# Effectiveness of interventions to prevent delirium in hospitalized patients: a systematic review

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## Abstract • Résumé

**Objective:** To determine the effectiveness of interventions to prevent delirium in hospitalized patients.

**Data sources:** Two databases, MEDLINE and CINAHL, were searched for relevant articles published from January 1966 to May 1995 and from January 1982 to May 1995 respectively. The bibliographies of identified articles were searched for additional references.

**Study selection:** Ten articles met the following three inclusion criteria: (a) original research article, (b) published in English or French and (c) controlled trial (nonrandomized or randomized) of an intervention to prevent delirium in hospitalized patients. The validity of the studies was independently assessed according to the criteria for intervention studies proposed by the Evidence-Based Medicine Working Group.

**Data extraction:** Information about study design, patient population, sample size, diagnostic criteria, interventions and results was systematically abstracted from each report. Absolute risk reduction (ARR) for delirium was calculated for each study.

**Data synthesis:** Eight trials involved surgical patients and two involved elderly medical patients; most of the studies had serious methodological limitations. Among the surgical patients the ARRs ranged from −13% to 81% and were not related to the type or timing of the intervention, or to the personnel involved. Among the elderly medical patients the ARRs ranged from −3% to 3%.

**Conclusion:** Interventions to prevent delirium among surgical patients may be modestly effective, but further trials are necessary.

**Objectif :** Déterminer l'efficacité des interventions qui visent à prévenir le délire chez les patients hospitalisés.

**Sources de données :** On a effectué des recherches dans deux bases de données, MEDLINE et CINAHL, pour trouver des articles pertinents publiés entre janvier 1966 et mai 1995, et entre janvier 1982 et mai 1995 respectivement. On a effectué des recherches dans les bibliographies des articles repérés pour y trouver d'autres références.

**Sélection d'études :** Dix articles ont satisfait aux trois critères d'inclusion suivants : a) article portant sur une recherche originale, b) publié en anglais ou en français et c) étude contrôlée (non randomisée ou randomisée) d'une intervention visant à prévenir le délire chez les patients hospitalisés. La validité des études a fait l'objet d'une évaluation indépendante fondée sur les critère relatifs aux études d'intervention proposés par le Groupe de travail sur la médecine fondée sur les preuves.

**Extraction des données :** On a résumé systématiquement les renseignements tirés de chaque rapport qui portaient sur la conception de l'étude, la population des patients, la taille de l'échantillon, les critères de diagnostic, les interventions et les résultats. On a calculé la réduction du risque absolu de délire à l'égard de chaque étude.

**Synthèse des données :** Huit études portaient sur des patients en chirurgie et deux, sur des patients âgés en médecine. La méthodologie de la plupart des études comportait de sérieuses limites. Chez les patients en chirurgie, la réduction du risque absolu a varié de −13 % à 81 % et n'était liée ni au


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type ou au moment de l'intervention, ni au personnel en cause. Chez les patients âgés en médecine, la réduction du risque relatif a varié de –3 % à 3 %.

**Conclusion :** Les interventions visant à prévenir le délire chez les patients en chirurgie peuvent être d'une efficacité limitée, mais d'autres études s'imposent.

Delirium is an organic mental disorder characterized by acute onset, altered level of consciousness, fluctuating course and disturbances in orientation, memory, attention, thought and behaviour.[1] It occurs in up to 51% of medical and surgical inpatients[2] and appears to be associated with significant increases in functional disability, length of hospital stay, rates of admission to long-term care institutions, rates of death and health care costs.[2–5]

Many cases of delirium occur after admission to hospital,[2] when there is a confluence of factors (e.g., drug intoxication, infections, unfamiliar environment and sensory deprivation) that predispose to, precipitate and perpetuate delirium. Procedures to abate these factors and prevent delirium have been described,[1,6–8] but their impact is not clear. Thus, we conducted a critical review of relevant original research articles to determine the effectiveness of interventions to prevent delirium in hospitalized patients. The review process, modified from the one described by Oxman, Cook and Guyatt,[9] involved systematic selection of research studies, assessment of validity, abstraction of data and examination of results.

## Methods

### *Literature search*

The selection of articles involved three steps. First, one of us (M.G.C.) searched two databases, MEDLINE and CINAHL (Nursing and Allied Health Database), for relevant research articles published from January 1966 to May 1995 and from January 1982 to May 1995, respectively, using the terms "delirium," "acute confusion" or "post-operative psychosis," and "prevention," "treatment" or "intervention." Second, the bibliographies of relevant articles were searched for additional references. Finally, all retrieved articles were screened by one of us (M.G.C.) against the following three inclusion criteria: (a) original research article, (b) published in English or French and (c) controlled trial (nonrandomized or randomized) of an intervention to prevent delirium in hospitalized patients.

### *Assessment of validity*

To determine validity two of us (M.G.C. and F.P.) independently assessed the methods and design of each trial according to the six criteria described by the Evidence-Based Medicine Working Group:[10] randomized study, no clinically significant differences between groups reported at baseline, equal treatment of groups except for the intervention, blind rating of outcomes, complete follow-up of all subjects enrolled in the trial and intention-to-treat analysis (outcome data analysed according to groups to which patients were assigned initially). Interobserver agreement (ICC) was 0.79. After discussion and consensus, we awarded 1 point for each criterion met and calculated a total quality score (ranging from 0 to 6) for each trial.

### *Abstraction of data*

Information about study design, patient population, diagnostic criteria, sample size, interventions and results was abstracted systematically from each report. To compare the effect of the interventions we calculated the incidence rate of delirium as measured in each study in the treatment and control groups. We then calculated the absolute risk reduction (ARR) and the 95% confidence interval (CI) around the ARR.[11]

## Results

Our selection process yielded 10 trials (Table 1) — 7 nonrandomized[12–18] and 3 randomized.[19–21] The 10 trials were separated into three groups: those involving middle-aged cardiac surgery patients,[12–14,19–21] those involving elderly orthopedic surgery patients[15,16] and those involving elderly medical patients.[17,18] The total quality scores for the trials are presented in Table 2.

### *Middle-aged cardiac surgery patients*

Lazarus and Hagens[12] conducted a nonrandomized trial of preoperative psychiatric assessment and postoperative nursing support and reorientation. The treatment group comprised 21 patients at one hospital; control subjects were 33 patients at another hospital. The treatment subjects received a psychiatric consultation 2 to 3 days before surgery and special postoperative nursing care. The consultation covered five areas (patient's view of his or her illness, reason for the surgery, attitudes toward the surgery, characteristic coping styles and current life situation); in addition, the psychiatrist tried to strengthen confidence in the hospital and to reduce the patient's anxiety concerning the surgery, sometimes with the use of tranquilizers. The nursing care encouraged a supportive reality-oriented relationship that stressed orientation to time, place and circumstances and avoided interruption of the patient's sleep. Outcome was assessed during the first 2 postoperative days. Overall, 14% of the treatment subjects experienced symptoms of delirium, as compared with 33% of the control subjects.

In another nonrandomized trial, Layne and Yudofsky[13] assessed the effectiveness of a preoperative psychiatric interview. The treatment group comprised 42 patients in one surgical unit, and the control group comprised 19 in another unit. The treatment subjects were interviewed the evening before surgery about their condition, the purpose of the surgery and any problems or apprehensions. Postoperatively, 10% of the treatment subjects and 22% of the control subjects had one or more symptoms of delirium.

Budd and Brown[14] conducted a nonrandomized trial of postoperative reorientation by nursing personnel. The first 15 enrolled patients constituted the control group and the following 16 patients constituted the

**Table 1: Summary of trials assessing effectiveness of interventions to prevent delirium in hospitalized patients**

| Patient category; trial | Design* | No. of patients: Treatment | No. of patients: Control | Criteria for delirium† | Intervention personnel | Timing of intervention | Incidence of delirium, %: Treatment | Incidence of delirium, %: Control | Absolute risk reduction, % |
|---|---|---|---|---|---|---|---|---|---|
| **SURGICAL PATIENTS** | | | | | | | | | |
| **Cardiac** | | | | | | | | | |
| Lazarus et al, 1968[12] | NR | 21 | 33 | Symptoms | Physician/ nurse | Preop + postop | 14 | 33 | 19 |
| Layne et al, 1971[13] | NR | 42 | 19 | Symptoms | Physician | Preop | 10 | 22 | 12 |
| Budd et al, 1974[14] | NR | 16 | 15 | Symptoms | Nurse | Postop | 6 | 87 | 81 |
| Chatham, 1978[19] | R | 10 | 10 | Symptoms | Nurse | Postop | Q‡ | – | – |
| Owens et al, 1981[20] | R | 32 | 32 | Symptoms | Nurse | Preop | 59 | 78 | 19 |
| Schindler et al, 1989[21] | R | 16 | 17 | DSM-III criteria | Physician | Preop + postop | 13 | 0 | −13 |
| **Orthopedic** | | | | | | | | | |
| Williams et al, 1985[15] | NR | 57 | 170 | Symptoms | Nurse | Preop + postop | 44 | 52 | 8 |
| Gustafson et al, 1991[16] | NR | 103 | 111 | DSM-III criteria | Physician | Preop + postop | 48 | 61 | 14 |
| **MEDICAL PATIENTS** | | | | | | | | | |
| Nagley, 1986[17] | NR | 30 | 30 | Symptoms | Nurse | – | 3 | 0 | −3 |
| Wanich et al, 1992[18] | NR | 135 | 100 | DSM-III criteria | Nurse | – | 19 | 22 | 3 |

*NR = nonrandomized, R = randomized.
†DSM-III = Diagnostic and Statistical Manual of Mental Disorders. 3rd ed. Washington: American Psychiatric Association, 1980.
‡Q = quantitative symptom measures only.

**Table 2: Consensus scores of study quality with respect to meeting (1) or not meeting (0) criteria for intervention studies proposed by the Evidence-Based Medicine Working Group[10]**

| Patient category; trial | Criterion; score: Randomized study | Similar groups at baseline | Equally treated groups | Blind-rated outcomes | Complete follow-up | Intention-to-treat analysis | Total score (0–6) |
|---|---|---|---|---|---|---|---|
| **SURGICAL PATIENTS** | | | | | | | |
| **Cardiac** | | | | | | | |
| Lazarus et al[12] | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| Layne et al[13] | 0 | 0 | 1 | 0 | 1 | 1 | 3 |
| Budd et al[14] | 0 | 1 | 1 | 0 | 1 | 1 | 4 |
| Chatham[19] | 1 | 0 | 1 | 1 | 1 | 1 | 5 |
| Owens et al[20] | 1 | 0 | 1 | 1 | 1 | 1 | 5 |
| Schindler et al[21] | 1 | 1 | 1 | 0 | 1 | 1 | 5 |
| **Orthopedic** | | | | | | | |
| Williams et al[15] | 0 | 1 | 1 | 0 | 1 | 1 | 4 |
| Gustafson et al[16] | 0 | 0 | 1 | 0 | 1 | 1 | 3 |
| **MEDICAL PATIENTS** | | | | | | | |
| Nagley[17] | 0 | 1 | 0 | 0 | 1 | 1 | 3 |
| Wanich et al[18] | 0 | 0 | 1 | 0 | 1 | 1 | 3 |

treatment group. Postoperatively, the treatment subjects were observed in the intensive care unit (ICU) for signs of delirium, whereupon a reorientation procedure was implemented that involved orienting the patient to time, place and physical status at each nursing contact. One or more symptoms of delirium (disorientation in place and time, restlessness, lability) occurred in 1 (6%) of the treatment subjects and 13 (87%) of the control subjects.

In a randomized trial, Chatham[19] assessed the effectiveness of postoperative education of the patient's spouse. There were 10 treatment subjects and 10 control subjects. Preoperatively, all of the patients were informed about the surgery and the ICU environment. Postoperatively, a significant family member (usually a spouse) of each patient in the treatment group was given educational material that described the postoperative care of the patient and encouraged frequent eye contact, touch and verbal orientation to person, place and time. Outcome was measured using an 11-item checklist during the first 4 postoperative days. Five of these items (orientation, appropriateness, confusion, delusions and sleep) were significantly improved or alleviated in the treatment group. Incidence rates of delirium could not be calculated.

In another randomized trial, Owens and Hutelmyer[20] tested the hypothesis that patients who were educated preoperatively about the possibility of unusual sensory or cognitive experiences would not have such experiences postoperatively or would feel comfortable with them if they occurred. Sixty-four consecutive patients were alternately assigned to either a treatment or a control group. The treatment subjects were visited before surgery by the nurse investigator, who discussed the possibility of memory loss, impaired concentration and hallucinations. They were reassured that such experiences were common and self-limited and should be discussed with staff. The control subjects received usual care. All patients were interviewed 4 to 8 days postoperatively. Twenty-five (78%) of the patients in the control group and 19 (59%) in the treatment group reported at least one unusual experience. The treatment patients, however, were more comfortable with the experiences.

Schindler, Shook and Schwartz[21] conducted a randomized trial of pre- and postoperative psychiatric intervention involving 16 treatment subjects and 17 control subjects. The treatment subjects received a preoperative psychiatric assessment that (a) established a therapeutic relationship, (b) facilitated expression of anxiety and concerns about the surgical procedure, (c) corrected misperceptions about the procedure, (d) provided information about the expected neuropsychological sequelae and (e) communicated pertinent findings (verbal and written) to surgical staff. In addition, they received daily supportive psychotherapy postoperatively from the same consultant who had performed the preoperative evaluation. Signs of delirium occurred in 13% of the treatment subjects and none of the control subjects. Nonetheless, the treatment subjects received less morphine or benzodiazepines postoperatively and had a shorter mean length of hospital stay (15.7 days v. 18.7 days).

*Elderly orthopedic surgery patients*

Williams and associates[15] conducted a nonrandomized trial of a systematic pre- and postoperative nursing intervention involving patients aged 60 years and over with a hip fracture who were cognitive before surgery. The study took place in four orthopedic units in two phases: a control phase (170 patients) and a treatment phase (57 patients). During the treatment phase, project staff discussed each case with the primary nurse on each nursing shift to ensure implementation of preventive and ameliorative approaches. Preventive approaches were related to strange environment, altered sensory input, loss of control and independence, immobility, pain and disruption of elimination patterns; ameliorative approaches were related to mild confusion, sundowning (agitation or confusion in the evening or at night), unsafe behaviours, hallucinations, delusions and fear. During the first 5 postoperative days the incidence of confusion was 44% in the treatment group and 52% in the control group; the incidence of severe confusion was 8% and 16%, respectively.

Gustafson and colleagues,[16] in a nonrandomized trial of a geriatric-anesthesiologic intervention for elderly patients with a hip fracture, compared 103 treatment subjects with 111 control subjects who had been admitted to the same unit 2 to 5 years previously. Treatment subjects received the following intervention: (a) surgery was performed as soon as possible; (b) a geriatrician carried out a preoperative examination, and patients found to have clinical signs of heart failure were given extra doses of diuretics and heparin (5000 U subcutaneously twice a day) for thrombosis prophylaxis; (c) arterial blood gas values were measured soon after admission, followed by administration of oxygen (1 L/min) nasally, and oxygen-enriched air throughout the operation and up to 7 days postoperatively, if appropriate; (d) for anesthesia, plain morphine was given subcutaneously along with spinal anesthesia, and hypotension was treated with phenylephrine; and (e) the geriatrician assessed all patients several times postoperatively, and those with confusion underwent special examinations. The control subjects received usual care involving various anesthetic techniques but no special pre- or postoperative interventions. During the first 7 postoperative days the incidence of confusion was 48% in the treatment group and 61% in the control group; 9% of the treatment subjects were confused for more than 7 days, as compared with 28% of the control subjects. Severe confusion occurred in 7% and 30% of the subjects respectively. The mean length of stay was 11.6 days in the treatment group and 17.4 days in the control group.

*Elderly medical patients*

Nagley,[17] in a nonrandomized trial, assessed 16 nursing activities to prevent confusion. The treatment group comprised 30 patients aged 65 years and over with intact language and cognition (a score of 4 or less on the Short Portable Mental Status Questionnaire [SPMSQ]) who were admitted to a general medical division; 30 similar patients admitted to another division constituted the control group. Nurses in the treatment division attended an educational session and received frequent reinforcement to implement 16 nursing activities related to patient comfort, sensory input, orientation and ambulation. Patients in the control division received usual hospital care. Degree of confusion was assessed 4 days after admission. Delirium appeared to develop in only one patient (in the treatment group); thus, there was no significant difference between the two groups.

Wanich and associates,[18] in a nonrandomized trial, assessed the effectiveness of a nursing intervention in preventing delirium among 135 treatment subjects admitted to a medical unit; the control group comprised 100 patients admitted to two different medical units. All of the subjects were 70 years of age and over and did not have a terminal illness. Treatment subjects were assessed daily by a geriatric nurse specialist, who directed the following nursing interventions: education of nursing staff; orientation and communication; mobilization; environmental modifications; education of caregivers; medication management; and discharge planning. Control subjects received usual nursing care. Outcomes (presence of delirium, mortality, discharge site, length of stay, change in functional status) were determined over 5 weeks. There were no significant differences between the two groups.

*Analysis*

The absolute risk reductions (ARRs) and 95% confidence intervals (CIs) for delirium in the 10 trials are presented in Fig. 1. The ARRs ranged from −13% to 81% for the cardiac surgery patients, 8% to 13% for the elderly orthopedic surgery patients and −3% to 3% for the elderly medical patients. There did not appear to be any association between the quality score and the risk difference.

The incidence rate of delirium varied greatly in the control groups of the different studies, from 0%[17,21] to approximately 80%.[14,20] This suggests that either the study populations were extremely heterogeneous or that the criteria for delirium differed to an unacceptable extent. Therefore, we did not calculate an overall estimate of the risk difference.

The variability in the results may be explained by differences in trial design, study quality, patient selection, criteria for delirium, type of interventions (physician v. nursing, preoperative v. postoperative) and sample size (Table 1). These explanations were considered for differences within each group of studies.

Among the cardiac surgery patients four interventions were beneficial, irrespective of the type of intervention, the personnel involved, the timing of the intervention (preoperative v. postoperative) or the sample size. However, study design did seem to influence outcomes: two of the three randomized trials did not show significant positive results,[20,21] although in one of these studies[21] delirium was infrequent in the population studied. There was little variability in the results of trials involving either elderly orthopedic patients or elderly medical patients.

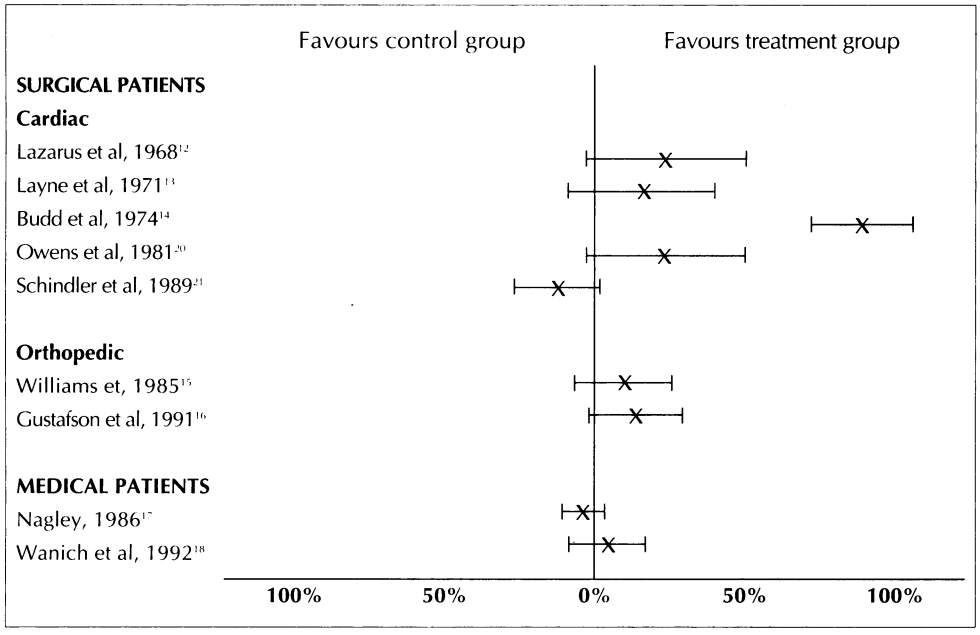


**Fig. 1: Absolute risk reductions and 95% confidence intervals for delirium, from studies assessing the effectiveness of interventions to prevent delirium in hospitalized patients.**

## Discussion

We proposed to determine the effectiveness of interventions to prevent delirium among hospitalized patients. Conclusions, however, are limited because of four methodological problems. First, the search strategy yielded a relatively small number of trials. Second, most of the trials were of nonrandomized design in which outcomes were not rated blind. Third, interpretation of the results was limited by the heterogeneity of the study populations and interventions. Finally, the rating scale we used, although based on evidence, has not been validated.

Limitations notwithstanding, the evidence suggests that a broad spectrum of preventive interventions involving psychiatric or medical assessment, support, education or reorientation may be modestly effective in reducing the frequency of delirium among surgical patients; elderly orthopedic surgery patients, however, seem to benefit less than younger cardiac surgery patients. Interestingly, interventions by nurses alone were as effective as interventions by physicians.

Preventive interventions appeared to be less effective for the elderly medical patients, but we could find only two published trials,[17,18] and both had serious limitations. In one,[17] delirium occurred in just 1 (3%) of the subjects; in the other, 80% of the cases of delirium were diagnosed at the time of admission and were, therefore, not preventable by hospital interventions. Moreover, elderly medical patients are more likely than surgical patients to have multiple, complex, chronic physical disorders that may be less amenable to preventive strategies. Detection and treatment procedures, such as those described in two recent trials,[22,23] might be more appropriate for this population.

Study validity was not related to absolute risk reduction. The absence of such a relation in this review may be attributed to features of the trials that were strongly related to outcomes not having been included in the validity assessment (e.g., differences in the populations studied, the diagnostic criteria used or the interventions).

## Conclusion

Interventions to prevent delirium in hospitalized patients may be modestly effective among surgical patients, but further trials are necessary. These trials should be conducted with rigorous standards and should target populations specified by age, premorbid level of cognition, general physical health, severity of illness and surgical procedure. They should be randomized and an adequate sample size determined with the use of power analysis (e.g., with a power of 80%, the sample size needed to detect the median absolute risk difference, 0.12, would be 292 at the 0.05 level of significance when the control rate of delirium is 22%). Outcome (i.e., frequency of new cases of delirium) should be rated blind as to study group. Standard criteria (i.e., those of the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, revised[24]) should be used to diagnose delirium, and symptom scales[25] should be used to rate its severity. Relatively simple patient education and reorientation interventions should be compared with procedures involving physicians. If treatment and control subjects are cared for in the same units, study design should minimize (or at least monitor) contamination of the usual care given to control subjects by the experimental treatment. Finally, because the quality of usual care probably varies, the trials should include process measures that indicate the actual differences in care received by the two groups.

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