



Outcomes Assessment

Falls in the Elderly

Prepared for Kansas Medicaid in February, 2006

EXECUTIVE SUMMARY

Purpose of Intervention	To reduce the risk of falls in the elderly. This was done by identifying patients at highest risk of falling, using diseases that may predispose them to falling and medications that may increase their fall risk as selection factors.
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Intervention	Intervention Type	Population-based mailing
	Intervention Mailing Date	June 2005
	Pre-intervention Period (Baseline)	December 2004 – May 2005
	Post-intervention Period (Post)	July 2005 – December 2005
	Number of Letters Mailed	811
	Number of Targeted Physicians	811
	Number of Targeted Patients	8,024
	Adjusted Targeted Patients	6,196
	Number of Control Physicians	1,404
	Number of Control Patients	943
	Adjusted Control Patients	755

Changes in Clinical Indicators

Clinical Indicator	Target			Control		
	Baseline	Dec-05	% Change	Baseline	Dec-05	% Change
High-Risk Drugs	688	641	-6.8%	123	114	-7.3%
High-Risk Drugs & 4 or More Medications	5,459	4,973	-8.9%	629	561	-10.8%
4 or More Medications and no high-risk drugs	49	28	-42.9%	3	2	-33.3%
Total	6,196	5,642	-8.9%	755	677	-10.3%

Savings Calculations

Total Drug Therapy	
Target Group: Actual Average Paid Amount Per Patient Per Month (Baseline)	\$385.10
% Change in Control Group from Baseline to Post	4.46%
Estimated Paid Amount Per Target Patient Per Month if No Intervention	\$402.27
Target Group: Actual Average Paid Amount Per Patient Per Month (Post)	\$399.11
Estimated Savings Per Patient Per Month	\$3.16
Total Number of Target Patients	6,196
6-Month Total Savings	\$19,607.98

High-Risk Drug Therapy	
Target Group: Actual Average Paid Amount Per Patient Per Month (Baseline)	\$168.92
% Change in Control Group from Baseline to Post	3.49%
Estimated Paid Amount Per Target Patient Per Month if No Intervention	\$174.82
Target Group: Actual Average Paid Amount Per Patient Per Month (Post)	\$172.61
Estimated Savings Per Patient Per Month	\$2.21
Total Number of Target Patients	6,196
6-Month Total Savings	\$13,663.86



BACKGROUND

Half of those over 80 years old living at home fall annually,¹ and the injury rate from falls is highest among the oldest-old.² Falls are also responsible for 40% of nursing home admissions. The cost of caring for the elderly after a fall has been estimated to be \$12.4 billion per year.³

Some disease states which are associated with an increased risk of falls include:^{4,5}

- Cerebrovascular disease
- Cardiac dysrhythmias
- Dementia
- Parkinson's disease and abnormal movement disorders
- Seizure disorders
- Peripheral neuropathy
- Osteoporosis
- Previous fracture
- Postural instability
- Cataracts
- Arthritis
- Depression

The correlation between the risk of falling and the use of certain drugs and drug classes has been well documented. Specific drugs or drug classes which can increase risk of falls ("high risk medications") include:^{2,4,5,6}

- Antidepressants
- Antipsychotics
- Barbiturates
- Benzodiazepines and other sedative hypnotics
- Levodopa
- Drugs with extrapyramidal side effects
- Beta blockers
- Calcium Channel Blockers
- Reserpine, methyl dopa, vasodilators
- Digoxin
- Hypoglycemics
- Sedating antihistamines
- Anticonvulsants
- Class IA antiarrhythmic medications
- Narcotic analgesics

Drug therapy is a modifiable risk factor for falling in the elderly. The risk of falling is dependent on the number of drugs taken by a patient, the drug dosage, concurrent disease states, changes in cognitive function, vision, balance, gait or muscle strength, and environmental factors. Taking four or more drugs, not just the high-risk drugs, increases the risk for falls.^{7,8,9} The risk is also greater when a change in medications has been made in the last two weeks.¹⁰

¹ Tinetti ME. Falls. In: Cassel CK, Riesenber DE, Sorenson LB, et al. (eds). *Geriatric Medicine* (2nd ed.). New York: Springer-Verlag 1990:528-34.

² Tibbitts GM. patients who fall: How to predict and prevent injuries. *Geriatrics* 1996;51(9):24-31.

³ Runge J. The cost of injury. *Emerg Med Clin North Am* 1993;11(1):241-53.

⁴ Alexander, N. Falls. In: Beers MH, Berkow R (eds). *The Merck Manual of Geriatrics*. Rahway NJ: Merck and Co., Inc. 2000 (www.merck.com/pubs/mm_geriatrics).

⁵ Thapa PB, Gideon P, Cost TW, Milam AB, Ray WA. Antidepressants and the risk of falls among nursing home residents. *N Engl J Med* 1998;339:875-82.

⁶ Tinetti ME. Preventing falls in elderly persons. *NEJM* 2003;348:42-49.

⁷ Svensson ML, Rundgren A, Larsson M, et al. Accidents in the institutionalized elderly: A risk analysis. *Aging* 1991;3(2):181-92.

⁸ Rubenstein LZ, Robbins AS, Josephson KR, et al. The value of assessing falls in an elderly population. *Ann Intern Med* 1990;113(4):308-16.

⁹ Baraff LJ, Della Penna R, Williams N, Sanders A. Practice Guideline for the ED Management of Falls in Community-Dwelling Elderly Persons. *Annals of Emerg Med* 1997, 30(4):480-99.

¹⁰ Wells BG, Middleton B, Lawrence G, et al. Factors associated with the elderly falling in intermediate care facilities. *Drug Intell Clin Pharm* 1985;19:142-5.

METHODOLOGY

Changes in high-risk drug and total pharmacy dollars paid, high-risk drug and total pharmacy dollars paid per patient per month (PPPM), and number of high-risk drug and total pharmacy claims were examined. This intervention identified providers whose elderly patients were at risk of a fall due to therapy issues. To assess the impact of the intervention, pharmacy drug claims were reviewed from July 2005 through December 2005.

Clinical Criteria: Criteria and rationale for clinical indicators are listed below. All physicians with at least one recipient 75 or older with a risk index of 10 or greater received letters.

- High-Risk Drugs

The indicator identifies patients receiving four or more different medications in a 90-day period or at least one high-risk medication.

Rationale: Drug therapy is a modifiable risk factor for falling in the elderly. The risk of falling is partially dependent on the number of drugs taken by a patient.

Definitions:

Adjusted Target Patients – All patients of physicians who were included in the intervention, who had pharmacy claims and were active plan members throughout the post-intervention time period. Additionally, when outcomes are performed, these patients' pre-intervention (baseline) hits are re-evaluated to make certain that the status of clinical indicators haven't changed for each patient due to late pharmacy and medical claims.

Adjusted Control Patients – All patients of physicians who had the same drug utilization and disease characteristics as targeted patients, but whose physicians were not mailed intervention materials and were active plan members throughout the post-intervention time period. Additionally, when outcomes are performed, these patients' pre-intervention (baseline) hits are re-evaluated to make certain that the status of clinical indicators haven't changed for each patient due to late pharmacy and medical claims.

High-Risk Drugs – succinimides, anticonvulsant benzodiazepines, cardiac calcium channel blockers, antidepressants, antianxiety benzodiazepines, insulins, anticholinergic antiemetics, cardiac glycosides, type 1A antiarrhythmics, metoclopramide, barbiturates, sulfonyleureas, antipsychotics, hydantoins, antihypertensives, beta blockers, first generation antihistamines, indomethacin, carbamazepine, anticonvulsant barbiturates, levodopa, levodopa/cardidopa, antiparkinson anticholinergics, oxybutynin, GI antispasmodics, skeletal muscle relaxants, lamotrigine, gluthetimide, valproic acid analogs, oxazolidinediones, phenacetamide, zolpidem, combination antihypertensives, anticholinergic antipsychotics, angiotensin-modulating, sedative/hypnotic benzodiazepines, topiramate, tiagabine, repaglinide, tolterodine, levetiracetam, zonisamide, oxcarbazepine, glyburide-metformin, analgesic opiates, felbamate, gabapentin, primidone, antihistamine/phenothiazine antiemetics, loop diuretics, and potassium sparing diuretics.

RESULTS

Characteristics

Table 1 describes the patient populations for both the target and control groups included in the population-based intervention based upon mean age, gender, number of providers, average number of prescriptions per patient per month, and intervention-related drug utilization. As can be seen from the table, the target group tended to be older, saw more providers, and utilized more prescriptions in the baseline period than the control group.

Table 1: Patient Characteristics

	Target (N=6,196)	Comparison (N=755)
Mean Age	84.9	83.3
Percentage Male	19.0%	17.6%
Percentage Female	81.0%	82.4%
Number of Providers	2.8	1.7
Average Number of Prescriptions PPPM*	8.3	2.4
Utilization of All Drugs**		
Average Number of Drugs***	11.5	10.5
Average Number of Claims	49.7	44.4
Average Days Supply	1,274.9	1,138.2
Average Amount Paid	\$2,310.61	\$2,075.50
Utilization of High-Risk Drugs**		
Average Number of Drugs***	4.6	4.3
Average Number of Claims	23.5	20.8
Average Days Supply	628.3	549.5
Average Amount Paid	\$1,020.93	\$828.79

* Number of prescriptions per patient per month (PPPM) is the average for the 6 month baseline period

** Based on 6 months of baseline claims data

*** A distinct drug is defined by using a coding system similar to the Hierarchical Ingredient Code List (HICL) in that distinct drugs are identified at the ingredient level.

Drug Utilization

Tables 2 and 3 report the drug utilization for all drugs and high-risk drugs, respectively. The average PPPM number of pharmacy claims increased from 8.3 at baseline, to 8.4 in the post-intervention period (a 1.1% increase) for the target group versus 7.4 at baseline to 7.5 in the post period (a 1.5% increase) for the control group for total drug utilization. The average PPPM number of high-risk drugs also increased – from 3.9 at baseline to 3.9 in the post-intervention period (a 1.5% increase) for the target group and 3.4 at baseline to 3.96 in the post period (a 3.1% increase) for the control group.

Table 2: Changes in Total Drug Utilization

Pharmacy Claims	Target			Control		
	Baseline	Post	% Change	Baseline	Post	% Change
Total Number of Pharmacy Claims*	308,138	311,632	1.1%	33,497	34,016	1.5%
Number of Pharmacy Claims PPPM*	8.3	8.4	1.1%	7.4	7.5	1.5%

** Based on 6 months of baseline claims data



Table 3: Changes in High-Risk Drug Utilization

Pharmacy Claims	Target			Control		
	Baseline	Post	% Change	Baseline	Post	% Change
Total Number of Pharmacy Claims*	144,736	146,569	1.3%	15,621	16,107	3.1%
Number of Pharmacy Claims PPPM*	3.9	3.9	1.3%	3.4	3.6	3.1%

** Based on 6 months of baseline claims data

Clinical Indicators

Table 4 shows the changes in clinical indicators from baseline to December 2005. The intervention saw an overall reduction in clinical indicators for the target and control groups of 8.9% and 10.3%, respectively.

Table 4: Changes in Indicators

Clinical Indicator	Target			Control		
	Baseline	Dec-05	% Change	Baseline	Dec-05	% Change
High-Risk Drugs	688	641	-6.8%	123	114	-7.3%
High-Risk Drugs & 4 or More Medications	5,459	4,973	-8.9%	629	561	-10.8%
4 or More Medications and no high-risk drugs	49	28	-42.9%	3	2	-33.3%
Total	6,196	5,642	-8.9%	755	677	-10.3%

Risk Index

Each patient's individual disease-state and drug-related risk factors were evaluated and combined into a single "Falls Risk Index". A list of diagnostic and drug-related factors associated with increased fall risk was derived from a review of the literature. The risk index was constructed for each patient by assigning a value to patients according to how many physicians each patient had, the number of prescriptions received, the number of high-risk drugs each patient was taking, and the number of diseases the patient had. A detailed explanation of how the risk index was calculated is located in the attached Appendix.

This index does not account for severity of disease or environmental risk factors, and the diagnoses and drugs were not weighted relative to one another in determining the overall risk index. The risk index was used to rank patients from high- to low-risk status. Providers who had patients at higher risk received information concerning falls. A frequency distribution of the risk index was used to determine the cut-off point for an intervention. Table 5 shows the number of patients and the percentage for risk index of 10 or less, 11-13, 14-16, 17-19, and 20 or more for the target patient population at baseline and in the post-intervention period.

Table 5: Comparison of Risk Index Scores at Baseline and Post-Intervention Period

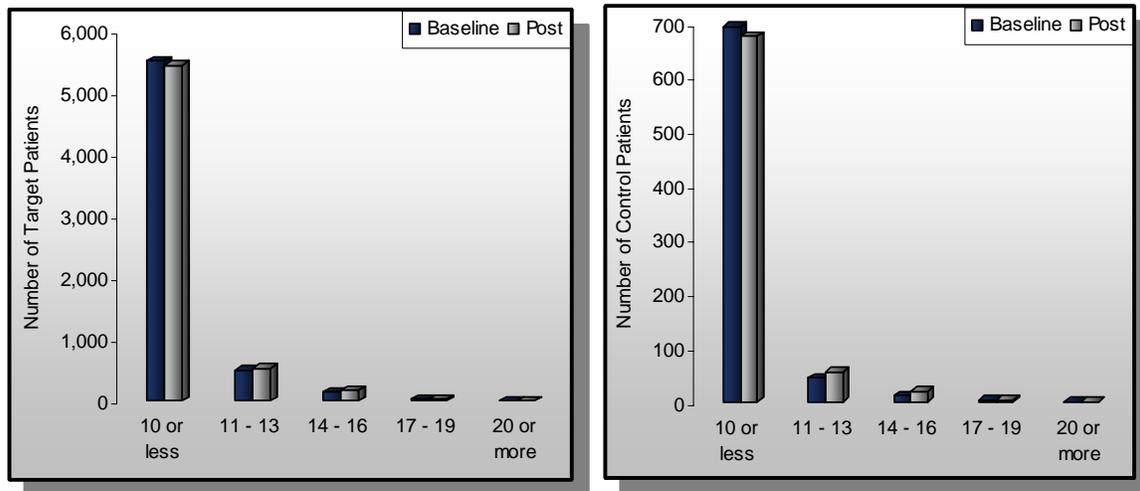
Population	Risk Index Score (Baseline)					Total
	10 or less	11 - 13	14 - 16	17 - 19	20 or more	
Adjusted Target Patients (N=6,196)	5,506	508	148	32	2	6,196
	88.9%	8.2%	2.4%	0.5%	0.0%	100.0%

Population	Risk Index Score (Baseline)					Total
	10 or less	11 - 13	14 - 16	17 - 19	20 or more	
Adjusted Control Patients (N=755)	694	44	12	4	1	755
	91.9%	5.8%	1.6%	0.5%	0.1%	100.0%

Population	Risk Index Score (Post)					Total
	10 or less	11 - 13	14 - 16	17 - 19	20 or more	
Adjusted Target Patients (N=6,196)	5,443	539	180	30	4	6,196
	87.8%	8.7%	2.9%	0.5%	0.1%	100.0%

Population	Risk Index Score (Post)					Total
	10 or less	11 - 13	14 - 16	17 - 19	20 or more	
Adjusted Control Patients (N=755)	676	55	19	4	1	755
	89.5%	7.3%	2.5%	0.5%	0.1%	100.0%

Figure 1: Graphical Comparison of Risk Index Scores at Baseline and Post-Intervention





BUSINESS ANALYSIS

The overall savings for the intervention is calculated in Tables 6 and 7. Per patient per month (PPPM) drug amount paid for total drugs and high-risk drugs were separately calculated for both the target and control groups for the six-month baseline and six-month post-intervention periods. The percent difference between the baseline and post-period PPPM paid amount was then calculated for the control group. This percentage was then multiplied by the baseline PPPM amount paid for the targeted group in order to estimate the PPPM amount paid in the post-intervention period for the targeted group had there been no intervention. The actual PPPM amount paid for the targeted group was then subtracted to obtain the estimated PPPM savings. Finally, the PPPM savings was multiplied by the number of intervention months and number of targeted patients.

This analysis was performed separately for all drugs and high-risk drugs. As a result of the intervention, the estimated per patient per month amount paid for all medications decreased \$3.16. This yields an overall estimated savings of \$19,608 for all drugs during the six-month post-intervention period. The per patient per month amount paid for high-risk drugs decreased \$2.21, which yields an overall estimated savings for high-risk drugs of \$13,664 during the six-month post-intervention period.

Table 6: Changes in Total Drug Amount Paid for All Medications

Savings Calculation:	
Target Group: Actual Average Paid Amount Per Patient Per Month (Baseline)	\$385.10
Target Group: Actual Average Paid Amount Per Patient Per Month (Post)	\$399.11
% Change in Target Group from Baseline to Post	3.64%
Control Group: Actual Average Paid Amount Per Patient Per Month (Baseline)	\$345.92
Control Group: Actual Average Paid Amount Per Patient Per Month (Post)	\$361.34
% Change in Control Group from Baseline to Post	4.46%
Estimated Paid Amount Per Target Patient Per Month if No Intervention	\$402.27
Estimated Savings Per Patient Per Month	\$3.16
Total Number of Target Patients	6,196
6-Month Total Savings	\$19,607.98

Table 7: Changes in Total Drug Amount Paid for High-Risk Medications

Savings Calculation:	
Target Group: Actual Average Paid Amount Per Patient Per Month (Baseline)	\$168.92
Target Group: Actual Average Paid Amount Per Patient Per Month (Post)	\$172.61
% Change in Target Group from Baseline to Post	2.19%
Control Group: Actual Average Paid Amount Per Patient Per Month (Baseline)	\$137.58
Control Group: Actual Average Paid Amount Per Patient Per Month (Post)	\$142.39
% Change in Control Group from Baseline to Post	3.49%
Estimated Paid Amount Per Target Patient Per Month if No Intervention	\$174.82
Estimated Savings Per Patient Per Month	\$2.21
Total Number of Target Patients	6,196
6-Month Total Savings	\$13,663.86



LIMITATIONS

Though similar, the intervention groups (target vs. control) were not completely homogeneous in terms of patient demographic characteristics. Target patients tended to be older, saw more providers, and utilized more prescriptions in the baseline period than the control patients. This is partially due to the fact that patients were not randomly placed in either the targeted or control group. Thus, the results of this study need to be interpreted in light of these differences among the groups.

The time frame of 6 months may not capture the full extent of the impact of the intervention. Providers may be required some time before they can change their patient's drug regimens. Additionally, if this study included only users of chronic medications, this may have more accurately reflected the pharmacy cost changes in both groups.

CONCLUSIONS

This falls in the elderly intervention focused on improving prescribing practices and reducing the overall cost of care. The intervention was successful in decreasing the number of patients taking four or more medications, including high-risk drugs by 8.9% and 10.3% for the target and control groups, respectively.

In terms of financial outcomes, the target group saw decreases in per patient per month (PPPM) amounts paid for all pharmacy claims and those related to high-risk medications. The target group's decrease was \$3.16 PPPM for all drugs and \$2.21 for high-risk drugs during the post-intervention period. This yielded an overall estimated savings of \$19,608 for all drugs and \$13,664 for high-risk drugs for the six-month post-intervention period.

APPENDIX

Risk Index Calculation

PARAMETER	VALUE
<ul style="list-style-type: none"> • Receiving prescriptions from 2 or more physicians 	1
<ul style="list-style-type: none"> • Number of Drugs <ul style="list-style-type: none"> <input type="checkbox"/> 4 – 7 drugs <input type="checkbox"/> 8 – 11 drugs <input type="checkbox"/> 12 – 50 drugs 	1 2 3
<ul style="list-style-type: none"> • Receiving high risk drugs 	# of high risk drugs
<ul style="list-style-type: none"> • High risk disease states 	# of diseases
Falls risk index total	Sum of above values