

Estimated Costs of Treating Stress Urinary Incontinence in Elderly Women According to the AHCPR Clinical Practice Guidelines

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Abstract

Urinary incontinence affects 10 million elderly and is estimated to cost more than \$10 billion annually. Treatments for this condition vary widely in efficacy and cost. Using the Agency for Health Care Policy and Research urinary incontinence guideline, we calculated expected costs for three commonly recommended treatments for stress urinary incontinence in elderly women: (1) behavioral therapy, (2) pharmacologic therapy, and (3) surgical therapy. We constructed decision trees for each treatment option and incorporated treatment efficacy rates stated in the guideline. Costs were determined from the literature. Using a Markov cohort simulation, 10-year expected costs per patient, in 1994 dollars, were lowest for surgical therapies and were highest for behavioral therapy (needle suspension surgery, \$25,388; phenylpropranolamine and estrogen, \$62,021; and behavioral therapy, \$68,924). All treatment strategies were less costly than that of untreated incontinence (\$86,726). Sensitivity analysis revealed that the results were highly affected by the likelihood of the patient's entering a nursing home, the cost of nursing home care, and the long-term relapse rate after surgery. In conclusion, on the basis of data from the urinary incontinence guideline, early surgical intervention is the least costly treatment for chronic stress incontinence in elderly women. Because the long-term effectiveness of most incontinence surgeries is uncertain, additional studies are necessary to substantiate these findings.

(Am J Man Care 1996;2:147-154)

Urinary incontinence (UI) affects nearly 10 million Americans and is estimated to result in combined medical and nursing home costs of \$10 billion annually (in 1987 dollars).^{1,2} Despite the prevalence and cost, however, many patients do not seek medical care for UI, often because they are embarrassed. Even when it is suspected, physicians frequently are hesitant to diagnose or treat incontinence because the etiology is difficult to determine and the efficacy, side effects, and costs of treatment vary widely.

The Agency for Health Care Policy and Research (AHCPR) has published a clinical practice guideline to address the problem of acute and chronic UI.³ The guideline, developed by a panel of experts, uses algorithms to aid physicians in diagnosing and managing UI in adults. It also provides an extensive review of the literature on UI, summarizing the efficacy rates and side effects of the most commonly prescribed treatments. Although the expert panel did not address the issue of costs, the AHCPR anticipated that standardizing the way in which practitioners diagnose and treat the problem would reduce the cost of incontinence-related medical care.

Several studies have estimated the economic costs of various interventions and therapies for UI.^{1,4-7} Most of these reports are of limited use to policy makers and clinicians, however, because they fail to compare alternative treatments and do not estimate costs over time for a disease state that often is chronic.

We used decision analysis to develop a model for estimating the expected costs and outcomes of the most common treatments for chronic stress UI, based on the treatment algorithms described in the AHCPR clinical practice guideline. For several reasons, our analysis focuses on stress UI in elderly, noninstitutionalized women. First, the disease burden in this group is especially high. Between 15% and 30% of elderly women suffer some form of incontinence⁸; in the frail elderly, the rate may be as high as 53%.⁹ Compared with urge, mixed, and overflow UI, stress

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Funded by a research contract from Eli Lilly and Company, Lilly Corporate Center, Indianapolis, IN 46285.

incontinence is one of the most common forms of UI in this group. Second, the consequences of UI in the elderly are particularly severe. Urinary incontinence is associated with prolonged hospitalizations, falls, urinary tract infections, and skin breakdown. In addition, chronic UI increases an elderly individual's risk of nursing home admission by at least 5% per year, irrespective of the presence of other comorbid conditions.¹⁰ Finally, the diagnostic criteria for stress incontinence are more clearly defined in women than are diagnoses of other types of incontinence and stress incontinence has a more uniform treatment protocol.

... METHODS ...

Our model is a cost-minimization analysis that compares the costs of alternative treatments for chronic stress UI in elderly women living at home. We took a societal cost perspective, comparing per-person expected direct medical care and nursing home costs over time. Indirect costs (eg, the value of work productivity lost as a result of incontinence) and intangible costs (pain and suffering) were not included in the analysis. Before analyzing the costs of the various treatment options, we first estimated the expected cost of caring for a patient with chronic, untreated UI. The annual cost of untreated UI included the daily cost of incontinence care plus the cost of treating incontinence-related adverse events. Yearly expected costs for each adverse event were computed by multiplying the annual incidence of the adverse event by the cost of caring for that event. The costs of caring

for adverse events were obtained from published reports and from the National Nursing Home Survey.¹¹

Costs for the various stress UI treatments were obtained from several sources. The cost of behavioral therapy was based on findings from a recently published study.⁶ Drug costs were based on the average wholesale prices listed in the *Red Book*.¹² Surgical costs were based on Medicare health claims data (MEDPARS) from Washington State.¹³ We identified surgical cases from the 1993 MEDPARS database by searching for cases with a primary or secondary ICD-9-CM diagnosis code for UI that also had an ICD-9-CM surgical procedure code for incontinence. In order to capture the costs of preoperative evaluation, surgery, and postoperative follow-up (including treatment of complications), we included all incontinence-related inpatient and outpatient visits that surgery patients incurred over the year of the database as "surgery-related." For the incontinence procedure itself, mean values were used to capture the costs of treating procedure-related complications that occurred during hospitalization (eg, postoperative infections or cardiovascular events). All costs were updated to 1994 dollars, using the price index for medical care services.¹⁴

We first estimated 1-year expected costs for untreated and treated stress UI. To estimate 1-year costs, decision trees were constructed to reflect the three treatment options described in the AHCPR guideline for stress UI: (1) behavioral therapy, (2) pharmacologic therapy, and (3) surgical therapy (Table 1). Decision tree chance nodes for each treatment were constructed on the basis of compliance and the AHCPR guideline estimates for probability of cure, partial cure, or no change in the condition. Compliance with surgical therapy was assumed to be 100%. Compliance with pharmacologic therapy was based on reported medical therapy dropout rates from the citations listed in the AHCPR guideline. Since compliance rates for behavioral therapy are not available, our estimate was based on consensus opinion from discussions with staff urologists and general internists at the University of Washington. In cases where the guideline reported a range of possible efficacies, we used the mean of that range. We assumed that a physician and patient would continue a partially effective treatment, but that an ineffective therapy would be discontinued at the end of 6 months. The decision tree is shown in Figure 1.

The AHCPR guideline notes that several treatment options may be tried in sequence, until clinical success has been achieved. To reflect this concept in the model, we assumed that patients who remained

Table 1. AHCPR Management Options for Stress Urinary Incontinence

Behavioral Therapy
· Bladder training
· Habit training
· Pelvic muscle training
· Prompted voiding
Pharmacologic Treatment
· Phenylpropanolamine
· Estrogen supplementation*
· Combined therapy (phenylpropanolamine plus estrogen)*
Surgical Treatment
· Retropubic suspension
· Needle suspension
· Sling
· Artificial sphincter
· Periurethral injections

AHCPR = Agency for Health Care Policy and Research.
*Includes the use of progestin to prevent endometrial hyperplasia.

completely incontinent at 6 months after the start of therapy would begin a different class of therapy. We limited the analysis to the two representative and plausible scenarios among the several combinations possible: (1) initial treatment with behavioral therapy, and treatment of behavioral therapy failures with medication (phenylpropranolamine plus estrogen); and (2) initial treatment with medication (phenylpropranolamine plus estrogen), and treatment of medication failures with surgery (needle suspension).

The combination of behavioral therapy and a medication may be an appropriate alternative to surgery. Unfortunately, however, no study has determined the efficacy of this combined-treatment strategy. We addressed this issue in the sensitivity analysis by comparing the expected cost of surgery with that of combined behavioral/pharmacologic therapy under a variety of efficacy assumptions.

On the basis of data from the AHCPR guideline, partial cures were estimated to reduce episodes of incontinence by 40%, and total cures were expected to reduce these episodes by 100%. We assumed that incontinence costs and adverse-event rates would decline as a linear function of the number of incontinence episodes. We determined treatment costs only, as UI evaluation costs based on the AHCPR guidelines have been determined elsewhere.²

We used a Markov cohort simulation to estimate the effects of treatment on UI-related costs over several years. Markov models are used when a decision process involves risk that is continuous over time, and when events may occur more than once.¹⁵ The Markov simulation begins with a hypothetical cohort of patients, all of whom initially are in the same state. During each risk cycle, patients may move into a terminal state (ie, death), or into an intermediate state; during each successive cycle, they can either remain in the intermediate state or move out of it. The process is repeated until the number of time periods of interest have been completed or until all patients have moved into a terminal state.

Our simulation cohort comprised 100 women aged 65 years and with chronic stress UI, who initially were treated with behavioral, pharmacologic, or surgical therapy. During each risk cycle, patients could move from their initial state (incontinence, at home) to one of four possible states: (1) cured (dry); (2) continued incontinence, at home; (3) continued incontinence, at a nursing home; and (4) death.

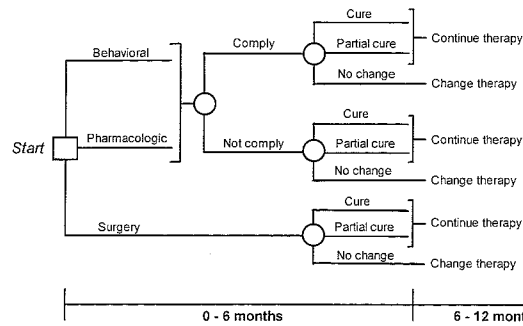


Figure 1. Decision tree representing the AHCPR stress urinary incontinence treatment options and outcomes. In each therapy arm, treatment failures at the end of 6 months are switched to a different therapy

moved to a nursing home; or (4) death (Figure 2). Each Markov cycle lasted 1 year. We ran the Markov model under the assumption that patients who remained completely incontinent at the end of 6 months of initial therapy were switched to one of the other treatment arms by the beginning of year 2. Those who remained incontinent at the end of year 2 were assumed to remain incontinent for the remainder of the analysis.

We assumed that “cures” remained dry and did not become incontinent, that the excess risk of entering a nursing home as a result of incontinence fell to zero for patients who became dry after therapy, and that patients who moved to a nursing home did not return home. The probability of death during each cycle was determined from population tables. We assumed that the mortality rate for nursing home patients was 50% higher than the population rate.^{16,17} Future expected costs were discounted at an annual rate of 5%. We ran each Markov simulation for 10 years, determining the total expected costs per person over this time period.

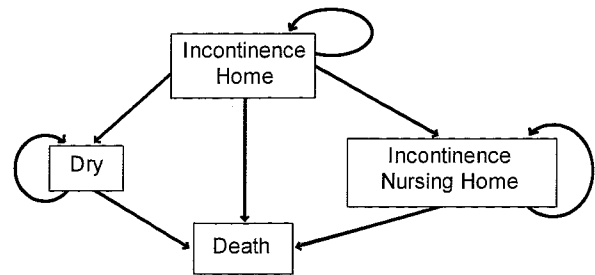


Figure 2. Markov cohort simulation for frail, elderly women with stress urinary incontinence. The simulation begins with all women initially incontinent and living at home. Women may move to one of four states during each cycle: (1) cured (dry); (2) continued incontinence, at home; (3) continued incontinence, at a nursing home; and (4) death. Cures remain dry until death and are not at risk of needing nursing home care as a result of their incontinence.

Although the population-based life expectancy for 65-year-old women is more than 15 years, we chose a 10-year time span to account for our notion that elderly women (at risk for nursing home placement) would not be likely to live as long as would a healthier cohort.

We performed a sensitivity analysis to test the robustness of our results to variations in the input parameters. In that analysis, the input values for short-term and long-term efficacy, compliance, and cost were varied, and the impact of changes in these inputs on expected costs was observed for each treatment strategy. We were particularly interested in analyzing inputs that the AHCPR guideline had considered to be preliminary or uncertain (eg, the long-term efficacy of several types of surgery). If the robustness of a particular input is in question, and changing that input has a large effect on expected costs, then clinical and policy decisions that are based on the stated estimate should be made with caution.

... RESULTS ...

The 1-year expected cost of untreated stress UI was \$5,076 (Table 2). This yearly cost included staff or housekeeping time to help the incontinent person (15% of the total yearly cost), supplies (13%), and hospital days to treat incontinence (18%). The expected probability of entering a nursing home constituted the largest portion of the yearly cost (35%). The 10-year expected cost for untreated stress UI derived from the Markov cohort model was \$86,726.

The most cost-effective treatment for stress incontinence for the first year was initial use of combined therapy with phenylpropanolamine and estrogen (Table 3). In the 1-year model, surgery was as much as three times as costly as pharmacologic therapy. Behavioral therapy was slightly more costly than drug therapy but was less costly than surgery. Giving behavioral therapy treatment failures phenylpropanolamine and estrogen during the second 6 months was more costly than not treating these individuals because the initial costs associated with training patients to use behavioral therapy techniques (\$729) was not recovered from incontinence-related savings during the following 6 months.

Over 10 years, surgery as initial therapy generally was the most cost-effective treatment strategy (Table 3). The surgical efficacy rates reported in the AHCPR guideline are the highest of those of all treatment strategies. As a result, the high initial cost of surgery was offset over time by the expected future savings in incontinence care and nursing home expenses. For example, the most cost-effective pharmacologic and surgical treatments in the 1-year model were estrogen plus phenylpropanolamine (\$3,926) and artificial sphincter surgery (\$7,478), respectively. During a 10-year period, however, the artificial sphincter procedure would be expected to produce savings of \$49,420 over the cost of combination drug therapy. Behavioral therapy was the least cost-effective strategy, largely as a result of the low rate of expected compliance with treatment.

In both the 1-year model and the 10-year model, the strategy of beginning treatment for stress UI with nonsurgical therapy and, during the second 6 months, treating failures with another nonsurgical therapy was uniformly inferior to the strategy of initial surgery. For example, given the average 10-year expected cost of the surgical procedures, starting with behavioral therapy and switching treatment failures to combined estrogen plus phenylpropanolamine at 6 months had a 10-year expected cost that was \$45,548 greater than the expected cost of initial surgery. In addition, in patients treated with surgery after failing 6 months of pharmacologic therapy, the 10-year ex-

Table 2. Baseline Urinary Incontinence Costs (Year One)

Item/Source	Unit Cost (1994 Dollars)	Incidence per Year	Expected Costs (Dollars)
Staff Time ⁶	2.06	365	750.33
Supplies ⁶	1.84	365	671.64
Falls, Evaluation ¹	1,640.70	0.01	19.69
Urinary Tract Infection			
Inpatient therapy	4,470.91	0.10	447.09
Outpatient therapy	246.10	2.00	492.21
Skin Breakdown ¹			
Minor therapy	90.24	0.35	31.58
Intermediate therapy	164.07	0.12	19.69
Ulcers	272.36	0.03	8.17
Other			
Hospital days ¹	492.21	1.80	885.98
Subtotal			3,326.38
Nursing Home Care ^{3,11}	35,000.00	0.05	1,750.00
Total Yearly Cost			5,076.38

Table 3. Initial Alternative Treatments for Stress Incontinence: 1-Year and 10-Year Costs

Incontinence Therapy	Compliance*	Effectiveness (%)			Expected Costs	
		No Change	Improvement [†]	Cure	1 Year	10 Year [‡]
No Treatment	NA	100	0	0	5,076	86,726
Behavioral Therapy	50	21	65	14	4,511	68,924
Pharmacologic Therapy						
Phenylpropanolamine	98	53	40	7	4,078	69,144
Estrogen [§]	100	61	35	4	4,492	74,701
Phenylpropanolamine and Estrogen [§]	90	53	21	26	3,926	62,228
Surgical Therapy						
Retropubic suspension	100	17	5	78	6,994	23,212
Needle suspension	100	12	4	84	13,703	25,388
Sling (fascial/artificial)	100	10	9	81	7,691	26,580
Artificial sphincter	100	4	4	92	7,478	12,808
Periurethral injection	100	25	16	59	7,855	36,061

*Noncompliance is assumed 25% as effective as full compliance
[†]Improvement is assumed to reduce incontinence episodes by 40%.
[‡]Based on a cohort of women starting at age 65.
[§]Includes the cost of daily progestin to prevent endometrial hyperplasia.

pected costs were higher than the cost of the immediate-surgery option, largely as a result of the high expected cost of nursing home care during the year of nonsurgical treatment.

Sensitivity Analysis

For all treatment options, 10-year expected costs were most sensitive to changes in the expected probability of entering a nursing home (Figure 3). The effect on expected costs of varying the probability of entering a nursing home varied greatly with the efficacy of the individual treatment. For an effective surgical treatment, such as creating an artificial sphincter, raising the probability of entering a nursing home by 3% increased 1-year and 10-year costs by 2% and 1%, respectively. In contrast, for behavioral therapy, 1-year and 10-year costs rose 24% and 46%, respectively. These findings suggest that the expected cost savings from surgery increases substantially for patients whose incontinence-related risk of nursing home care exceeds 5%. A frail, elderly individual with additional comorbid conditions, such as visual impairment or problems with ambulation is a likely example of such a patient.

Short-term and long-term costs also were sensitive to the cost of nursing home care. For example, in the case of combined phenylpropanolamine and

estrogen therapy, a 20% increase in the yearly cost of living in a nursing home increased the expected treatment cost by 12% over 10 years. As with the sensitivity of costs to the probability of entering a nursing home, less effective treatments were affected disproportionately by increases in the annual cost of nursing home care. Long-term costs were relatively insensitive to medication costs. For example, doubling the cost of phenylpropanolamine increased 10-year expected costs by \$534 (less than 1%).

One might question whether surgery would be a cost-effective treatment option for elderly incontinent patients with a very high expected 1-year mortality (for example, patients with advanced malignancy). In

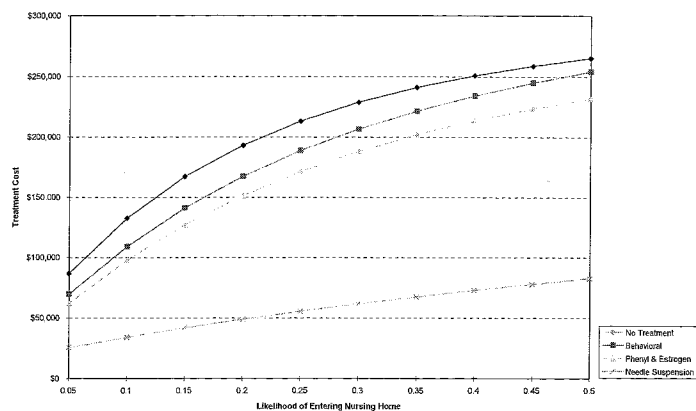


Figure 3. Ten-year expected costs, by treatment cost and likelihood of entering a nursing home. Based on a nursing home cost of \$35,000 per year and a surgical failure rate of 0%

our model, the expected cost of treating an incontinent patient with surgery exceeded the cost of medical therapy for 3.5 years. After 3.5 years, the “up front” costs of surgery were more than offset by the savings in expected future incontinence costs. For patients who already were residents of nursing homes and whose expected survival was 8 years or less, medical therapy was less costly than surgery.

Initial treatment with behavioral and pharmacologic therapy combined was inferior to surgery alone over the long run, unless one assumes that the efficacy of combined therapy greatly exceeds the efficacy of either treatment alone. For example, when combining the costs of behavioral therapy with that of the most effective pharmacologic treatment (phenylpropranolamine plus estrogen), one must assume a cure rate of 96% for this regimen before it compares favorably with the average 10-year cost of any of the available surgical therapies.

The authors of the AHCPR UI guideline warn that the efficacy data for surgical therapy must be interpreted with caution because published reports vary widely in how they report outcomes (ie, cure, improvement, and complications), often fail to present information on patient-selection criteria, and usually involve studies of young and middle-aged women. To

address these concerns, we modeled a scenario in which a certain percentage of surgical “cures” reverted to incontinence each year after surgery. Long-term costs were reestimated after varying this annual surgical “failure” rate from 0% to 50%. “Failures” were assumed to relapse to their former state of incontinence, again incurring the costs of incontinence care. For needle suspension, surgery remained cost-effective when compared with combined phenylpropranolamine and estrogen therapy up to an annual surgical failure rate of nearly 25% (Figure 4). Other, less costly surgical procedures remained cost-effective at slightly higher annual failure rates.

... DISCUSSION ...

Urinary incontinence is costly to society, both in terms of patient morbidity and utilization of health-care resources. The AHCPR incontinence guideline was created to improve diagnosis and management of this condition. Our model extends the AHCPR algorithm by providing a comparison of the relative short-term and long-term costs of incontinence without treatment and with each recommended therapy. In the model, behavioral and pharmacologic treatments initially were less expensive than surgical therapy; over time, however, they became substantially more expensive than that treatment option. Surgery reduced long-term costs because it is highly efficacious when compared with the other treatments, and therefore reduces future incontinence-related nursing home admissions.

We note the limitations of our model. First, we acknowledge the limitations of using claims data to estimate the costs of surgery for UI. Our database has captured the costs of pre- and postoperative evaluation, surgery, and follow-up treatments for surgery-related complications (eg, mechanical failure of an artificial sphincter or genitourinary fistulas) that occur as long as 1 year after the procedure. However, we have not captured the cost of evaluating and treating complications that occur more than 1 year after the initial procedure was performed. Furthermore, insurance claims provide only a limited record of the medical history. By counting all incontinence-related claims for surgical patients during the database year as surgery related, we may have included some claims that were unrelated to the patients’ surgery.

A second limitation of our model was our assumption that cost savings are a linear function of the efficacy of treatment. In fact, the actual relationship between cost savings and treatment efficacy is unknown. If the curve is nonlinear, then our estimates

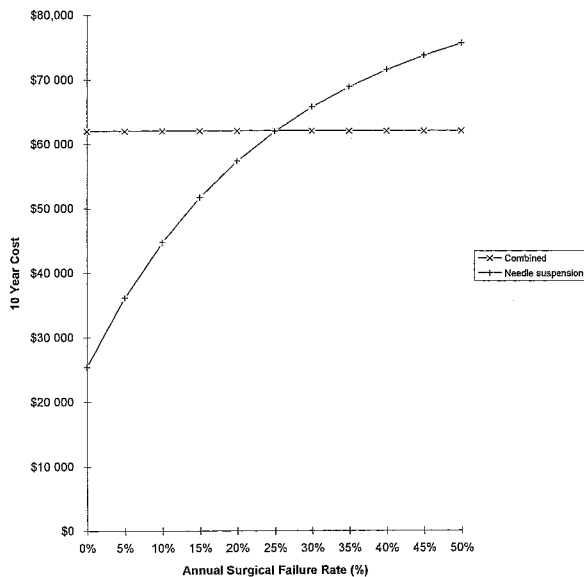


Figure 4. Ten-year expected costs as surgical failure rate varies. The probability of entering a nursing home is held at 5%. The cost of living in a nursing home is held constant at \$35,000 per year.

may have overstated or understated the actual expected cost of incontinence. Third, the annual cost of nursing home care in our model overstates the true incremental cost of living in a nursing home relative to the cost of living at home, because certain indirect costs are common to both situations (eg, food, housing, and the value of assistance from family members replaced by that from caregivers). Nevertheless, patients, families, and third-party payers, such as Medicare and Medicaid, will bear the majority of the nursing home costs as they are stated here. Finally, because our study relies on secondary data, the results are subject to the limitations of the incontinence literature and the MEDPARS database.

We have incorporated the notion that patients may relapse months to years after an initially successful surgical procedure. Recent reports suggest that relapses may be common after some surgical procedures for stress UI, with long-term surgical failure rates ranging from 7% at 5 years to 50% at 8 years, depending on the procedure.¹⁸⁻²⁰ In our model, the 10-year expected cost for surgery begins to exceed that for medical therapy when the annual surgical failure rate surpasses 25%. These calculations do not include the cost of a second procedure during the 10-year follow-up period.

What are the patient-management implications of our model? First and foremost, our results suggest that treating stress UI with *any* of the recommended therapies from the AHCPR guideline not only relieves suffering, but also saves money. Clinicians should be encouraged to treat stress UI, even if circumstances permit the use only of therapies that are comparatively less effective, because the “no treatment” option is more costly than any recommended treatment. Second, based on the efficacy data reported in the AHCPR guideline, the combination of behavioral and pharmacologic therapy for stress UI generally is more costly than surgery. We have demonstrated that, when comparing therapies, differences in efficacy translate into substantial differences in economic benefits. Although we do not expect our report to compel physicians to refer every case of chronic stress incontinence for immediate surgery, it suggests that surgery should be considered for patients who do not respond promptly to medical therapy.

Our results also suggest that surgery should be given additional consideration in the case of frail, elderly patients who are at high risk for entering a nursing home *for reasons other than* incontinence. Urinary incontinence in these individuals probably is likely to precipitate nursing home admission at a much higher rate than our baseline rate of 5%. Our

analysis suggests that the expected savings from surgery become much higher with increases in the probability of entering a nursing home as a result of UI.

As noted, compliance with behavioral or medical therapy may be reduced in the frail elderly, further reducing the relative efficacy of these treatment options. It is unlikely that the literature reports for compliance with behavioral and medical therapy can be achieved in clinical practice. Most published studies are performed in carefully controlled situations with extensive support and, in the case of behavioral therapy, several weeks of supervised training. Since such programs are usually unavailable in the home setting, actual compliance is likely to be less. Lacking “real world” compliance data, we used the literature rates as “best case” scenarios. The compliance estimate for behavioral therapy was based on expert opinion of what could be achieved under “optimal” outpatient management in the elderly. Actual compliance rates will, of course, vary depending on the patients and setting where care is delivered. Although many stress UI procedures can be performed under local or regional anesthesia on an outpatient basis, physicians also must consider the risks to elderly patients of the surgical procedure itself. The studies cited by the AHCPR guideline reported no perioperative mortalities. Nevertheless, one might expect that a small risk of surgical fatality does exist for some elderly women who are eligible for these procedures.

Urinary incontinence is often a complex, multifactorial process. However, the published UI treatment literature largely contains studies of single therapies for carefully selected patients. Single-treatment approaches, even as outlined in the AHCPR guideline, are of limited value if the etiology of a patient’s incontinence is multifactorial. Most clinicians who are familiar with treating incontinence recognize that multimodal therapy is the rule, not the exception. Beyond “ranking” treatments in order of economic preference, the primary point that readers should take from this analysis is that early screening, diagnosis, and intervention (covering the period during which single therapies are most likely to be efficacious) will benefit patients and reduce societal healthcare expenditures.

... CONCLUSION ...

The AHCPR UI guideline was designed to provide a comprehensive approach for all patients with incontinence. Using data from the guideline, we have found that treatment of stress UI is cost-effective relative to no treatment, and that surgical therapy appears to be

the most cost-effective of the treatment options studied. However, much of the information on treatment efficacy reported in the guideline was based on small studies, in select groups of patients, and with limited follow-up periods. This limitation is particularly true for the data on surgical procedures. Although our results suggest that early surgical intervention should be considered in patients with stress incontinence, these findings are dependent on the high surgical efficacy rates that are reported in the guideline, and on a low rate of relapse after surgery. Further work is needed to identify the short-term and long-term efficacy of surgical therapy for stress UI in elderly women.

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