
DELIRIUM – LITERATURE LIST

PROGNOSTICS, RISK FACTORS, OUTCOMES

- Avelino-Silva TJ et al. Prognostic effects of delirium motor subtypes in hospitalized older adults: A prospective cohort study. *PLoS One* 2018;13:e019092
- Cole MG et al. Partial and No Recovery from Delirium in Older Hospitalized Adults: Frequency and Baseline Risk Factors. *J Am Geriatr Soc* 2015;63:2340-2348
- Konttinen N et al. Outcome after anaesthesia and emergency surgery in patients over 100 years old. *A Anaesthesiol Scand* 2006;50:283-289
- Koster S et al. Delirium after cardiac surgery and predictive validity of a risk checklist. *Thoracic Surgery* 2008;86:1883-1887
- Isaia G et al. Delirium in elderly home-treated patients: a prospective study with 6-month follow-up. *Age (Dordr)* 2009;31:109-117
- Marcantonio ER et al. Reducing delirium after hip fracture: a randomized trial. *J Am Geriatr Soc* 2001;49:516-522
- McCusker J et al. Delirium in older medical inpatients and subsequent cognitive and functional status: a prospective study. *CMAJ* 2001;165:575-583
- Pandharipande PP et al. Long-term cognitive impairment after critical illness. *N Engl J Med* 2013; 369: 1306–16
- Pandharipande PP et al. Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients. *Anesthesiology* 2006;104:21-26
- Sato K et al. The impact of delirium on outcomes in acute, non-intubated cardiac patients. *Eur Heart J Acute Cardiovasc Care* 2017; 6: 553–9

ANESTHESIA / ANALGESIA / SEDATION

- Chan MT et al. BIS-guided anesthesia decreases postoperative delirium and cognitive decline. *J Neurosurg Anesthesiol* 2013;25:33-42
- Ellard L et al. Type of anesthesia and postoperative delirium after vascular surgery. *J Cardiothorac Vasc Anesth* 2014;28:458-461
- Hou R et al. POCD in patients receiving total knee replacement under deep vs light anesthesia: A randomized controlled trial. *Brain and Behavior* 2018;8:2:e00910
- Luetz A, Balzer F, Radtke FM, et al.: Delirium, sedation and analgesia in the intensive care unit: a multinational, two-part survey among intensivists. *PLoS One* 2014; 9: e110935.

COSTS

- Leslie DL et al. One-year health care costs associated with delirium in the elderly population. *Arch Intern Med* 2008;168:27-32
- Zywił MG et al. Health economic implications of perioperative delirium in older patients after surgery for a fragility hip fracture. *J Bone Joint Surg Am* 2015;97:829-836

DELIRIUM – LITERATURE LIST

INTERVENTIONS / PROPHYLAXIS

- Inouye SK et al. A multicomponent intervention to prevent delirium in hospitalized older patients. *NEJM* 1999;340:669-676
- Inouye SK et al. The role of adherence on the effectiveness of nonpharmacologic interventions: evidence from the delirium prevention trial. *Arch Int Med* 2003;163:958-964
- Kalisvaart KJ et al. Haloperidol prophylaxis for elderly hip-surgery patients at risk for delirium: a randomized placebo-controlled study. *JAGS* 2005;53:1658-1666
- Kratz T et al. Prävention des postoperativen Delirs. Eine prospektive Intervention mit gerontopsychiatrischer Liaisonpflege auf chirurgischen Stationen im Allgemeinkrankenhaus. *Dtsch Arztebl Int* 2015;112:289-296
- Luetz A et al. Feasibility of noise reduction by a modification in ICU environment. *Physiol Meas* 2016;37:1041-1055
- Shi Q et al. Delirium in acute stroke: a systematic review and meta-analysis. *Stroke* 2012; 43:645-649
- Siddiqi N et al. Interventions for preventing delirium in hospitalised non-ICU patients. *Cochrane Database of Systematic Reviews* 2016
- Spies M et al. Delir – ein evidenzbasierter Überblick. *WKW Education* 2019;14:1-17
- Stollings J et al. Delirium in critical illness: clinical manifestations, outcomes, and management. *Intensive Care Med.* 2021 Aug 16 : 1–15
- Watt J et al. Identifying older adults at risk of delirium following elective surgery. A systematic review and meta-analysis. *J Gen Intern Med* 2018;33:500-509

VENTILATION

- Wang J et al, The Potential Role of Lung-Protective Ventilation in Preventing Postoperative Delirium in Elderly Patients Undergoing Prone Spinal Surgery: A Preliminary Study. *Med Sci Monit* 2020;26:e926526

REVIEWS

- Heymann A, Spies CD, Postoperative delirium and cognitive deficit. *Prevention and therapy. AINS* 2010;45:112-116
- Höchter D et al. Das Delir – Prophylaxe and Behandlung. *Anästh Intensivmed* 2016;57:24-30
- Schiemann A, Spies C. Analgesie, Sedierung und Delir in der Intensivmedizin. *Intensivmed* 2011;48:135. <https://doi.org/10.1007/s00390-011-0265-y>

OTHERS

- ARGEBAU – Bauministerkonferenz, Netzwerk Krankenhausbau, Planungshilfe Intensivtherapie, 2018; <https://www.bauministerkonferenz.de/verzeichnis.aspx?id=22338&o=512005430>
- <https://krank.de/medizinprodukte/intensivbetten/>

TEXT BOOKS

- „Duale Reihe Anästhesie, Intensivmedizin, Notfallmedizin, Schmerztherapie“; Schulte am Esch (Herausgeber und Andere); Thieme Verlag; 4. Auflage; September 2011.

ABSTRACTS – IN ALPHABETICAL ORDER

WRITER	SUBJECT	PUBLICATION	PAGES
Avelino-Silva TJ	Prognostic effects of delirium motor subtypes in hospitalized older adults: A prospective cohort study	PLoS One 2018;13:e019092	7
Chan MT et al.	BIS-guided anesthesia decreases postoperative delirium and cognitive decline	J Neurosurg Anesthesiol 2013;25:33-42	8
Cole MG et al	Partial and No Recovery from Delirium in Older Hospitalized Adults: Frequency and Baseline Risk Factors	J Am Geriatr Soc 2015;63:2340-2348	
DAS Taskforce 2015	Evidence and consensus based guideline for the management of delirium, analgesia, and sedation in intensive care medicine. Revision 2015, short version	Ger Med Sci (2015) 13:doc19	9
Ellard L et al	Type of anesthesia and postoperative delirium after vascular surgery	J Cardiothorac Vasc Anesth 2014;28:458-461	10
Heymann A, Spies C	Postoperative delirium and cognitive deficit. Prevention and therapy	AINS 2010;45:112-116	11
Höchter D et al	Das Delir – Prophylaxe and Behandlung	Anästh Intensivmed 2016;57:24-30	11
Hou R et al	POCD in patients receiving total knee replacement under deep vs light anesthesia: A randomized controlled trial	Brain and Behavior 2018;8:2:e00910	12

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WRITER	SUBJECT	PUBLICATION	PAGES
Hughes CG et al	American Society for Enhanced Recovery and Perioperative Quality initiative Joint Consensus Statement on Postoperative Delirium Prevention	Anesth Analg 2020;130:1572-1590	13
Inouye SK et al	A multicomponent intervention to prevent delirium in hospitalized older patients.	NEJM 1999;340:669-676	
Inouye SK et al	The role of adherence on the effectiveness of nonpharmacologic interventions: evidence from the delirium prevention trial.	Arch Int Med 2003;163:958-964	14
Isaia G et al	Delirium in elderly home-treated patients: a prospective study with 6-month follow-up.	Age (Dordr) 2009;31:109-117	15
Kalisvaart KJ et al	Haloperidol prophylaxis for elderly hip-surgery patients at risk for delirium: a randomized placebo-controlled study	JAGS 2005;53:1658-1666	16
Konttinen N et al. Outcome after anaesthesia and emergency surgery in patients over 100 years old.	Outcome after anaesthesia and emergency surgery in patients over 100 years old.	Anaesthesiol Scand 2006;50:283-289	17
Koster S et al	Delirium after cardiac surgery and predictive validity of a risk checklist.	Thoracic Surgery 2008;86:1883-1887	18
Kratz T et al	Prävention des postoperativen Delirs. Eine prospektive Intervention mit gerontopsychiatrischer Liaisonpflege auf chirurgischen Stationen im Allgemeinkrankenhaus	Dtsch Arztebl Int 2015;112:289-296	19

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WRITER	SUBJECT	PUBLICATION	PAGES
Leslie DL et al	One-year health care costs associated with delirium in the elderly population	Arch Intern Med 2008;168:27-32	20
Luetz A et al	Feasibility of noise reduction by a modification in ICU environment	Physiol Meas 2016;37:1041-1055	21
Luetz A et al	Delirium, sedation and analgesia in the intensive care unit: a multinational, two-part survey among intensivists	PLoS One 2014; 9: e110935	22
Marcantonio ER et al	Reducing delirium after hip fracture: a randomized trial	J Am Geriatr Soc 2001;49:516-522	23
McCusker J et al	Delirium in older medical inpatients and subsequent cognitive and functional status: a prospective study	CMAJ 2001;165:575-583	24
Pandharipande PP et al	Long-term cognitive impairment after critical illness	N Engl J Med 2013; 369: 1306–16	
Pandharipande PP et al	Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients	Anesthesiology 2006;104:21-26	25
Sato K et al	The impact of delirium on outcomes in acute, non-intubated cardiac patients	Eur Heart J Acute Cardiovasc Care 2017;6:553-559	26
Schiemann A, Spies C	Analgesie, Sedierung und Delir in der Intensivmedizin	Intensivmed 2011;48:135	27
Shi Q et al	Delirium in acute stroke: a systematic review and meta-analysis	Stroke 2012; 43:645-649	27

ABSTRACTS – IN ALPHABETICAL ORDER

WRITER	SUBJECT	PUBLICATION	PAGES
Siddiqi N et al	Interventions for preventing delirium in hospitalised non-ICU patients	Cochrane Database of Systematic Reviews 2016	28
Spies M et al	Delir – ein evidenzbasierter Überblick	WKW Education 2019;14:1-17	29
Stollings J et al	Delirium in critical illness: clinical manifestations, outcomes, and management	Intensive Care Med. 2021 Aug 16 : 1–15	30
Wang J et al	The Potential Role of Lung-Protective Ventilation in Preventing Postoperative Delirium in Elderly Patients Undergoing Prone Spinal Surgery: A Preliminary Study	Med Sci Monit 2020;26:e926526	31
Watt J et al	Identifying older adults at risk of delirium following elective surgery. A systematic review and meta-analysis	J Gen Intern Med 2018;33:500-509	32
Zorembo N, Coburn M	Delir im Krankenhaus / Acute confusional states in Hospital	Dtsch Arztebl Int 2019;116:101-106	33
Zorembo N.	Management of delirium in the intensive care unit: Non-pharmacological therapy options.	Med Klin Intensivmed Notfmed 2017;112:320-325	
Zywił MG et al	Health economic implications of perioperative delirium in older patients after surgery for a fragility hip fracture	J Bone Joint Surg Am 2015;97:829-836	34

STU	Avelino-Silva TJ et al	Prognostic effects of delirium motor subtypes in hospitalized older adults: A prospective cohort study	PLoS One 2018;13:e019092
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Abstract

Objectives: To investigate the association between delirium motor subtypes and hospital mortality and 12-month mortality in hospitalized older adults.

Design: Prospective cohort study conducted from 2009 to 2015.

Setting: Geriatric ward of a university hospital in Sao Paulo, Brazil.

Participants: We included 1,409 consecutive admissions of acutely ill patients aged 60 years and over. We excluded admissions for end-of-life care, with missing data on the main variables, length of stay shorter than 48 hours, or when consent to participate was not given.

Main outcomes and measures: Delirium was detected using the Confusion Assessment Method and categorized in hypoactive, hyperactive, or mixed delirium. Primary outcomes were time to death in the hospital, and time to death in 12 months (for the discharged sample). Comprehensive geriatric assessment was performed at admission and included socio-demographic, clinical, functional, cognitive, and laboratory variables. Further clinical data were documented upon death or discharge. Multivariate analyses used Cox proportional hazards models adjusted for possible confounders.

Results: We included 1,409 admissions, with a mean age of 80 years. The proportion of in-hospital deaths was 19%, with a cumulative mortality of 38% in 12 months. Delirium occurred in 47% of the admissions. Hypoactive delirium was the predominant motor subtype (53%), followed by mixed delirium (30%) and hyperactive delirium (17%). Hospital mortality rates were respectively 33%, 34% and 15%. We verified that hypoactive and mixed delirium were independently associated with hospital mortality, with respective hazard ratios of 2.43 (95%CI = 1.64-3.59) and 2.31 (95%CI = 1.53-3.50). Delirium motor subtypes were not independently predictive of 12-month mortality.

Conclusions: One in three acutely ill hospitalized older adults who suffered hypoactive or mixed delirium died in the hospital. Clinicians should be aware that hypoactive symptoms of delirium, whether shown exclusively or in alternation with hyperactive symptoms, are indicative of a worse prognosis in this population.

<https://pubmed.ncbi.nlm.nih.gov/29381733/>

STU	Chan MT et al	BIS-guided anesthesia decreases postoperative delirium and cognitive decline.	J Neurosurg Anesthesiol 2013;25:33-42
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Background: Previous clinical trials and animal experiments have suggested that long-lasting neurotoxicity of general anesthetics may lead to postoperative cognitive dysfunction (POCD). Brain function monitoring such as the bispectral index (BIS) facilitates anesthetic titration and has been shown to reduce anesthetic exposure. In a randomized controlled trial, we tested the effect of BIS monitoring on POCD in 921 elderly patients undergoing major noncardiac surgery.

Methods: Patients were randomly assigned to receive either BIS-guided anesthesia or routine care. The BIS group had anesthesia adjusted to maintain a BIS value between 40 and 60 during maintenance of anesthesia. Routine care group had BIS measured but not revealed to attending anesthesiologists. Anesthesia was adjusted according to traditional clinical signs and hemodynamic parameters. A neuropsychology battery of tests was administered before and at 1 week and 3 months after surgery. Results were compared with matched control patients who did not have surgery during the same period. Delirium was measured using the confusion assessment method criteria.

Results: The median (interquartile range) BIS values during the maintenance period of anesthesia were significantly lower in the control group, 36 (31 to 49), compared with the BIS-guided group, 53 (48 to 57), $P < 0.001$. BIS-guided anesthesia reduced propofol delivery by 21% and that for volatile anesthetics by 30%. There were fewer patients with delirium in the BIS group compared with routine care (15.6% vs. 24.1%, $P = 0.01$). Although cognitive performance was similar between groups at 1 week after surgery, patients in the BIS group had a lower rate of POCD at 3 months compared with routine care (10.2% vs. 14.7%; adjusted odds ratio 0.67; 95% confidence interval, 0.32-0.98; $P = 0.025$).

Conclusions: BIS-guided anesthesia reduced anesthetic exposure and decreased the risk of POCD at 3 months after surgery. For every 1000 elderly patients undergoing major surgery, anesthetic delivery titrated to a range of BIS between 40 and 60 would prevent 23 patients from POCD and 83 patients from delirium.

<https://pubmed.ncbi.nlm.nih.gov/23027226/>

GUI	DAS Taskforce 2015	Evidence and consensus based guideline for the management of delirium, analgesia, and sedation in intensive care medicine. Revision 2015, short version	Ger Med Sci (2015) 13:doc19
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In 2010, under the guidance of the DGAI (German Society of Anaesthesiology and Intensive Care Medicine) and DIVI (German Interdisciplinary Association for Intensive Care and Emergency Medicine), twelve German medical societies published the "Evidence- and Consensus-based Guidelines on the Management of Analgesia, Sedation and Delirium in Intensive Care". Since then, several new studies and publications have considerably increased the body of evidence, including the new recommendations from the American College of Critical Care Medicine (ACCM) in conjunction with Society of Critical Care Medicine (SCCM) and American Society of Health-System Pharmacists (ASHP) from 2013. For this update, a major restructuring and extension of the guidelines were needed in order to cover new aspects of treatment, such as sleep and anxiety management. The literature was systematically searched and evaluated using the criteria of the Oxford Center of Evidence Based Medicine. The body of evidence used to formulate these recommendations was reviewed and approved by representatives of 17 national societies. Three grades of recommendation were used as follows: Grade "A" (strong recommendation), Grade "B" (recommendation) and Grade "O" (open recommendation). The result is a comprehensive, interdisciplinary, evidence and consensus-based set of level 3 guidelines. This publication was designed for all ICU professionals, and takes into account all critically ill patient populations. It represents a guide to symptom-oriented prevention, diagnosis, and treatment of delirium, anxiety, stress, and protocol-based analgesia, sedation, and sleep-management in intensive care medicine.

<https://pubmed.ncbi.nlm.nih.gov/26609286/>

STU	Ellard L et al	Type of anesthesia and postoperative delirium after vascular surgery	J Cardiothorac Vasc Anesth 2014;28:458-461
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Objective: The purpose of this study was to investigate the association between general (GA), regional (RA), and local (LA) anesthetic techniques with respect to the development of delirium after vascular surgery. The authors hypothesized that patients undergoing GA for vascular surgery would have a higher incidence of postoperative delirium. The role of LA with respect to postoperative delirium in vascular surgery patients previously has not been reported.

Design: Retrospective review.

Setting: Tertiary referral center, university hospital.

Participants: 500 patients undergoing vascular surgical procedures.

Interventions: Based on the chosen anesthetic technique, all patients were divided into GA, RA, and LA groups, respectively. Exclusion criteria were patients with preoperative dementia or abnormal level of consciousness, patients undergoing open abdominal aneurysm repair surgery, and patients undergoing carotid endarterectomy. All anesthetic techniques were conducted according to routine institutional practices. Patients in both the RA and LA groups received intravenous sedation.

Measurements and main results: Three hundred ninety-six (79%) patients received GA, 73 (15%) RA, and 31 (6%) LA. The overall incidence of delirium was 19.4% and rates were similar among the 3 groups, with 73 (18.4%) patients in the GA group, 17 (23.2%) in the RA group, and 7 (22.5%) in the LA group ($p = 0.56$). Patients in the LA group were more likely to have emergency surgery and also had a higher incidence of previous cerebrovascular accidents or transient ischemic attacks. There was no significant difference with respect to either onset or duration of delirium among the 3 groups. Median length of hospital stay and in-hospital mortality were similar among the 3 groups. Conclusions: Delirium rates after vascular surgery were similar with local, regional, or general anesthesia techniques. The presence of risk factors for the development of postoperative delirium should not influence the type of anesthesia provided.

<https://pubmed.ncbi.nlm.nih.gov/24680130/>

REV	Heymann A, Spies CD	Postoperative delirium and cognitive deficit. Prevention and therapy	AINS 2010;45:112-116
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To date, there are few studies available focusing on prevention and therapy of delirium in ICU patients. Monitoring during routine care is important because without using validated tools only one third of the delirious patients will be detected. A lot of non-pharmacological interventions like re-orientation and helping the patient to get back his autonomy, but also goal-orientated sedation support prevention and therapy of delirium. Furthermore, there are hints that pharmacological intervention can reduce incidence and severity of delirium. For delirium prevention there are drugs available acting on different receptor systems (acetylcholine, dopamine, opioid, glutamate). For the use of this drugs, a strict risk-benefit-consideration is necessary due to the low level of evidence of the existing studies. Therapeutically causative and symptom-orientated approaches should be preferred.

<https://pubmed.ncbi.nlm.nih.gov/20155641/>

REV	Höchster D et al	Das Delir – Prophylaxe and Behandlung	Anästh Intensivmed 2016;57:24-30
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Delirium is the most common disorder of consciousness in the intensive care unit as well as in the perioperative setting. Delirium in critically ill patients is of great importance as it adds significantly to the burden of care and is associated with worse outcome. There are some simple and well validated scores to detect/diagnose a delirium. These assessment tools are part of the German S3-guideline for analgesia, sedation and delirium management. In addition, delirium monitoring is also part of the ABCDE-bundles of the American guidelines. Detection of risk factors on the one hand, as well as a reduction of iatrogenic risks on the other hand play a pivotal role in delirium prevention. The therapy is symptom-oriented and includes the management of hallucinations, anxiety and agitation and reducing sympathetic tone. It is essential that physicians and nurses are familiar with the delirium assessment and that treatment algorithms are implemented in standard patient care.

https://www.ai-online.info/images/ai-ausgabe/2016/01-2016/2016_1_24-30_Das%20Delir%20%20Prophylaxe%20und%20Behandlung.pdf

STU	Hou R et al	POCD in patients receiving total knee replacement under deep vs light anesthesia: A randomized controlled trial.	Brain and Behavior 2018;8:2;e00910
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Objectives: Clinical observation, as well as randomized controlled trials, indicated an increasing rate of postoperative cognitive dysfunction (POCD) with increasing depth of general anesthesia. However, the findings are subject to bias due to varying degree of analgesia. In this trial, we compared the rate of POCD between patients receiving light versus high anesthesia while holding analgesia comparable using nerve block.

Methods: Elderly patients (60 years) receiving elective total knee replacement were randomized to receive the surgery under general anesthesia at BIS 40-50 (LOBIS group) or BIS 55-65 (HIBIS group). The femoral nerve and the sciatic nerve were blocked under ultrasonic guidance in all patients before induction. Cognitive performance was assessed with Montreal cognitive assessment (MoCA) at the baseline and 1d, 3d, and 7d after the surgery. POCD was defined by Z score of >1.96 using cross-reference. The extubation time and recovery time were also compared.

Results: A total of 66 patients were randomized; 60 (n = 30 per group) completed trial as the protocol specified. POCD occurred in six patients (20%) in the LOBIS group vs. in one patient (3.3%) in the HIBIS group (Figure 3, p = .04). In all seven cases, the diagnosis of POCD was based on MoCA assessment on 1d after the surgery. Assessment in 3d and 7d after surgery did not reveal POCD in any case. Extubation time was longer in the LOBIS group (12.16 ± 2.58 vs. 5.77 ± 3.01 min in the HIBIS group (p < .001)). The time of comeback of directional ability was 13.47 ± 3.14 and 6.17 ± 3.23 min in the LOBIS and HIBIS groups, respectively (p < .001).

Conclusions: In elderly patients receiving a total knee replacement, lighter anesthesia could reduce the rate of POCD with complete analgesia during surgery.

<https://pubmed.ncbi.nlm.nih.gov/29484267/>

GUI	Hughes CG et al	American Society for Enhanced Recovery and Perioperative Quality initiative Joint Consensus Statement on Postoperative Delirium Prevention	Anesth Analg 2020;130:1572-1590
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Objectives: Postoperative delirium is a geriatric syndrome that manifests as changes in cognition, attention, and levels of consciousness after surgery. It occurs in up to 50% of patients after major surgery and is associated with adverse outcomes, including increased hospital length of stay, higher cost of care, higher rates of institutionalization after discharge, and higher rates of readmission. Furthermore, it is associated with functional decline and cognitive impairments after surgery. As the age and medical complexity of our surgical population increases, practitioners need the skills to identify and prevent delirium in this high-risk population. Because delirium is a common and consequential postoperative complication, there has been an abundance of recent research focused on delirium, conducted by clinicians from a variety of specialties. There have also been several reviews and recommendation statements; however, these have not been based on robust evidence. The Sixth Perioperative Quality Initiative (POQI-6) consensus conference brought together a team of multidisciplinary experts to formally survey and evaluate the literature on postoperative delirium prevention and provide evidence-based recommendations using an iterative Delphi process and Grading of Recommendations Assessment, Development and Evaluation (GRADE) Criteria for evaluating biomedical literature.

<https://pubmed.ncbi.nlm.nih.gov/32022748/>

STU	Inouye SK et al	The role of adherence on the effectiveness of nonpharmacologic interventions: evidence from the delirium prevention trial.	Arch Int Med 2003;163:958-964
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Background: The impact of adherence on outcome for a nonpharmacologic intervention strategy has not been previously examined.

Objective: To examine the impact of level of adherence on effectiveness of the intervention strategy in a large clinical trial of nonpharmacologic interventions to prevent delirium.

Methods: The subjects included 422 consecutive patients 70 years or older admitted to the medicine service at a university hospital. The intervention protocols were targeted toward 6 delirium risk factors. The primary outcome was new-onset delirium during hospitalization.

Results: During 9882 patient-days, complete adherence rates for individual intervention protocols ranged from 10% for the sleep protocol to 86% for the orientation protocol. The rate of complete adherence with all protocols was 57%, and combined partial and complete adherence was 87%. Higher levels of adherence resulted in lower delirium rates, with a significant graded effect, for orientation, mobility, and therapeutic activities protocols, and for the composite adherence measure. After controlling for potential confounding variables, such as illness severity, comorbidity, baseline delirium risk, and functional status, adherence continued to demonstrate a consistently strong and significant protective effect against delirium (adjusted odds ratio, 0.69; 95% confidence interval, 0.56-0.87). Patients in the highest adherence group demonstrated an 89% reduction in delirium risk compared with patients in the lowest group.

Conclusions: Adherence played an important independent role in the effectiveness of a nonpharmacologic multicomponent intervention strategy. Higher levels of adherence resulted in reduced rates of delirium in a directly graded fashion, with extremely low levels of delirium in the highest adherence group. Thus, adherence must be ensured in nonpharmacologic interventions to optimize effectiveness.

<https://pubmed.ncbi.nlm.nih.gov/12719206/>

STU	Isaia G et al	Delirium in elderly home-treated patients: a prospective study with 6-month follow-up.	Age (Dordr) 2009;31: 109-117
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Delirium usually occurs during hospitalisation. The aims of this study were to evaluate the incidence of delirium in "hospital-at-home" compared to a traditional hospital ward and to assess mortality, hospital readmissions and institutionalisation rates at 6-month follow-up in elderly patients with intermediate/high risk for delirium at baseline according to the criteria of Inouye. We performed a prospective, non-randomised, observational study with 6-month follow-up on 144 subjects aged 75 years and older consecutively admitted to the hospital for an acute illness and followed in a geriatric hospital ward (GHW) or in a geriatric home hospitalisation service (GHHS). Baseline socio-demographic information, clinical data, functional, cognitive, nutritional status, mood, quality of life, and caregiver's stress scores were collected. Of the 144 participants, 14 (9.7%) had delirium during their initial hospitalisation: 4 were treated by GHHS and 10 in a GHW. The incidence of delirium was 16.6% in GHW and 4.7% in GHHS. All delirious patients were very old, with a high risk for delirium at baseline of 60%, according to the criteria of Inouye. In GHW, the onset of delirium occurred significantly earlier and the mean duration of the episode was significantly longer. The severity of delirium tended to be higher in GHW compared to GHHS. At 6-month follow-up, mortality was significantly higher among patients who suffered from an episode of delirium. Moreover, they showed a trend towards a greater institutionalisation rate. GHHS may represent a protective environment for delirium onset in acutely ill elderly patients.

<https://pubmed.ncbi.nlm.nih.gov/19507055/>

STU	Kalisvaart KJ et al	Haloperidol prophylaxis for elderly hip-surgery patients at risk for delirium: a randomized placebo-controlled study	JAGS 2005;53:1658-1666
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Objectives: To study the effectiveness of haloperidol prophylaxis on incidence, severity, and duration of postoperative delirium in elderly hip-surgery patients at risk for delirium.

Design: Randomized, double-blind, placebo-controlled trial.

Setting: Large medical school-affiliated general hospital in Alkmaar, The Netherlands.

Participants: A total of 430 hip-surgery patients aged 70 and older at risk for postoperative delirium.

Intervention: Haloperidol 1.5 mg/d or placebo was started preoperatively and continued for up to 3 days postoperatively. Proactive geriatric consultation was provided for all randomized patients.

Measurements: The primary outcome was the incidence of postoperative delirium (Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, and Confusion Assessment Method criteria). Secondary outcomes were the severity of delirium (Delirium Rating Scale, revised version-98 (DRS-R-98)), the duration of delirium, and the length of hospital stay.

Results: The overall incidence of postoperative delirium was 15.8%. The percentage of patients with postoperative delirium in the haloperidol and placebo treatment condition was 15.1% and 16.5%, respectively (relative risk=0.91, 95% confidence interval (CI)=0.6-1.3); the mean highest DRS-R-98 score+/-standard deviation was 14.4+/-3.4 and 18.4+/-4.3, respectively (mean difference 4.0, 95% CI=2.0-5.8; P<.001); delirium duration was 5.4 versus 11.8 days, respectively (mean difference 6.4 days, 95% CI=4.0-8.0; P<.001); and the mean number of days in the hospital was 17.1+/-11.1 and 22.6+/-16.7, respectively (mean difference 5.5 days, 95% CI=1.4-2.3; P<.001). No haloperidol-related side effects were noted.

Conclusion: Low-dose haloperidol prophylactic treatment demonstrated no efficacy in reducing the incidence of postoperative delirium. It did have a positive effect on the severity and duration of delirium. Moreover, haloperidol reduced the number of days patients stayed in the hospital, and the therapy was well tolerated.

<https://pubmed.ncbi.nlm.nih.gov/16181163/>

STU	Konttinen N et al	Outcome after anaesthesia and emergency surgery in patients over 100 years old.	Anaesthesiol Scand 2006;50:283-289
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Background: Deteriorated organ function and reduced stress response in very old patients may cause post-operative morbidity and mortality. We wanted to identify immediate and longer-term outcome after anaesthesia and surgery in the oldest of the old patients.

Methods: We analysed retrospectively anaesthesia and hospital records of patients who were over 100 years old when undergoing major emergency surgery in our hospital during 1990-2004.

Results: Altogether, 12 patients (median age 101 years) underwent 14 operations (nine for hip fracture, four for lower extremity circulatory problems and one for peritonitis). During anaesthesia, invasive arterial pressure was monitored in eight patients while central venous pressure (CVP) was monitored in only one patient. Spinal anaesthesia with bupivacaine was given as a continuous technique in six and as single-shot spinal anaesthesia in five cases. Both spinal (11) and general (3) anaesthesias were characterized by marked drops in arterial pressure. Haemodynamics was managed with intravenous (i.v.) fluids and vasopressors. Five patients had post-operative delirium. Mortality at 30 days, 6 months and 1 year was 25%, 42% and 50%, respectively. Within 15 days of the operation, three patients had died (pneumonia, cerebral infarction and myocardial infarction). Nine patients returned home and six of them lived in their pre-operative mental and physical state for at least a year.

Conclusion: Independently of the anaesthetic method, marked drops in blood pressure occurred, requiring pharmacological intervention. We assume that in most of the patients, hypovolaemia explains the intra-operative haemodynamic instability. A 25%, 30-day mortality may be regarded as acceptable and, overall, these very old patients tolerated emergency surgery quite well.

<https://pubmed.ncbi.nlm.nih.gov/16480460/>

STU	Koster S et al	Delirium after cardiac surgery and predictive validity of a risk checklist	Thoracic Surgery 2008;86:1883-1887
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Background: Delirium or acute confusion is a temporary mental disorder that occurs frequently among hospitalized elderly patients. Patients who undergo cardiac surgery have an increased risk of delirium, which is associated with many negative consequences. Therefore, prevention or early recognition of delirium is essential.

Methods: In this observational study, a risk checklist for delirium was used during the preoperative outpatient screening in 112 patients who underwent elective cardiac surgery. The Delirium Observation Screening (DOS) scale was used before and after surgery to assess whether delirium had developed in patients. The psychiatrist was consulted to confirm or refute the diagnosis delirium.

Results: The incidence of delirium after cardiac surgery was 21%, and the mean duration of delirium was 2.5 days. The time to discharge was 11 days longer for patients with delirium. The delirium risk checklist could accurately predict postoperative delirium in patients who underwent elective cardiac surgery based on a disturbance in the electrolytes sodium and potassium and on EuroSCORE (European System for Cardiac Operative Risk Evaluation). When using a probability of delirium of 50%, the sensitivity of the risk checklist was 25.0% and specificity was 95.5%. The predictive value of a positive test was 60.0%, and the predictive value of a negative test was 82.4%. The area under the receiver-operating characteristic curve was 0.75.

Conclusions: With the risk checklist for delirium, patients at an increased risk of delirium after elective cardiac surgery can be identified.

<https://pubmed.ncbi.nlm.nih.gov/19022003/>

STU	Kratz T et al	Prävention des postoperativen Delirs. Eine prospektive Intervention mit gerontopsychiatrischer Liaisonpflege auf chirurgischen Stationen im Allgemeinkrankenhaus	Dtsch Arztebl Int 2015;112:289-296
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Hintergrund: Delirien komplizieren häufig die stationäre Behandlung älterer Patienten und führen sowohl zu erhöhter Verweildauer, Kosten sowie Pflegeaufwand als auch gegebenenfalls zu einer Heimeinweisung. Insbesondere postoperativ treten Delirien bei älteren und kognitiv eingeschränkten Patienten auf.

Methode: In einer offenen Studie wurde auf zwei chirurgischen Stationen eines Allgemeinkrankenhauses systematisch die Häufigkeit postoperativer Delirien bei über 70 Jahre alten Patienten erhoben. In einer sechsmonatigen Prävalenzphase wurde die Anzahl der postoperativ deliranten Patienten im Untersuchungszeitraum (März bis August 2011) erhoben, aber noch nicht interveniert. Nach Abschluss der Prävalenzphase führte ein geschulter Delirpfleger während eines zehnmonatigen Zeitraums (September 2011 bis Juni 2012) auf einer der beiden Stationen Interventionen durch, die sich an das „Hospital Elder Life Program“ (HELP) anlehnten. Das Ziel dieser Maßnahmen war die Prävention postoperativer Delirien. Die Patienten der zweiten Station dienten als Kontrollgruppe.

Ergebnisse: Von allen Patienten, die keine Intervention erhalten hatten, entwickelten 20,2 % (95%-Konfidenzintervall [95%-KI]: 14,6–26,4) ein postoperatives Delir. In der Interventionsphase kam es bei 20,8 % (95%-KI: 11,3–32,1) derjenigen, bei denen keine spezifische Intervention durchgeführt wurde, zu einem postoperativen Delir. Dahingegen konnte die Häufigkeit postoperativer Delirien auf der Interventionsstation auf 4,9 % (95%-KI: 0,0–11,5) reduziert werden. Die durch den Delirpfleger eingesetzten Maßnahmen wie etwa Validation, Schlafverbesserung, kognitive Aktivierung, Frühmobilisation, Verbesserung der Sensorik sowie der Nahrungs- und Flüssigkeitsaufnahme kamen dabei zum Tragen. Als wichtige Prädiktoren für ein postoperatives Delir stellten sich der „Mini-Mental-Status-Test“, das Alter sowie das Vorliegen einer präoperativen Infektion heraus.

Schlussfolgerung: Die Etablierung eines Delirpflegers, die Anwendung pflegerischer Maßnahmen, die postoperative Begleitung sowie die kognitive Aktivierung sind bei älteren und kognitiv eingeschränkten Patienten mit einer Reduktion des Risikos für ein postoperatives Delir assoziiert.

<https://pubmed.ncbi.nlm.nih.gov/26008890/>

STU	Leslie DL et al	One-year health care costs associated with delirium in the elderly population.	Arch Intern Med 2008;168:27-32
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Background: While delirium has been increasingly recognized as a serious and potentially preventable condition, its long-term implications are not well understood. This study determined the total 1-year health care costs associated with delirium.

Methods: Hospitalized patients aged 70 years and older who participated in a previous controlled clinical trial of a delirium prevention intervention at an academic medical center between 1995 and 1998 were followed up for 1 year after discharge. Total inflation-adjusted health care costs, calculated as either reimbursed amounts or hospital charges converted to costs, were computed by means of data from Medicare administrative files, hospital billing records, and the Connecticut Long-term Care Registry. Regression models were used to determine costs associated with delirium after adjusting for patient sociodemographic and clinical characteristics.

Results: During the index hospitalization, 109 patients (13.0%) developed delirium while 732 did not. Patients with delirium had significantly higher unadjusted health care costs and survived fewer days. After adjusting for pertinent demographic and clinical characteristics, average costs per day survived among patients with delirium were more than 2(1/2) times the costs among patients without delirium. Total cost estimates attributable to delirium ranged from \$16 303 to \$64 421 per patient, implying that the national burden of delirium on the health care system ranges from \$38 billion to \$152 billion each year.

Conclusions: The economic impact of delirium is substantial, rivaling the health care costs of falls and diabetes mellitus. These results highlight the need for increased efforts to mitigate this clinically significant and costly disorder.

Conclusions: One in three acutely ill hospitalized older adults who suffered hypoactive or mixed delirium died in the hospital. Clinicians should be aware that hypoactive symptoms of delirium, whether shown exclusively or in alternation with hyperactive symptoms, are indicative of a worse prognosis in this population.

<https://pubmed.ncbi.nlm.nih.gov/18195192/>

STU	Luetz A et al	Feasibility of noise reduction by a modification in ICU environment	Physiol Meas 2016;37:1041-1055
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Noise is a proven cause of wakefulness and qualitative sleep disturbance in critically ill patients. A sound pressure level reduction can improve sleep quality, but there are no studies showing the feasibility of such a noise reduction in the intensive care unit (ICU) setting. Considering all available evidence, we redesigned two ICU rooms with the aim of investigating the physiological and clinical impact of a healing environment, including a noise reduction and day-night variations of sound level. Within an experimental design, we recorded 96 h of sound-pressure levels in standard ICU rooms and the modified ICU rooms. In addition, we performed a sound source observation by human observers. Our results show that we reduced A-weighted equivalent sound pressure levels and maximum sound pressure levels with our architectural interventions. During night-time, the modification led to a significant decrease in 50 dB threshold overruns from 65.5% to 39.9% (door side) and from 50% to 10.5% (window side). Sound peaks of more than 60 decibels were significantly reduced from 62.0% to 26.7% (door side) and 59.3% to 30.3% (window side). Time-series analysis of linear trends revealed a significantly more distinct day-night pattern in the modified rooms with lower sound levels during night-times. Observed sound sources during night revealed four times as many talking events in the standard room compared to the modified room. In summary, we show that it is feasible to reduce sound pressure levels using architectural modifications.

<https://pubmed.ncbi.nlm.nih.gov/27243942/>

STU	Luetz A et al	Delirium, sedation and analgesia in the intensive care unit: a multinational, two-part survey among intensivists	PLoS One 2014; 9: e110935
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Analgesia, sedation and delirium management are important parts of intensive care treatment as they are relevant for patients' clinical and functional long-term outcome. Previous surveys showed that despite this fact implementation rates are still low. The primary aim of the prospective, observational multicenter study was to investigate the implementation rate of delirium monitoring among intensivists. Secondly, current practice concerning analgesia and sedation monitoring as well as treatment strategies for patients with delirium were assessed. In addition, this study compares perceived and actual practice regarding delirium, sedation and analgesia management. Data were obtained with a two-part, anonymous survey, containing general data from intensive care units in a first part and data referring to individual patients in a second part. Questionnaires from 101 hospitals (part 1) and 868 patients (part 2) were included in data analysis. Fifty-six percent of the intensive care units reported to monitor for delirium in clinical routine. Forty-four percent reported the use of a validated delirium score. In this respect, the survey suggests an increasing use of delirium assessment tools compared to previous surveys. Nevertheless, part two of the survey revealed that in actual practice 73% of included patients were not monitored with a validated score. Furthermore, we observed a trend towards moderate or deep sedation which is contradicting to guideline-recommendations. Every fifth patient was suffering from pain. The implementation rate of adequate pain-assessment tools for mechanically ventilated and sedated patients was low (30%). In conclusion, further efforts are necessary to implement guideline recommendations into clinical practice.

<https://pubmed.ncbi.nlm.nih.gov/25398099/>

STU	Marcantonio ER et al	Reducing delirium after hip fracture: a randomized trial	J Am Geriatr Soc 2001;49:516-522
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Objectives: Delirium (or acute confusional state) affects 35% to 65% of patients after hip-fracture repair, and has been independently associated with poor functional recovery. We performed a randomized trial in an orthopedic surgery service at an academic hospital to determine whether proactive geriatrics consultation can reduce delirium after hip fracture.

Design: Prospective, randomized, blinded.

Setting: Inpatient academic tertiary medical center.

Participants: 126 consenting patients 65 and older (mean age 79 +/- 8 years, 79% women) admitted emergently for surgical repair of hip fracture.

Measurements: Detailed assessment through interviews with patients and designated proxies and review of medical records was performed at enrollment to ascertain prefracture status. Subjects were then randomized to proactive geriatrics consultation, which began preoperatively or within 24 hours of surgery, or "usual care." A geriatrician made daily visits for the duration of the hospitalization and made targeted recommendations based on a structured protocol. To ascertain study outcomes, all subjects underwent daily, blinded interviews for the duration of their hospitalization, including the Mini-Mental State Examination (MMSE), the Delirium Symptom Interview (DSI), and the Memorial Delirium Assessment Scale (MDAS). Delirium was diagnosed using the Confusion Assessment Method (CAM) algorithm.

Results: The 62 patients randomized to geriatrics consultation were not significantly different ($P > .1$) from the 64 usual-care patients in terms of age, gender, prefracture dementia, comorbidity, type of hip fracture, or type of surgical repair. Sixty-one percent of geriatrics consultation patients were seen preoperatively and all were seen within 24 hours postoperatively. A mean of 10 recommendations were made throughout the duration of the hospitalization, with 77% adherence by the orthopedics team. Delirium occurred in 20 / 62 (32%) intervention patients, versus 32 / 64 (50%) usual-care patients ($P = .04$), representing a relative risk of 0.64 (95% confidence interval (CI) = 0.37-0.98) for the consultation group. One case of delirium was prevented for every 5.6 patients in the geriatrics consultation group. There was an even greater reduction in cases of severe delirium, occurring in 7 / 60 (12%) of intervention patients and 18 / 62 (29%) of usual-care patients, with a relative risk of 0.40 (95% CI = 0.18-0.89). Despite this reduction in delirium, length of stay did not significantly differ between intervention and usual-care groups (median +/- interquartile range = 5 +/- 2 days in both groups), likely because protocols and pathways predetermined length of stay. In subgroup analyses, geriatrics consultation was most effective in reducing delirium in patients without prefracture dementia or activities of daily living (ADL) functional impairment.

Conclusions: Proactive geriatrics consultation was successfully implemented with good adherence after hip-fracture repair. Geriatrics consultation reduced delirium by over one-third, and reduced severe delirium by over one-half. Our trial provides strong preliminary evidence that proactive geriatrics consultation may play an important role in the acute hospital management of hip-fracture patients.

<https://pubmed.ncbi.nlm.nih.gov/11380742/>

STU	McCusker J et al	Delirium in older medical inpatients and subsequent cognitive and functional status: a prospective study	CMAJ 2001;165:575-583
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Background: Delirium in older hospital inpatients appears to be associated with various adverse outcomes. The limitations of previous research on this association have included small sample sizes, short follow-up periods and lack of consideration of important confounders or modifiers, such as severity of illness, comorbidity and dementia. The objective of this study was to determine the prognostic significance of delirium, with or without dementia, for cognitive and functional status during the 12 months after hospital admission, independent of premorbid function, comorbidity, severity of illness and other potentially confounding variables.

Methods: Patients 65 years of age and older who were admitted from the emergency department to the medical services were screened for delirium during their first week in hospital. Two cohorts were enrolled: patients with prevalent or incident delirium and patients without delirium, but similar in age and cognitive impairment. The patients were followed up at 2, 6 and 12 months after hospital admission. Analyses were conducted for 4 patient groups: 56 with delirium, 53 with dementia, 164 with both conditions and 42 with neither. Baseline measures included delirium (Confusion Assessment Method), dementia (Informant Questionnaire on Cognitive Decline in the Elderly), physical function (Barthel Index [BI]) and premorbid instrumental activities of daily living, IADL), the Mini-Mental State Examination (MMSE), comorbidity, and physiologic and clinical severity of illness. Outcome variables measured at follow-up were the MMSe, Barthel Index, IADL and admission to a long-term care facility.

Results: After adjustment for covariates, the mean differences in MMSE scores at follow-up between patients with and without delirium were -4.99 (95% confidence interval [CI] -7.17 to -2.81) for patients with dementia and -3.36 (95% CI -6.15 to -0.58) for those without dementia. At 12 months, the adjusted mean differences in the BI were -16.45 (95% CI -27.42 to -5.50) and -13.89 (95% CI -28.39 to 0.61) for patients with and without dementia respectively. Patients with both delirium and dementia were more likely to be admitted to long-term care than those with neither condition (adjusted odds ratio 3.18, 95% CI 1.19 to 8.49). Dementia but not delirium predicted worse IADL scores at follow-up. Unadjusted analyses yielded similar results.

Interpretation: For older patients with and without dementia, delirium is an independent predictor of sustained poor cognitive and functional status during the year after a medical admission to hospital.

<https://pubmed.ncbi.nlm.nih.gov/11563209/>

STU	Pandharipande PP et al	Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients	Anesthesiology 2006;104:21-26
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Background: Delirium has recently been shown as a predictor of death, increased cost, and longer duration of stay in ventilated patients. Sedative and analgesic medications relieve anxiety and pain but may contribute to patients' transitioning into delirium.

Methods: In this cohort study, the authors designed a priori an investigation to determine whether sedative and analgesic medications independently increased the probability of daily transition to delirium. Markov regression modeling (adjusting for 11 covariates) was used in the evaluation of 198 mechanically ventilated patients to determine the probability of daily transition to delirium as a function of sedative and analgesic dose administration during the previous 24 h.

Results: Lorazepam was an independent risk factor for daily transition to delirium (odds ratio, 1.2 [95% confidence interval, 1.1-1.4]; $P = 0.003$), whereas fentanyl, morphine, and propofol were associated with higher but not statistically significant odds ratios. Increasing age and Acute Physiology and Chronic Health Evaluation II scores were also independent predictors of transitioning to delirium (multivariable P values < 0.05).

Conclusions: Lorazepam administration is an important and potentially modifiable risk factor for transitioning into delirium even after adjusting for relevant covariates.

<https://pubmed.ncbi.nlm.nih.gov/16394685/>

STU	Sato K et al	The impact of delirium on outcomes in acute, non-intubated cardiac patients	Eur Heart J Acute Cardio-vasc Care 2017; 6: 553–9
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Background: Because of progress in cardiovascular management, many critically ill geriatric patients undergo various procedures and intensive cardiovascular care treatments. Although delirium frequently affects geriatric patients post-procedurally and after intensive cardiovascular care, the impact of delirium on acute cardiac patients has not been well understood. The objective of this study was to investigate the impact of delirium on outcomes in acute, non-intubated cardiac patients.

Methods: This was a prospective cohort study including non-surgical cardiac patients aged 65 years or older admitted to the intensive care unit or intensive cardiac care unit. We excluded mechanically ventilated patients. Delirium was evaluated using the confusion assessment method for the intensive care unit. The primary outcome analysed was 60-day mortality. The secondary outcomes analysed were risk and precipitating factors for delirium development.

Results: Of 163 patients, 35 (21.5%) developed delirium. Patients with delirium had higher 60-day mortality rates than those without delirium (22.9% versus 3.9%, $P < 0.001$) and spent an average of 10 days longer in the hospital (32 ± 20 versus 22 ± 16 days, $P = 0.002$). On the multivariable Cox analysis, delirium was independently associated with 60-day mortality (adjusted hazard ratio 3.91; 95% confidence interval 1.06-17.36; $P = 0.04$), which was also confirmed by the propensity score-matched analysis. Dementia, history of cerebrovascular disease, and higher sequential organ failure assessment score were significantly associated with delirium development.

Conclusions: Acute delirium is common and predicts mortality in non-intubated cardiac patients. Cardiac critical care providers should be aware of this neurological condition.

<https://pubmed.ncbi.nlm.nih.gov/26691728/>

REV	Schiemann A, Spies C	Analgesie, Sedierung und Delir in der Intensivmedizin	Intensivmed 2011;48:135
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Analgesia, sedation and delirium management form integral components of the therapy of critically ill patients in intensive care medicine, receiving comprehensive attention in the current 2010 S3 guidelines. The major requirements on intensive care medicine are to improve the condition of intensive care patients, their outcome and survival, as well as to reduce costs. Target-controlled sedation without over-sedation while providing sufficient analgesia should increase the duration of mechanical ventilation and reduce complications. Modern ventilator modes support spontaneous breathing in the intensive care patient. Deep sedation resembling general anaesthesia should be reserved for specific indications. In addition, the importance of delirium in intensive care medicine is receiving increasing attention. For the first time, a whole chapter in the guidelines has been devoted to delirium management.

<https://link.springer.com/article/10.1007/s00390-011-0265-y>

REV	Shi Q et al	Delirium in acute stroke: a systematic review and meta-analysis	Stroke 2012; 43:645-649
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Background and purpose: Delirium is common in the early stage after hospitalization for an acute stroke. We conducted a systematic review and meta-analysis to evaluate the outcomes of acute stroke patients with delirium.

Methods: We searched MEDLINE, EMBASE, CINAHL, Cochrane Library databases, and PsychInfo for relevant articles published in English up to September 2011. We included observational studies for review. Two reviewers independently assessed studies to determine eligibility, validity, and quality. The primary outcome was inpatient mortality and secondary outcomes were mortality at 12 months, institutionalization, and length of hospital stay.

Results: Among 78 eligible studies, 10 studies (n=2004 patients) met the inclusion criteria. Stroke patients with delirium had higher inpatient mortality (OR, 4.71; 95% CI, 1.85-11.96) and mortality at 12 months (OR, 4.91; 95% CI, 3.18-7.6) compared to nondelirious patients. Patients with delirium also tended to stay longer in hospital compared to those who did not have delirium (mean difference, 9.39 days; 95% CI, 6.67-12.11) and were more likely to be discharged to a nursing homes or other institutions (OR, 3.39; 95% CI, 2.21-5.21).

Conclusions: Stroke patients with development of delirium have unfavorable outcomes, particularly higher mortality, longer hospitalizations, and a greater degree of dependence after discharge. Early recognition and prevention of delirium may improve outcomes in stroke patients.

<https://pubmed.ncbi.nlm.nih.gov/22267831/>

REV	Siddiqi N et al	Interventions for preventing delirium in hospitalised non-ICU patients	Cochrane Database of Systematic Reviews 2016
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Background and purpose: Delirium is common in the early stage after hospitalization for an acute stroke. We conducted a systematic review and meta-analysis to evaluate the outcomes of acute stroke patients with delirium.

Methods: We searched MEDLINE, EMBASE, CINAHL, Cochrane Library databases, and PsychInfo for relevant articles published in English up to September 2011. We included observational studies for review. Two reviewers independently assessed studies to determine eligibility, validity, and quality. The primary outcome was inpatient mortality and secondary outcomes were mortality at 12 months, institutionalization, and length of hospital stay.

Results: Among 78 eligible studies, 10 studies (n=2004 patients) met the inclusion criteria. Stroke patients with delirium had higher inpatient mortality (OR, 4.71; 95% CI, 1.85-11.96) and mortality at 12 months (OR, 4.91; 95% CI, 3.18-7.6) compared to nondelirious patients. Patients with delirium also tended to stay longer in hospital compared to those who did not have delirium (mean difference, 9.39 days; 95% CI, 6.67-12.11) and were more likely to be discharged to a nursing homes or other institutions (OR, 3.39; 95% CI, 2.21-5.21).

Conclusions: Stroke patients with development of delirium have unfavorable outcomes, particularly higher mortality, longer hospitalizations, and a greater degree of dependence after discharge. Early recognition and prevention of delirium may improve outcomes in stroke patients.

<https://pubmed.ncbi.nlm.nih.gov/26967259/>

REV	Spies M et al	Delir – ein evidenzbasierter Überblick	WKW Education 2019; 14:1-17
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Das Delir ist eine organische Erkrankung mit primär psychiatrischer Symptomatik und zählt zu den sog. organischen Psychosyndromen (OPS). OPS sind eine Gruppe von Störungen, bei welchen eine organische Ursache, die mittels medizinischer Routineverfahren erfasst werden kann (z. B. Labor, Bildgebung), die Art, das Ausmaß und den Verlauf einer psychiatrischen Symptomatik erklärt. Dadurch unterscheiden sich OPS, die in der International Classification of Mental Disorders – 10 (ICD-10) einem eigenen Kapitel zugeordnet sind (F0: Organische Psychische Störungen), von anderen psychiatrischen Erkrankungen wie der Depression oder der Schizophrenie, weil die Therapie neben der Behandlung der psychischen Symptome vor allem auch darin besteht, die organische Ursache zu beseitigen, beispielsweise eine antibiotische Therapie bei einem bakteriellen Infekt oder eine ausreichende Flüssigkeitszufuhr bei Exsikkose. Unter Delirien versteht man innerhalb der OPS die akuten organischen Psychosen, die eine Bewusstseinsstörung beinhalten. Die Erkrankung befindet sich somit an der Schnittstelle zwischen somatischer Medizin und Psychiatrie und stellt durch ihre Häufigkeit und den außerordentlichen Pflegeaufwand eine besondere Herausforderung im klinischen Alltag sämtlicher medizinischer Disziplinen dar.

<https://link.springer.com/article/10.1007/s11812-019-00093-1>

REV	Stollings J et al	Delirium in critical illness: clinical manifestations, outcomes, and management	Intensive Care Med. 2021 Aug 16 : 1–15.
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Delirium is the most common manifestation of brain dysfunction in critically ill patients. In the intensive care unit (ICU), duration of delirium is independently predictive of excess death, length of stay, cost of care, and acquired dementia. There are numerous neurotransmitter/functional and/or injury-causing hypotheses rather than a unifying mechanism for delirium. Without using a validated delirium instrument, delirium can be misdiagnosed (under, but also overdiagnosed and trivialized), supporting the recommendation to use a monitoring instrument routinely. The best-validated ICU bedside instruments are CAM-ICU and ICDSC, both of which also detect subsyndromal delirium. Both tools have some inherent limitations in the neurologically injured patients, yet still provide valuable information about delirium once the sequelae of the primary injury settle into a new post-injury baseline. Now it is known that antipsychotics and other psychoactive medications do not reliably improve brain function in critically ill delirious patients. ICU teams should systematically screen for predisposing and precipitating factors. These include exacerbations of cardiac/respiratory failure or sepsis, metabolic disturbances (hypoglycemia, dysnatremia, uremia and ammonemia) receipt of psychoactive medications, and sensory deprivation through prolonged immobilization, uncorrected vision and hearing deficits, poor sleep hygiene, and isolation from loved ones so common during COVID-19 pandemic. The ABCDEF (A2F) bundle is a means to facilitate implementation of the 2018 Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU (PADIS) Guidelines. In over 25,000 patients across nearly 100 institutions, the A2F bundle has been shown in a dose – response fashion (i.e., greater bundle compliance) to yield improved survival, length of stay, coma and delirium duration, cost, and less ICU bounce-backs and discharge to nursing homes.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8366492>

STU	Wang J et al	The Potential Role of Lung-Protective Ventilation in Preventing Postoperative Delirium in Elderly Patients Undergoing Prone Spinal Surgery: A Preliminary Study	WKW Education 2019; 14:1-17
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Background: Postoperative delirium (POD) is a frequent complication in elderly patients, usually occurring within a few days after surgery. This study investigated the effect of lung-protective ventilation (LPV) on POD in elderly patients undergoing spinal surgery and the mechanism by which LPV suppresses POD. **MATERIAL AND METHODS** Seventy-one patients aged ≥ 65 years were randomized to receive LPV or conventional mechanical ventilation (MV), consisting of intermittent positive pressure ventilation following induction of anesthesia. The tidal volume in patients who received MV was 8 ml/kg predicted body weight (PBW), and the ventilation frequency was 12 times/min. The tidal volume in patients who received LPV was 6 ml/kg PBW, the positive end-expiratory pressure was 5 cmH₂O, and the ventilation frequency was 15 times/min, with a lung recruitment maneuver performed every 30 min. Blood samples were collected immediately before anesthesia induction (T₀), 10 min (T₁) and 60 min (T₂) after turning over, immediately after the operation (T₃), and 15 min after extubation (T₄) for blood gas analysis. Simultaneous cerebral oxygen saturation (rSO₂) and cerebral desaturation were recorded. Preoperative and postoperative serum concentrations of interleukin (IL)-6, IL-10 and glial fibrillary acidic protein (GFAP) were measured by ELISA. POD was assessed by nursing delirium screening score. **RESULTS** Compared with the MV group, pH was lower and PaCO₂ higher in the LPV group at T₂. In addition PaO₂, SaO₂, and PaO₂/FiO₂ were higher at T₁, and T₄, and rSO₂ was higher at T₃, and T₄ in the LPV than in the MV group (P<0.05 each). Postoperative serum GFAP and IL-6 were lower and IL-10 higher in the LPV group. The incidences of cerebral desaturation and POD were significantly lower in the LPV group (P<0.05). **CONCLUSIONS** LPV may reduce POD in elderly patients undergoing spinal surgery by inhibiting inflammation and improving cerebral oxygen metabolism.

<https://pubmed.ncbi.nlm.nih.gov/33011734/>

REV	Watt J et al	Identifying older adults at risk of delirium following elective surgery. A systematic review and meta-analysis	J Gen Intern Med 2018;33:500-509
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Background: Postoperative delirium is a common preventable complication experienced by older adults undergoing elective surgery. In this systematic review and meta-analysis, we identified prognostic factors associated with the risk of postoperative delirium among older adults undergoing elective surgery.

Methods: Medline, EMBASE, CINAHL, Cochrane Central Register of Controlled Trials, and AgeLine were searched for articles published between inception and April 21, 2016. A total of 5692 titles and abstracts were screened in duplicate for possible inclusion. Studies using any method for diagnosing delirium were eligible. Two reviewers independently completed all data extraction and quality assessments using the Cochrane Risk-of-Bias Tool for randomized controlled trials (RCTs) and the Newcastle-Ottawa Scale (NOS) for cohort studies. Random effects meta-analysis models were used to derive pooled effect estimates.

Results: Forty-one studies (9384 patients) reported delirium-related prognostic factors. Among our included studies, the pooled incidence of postoperative delirium was 18.4% (95% confidence interval [CI] 14.3-23.3%, number needed to follow [NNF] = 6). Geriatric syndromes were important predictors of delirium, namely history of delirium (odds ratio [OR] 6.4, 95% CI 2.2-17.9), frailty (OR 4.1, 95% CI 1.4-11.7), cognitive impairment (OR 2.7, 95% CI 1.9-3.8), impairment in activities of daily living (ADLs; OR 2.1, 95% CI 1.6-2.6), and impairment in instrumental activities of daily living (IADLs; OR 1.9, 95% CI 1.3-2.8). Potentially modifiable prognostic factors such as psychotropic medication use (OR 2.3, 95% CI 1.4-3.6) and smoking status (OR 1.8 95% CI 1.3-2.4) were also identified. Caregiver support was associated with lower odds of postoperative delirium (OR 0.69, 95% CI 0.52-0.91).

Discussion: Though caution must be used in interpreting meta-analyses of non-randomized studies due to the potential influence of unmeasured confounding, we identified potentially modifiable prognostic factors including frailty and psychotropic medication use that should be targeted to optimize care.

<https://pubmed.ncbi.nlm.nih.gov/29374358/>

REV	Zoremba N	Management of delirium in the intensive care unit: Non-pharmacological therapy options	Med Klin Intensivmed Notfmed 2017;112:320-325
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Background: Non-pharmacological intervention strategies are used in the prevention and therapy of delirium.

Objectives: Investigation of the effectiveness of non-pharmacological therapy options.

Methods: Analysis of review articles and studies in order to make recommendations for the clinical practice.

Results: Reorientation, promotion of mental activities, adequate communication, early physiotherapy and avoidance of both polypharmacy and sleep deprivation have a high impact on the prevention and therapy of delirium.

Conclusion: Non-pharmacological intervention strategies are very important in the prevention and therapy of delirium.

<https://pubmed.ncbi.nlm.nih.gov/26668055/>

STU	Zywiell MG et al.	Health economic implications of perioperative delirium in older patients after surgery for a fragility hip fracture	J Bone Joint Surg Am 2015;97:829-836
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Background: Patients who experience a fragility hip fracture are at high risk for perioperative delirium. The purpose of the present study was to evaluate the impact, from a hospital perspective, of perioperative delirium on the length of the hospital stay and episode-of-care costs for elderly patients who underwent surgical treatment of a fragility hip fracture.

Methods: A total of 242 patients sixty-five years of age or older (mean age, eighty-two years; range, sixty-five to 103 years) who underwent surgical treatment of a fragility hip fracture at a single center between January 2011 and December 2012 were evaluated. Demographic, clinical, surgical, and adverse-events data were extracted and analyzed. The confusion assessment method (CAM) was used prospectively to detect perioperative delirium.

Results: One hundred and sixteen (48%) of the 242 patients developed perioperative delirium during their stay in the hospital. Compared with patients with no delirium, delirium was associated with a mean incremental total length of hospital stay of 7.4 days (95% confidence interval [CI] = 3.7 to 11.2 days; $p < 0.001$), a mean incremental length of stay following surgery of 7.4 days (95% CI = 3.8 to 11.1 days; $p < 0.001$), and a mean incremental episode-of-care cost (in 2012 Canadian dollars) of \$8286 (95% CI = \$3690 to \$12,881; $p < 0.001$). The total incremental episode-of-care cost attributable to delirium over the study period was \$961,131 in 2012 Canadian dollars.

Conclusions: Nearly 50% of elderly patients who underwent surgery for a fragility hip fracture developed perioperative delirium, which was associated with a significant incremental in-hospital length of stay and significant incremental episode-of-care costs. These findings highlight the importance of implementing cost-effective interventions to reduce the prevalence of perioperative delirium in elderly patients with a low-energy hip fracture.

<https://pubmed.ncbi.nlm.nih.gov/25995494/>