patients with nocturnal asthma symptoms to determine which agents are most efficacious, cost-effective, and have the fewest adverse effects.

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An Alternative Treatment for Low Back Pain

Ghoname EA, Craig WF, White PF, et al. Percutaneous electrical nerve stimulation for low back pain: a randomized crossover study. JAMA 1999; 281:818-23.

Clinical question **Does percutaneous electrical nerve stimulation (PENS) improve pain and functioning in patients with chronic low back pain?**

Background Low back pain is one of the most common and disabling problems in our society, and current therapies are mostly unsatisfactory. Newer research has shown that PENS is effective for management of pain associated with low back pain. This study compares PENS with transcutaneous electrical nerve stimulation (TENS) and exercise therapy in the treatment of low back pain caused by degenerative disc disease.

Population studied Sixty patients participated in the study. Participants had chronic (>3 months) stable low back pain, were taking oral nonopiod analgesics, had radiologically confirmed degenerative disc disease, and had no acute or long-term illnesses. Patients with drug or alcohol abuse, long-term opioid use, a change in the character or severity of the pain within the last 3 months, presence of sciatica, previous use of nontraditional analgesic therapies, pending medicolegal litigation, or inability to complete a health status assessment questionnaire were excluded from the study. The population seems similar to that of the typical family practice, but demographic information (eg, diagnostic work-up, duration of pain, back operations, disability, or referral pattern) is lacking, and would have provided additional clues to understanding which patients could most benefit from this therapy.

Study design and validity This randomized sham-controlled crossover study compared sham-PENS, PENS, TENS, and flexion-extension exercise during a 15-week study period. The PENS therapy consisted of 10 32-gauge acupuncture-like needle probes placed to a 2- to 4-cm depth in a dermatomal distribution of the pain; electrical stimulation was then applied with intensity adjusted to produce a tapping sensation without muscle contractions. The sham-PENS therapy was identical, except that electrical stimulation was not applied. Each patient received one of the 4 treatment modalities for 30 minutes 3 times a week for 3 weeks, according to 1 of 4 computer-generated sequences.

The study design is strong. Its strengths include randomization of modality sequence, the crossover design, blinded collection of data, inclusion of the sham-PENS control group and a wash-out period, and clinically relevant outcomes. The lack of emphasis on confounding variables (eg, disability status), and the small numbers (limiting the power for detecting confounders) are the main weaknesses.

Outcomes measured Pain response, physical activity, quality of sleep, and sense of well-being were measured using visual analog scales (VASs) and the physical and mental component scores of the 36-Item Short-Form Health Survey (SF-36). Oral analgesic requirements and adverse effects were recorded in daily diaries. An overall assessment of relative effectiveness was obtained at the completion of all modalities. Useful outcomes that were not measured include cost (both financial and time) and feasibility of obtaining each service (clinical setting and capable providers).

Results All patients completed the study. PENS produced a significant improvement from baseline in mean VAS scores for pain and level of activity (P <.03), and from sham-PENS, TENS, or exercise (P <.02). The SF-36 scores corroborated these findings. PENS also decreased consumption of nonopioid analgesics from 2.6 pills (±1.4) per day to 1.3 pills (±1.2) per day (P <.008), while the other 3 modalities did not. PENS was the preferred therapy for 91% of the study patients, and greater than 80% of patients indicated they would be willing to pay extra to receive PENS therapy. The authors did not comment on the patients' reported adverse effects.

Recommendations for clinical practice **This study provides fairly strong evidence that PENS therapy is superior to TENS, exercise, and placebo in providing short-term pain relief and improved physical function for patients with chronic low back pain. When confronted with the frustrations of the limited options for low back pain, physicians should consider PENS as a potential alternative. Future research is needed on the utility for acute low back pain, cost-effectiveness, use in combination with other modalities, ideal**

frequency of treatment and electrical stimulation, and the length of the therapeutic effect.

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Preventing Delirium in Hospitalized Older Patients

Inouye SK, Bogardus ST, Charpentier PA, et al. A multicomponent intervention to prevent delirium in hospitalized older patients. N Engl J Med 1999; 340:669-76.

Clinical question **Does a multicomponent delirium-prevention protocol reduce the incidence and severity of delirium in elderly hospitalized patients?**

Background Delirium is a dangerous and costly medical condition, doubling the risk of death and tripling the risk of residential care among hospitalized elderly patients.[1] A recent systematic review found essentially no effect of multidisciplinary team interventions on preventing delirium, but stated that more research was necessary because of the methodologic limitations of the studies reviewed.[2]

Population studied The authors studied 852 patients, aged 70 years or older, admitted to a general internal medicine (not intensive care) teaching service at a tertiary care center. Inclusion criteria were age greater than 70 years, no delirium on admission, and intermediate or high risk for delirium at baseline. The risk for delirium was assessed using a validated predictive model previously published by the authors.[3] Patients were excluded for inability to participate in an interview, coma or terminal illness, a hospital stay of 48 hours or less, prior enrollment in this study, or unavailability of the examiner or patient.

Study design and validity This was a controlled clinical trial using a prospective matching technique instead of randomization. The authors chose this technique because of the difficulties associated with randomization into an experimental unit in an overcrowded hospital. The authors admit to some difficulty in finding matching controls for those at the extreme ends of the matching criteria (eg, age), but overall the matching was done carefully. Patients who were excluded, those who refused, and those who could not be matched were not significantly different from the experimental group. Patients were assessed on admission with a battery of previously validated cognitive tests and severity of medical illness scores.

The intervention group was subjected to a delirium risk factor modification program (the Elder Life Program) implemented by a highly trained health care team. Six risk factors were targeted for intervention: cognitive impairment, hearing impairment, sleep deprivation, immobility, visual impairment, and dehydration. Each risk factor had a preventive protocol associated with it, and the combination of protocols was individualized to the patients on the basis of a patient's risk factors. The control group received standard hospital care. The attending physicians and residents cared for patients in both groups. Patients were followed daily throughout their hospitalization for evidence of dementia assessed using 3 cognitive tests (the Mini-Mental State Examination, the Digit Span test, and the Confusion Assessment Method rating). On discharge or day 5 of hospitalization, whichever came first, the patients were re-assessed for delirium risk factors, and their charts were reviewed for evidence of delirium.

Outcomes measured The primary outcome was delirium, as assessed by the Confusion Assessment Method criteria (acute onset and fluctuating course of delirium, inattention, and either disorganized thinking or altered level of consciousness). Total days of delirium and the number of episodes of delirium in each hospitalization were also recorded. Outcomes were appropriately assessed using an intention-to-treat analysis.

Results No significant differences in baseline characteristics (demographic factors, dementia risk factors, or reason for admission) were found between the intervention and control groups. Of note, 25% of the patients had a Mini-Mental State Examination score of 20 or less at entry; this study did not exclude demented patients, which adds to its usefulness. The risk of a first episode of delirium was reduced by 5.1% in the intervention group. This means that a physician would need to apply this intervention to 20 patients for the first 5 days of hospitalization to prevent the first episode of delirium in 1 patient (number needed to treat = 20). The total number of days of delirium were reduced in the intervention group (105 vs 161, $P = .02$) as were the total number of episodes of delirium (62 vs 90, $P = .03$). The authors felt that the largest benefit was obtained in preventing the first episode of delirium. There were no adverse effects noted from the intervention, and adherence to the intervention program was 87%. Noncompliance resulted from refusal by the patient, unavailability of the patient or the intervention staff, or medical contraindications. The cost of the intervention was $6341 per case of delirium prevented.

Recommendations for clinical practice **This well-designed study demonstrates the efficacy of a hospital-based intervention protocol to reduce the incidence of delirium for at-risk elderly hospitalized patients. These results represent the most**