questionnaires and assessments on 5,316 patients seen since 1997 (3,171 males and 2,145 females). All data collected by the tablet-based intake methodology is available to the Pulmonologists for research, analysis, and other uses via a secure, HIPAA-compliant, web-enabled database maintained by the vendor, Patient Tools, Inc. Selected items of the Kaiser Permanente medical record populate this database, however patient name and address are never one of the shared data elements. Next steps in advancing the utility of the data include delivering each patient's assessment to their Kaiser Permanente medical record in electronic format.

Dr. Stelzner believes that such databases can be useful to Kaiser Permanente researchers and quality improvement staff due to the completeness, comprehensiveness, and digital format of the data collected via the intake tablet system. Return visit data and progression of patient progress over time (such as that measured by various lifestyle and symptomatology scores) can also be stored in the same database.

**Future Plans:**

The success of the intake process improvements has motivated Dr. Stelzner to look at other patient care situations in which better data "up front" can reduce morbidity, mortality, and costs. His next focus for automating and systematizing care will likely be the need for prophylactic beta blockers to reduce the incidence of perioperative myocardial infarction. With present paper-based interview and intake assessment procedures, he estimates avoidable myocardial infarctions are occurring due to missed risk factors in his metro Denver hospitals.

**Additional  
Information:**

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