

Efficacy of an Herbal Dietary Supplement (Smooth Move) in the Management of Constipation in Nursing Home Residents: A Randomized, Double-Blind, Placebo-Controlled Study

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Objective: To investigate the efficacy and cost effectiveness of an herbal tea, Smooth Move, in nursing home residents with chronic constipation.

Design: Double-blind, placebo-controlled, 2-armed, parallel-group clinical trial.

Setting: A 483-bed nursing home in Allentown, Pennsylvania, operated by Lehigh County Government.

Participants: A total of 86 nursing home residents with chronic constipation.

Interventions: Participants (n = 86) were randomly assigned to receive Smooth Move (n = 42) or a placebo (n = 44), once daily, in addition to standard treatment for chronic constipation. The study period was 28 days.

Measurements: The primary efficacy parameter was the difference in total number of bowel movements. Secondary parameters included the difference in aver-

age number of standard treatment doses dispensed, and the difference in total medication costs.

Results: Compared to placebo, in the intention to treat (ITT analysis) there was a statistically significant increase in the number of bowel movements in the Smooth Move group. The Smooth Move group (n = 42) compared with the placebo group (n = 44) experienced an average of 4.14 more bowel movements during the 28-day study period versus the 28-day pre-study period ($P = .017$).

Conclusion: Smooth Move herbal tea, when added to the standard treatment regimen for nursing home residents with chronic constipation, increased the average number of bowel movements compared to the addition of a placebo tea. (*J Am Med Dir Assoc* 2006; 7: 556–561)

Keywords: Constipation; elderly; herbal tea; laxatives; randomized clinical trial senna

Constipation is a significant problem in the elderly.¹ The prevalence of constipation and the impact on quality of life are greatest in the elderly,² with a reported incidence among ambulatory adults 65 years of age and older of 26% in men and 34% in women.³ Constipation in elderly people living in nursing homes and hospitals is generally considered to be higher than those living in the community. Once admitted, other factors may contribute to constipation (eg, changes in diet and activity; loss of privacy).² More than 80% of nursing home and/or extended-care facility residents are reported to suffer from constipation.³ This population includes persons

with the highest frequency of risk factors (eg, immobility, polypharmacy, and chronic medical conditions).⁴ Volicer et al⁵ reported that dementia is a risk factor for constipation, and residents may be more difficult to manage than cognitively intact patients. Risk factors for constipation include the use of certain drugs (eg, anticholinergic antidepressants, opioid analgesics, and nonsteroidal anti-inflammatory drugs [NSAIDs] including aspirin). In clinical practice, however, the drug(s) that may be causing the constipation may need to be continued in spite of their negative effects on bowel function. In a constipation care study by Frank et al,⁶ it was concluded that nursing staff performance of constipation care-related tasks is time consuming and costly in the long-term care setting.

In this study, 54.65% of the resident population were dementia/Alzheimer's patients (26 in the placebo group and 21 in the Smooth Move group) routinely receiving constipation-causing medications plus a range of interventions to relieve constipation including orally ingested liquids, powders, and tablets; supposi-

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tories; and enemas. The aim of this study was to investigate the effects of introducing an herbal dietary supplement, Smooth Move herbal tea, into the daily regimen of elderly long-term care facility residents.

METHODS

Study Design

The study was designed as a randomized, double-blind, placebo-controlled, single center study. The participants were randomly assigned to receive either Smooth Move tea or placebo tea. Residents continued to be administered their existing laxative medications and/or enemas in addition to the investigational product. At the discretion of the nursing staff and physician, the dosage of the laxatives could be adjusted according to bowel function. For all residents already using Smooth Move, there was an initial 28-day washout period before resuming Smooth Move at start of study. This design enabled the analysis of differences in total bowel movements, for each group, in the 28-day pre-study period versus the 28-day study period, and an analysis of those differences comparing the Smooth Move group against the placebo group.

This study was designed to assess, in the real-life situation of a busy nursing home with elderly residents receiving numerous medications, including constipation-causing medications, the effects of introducing an herbal dietary supplement (Smooth Move herbal tea) in the regimen of residents suffering from chronic constipation, the dispensing of standard treatment by nursing home staff, and on costs of care and medications. Subjects with chronic constipation were defined as residents who used laxatives at least once a week. This included residents who received a daily laxative and/or those who used the bowel routine protocol once a week. The following describes the bowel routine protocol: If no bowel movement (BM) by day 2, evening nurse gives a laxative on day 2 (1700 h): Milk of Magnesia (MOM) 30 mL orally; if no BM by day 3, evening nurse gives a laxative on day 3 (1700 h): MOM 30 mL orally; if no BM by the morning of day 4, day nurse gives a suppository that morning: Dulcolax rectal suppository; if no BM within 3 to 5 hours of suppository insertion, give an enema.

In this design, even if nursing staff did not adjust standard treatment interventions, the addition of Smooth Move provides a measurable variable for differences in total number of bowel movements.

The study protocol and the informed consent form were reviewed and approved by the local Institutional Review Board (IRB) of Sacred Heart Hospital, Allentown, Pennsylvania, on July 12, 2004. Each resident, or his or her legal guardian, was informed both orally and in writing. Written informed consent was obtained from all residents, or from their legal guardians, before study participation.

Subjects and nursing home staff were not compensated for participating. This study was investigator-initiated research, and the lead investigator approached the sponsor about cooperating on the study. Expenses related to the development of the study were assumed by the study sponsor. The principal

investigator has no equity interest or intellectual property rights in the investigational product, however a small stipend was paid by the sponsor for some labor and expenses in the development of this study.

Patients

Residents were recruited at the County Nursing Home in Allentown, Pennsylvania. Evaluated for enrolment were male and female nursing home residents with chronic constipation, who had been living at the center for at least 1 month, and were presently receiving laxative medications (eg, Dulcolax, Metamucil, Milk of Magnesia, and Senokot). Because a significant number of the study participants were nursing home residents with dementia, it was not feasible in all cases to require a diagnosis according to "Rome II" criteria for functional constipation as a prerequisite for the inclusion criteria. Such a diagnosis would require a level of communication with the patient that was not usually possible. Exclusion criteria were patients on feeding tube, thickened liquids, currently on Smooth Move herbal tea, diarrhea, patients with ileus, renal failure, dialysis, Crohn's disease, ulcerative colitis, chronic abdominal pain, and patients at the facility for less than 1 month.

Treatment

Residents with chronic constipation were randomized to receive either placebo tea or Smooth Move tea (Traditional Medicinals, Sebastopol, CA) at a serving of 1 cup each afternoon. The tea was dispensed by the day shift, usually with lunch, because the night shift had fewer staff and there would be better compliance if given by the day shift.

The investigational products were supplied as homogeneous mixtures of dried botanicals packaged in unbleached double-pouch filter tea bags, individually sealed in plain white tamper-evident envelopes. Each single serving of Smooth Move contained 2000 mg of pharmacopeial-grade ingredients including 1080 mg of the stimulant laxative active ingredient senna leaf PhEur (*Cassia angustifolia* Vahl). Prepared as directed, one cup of the herbal tea contains 20 mg sennosides A and B (± 4.0 mg per cup), as determined by high performance liquid chromatography (HPLC).

While the risks of laxative abuse have been overemphasized,⁷ senna leaf teas are nonetheless contraindicated in cases of ileus, acute intestinal inflammation (eg, Crohn's disease, colitis ulcerosa, appendicitis), abdominal pain of unknown origin, and severe dehydration states with water and electrolyte depletion. In case of overdose, symptoms of intoxication may include diarrhea with excessive dehydration and loss of electrolytes, especially potassium. Emergency measures for overdose include electrolyte and fluid-regulating measures. Potential drug interactions for senna teas, with chronic use or abuse, include potassium depletion, which may potentiate the action of cardiac glycosides and may also lead to a possible interaction with antiarrhythmic agents. Potassium deficiency can be intensified by concomitant ingestion of saluretics, adrenal corticosteroids, or licorice root. Possible side effects of senna teas, in individual cases, may include cramp-like discomforts of the gastrointestinal tract, particularly in patients

with irritable colon. In these cases, a dosage reduction is necessary. The metabolites may cause an intensive yellow or red-brown discoloration of urine (pH dependent), which is not clinically significant.⁸

Smooth Move also contains licorice root PhEur (*Glycyrrhiza glabra* L.). One cup of the herbal tea contains approximately 15 mg of glycyrrhizic acid, which is significantly below the level of concern for known side effects of licorice overdose. On prolonged use of licorice (>6 weeks' daily use) at overdose levels (>50,000 mg licorice daily), sodium and water retention and potassium loss may occur, accompanied by hypertension, edema, hypokalemia, and, in rare cases, myoglobinuria.⁹

Also contained in Smooth Move, in order of predominance, are bitter fennel fruit PhEur (*Foeniculum vulgare* Miller sp. *vulgare* var. *vulgare*), sweet orange peel MFR (*Citrus sinensis* (L.) Osbeck), cinnamon bark JP (*Cinnamomum cassia* Blume), coriander fruit PhEur (*Coriandrum sativum* L.), ginger rhizome PhEur (*Zingiber officinale* Roscoe), and sweet orange peel oil PhEur (*Citrus sinensis* (L.) Osbeck) dried on acacia gum PhEur (*Acacia senegal* L. Willdenow).

These additional herbs are traditionally combined with senna leaf. Their role in the Smooth Move formula is to minimize the intestinal cramping a stimulant laxative may cause. For example, bitter fennel fruit and coriander fruit are common additions to traditional senna preparations for this reason. Both herbs have demonstrated carminative and spasmolytic properties. Also, licorice root is often included in laxative preparations because it is known to potentiate the action of anthraquinone drugs such as senna leaf (raising the moistening ability of the bowel contents, as a result of the high surfactant activity of glycyrrhizin), so that lower doses of the stimulant laxative active ingredient are required for efficacy. It is also included as an antispasmodic component in laxative herbal teas.¹⁰

The placebo tea was a nonmedicinal, food/beverage tea, indistinguishable in appearance, aroma, and taste, containing 2000 mg of an herbal mixture that did not contain a stimulant laxative active ingredient. The placebo tea contained roasted carob fruit (*Ceratonia siliqua* L.), fennel fruit (*Foeniculum vulgare* Miller), sweet orange peel (*Citrus sinensis* [L.] Osbeck), Saigon cinnamon bark (*Cinnamomum loureirii* Nees), coriander fruit (*Coriandrum sativum* L.), ginger rhizome (*Zingiber officinale* Roscoe), and orange flavor.

The investigational products were prepared for, and dispensed to, the residents by nursing home staff (eg, registered nurse [RN] or licensed practical nurse [LPN]) and according to standard medicinal tea preparation instructions for uniformity of dose, composition, and strength: "Pour 240 mL boiling water over 1 tea bag in a heat-resistant cup. Do not use a microwave. Cover the cup with a lid and allow the tea to steep for 10 to 15 minutes. Gently squeeze the tea bag over the cup, using a spoon or kitchen tongs, in order to release any remaining extractive from the herbal formulation."

The addition of sweeteners (eg, honey or sugar) was allowed, if desired by the resident, in order to make the tea more palatable, thus improving dosage adherence. Because this study was designed to mimic real world conditions, the adding

of a sweetener was not deemed to be a confounding factor, and it was assumed that a similar number of residents from the active and placebo groups would use a sweetener in the tea.

For the purpose of obtaining data for evaluation, the nurses used the standard forms in use at this nursing home, including the Monthly Medication Record (one filled out for each study participant), Doctor's Order Form, and Monthly Flow Sheet. Bowel movements were recorded on the monthly flow records. All laxative medications were indicated on the Monthly Medication Administration Record including the bowel routine protocol. The initials of the nurse accompanied each routine laxative and investigational product dispensed. Adverse events were recorded using the MedWatch form.

Subjects were evaluated by the nursing staff for any untoward symptoms such as vomiting, diarrhea, or abdominal pain. Nursing staff had the discretion to withhold the herbal tea and were instructed to notify the attending physicians if the subject's condition did not improve. Routine electrolytes were not performed in this study. The nursing staff monitored study participants in the same manner as any other nursing home resident on laxatives.

Randomization and Blinding

Ninety-two residents were recruited and were randomly assigned to receive either Smooth Move herbal tea or placebo beverage tea. The study statistician performed the randomization employing MINITAB v14, a statistical software package. The randomization code for each resident was stored in 2 sealed envelopes. To maintain double-blind conditions, the placebo and Smooth Move tea bags, labels, and packaging were indistinguishable and did not allow unblinding. The clinical study investigators, statistician, and study sponsor remained blinded throughout the study. After study close out, the codes were broken for statistical analysis.

Sample Size Calculation

No clinical trial data exist on Smooth Move herbal tea, however several clinical studies have been carried out on other herbal laxative preparations containing senna fruit, senna leaf, or senna extract.¹¹⁻¹⁸

Based on the methodological recommendations of a systematic review of the effectiveness of laxatives in the elderly by Petticrew et al,² a sample size of 92 was selected to have the power to detect a mean difference of 1.5 bm/wk; significance level = 5%; allows for a 20% drop-out rate.

Statistical Analysis

The intention to treat (ITT) population consisted of all residents who completed the study. Forty-five residents were assigned to the Smooth Move group, but 1 expired before the study began and there were 2 subsequent dropouts, making a total of 42 who completed the study in this group. Forty-seven residents were assigned to the placebo group, but 1 expired during the study and there were also 2 dropouts, making a total of 44 in the placebo group who completed the study.

The following are the efficacy measurements assessed in this study:

Assessed for eligibility (n = 476)		
↓		
Excluded (n = 384)		
<ul style="list-style-type: none"> ➤ Not meeting inclusion criteria (n = 276) ➤ Refused to participate (n = 58) ➤ Other reasons (n = 50) 		
92 patients randomized		
↓		
	Block Randomization	
↙		↘
45 to Smooth Move		47 to placebo
↓		↓
2 Dropouts		2 Dropouts
1 Expired before study		1 Expired during study
↓		↓
42 Completed study		44 Completed study
32 were compliant 25+%		35 were compliant 25+%

Fig. 1. Flow chart of the clinical trial.

- Differences in the average number of bowel movements: 2-sample *t* test incorporating the Welch-Satterthwaite approximation.
- Differences in the average number of standard treatments administered: 2-sample *t* test, Mann-Whitney test or analysis of frequencies (such as a chi-square goodness of fit test).
- Differences in the average cost of treatments: total costs were simply tallied for each month. No statistical tests were run.

MINITAB 14, a statistical software package, was used for all data analyses and hypothesis testing. Standard exploratory data analysis was also used to assess deviations from normality.

RESULTS

Of the 476 total nursing home residents, 200 qualified for the study. Of those, 58 refused participation and another 50 were determined by the attending physicians to be inappropriate candidates for this study for various reasons. Therefore, a total of 92 residents were recruited (Figure 1); 45 randomly assigned to the Smooth Move group and 47 to the placebo group. Within the Smooth Move group, there were 2 dropouts and 1 expiration (prior to study start). Within the placebo group there were 2 dropouts and 1 expiration (during the study period). Thus, all ITT analyses included 86 residents (Smooth Move: *n* = 42; placebo: *n* = 44).

Primary Efficacy Parameter

There was a statistically significant increase in the number of bowel movements in the Smooth Move group compared to placebo. In the ITT analysis, the Smooth Move group (*n* = 42) compared with the placebo group (*n* = 44) experienced an average of 4.14 more bowel movements during the 28-day study period versus the 28-day pre-study period (*P* = .017); SD 9.54, SE mean 1.5. Because residents in both groups also remained on standard treatment for chronic constipation, the addition of Smooth Move tea was the only known variable that could account for the increase in bowel movements. The patients in both groups followed the same bowel routine protocol, and there were no notable differences between the

2 groups in their use of usual laxatives. For example, any patient recorded to be taking Senokot-S in February was also taking it in March, and often at the exact same dosage. There were no patients taking Senokot-S in March for the first time.

The primary reason that residents continued to receive usual laxatives when needed as per the bowel routine protocol is because of the risk of fecal impaction in this population. The Centers for Medicare and Medicaid Services (CMS) consider a fecal impaction in the long-term care setting to be a “Sentinel Event,” and they are identified on the Quality Indicator report. A Sentinel Event is a quality indicator that represents a significant occurrence and should occur very infrequently, if at all, in a facility. The nature of these indicators is serious enough to warrant investigation should they occur only once. Therefore removing residents from their standard treatments during the course of the study could have placed the residents at risk for a fecal impaction and the facility could be cited.

Secondary Efficacy Parameters

Differences in costs and/or number of standard treatment interventions between the Smooth Move group and the placebo group were not significant. The total number of laxative interventions for the months of February and March are larger for the placebo group (Table 1). A comparison of placebo and Smooth Move groups with respect to total number of interventions for February, March, and for the change between February and March are not statistically significant (*P* values are .4964, .2770, and .1893, respectively); however, the differences do impact total cost. Total costs for the placebo group for February and March were similar (average: Feb \$429.04, Mar \$458.01). Total costs for the Smooth Move group for February and March were also similar (average: Feb \$278.04, Mar \$256.42). The cost calculations were derived from the invoiced prices paid by nursing home pharmacy to the pharmaceutical distributor. The cost assigned to the investigational product was derived from current wholesale distributor pricing.

Compliance

For determining single-dose compliance, the stimulant laxative monograph (21 CFR, §334.60) was referred to, wherein the oral dosage for sennosides A and B is 12 to 50 mg. Therefore, based on the monograph, it was determined that drinking at least 50% and up to 100% of 1 cup would provide an effective single dose of sennosides. Data collectors noted whether or not a resident consumed at least one-half cup of tea and tallied the number of compliant days over the course of 28 days. Data collectors also noted if residents refused tea.

Table 1. Total Costs and Total Interventions Comparisons

	No. Interventions		Cost (USD)	
	February	March	February	March
Placebo	2081	2162	429.04	458.01
Smooth Move	1875	1754	278.04	256.42
Difference	206	408	151	201.59

Table 2. Compliance Descriptive Statistics: % High Compliance

Variable Group % High Comp	n	Mean	SD	Min	Q1	Median	Q3	Max
Placebo	44	0.6096	0.3374	0.00000	0.3036	0.6607	0.9643	1.0000
Smooth Move	42	0.5876	0.3510	0.00000	0.2411	0.7143	0.8929	1.0000

Percentage (%) High Compliance is computed by dividing the number of adequate doses by 28 (Table 2). An ad hoc threshold of 25% is used to categorize residents as compliant/non-compliant for the duration of the study. The statistician chose a 25% threshold simply to aid interpretation.

Safety

Overall, 4 residents experienced 5 serious adverse events (SAEs) in this study; 5 events (4 residents, 9.0%) in the placebo group, 0 events (0 residents, 0.0%) in the Smooth Move group. Of the 4 residents who experienced the SAEs in the placebo group, 1 expired from natural causes, and the other 3 were admitted to the acute care hospital. All adverse events were assessed as being unrelated to the clinical trial. System-organ classes and codes involved were gastrointestinal (GI) system disorders (1 resident had GI virus with diarrhea and hypotension and volume depletion, and GI bleed); another resident experienced a urinary system disorder (acute renal failure) and respiratory system disorders (pneumonia); a third resident had mental status changes with bilateral pulmonary rhonchi; and there was 1 expected death after being on “comfort care” for more than 6 months (1 event). Adverse event reports were prepared at the end of the study period and submitted to MedWatch, the Food and Drug Administration safety information and adverse event reporting program. We did not address drug-drug interactions in this study.

Chronic constipation is a serious medical condition and it is seen especially in long-term care facilities where many of the residents have dementia as well as being on multiple medications that have the potential to cause or aggravate the problem. Bulk laxatives are usually not effective in this population group as they often have delayed transit time and stool softeners, which reduce surface tension to allow water to penetrate, have not proven to be very effective. The long-held belief that the chronic use of stimulant laxatives is harmful has not been substantiated in clinical practice. If used appropriately, there is no evidence to suggest that senna causes any morphologic changes of colonic muscles or neurons, or causes cathartic colon or an increase in colorectal cancers. Electrolyte disturbance can be seen in the context of laxative abuse but this should not occur when used under medical supervision.⁷

DISCUSSION

The results of this study show that Smooth Move herbal tea has proven to be superior to placebo. It would appear that one of the shortcomings of this study was that the tea was given on day shift while the effects occurred on the later shifts. The nurses on those shifts did not recommend reducing the usual laxatives

and not enough emphasis was placed on a protocol for day shift to reduce laxatives. This is probably the main reason for the continued use of the standard regimen even though some of the residents may have managed on the herbal tea alone. This should be addressed in follow-up studies.

Another possible limitation of this study is that while the difference in total number of bowel movements was evaluated, other potentially related variables such as stool consistency, stool weight, and ease of defecation were not evaluated. The reason for this is because the conducting of additional, nonroutine and time-consuming bowel sample evaluations was not practical or feasible given the staff and time limitations. In any case, it was observed that the total number of stools in the placebo group remained almost unchanged during the 28-day pre-study period compared to the 28-day study period, while there was an increase in the number of stools in the Smooth Move group. Because residents in both groups also remained on standard treatment for chronic constipation, the addition of Smooth Move tea was the only known variable that could account for the increase in bowel movements. The investigators also saw no reason to expect any significant changes in the stool weights or consistency between the 2 groups under these conditions.

CONCLUSION

Smooth Move, a traditional herbal tea formula for relieving constipation, has proven to be superior to placebo as determined by a clinically relevant difference in the average number of bowel movements.

Although we encountered no adverse events with the daily use of the laxative tea, it is recommended that it be used no more than 3 times per week when bulk or osmotic laxatives fail. The tea can be used alone or in combination with the previously mentioned laxatives.⁷ If a stimulant laxative is indicated, the use of Smooth Move should be considered as the product is effective, contains herbs that reduce cramping, and has been well accepted by the residents and staff. With the increased vigilance on the number and cost of prescription medications used in the geriatric population, it would be refreshing to see an order for herbal tea.

The results of this study warrant follow-up with a larger multicenter study to further assess efficacy and cost-effectiveness.

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