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clinical contributions

Vobs Honorable Mention:
The Kaiser Permanente Therapy Management Strategy (KPTMS)

Introduction

The Kaiser Permanente (KP) Colorada Region serves 338,000 members,[1] 54,000 of whom are enrolled in a Medicare+Choice Program.[2] Postacute care for the Region's members is provided through contracts with five skilled nursing facilities, a transitional care unit, multiple acute care specialty hospitals, home health agencies, and Medicare Part B service providers in more than 90 long-term care facilities. A nursing facility rounding service consisting of seven physicians and three nurse practitioners provides direct services for members in skilled nursing facilities and long-term care nursing facilities and participates in physician-directed interdisciplinary teams. Ambulatory Rehabilitation services for KP members are provided internally by Kaiser Permanente.

In 1998, therapy in the Continuing Care Program was challenged by inconsistency, haphazard direction, and unnecessary expense. Patients who could not benefit from uncomfortable, intrusive, and costly therapy remained in the nursing facility for extended stays despite uncertain benefit. Because of a lack of comparable functional outcome measures across the continuum of care, case management was inconsistent. Sometimes, when we denied therapy we knew would not be beneficial, we appeared to be denying "needed" care; some other therapy was terminated before exhausting its potential to benefit the patient. Often, decisions to continue therapy relied heavily on practitioners who had a financial interest in continuing therapy and therefore had a possible motive for making clinical decisions that did not adequately consider the patient's comfort, clinical outcome, or desire to return home. The KP Colorado Region was spending substantial resources on therapy despite uncertainty about outcome.

The solution to these problems—and the key to assuring quality of care throughout the postacute care continuum—is to develop and implement a strong, patient-centered partnership among facilities, clinical practitioners, patients, and patients' families so that the level of care could be managed using appropriate databases, skilled nursing facility services, and home health services to give patients the right care in the right place at the right time. Case managers and health care practitioners must receive decision support, and quality outcomes must be measured across the continuum of care using a common language in all settings. This objective, outcome-based case management system should benchmark Regional performance against a national database and should unify clinical and financial objectives toward excellence by guarding patients against two costly inefficiencies: underutilization of needed services and imposition of futile therapies. In addition, clinical and financial outcomes must be aligned to better control

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> *Often, decisions to continue therapy relied heavily on practitioners who had a financial interest in continuing therapy.*

Table 1. Kaiser Permanente Therapy Management Strategy (KPTMS) Team members
Contact persons
Glenn Gade MD, Chief of Geriatrics
Beth A Martin, RN, MBA, Director Continuing Care
Personnel
Cindy Talocco, Care Coordinator
Don Backstrom, Care Coordinator
Doug Connor, PhD
Judith Boyd, Case Manager
Jan McIllwaine, Case Manager
Marilynn Brown, Case Manager
Tom Dry, MD
Cheryl Stearns, MD
Paul Wright, MD
Shannon Cupp, MD
Beth Rush-Nollenberger, MD
Ann Hornbaker, NP
Chris Suratt, NP
Sue VanOrden, PT, Regional Rehab Director
Dave Mulica, MD
Carol Barnes, MS, PT, GCS, Outcomes Manager
Linda Smith, RN, NP, Regional Director of Operations
Robin Gunning, MD, Director, Nursing Facility Rounding Service
Affiliates
SeniorMetrix, Inc (formally Nova Care/Polaris)
Reg Warren, PhD
Chris Wirtalla, Systems Analyst
Contract Skilled Nursing Facilities
Boulder Manor Health Care Center
Life Care Center of Longmont
Life Care Center of Westminster
Cherry Creek Nursing Center
Western Hills Care Center
Transitional Care Unit
Exempla St Joseph Hospital
Home Health Agencies
Visiting Nurse's Association of Colorado
Boulder Community Home Care
Medicare Part B Contract Providers
NovaCare
Visiting Nurse's Association
Acute Rehabilitation Specialty Hospitals
Craig Hospital, Mapleton Center at Boulder Community Hospital, Spalding Rehabilitation Hospitals, and Mediplex Rehabilitation Hospital
More than 250 clinicians in postacute care contract network (physical therapists, occupational therapists, speech therapists, registered nurses, social workers)

the cost of postacute services while maintaining clinical outcomes that positively affect total expenses. To achieve these goals, the Kaiser Permanente Therapy Management Strategy (KPTMS) project was implemented in May 1998 and is ongoing (Table 1). The project was conceived and developed under the leadership of Beth Martin, RN, MBA, Director of Continuing Care, and was strongly supported by the executive administration of the KP Colorado Region: Glenn Gade, MD, Chief of Geriatrics; Linda Smith, Director of Operations; and Robin Gunning, MD, Medical Director of the Nursing Facility Rounding Service. The KP Colorado Region partnered with SeniorMetrix, Inc, which contributed much to the success of the project by providing the information systems, training, data analysis, and a full-time, on-site project manager to implement and develop the project. The KPTMS project has achieved ongoing, excellent results, recognition for which belong to the KP Colorado physicians, nurse practitioners, care coordinators, and case managers—as well as the many practitioners in the contract network—who were responsible for day-to-day patient care and operations.

This retrospective study describes outcomes of using the KPTMS at selected skilled nursing facilities, acute care rehabilitation hospitals, home health departments, and long-term care facilities. The study also compares pre- and postintervention results and benchmarks them against national data.

Methods
Subjects

The project was extended across the postacute care continuum to include Home Health services, long-term care, and acute care rehabilitation. The data in this report thus were collected from three groups of patients: patients who received rehabilitation services in SNF's or long-term care from May 1998 through March 2000, patients who received Home Health rehabilitation services from July 1998 through March 2000, and patients who received Acute Rehabilitation services from July 1999 through March 2000.
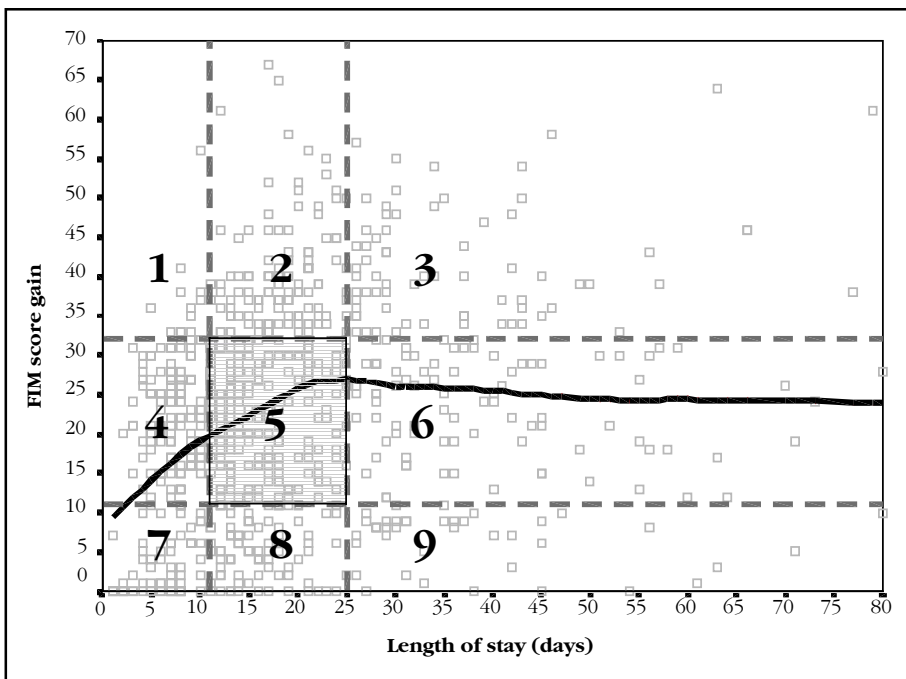

Figure 1. Example of Care Corridor plotted for hip fracture patients. Squares indicate cases managed. The Care Corridor is considered Sector 5. Patient cases outside of Sector 5 each need individual case management strategies.

> *We measured quality by using a well-known, relevant, accepted measure—the Functional Independence Measure (FIM), which quantifies decrease in patient disability.*

Subjects were selected from among all consecutively admitted patients aged 18 years or older who received postacute care rehabilitation (true for 90-95% of all admitted patients) and for whom a complete KPTMS record was available (true for more than 95% of all admitted patients). Patients were excluded from the study if their age was <19 years or >120 years at admission, if length of inpatient stay was <1 day or >100 days, if the patient was admitted >365 days after onset of the condition requiring rehabilitation, or if the patient received >1000 hours of treatment. These criteria thus excluded approximately 6% of patients receiving services under Medicare Part A, 6% of patients receiving services under Medicare Part B, and 5% of patients re-

ceiving Home Health care. The study thus included 10,241 patients, of whom 44% received care in a skilled nursing facility, 41% received Home Health care, 13% received long-term care, and 2% received rehabilitative acute care.

Measures and variables

We measured quality by using a well-known, relevant, accepted measure—the Functional Independence Measure (FIM), which quantifies decrease in patient disability—as the key dependent variable for quality.[3] The FIM measures functional ability in 18 areas of motor and cognitive activities of daily living and produces scores ranging from 18 to 126. The FIM was selected from among other functional measures available in the postacute care setting because it has been used extensively, gives excellent interrater reliability when used in clinical settings,[4] and has effectively predicted discharge status in acute care settings.[5] In addition, change in FIM rating has been shown to correlate with change in burden of care:[6] Each unit of improvement on the FIM scale reflects approximately three minutes less care

needed per day. FIM score was also an important factor in the discharge planning process: patients discharged home alone averaged a FIM score of 108; patients discharged home with help averaged a FIM score of 97; patients discharged to assisted living averaged a score of 85; and patients with a FIM score under 80 required 24-hour care.

In addition to the FIM, three other measures were used: a Medical Complexity Scale, a Quality Index, and a Satisfaction Measure. The Medical Complexity Scale was developed by SeniorMetrix, Inc, and assesses the amount and relevance of comorbidities as they relate to functional disability. Scores on the Medical Complexity Scale ranged from zero ("no systemic disease other than primary diagnosis") to five ("moribund/terminal"); intermediate scores on the Medical Complexity Scale represented conditions described as "premorbid, inactive, and/or irrelevant systemic disease" (score of one), "active, relevant systemic disease not limiting function" (score of two), "active, systemic disease limiting function" (score of three), and "active, systemic disease severely limiting function" (score of four). The Quality Index is an index of quality performance (ie,

quality and effectiveness of care received) adjusted for severity of a patient's disability at admission.

The Quality Index provides a severity-adjusted comparison with historical quality-of-care performance.

Jointly developed by Kaiser Permanente and SeniorMetrix, Inc, the Quality Index provides a severity-adjusted comparison with historical quality-of-care performance (baseline score = 100) and represents the combined, adjusted influences of FIM Gain and rates of patient discharge to the community. We considered Quality Index score to have changed substantially if, at the end of the study period, the score had changed ±5 index points from the historical baseline score.

Independent variables included length of inpatient stay per episode (ie, discharge date minus admission date to postacute care setting), length of inpatient stay per treatment cycle (ie, end date of therapy minus start date of therapy), duration of treatment (ie, total number of hours of physical, occupational, and speech therapy received), and

number of visits (ie, total number of physical encounters in the Home Health setting).

Dependent variables included the FIM at discharge (ie, total FIM score as recorded within 72 hours of discharge from care setting), FIM gain (ie, FIM score at discharge minus FIM score at admission), Quality Index score, length of inpatient stay (ie, number of days per episode or treatment cycle), Patient Satisfaction score, and rate at which patients were discharged to the community (ie, to their home, to an assisted-living facility, to a board-and-care facility, to day treatment, or to a combination of these).

Risk adjustment variables (confounding variables) included age, number of days between onset and admission (ie, admission date minus date of event etiologically related to need for rehabilitation), FIM score at admission (ie, total FIM score representing functional skill of patient within 72 hours of admission), Medical Complexity score (ie, on a scale of 0-5, an ordinal scaling of disability severity and relevance of comorbidities to degree of function during activities of daily living), and patient's identified Impairment Group (ie, a standard grouping method for rehabilitation populations.)[6]

Table 2. Medicare Part A Care Corridors categorized by impairment group									
Impairment group	**No. of outcomes**	**Mean age (yr)**	**Mean no. of days after onset**	**Mean FIM score at admission**	**Mean length of stay (days)**	**Mean FIM score gain**	**Percentage of patients discharged to community**	**Mean Medical Complexity score**	**Mean duration of therapy per case (hr)**
Stroke	136	77	10	63	17	24	60	2.54	107
Brain dysfunction	25	77	18	66	12	18	48	2.72	78
Neurologic	29	71	151	65	10	21	69	2.76	77
Spinal cord	7	69	6	73	10	15	57	1.71	53
Amputation of limb	18	76	14	79	10	16	61	2.72	166
Arthritis	23	71	65	85	7	18	87	2.30	44
Pain syndromes	56	79	4	79	9	18	80	2.45	54
Orthopedic	376	80	10	72	13	21	68	2.46	102
Cardiac	73	82	9	80	10	20	78	2.74	60
Pulmonary	87	79	7	75	8	13	61	3.07	55
Other	249	76	13	75	10	18	66	2.75	57
Developmental Disability	29	82	3	67	12	16	79	2.90	67
Debility	28	77	5	68	11	17	61	2.86	106

Care corridors (Figure 1) classified by impairment group (Table 2) were developed as an innovative standard for measuring utilization or best practices. Using these Care Corridors, practice variation was analyzed to identify "outlier groups" within specific diagnostic categories. For example, a dense concentration of hip fracture cases in a given sector (ie, indicated by high FIM gain and short length of inpatient stay, as in sector 1 of Figure 1) would suggest a need to review admission criteria. Conversely, a dense concentration of cases in a given sector (eg, sector 9 in Figure 1) would suggest a need for the KPTMS Project Team to monitor patient progress more closely. In addition, the KPTMS project provided comparative analysis of facilities in KP's contract network to ensure consistent delivery of high-quality care.

> **The KPTMS project provided comparative analysis of facilities in KP's contract network to ensure consistent delivery of high-quality care.**

A graph (Figure 2) was generated for each patient in KPTMS documenting progress made by the patient during the rehabilitation stay. The graph became part of the patient's medical record at the facility and was entered into KP's CIS system, where the patient's Primary Care Provider can access information about the patient's functional profile.

Data integrity

All clinicians using the measurement tools (more than 350 clinicians, including physical therapists, occupational therapists, speech therapists, physicians, nurses, and social workers) participated in a training

process and were certified by examination. Clinicians participating in the KPTMS project were required to show consistency in using the FIM and Medical Complexity Scale; overall agreement level of 83% was achieved as of March 2000 and was considered sufficient. To be considered in our data analysis, results had to show interrater reliability of 80% or greater among at least 80% of treating clinicians at participating facilities and agencies.
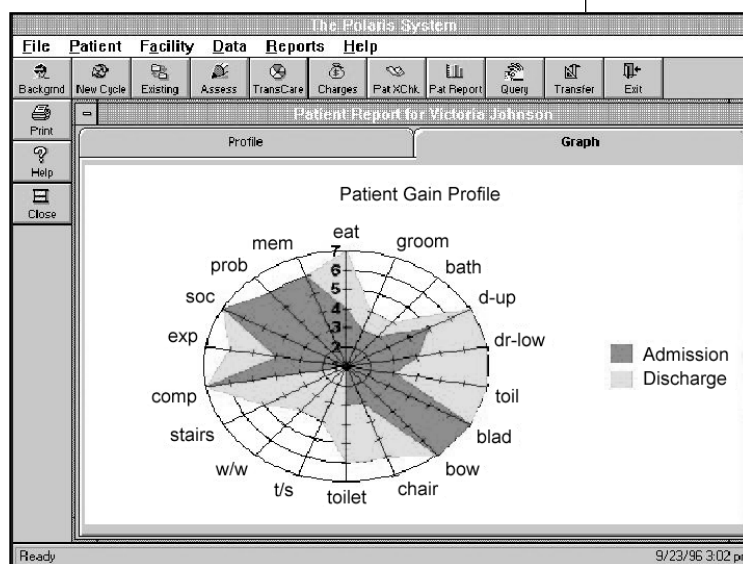

Figure 2. Example of polar graph generated for each KPTMS patient to document progress (indicated by shaded area) in 18 categories of activity during inpatient stay for rehabilitation. Abbreviations for categories: eat = eating; groom = grooming; bath = bathing; d-up = dressing upper extremities; dr-low = dressing lower extremities; toilet = toileting; blad = bladder control; bow = bowel control; chair = transfer to chair; t/s = transfer to tub or shower; w/w = walking or wheelchair mobility; stairs = ability to climb stairs; comp = comprehension; exp = expressive communication; soc = social interaction; prob = problem-solving; mem = memory.

Table 3. Comparison of historical and recent quality outcomes as measured for the KPTMS project						
Variable	**Historical (1997) value**	**July 1998–June 1999**	**June 1999–May 2000**	**Difference**	**p value**	**Statistical test used**
FIM score at admission	81	72	69	-12	p .000	one-sample t test
FIM score at discharge	104	91	90	-14	p .000	one-sample t test
Unadjusted FIM Gain	23	NA	21	-2	NA	NA
Percentage of patients discharged to community	70	71	74	+4	p .001	one-sample t test
Length of inpatient stay per episode	15.8	14.1	13.8	-2	p .000	Independent, two-tailed t test
Length of inpatient stay per treatment cycle	13.9	11.9	11.0	-2.9	p .000	one-sample t test

NA = not applicable
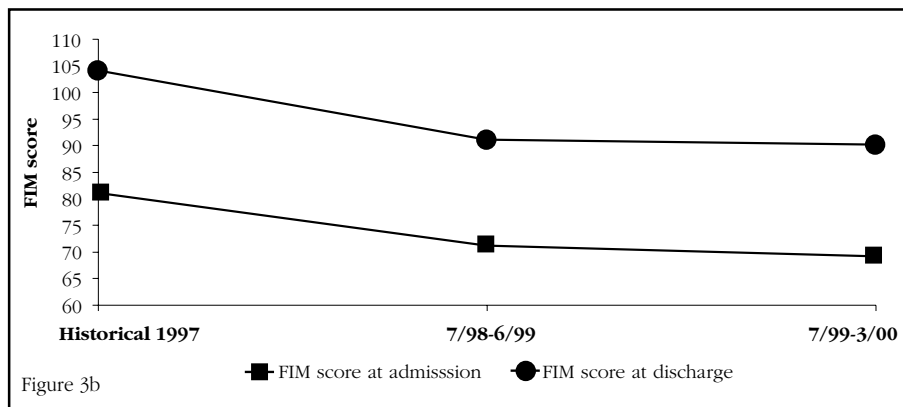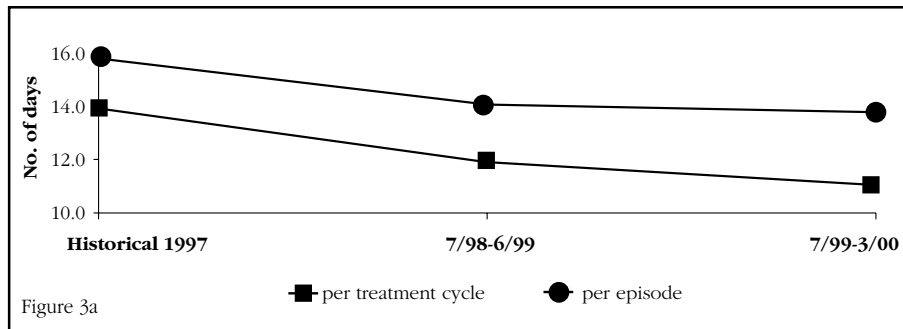
Figure 3a

Figure 3b

Figure 3. Trends for outcomes in KPTMS variables: a) length of inpatient stay per treatment cycle and per episode; b) FIM score at admission and at discharge. Historical records of 200 patients receiving rehabilitation services prior to implementation of KPTMS were available and contained relevant dependent and independent measures. These records were from SNFs used during the KPTMS project and represent a reliable indication of postacute utilization and outcomes prior to the initiation of KPTMS. Not shown: upward trend in mean rates of patient discharge to community (70% for historical 1997, 71% for July 1998 through June 1999, and 74% for July 1999 through March 2000).

Figure 4. Sample calculation of Quality Index result for patient receiving services in skilled nursing facility under Medicare Part A. Multipliers reflect weighting for each quality measure.

Data were audited by medical record review, by weekly review of Outcomes Tracking Logs by the Outcomes Manager, and by outlier analysis in the SeniorMetrix software system database management process.

Statistical analysis

Variables compared in the trend analysis were tested using the one-sample, two-tailed t test ($p < .05$) or using an independent, two-tailed t test ($p < .05$). This procedure was used to compare cumulative sample averages to historical averages. For the Quality Index, percentile change of ± 5 was considered clinically significant.

For analysis of variance, the SPSS software application[7] was used to generate scatterplots of length of inpatient stay vs FIM gain for matched samples and line of best fit. The resulting "lowess" curve was a locally weighted regression curve.

To adjust for severity of disability, matched samples from the KPTMS population were obtained by determining score ranges of ± 1 standard deviation for three variables (age, number of days from onset of condition requiring rehabilitation to date of admission, and FIM score at admission) and by identifying records in the SeniorMetrix database that fell within the score ranges for all three variables. If statistically significant differences between the two samples were found for any variable, the score range for that variable was reduced from ± 1 SD to $\pm .75$ or $\pm .50$ or $\pm .25$ until the difference was eliminated (independent, two-tailed t test, $p < .05$). For comparisons involving multiple diagnoses, distribution profiles were created.

Financial effectiveness goals were established considering Milliman & Robertson standards.[8]

Implementation

We tailored implementation of the KPTMS project to be minimally disruptive to the facility. We also provided decision support to clinical teams along with benchmarks from their own practice. Individual patient reports were used to engage patients and their fami-

lies and to focus on patient satisfaction. We partnered with an outside agency, SeniorMetrix, Inc, which provided information systems, consultation, analysis, and outcome expertise in the area of rehabilitation.

Results

During the initial 21 months of the project, integration of FIM scoring into daily therapeutic decision making and case management improved outcome quality in postacute care settings while reducing medical utilization in those settings. As depicted in Figure 3a, length of stay per episode at a skilled nursing facility has decreased significantly from a historical baseline of 15.8 days to 13.8 days (Table 3). A "natural decline" of .2 days was eliminated from the episode decrease to account for a two-year declining trend in utilization before the baseline period. Meanwhile, number of days of therapy per cycle decreased significantly from 13.9 days to 11 days (Table 3).

Clinical results for functional independence are shown in Figure 3b. Statistically, patients had significantly less disability historically (FIM score of 81 at
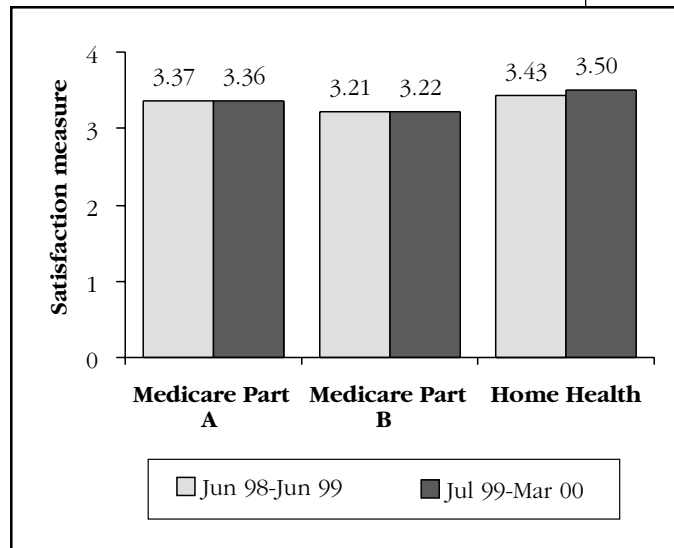

Figure 5. Graphs show Patient Satisfaction scores for patients receiving Medicare Part A services, Medicare Part B services, and Home Health services: mean scaled scores (1 = "poor", 2 = "fair," 3 = "good," 4 = "excellent") assigned by patients in each group when asked to give an overall rating for their therapy experience.

Table 4. Results for quality measures in six-facility KPTMS contract network

Quality measure	Facility					
	1	2	3	4	5	6
Mean length of inpatient stay (days)	11.7	10.3	10.9	13.3	9.8	11.2
Mean duration of treatment (hr)	18	18	20	17	8	18
Mean FIM score gain (index points)	19	24	21	22	16	21
Mean rate of patient discharge to community (%)	81	79	73	76	81	66
Increase in Quality Index score (index points)	6.75	15.75	4.25	13.75	3.50	6.75

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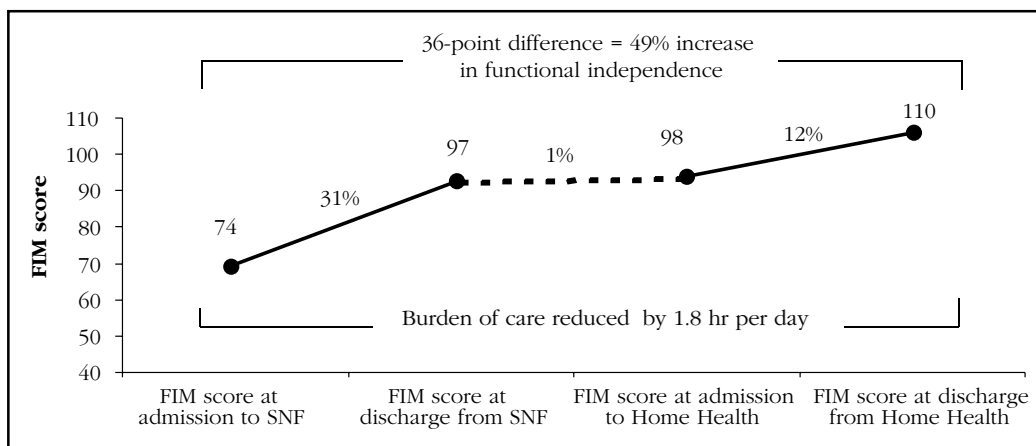

Figure 6. Graph shows KPTMS project outcomes for functional independence of patients who received Home Health services and care in skilled nursing facilities.

admission) than at the end of the study period (FIM score of 69 at admission); and as expected, FIM scores at discharge fell significantly, from 104 to 90 (Table 3). Thus, the resulting FIM gain fell two points, from 23 at baseline to 21 at the end of the study period. However, this difference is unadjusted. Despite lower FIM scores at discharge, significantly more patients were discharged to the community (Table 3), probably because of the integration of Home Health services during the second year of the KPTMS project.

The KPTMS project resulted in a Quality Index score of 107.56 (Figure 4), which represents a substantial improvement in quality outcome. Results for quality measures at the six facilities in the KPTMS contract network are shown in Table 4.

Relevant comorbidity—an aspect of the Medical Complexity score—increased statistically significantly during the reporting period: For the first half of the project (ie, June 1998 through May 1999), the mean Medical Complexity score was 2.60, whereas the score was 2.70 for the second half of the study period (ie, June 1999 through March 2000) (p < .003).

Figure 5 shows Patient Satisfaction results. Throughout the project, patients variably evaluated their preparedness to be discharged from the skilled nursing facility setting. At the end of the study period, the most recent scores for Patient Satisfaction were almost identical to those recorded during the earliest quarter of the KPTMS project, when mean length of inpatient stay was two days longer. Nonetheless, overall patient satisfaction remained at or above the levels recorded early in the KPTMS project, and the combination of reduced length of in-

Table 5. KPTMS project achievements aligned with KP Colorado Regional goals

KPTMS Project Achievements	Regional Goals
• Strong partnerships were formed with ≥300 people in ≥10 different organizations and with ≥30 Health Plan and medical group employees in ≥6 departments	• Improve quality by coordinating and enhancing partnerships • Achieve impressive integration with affiliates
• Care was integrated across the entire continuum of postacute care	• Design and implement integrated systems for delivering care
• Case management decisions now made on objective data and reflect care patterns within facility	• Ensure that medical decisions are evidence-based
• "Care Corridors" developed for 15 impairment groups (Figure 4)	• Establish clinical pathways and standards of care
• Despite more disabled patient population, patients' functional improvement maintained, and patients' discharge rates to community have improved	• Obtain excellent clinical outcomes
• Patient levels of satisfaction good to excellent and remain stable	• Achieve high levels of customer satisfaction
• KPTMS project avoided $1,800,000 in gross costs	• Achieve favorable financial return

Table 6. Quality measure benchmark values obtained in KPTMS project compared with benchmark values recorded in SeniorMetrix database

Quality measure	Benchmark value for patient population		
	Receiving Medicare Part A services at KPTMS skilled nursing facility or tertiary care unit (n = 983)	Receiving Medicare Part A services as recorded in SeniorMetrix database (n = 4069)	Receiving Managed care services as recorded in SeniorMetrix database (n = 1350)
Mean age of patient (yr)	78	81	76
Mean no. of days from onset of condition to admission	9	26	33
FIM score at admission	70	72	72
Mean length of inpatient stay (days)	11.5	19	14
FIM score gain	22	19	20
Rate of patient discharge to community (%)	75	67	76
Mean duration of treatment (hr)	18.75	40.75	23.0
Mean Medical Complexity score	2.68	2.37	2.52

patient stay and improved quality outcomes resulted in avoidance of $1.8 million in gross costs for Medicare Part A services alone.

Table 5 shows how KPTMS project achievements successfully met goals of the project.

When compared with large samples of Medicare Part A records and records of patients receiving care in managed care skilled nursing facilities—records collected from the SeniorMetrix, Inc, Postacute Database, which contains more than 125,000 patient records—participants in the KPTMS project showed equal or better FIM gain and rates of patient discharge to the community as well as fewer required days in skilled nursing facilities and fewer required hours of therapy (Table 6). Changes in cost for different care settings are shown in Table 7.

Figure 6 depicts total patient improvement measured across care settings. The cost efficiency of using this approach is shown in Figure 7: overall cost per case decreased, whereas the cost efficiency of obtaining a unit of functional gain increased. Figure 8 shows that overall variation in utilization was reduced while outcome was maintained.

> ***The primary effect of the KPTMS project was to reduce variation in utilization patterns as well as overall amount of medical utilization while maintaining functional outcomes.***

Discussion

The relation between functional outcome and cost of postacute care has been studied previously; however, those investigations had limited applicability, either because of small sample size[9] or because their conclusions were based on extensive data sets that focused primarily on differences between hospital-based rehabilitation and rehabilitation received in skilled nursing facilities.[10] In addition, although a growing body of literature identifies processes that can be used to evaluate quality of postacute care, scant evidence shows this system assessment to be operational.[11,12] The KPTMS project was therefore designed to find for the skilled nursing facility setting the "opti-mal utilization threshold," wherein functional outcomes were maintained when compared with a historical baseline and with other comparable populations of patients in skilled nursing facilities.

The primary effect of the KPTMS project was to reduce variation in utilization pat-terns as well as overall amount of medical utilization while maintaining functional outcomes, but this result does not always follow reduction in care. For example, preliminary analysis of the recent impact of PPS on rehabilitation outcomes in skilled nursing facilities[13] showed that a 40% reduction in

Table 7. Financial outcomes across the continuum of care in skilled nursing facilities, Home Health departments, Acute Care Rehabilitation facilities, and facilities delivering services under Medicare Part B

	Skilled nursing facility	Home Health	Medicare Part B	Acute care rehabilitation facility
Mean length of inpatient (days)				
1997-1998	15.8	NA		
1998-1999	14.1	NA		35
1999-2000	13.6[a]	NA		22[c]
No. of visits per case				
1997-1998	NA	9.8	6.5	
1998-1999	NA	8.8	5.7	
1999-2000	NA	7.6	4.5[c]	
No. of admissions				
1997-1998	2216			
1998-1999	2091	962		
1999-2000	1966[a]	2300	196[c]	45[c]
Mean cost per visit				
1997-1998	NA	$64	$96	
1998-1999	NA	$64	$82	
1999-2000	NA	$64	$82[c]	
Mean cost per day				
1997-1998	$300			$1000
1998-1999	$300			$1000
1999-2000	$300[a]			$1000[c]
Total cost				
1997-1998	$10.5M			
1998-1999	$8.8M	$541,798		
1999-2000	$8.0M[a]	$1.11M[b]	$72,324[c]	$990,000
Mean cost per case				
1997-1998	$4740		$533	
1998-1999	$4230	$560	$467	$35,000
1999-2000	$4080[a]	$486	$369[c]	$22,000[c]
Mean savings per case				
1998-1999	$510	$67		
1999-2000	$660[a]	$141	$98[c]	$13,000[c]
Total savings				
1998-1999	$1.1M	$88,929	$85,449	
1999-2000	$1.3M[a]	$324,300	$12,700[c]	$88,000[d]

[a]1999-2000 results extrapolated from March 1999 statistics.
[b]Although Home Health costs rose, overall savings to system increased from less care required at skilled nursing facilities while quality maintained.
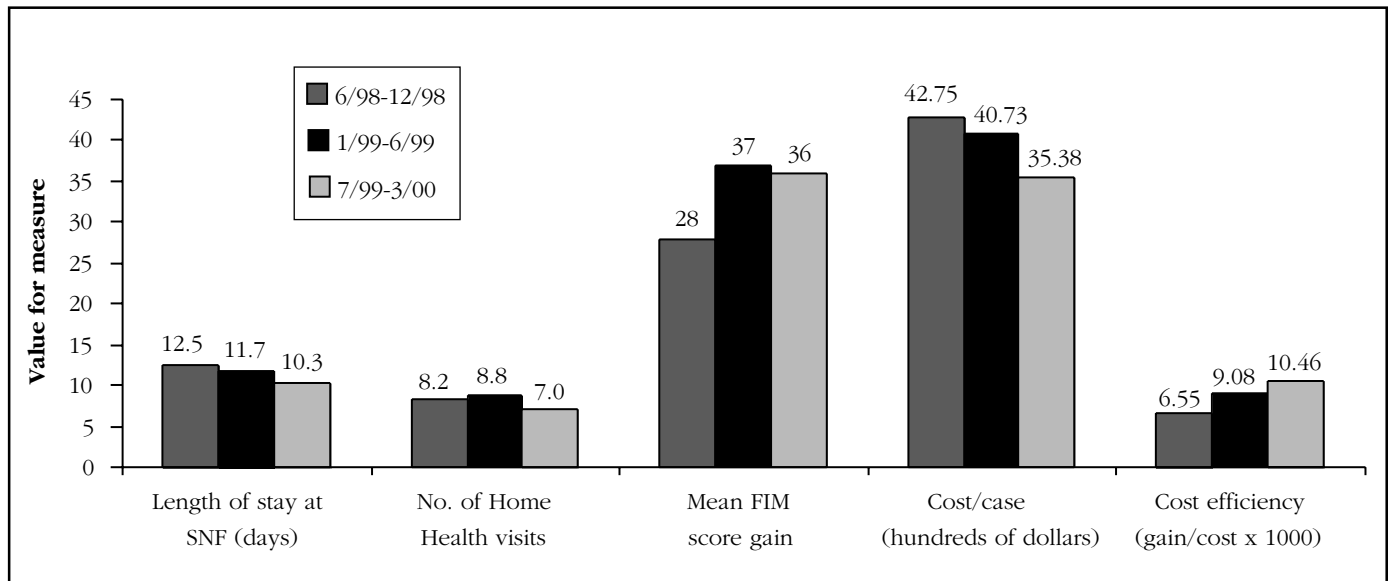[c]For six months.
[d]Agreed-upon maximum savings.

Figure 7. Graphs show results for five KPTMS project efficiency measures. FIM score gain = difference between mean FIM score for Home Health patients and mean FIM score for patients at admission to skilled nursing facility. Cost analyses were based on an estimated $64 per Home Health visit and $300 per day in skilled nursing facility.
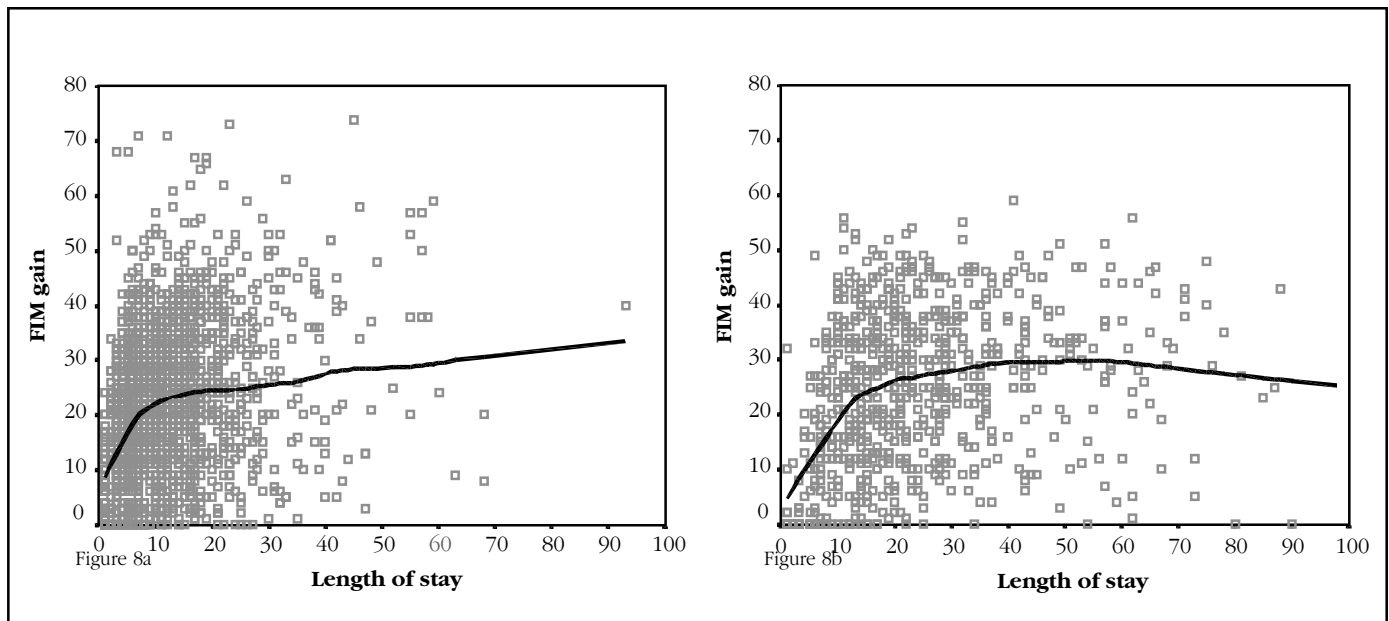

Figure 8. Plots show FIM gain vs length of inpatient stay for two matched patient populations: a) patients in KPTMS project facilities (n = 2091) and b) patients in non-KPTMS project facilities (n = 805). Patient sample in (b) was derived using the severity adjustment process described in the text. Curved line is a locally weighted regression curve or "lowess" curve.[7] Squares represent intersection of length of inpatient stay and FIM score gain for each patient. For the patients in (a), shift in data distribution to lower utilization (ie, shift of data to left) with comparable outcome (ie, similar height of lowess curve) represents influence of decision support provided to the clinical teams at every weekly patient care conference.

therapy utilization caused a 21% loss of functional outcome. In the KPTMS project, 13% reduction in medical utilization (ie, from 15.8 days to 13.8 days) did not negatively affect patient outcomes. All initial goals of the KPTMS project were met or exceeded: clinical quality measures improved, medical utilization and costs were reduced, and levels of satisfaction expressed by patients and by participants in the KP contract network satisfaction remain good to excellent. KPTMS has also remained patient-centered: care decisions are made not on the basis of arbitrary caps or human resource-intensive procedures but are instead made on the basis of data applied on a case-by-case basis. Using the patient's own outcomes in this way has enabled patients to receive the right care in the right place at the right time, has provided on-site decision support to practitioners and to case managers, has improved the KPTMS Project Team's ability to predict both the course of care and the likely disposition for the patient, and has resulted in development of best practices (Care Corridors) across the postacute care continuum.

The KPTMS project was a true multidisciplinary team effort involving multiple departments within KP Colorado, ten different care provider corporations, and hundreds of clinicians—including physicians, nurses, therapists, discharge planners, and case managers. These project participants integrated the data-based outcomes and systems of care delivery of KPTMS into their professional practice to improve care outcomes and the care experience for the patient. These objectives were achieved as a result of several major innovations in health care delivery that were introduced by KPTMS. These innovations included formation of strong partnerships between KP and its contract network as a way to manage the continuum of care instead of managing care in only one care setting. In addition, clinical outcomes were linked with financial outcomes, an action demonstrating that application of a consistent standard to continuing therapy reduced cost and improved quality. Moreover, KPTMS linked clinical decisions to real-time data about

care outcomes; outcome data did not "sit on a shelf" but instead were applied on a day-to-day basis to ensure a high standard of care for KP members.

> **More than 10,000 episodes of postacute care have been positively affected.**

More than 10,000 episodes of postacute care have been positively affected by KPTMS, and most of these episodes involve patients who are enrolled in the Medicare+Choice Program. As another result of the KPTMS project, KP can now compare contract network providers and facilities in several areas of quality and utilization, use Care Corridors with our evidence-based case management system to predict course of care, and know what mean lengths of inpatient stay to expect for various impairment groups.

Transferring KPTMS to other KP Regions

The KP San Diego Medical Service Area initiated the KPTMS project on July 1, 2000. The KP Mid-Atlantic Region visited Denver on two occasions to observe KPTMS in action and is looking closely at our results. The KP Northern California Region has initiated a statewide rollout of the program, commencing with their East Bay Service Area January 1, 2001. Other clinical departments in the KP Colorado Region plan to adapt the KPTMS program of data-based outcomes to guide further therapy decisions.

Next steps for KPTMS

The KPTMS project is evolving in several directions. During the next year, best practice standards (categorized by diagnosis) will be developed with severity-adjusted groupings, "stretch standards" will be instituted (adjusting Quality Index scores from historical baseline values to current baseline values), and care algorithms will be developed to help predict required care. Sufficient data have been collected to allow the investigators to go forward with identifying optimal

utilization, not only within a post acute setting but across various combinations of postacute settings. In addition, the KPTMS project will incorporate postdischarge follow-up of patients, identify patterns of medical underutilization, and become integrated into other departments in the KP Colorado Region. ❖

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