Table 1. Search Strategy

<table>
<thead>
<tr>
<th>DATABASE SEARCHED &amp; TIME PERIOD COVERED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following databases have been searched for relevant information:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Database</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>CINAHL (Cumulative Index to Nursing and Allied Health Literature)</td>
<td>Searched September 10, 2012</td>
</tr>
<tr>
<td>Cochrane Library</td>
<td>Searched September 10, 2012</td>
</tr>
<tr>
<td>EMBASE (Excerpta Medica)</td>
<td>1999 – September 7, 2012</td>
</tr>
<tr>
<td>MEDLINE</td>
<td>1999 – September 7, 2012</td>
</tr>
<tr>
<td>PreMEDLINE</td>
<td>1999 – September 7, 2012</td>
</tr>
<tr>
<td>PubMed</td>
<td>Searched September 7, 2012</td>
</tr>
</tbody>
</table>

**HAND SEARCHES OF JOURNAL & NONJOURNAL LITERATURE**

Journals and supplements maintained in ECRI Institute’s collections were routinely reviewed. Nonjournal publications and conference proceedings from professional organizations, private agencies, and government agencies were also screened. Other mechanisms used to retrieve additional relevant information included review of bibliographies/reference lists from peer-reviewed and gray literature. (Gray literature consists of reports, studies, articles, and monographs produced by federal and local government agencies, private organizations, educational facilities, consulting firms, and corporations. These documents do not appear in the peer-reviewed journal literature.)

**TOTAL NUMBER OF RESULTS:** 673
<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Description of Patient Safety Strategy</th>
<th>Study Design and Patients</th>
<th>Theory or Logic Model</th>
<th>Contexts</th>
<th>Implementation Details</th>
<th>Outcomes: Benefits</th>
<th>Outcomes: Harms</th>
<th>Influence of Contexts on Outcomes</th>
<th>Overall Risk of Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colombo et al. 2012 (19) Italy</td>
<td>Reorientation strategy where patients are 1) called by their first name, 2) given information on the ward, hospital, and illness progression; 3) mnemonically stimulated. Additional environmental, acoustic, and visual stimulation is provided.</td>
<td>Prospective controlled before-after (CBA) study of 314 critically-ill patients admitted to a mixed medical-surgical ICU</td>
<td>Not reported, but the authors cite a recent review by key opinion leaders that proposed the strategy used in this study for critically-ill patients.</td>
<td><strong>External:</strong> None mentioned. <strong>Organizational Characteristics:</strong> Mixed medical-surgical ICU in a University hospital. <strong>Teamwork:</strong> Four research nurses were trained to assess delirium, collect and input data into an electronic database, and to apply the Confusion Assessment Method for the ICU (CAM-ICU). Other team members not reported. <strong>Leadership:</strong> The lead author supervised proper application of the shared interventional reorientation algorithm. <strong>Culture:</strong> Not reported. <strong>Implementation Tools:</strong> Nurse training in application of the algorithm.</td>
<td>Phase 1 involved implementing a sedation algorithm (used in Phase II as well). Mechanically-ventilated patients underwent daily interruption of sedation along with spontaneous breathing trial when clinically possible. Delirium assessment with CAM-ICU was performed twice daily (10 am and 10 pm) after sedation interruption. Pain was also assessed. Phase 1 lasted 5 months. Phase II was the intervention phase, where the reorientation strategy described under Description of Patient Safety Strategy was implemented. Phase II lasted 6 months.</td>
<td>Delirium incidence decreased from 35.5% during observational phase of study to 22% in the interventional phase (p&lt;0.020).</td>
<td>Not reported</td>
<td>Not reported</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 2. Delirium Prevention – Multi-component Interventions
<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention Type</th>
<th>Setting</th>
<th>Sample Size</th>
<th>Age</th>
<th>Admissions</th>
<th>Intervention Details</th>
<th>Outcomes</th>
</tr>
</thead>
</table>
| Deschot et al. 2012 | Controlled clinical trial | Inpatient geriatric consultation team (IGCT) | 171 patients aged ≥ 65 years admitted to an academic hospital emergency department with a hip fracture | IGCTs are intended to advise, sensitize and educate healthcare professionals on issues related to older adults and geriatric medicine, and to provide expertise for older adults on non-geriatric wards. | Delirium incidence*  
Intervention: 21/74 (28.4%)  
Control: 25/57 (43.9%)  
Relative risk (RR): 0.65 (95% CI 0.41 to 1.03, p=0.067)  
*Calculated by reviewers based on reported data |
| Martinez et al. 2012| Single-blind randomized controlled trial (RCT) | Prophylactic environmental management of in-hospital | Not reported | Not reported | A non-pharmacological intervention included the following six  
1. Team nurse administers preoperative comprehensive geriatric assessment  
2. Geriatrician assesses medical status  
3. Further evaluations are requested postoperatively based on team recommendations  
4. “Multidimensional image” of the patient is developed  
5. A detailed report is generated (inserted in electronic and paper files); discussed with primary nurse, head nurse and traumatologist  
6. IGCT nurse responsible for feedback and follow through with recommendations or new issues | Delirium incidence:  
Intervention: 8 (5.6%)  
No harms reported for intervention. Four patients |
Chile

Delirium (PEMID), a multicomponent management protocol

- 287 patients > 70 years admitted to an internal medicine ward and considered to have at least one risk factor for delirium

Characteristics:
- Naval hospital
- Teamwork: 3 independent observers assessed patients
- Leadership: Not reported
- Culture: Not reported

Implementation
- Tools:
  - Educational pamphlet, interviews with family members, familiar items (e.g., photos) and items necessary for daily living (e.g., glasses)

1. **Education:** During a 10 minute interview, family members were educated on clinical features and prognostic implications of acute confusional syndrome. Educational pamphlet also distributed.
2. A clock and calendar was placed in the patients room
3. Patients glasses, dentures and hearing aids made available
4. Familiar objects such as photographs, cushions and radios placed in the room
5. Family members reorient patient with current date, time and events
6. Families allowed 5 hour visitations

Physicians provided delirium treatments.

Control: 19 (13.3%)

Control: 19 (13.3%)

RR = 0.41 (95% CI 0.19-0.92, p=0.027)
in the control group experienced falls, one of which resulted in a fracture.

USA

System-wide quality improvement (QI) project to prevent delirium in hospitalized patients

Prospective CBA study

- 199 patients

External:
- None mentioned

Organizational Characteristics:
- 6 community hospitals (part of Summa Health System), over 2,000 licensed beds. Acute Care for Elders (ACE) unit had prior experience using delirium treatments.

- First obtained stakeholder agreement, then multidisciplinary workgroup devised strategy and carried out the pilot project. It involved education of ACE unit staff on delirium screening, prevention and treatment protocols that were then implemented:

1. **Education**: Patients were educated on the importance of delirium screening and prevention. Educational materials were distributed to all patients.
2. **Aids**: Visual aids such as calendars and clocks were placed in the patients' rooms to help them maintain a sense of time.
3. **Familiar objects**: Photographs of family members were displayed in the patient's room to help them feel connected.
4. **Interaction**: Families were allowed 5-hour visits to help maintain a sense of normalcy.
5. **Intervention**: Physicians were trained on delirium management and treatments were provided.

Delirium incidence decreased from 8.8% in pre-implementation group to 7.2% in implementation group (not statistically significant). Mean length of stay decreased from 7.6 days to 4 days (difference 3.6 days).

No harms reported for intervention. Deaths, ICI transfers, and 30-day readmissions all decreased in intervention group.

Allen et al. 2011(17)
Incident delirium: 25/87 (29%) Intervention: 64/83 (77%)

P = 0.001 (95% CI: 0.06-0.24)

OR = 0.12 (95% CI: 0.06-0.24)

P < 0.0001

Authors also state “there were no significant differences in mean scores between groups.”

Organizational characteristics:
- Inner city public hospital with 7-bedded general ICU

Leadership:
- Researchers (Director of School Nurses) gave family members the information booklet at admission to the unit; researcher provided explanation of the study and booklet on Day 1; from Day 2 to transfer to ward, nurses facilitated family access to patient, and families implemented the booklet’s advice.

Implementation tools:
- Staff education and training, use of audit and feedback implemented.

Culture statement:
- Summa Health System maintains a strong commitment to patient safety and quality.

Results:
- Incident delirium: Intervention 25/87 (29%) vs. Control 64/83 (77%)
- OR = 0.12 (95% CI: 0.06-0.24)
- P < 0.0001

There were no significant differences in mean scores between groups.
| Chen et al. 2011(6) | Modified Hospital Elder Life Program (HELP); modified to include 3 shared risk factors (functional, nutritional, and cognitive status) targeted by 3 modified HELP protocols (early mobilization, nutritional assistance, and therapeutic cognitive activities) | CBA study (historical control) | 189 patients aged ≥65 years admitted to a gastrointestinal ward for elective surgery, with expected length of stay >6 days | Prior evidence suggests the HELP model can prevent and reduce older patients’ post-surgical functional decline. The authors’ earlier work suggests that 3 key elements are the most relevant for surgical patients and those were used in this study. | The trained HELP nurse helped (sometimes with family members) mobilize patients and simultaneously engaged them in cognitive activities (such as discussing things that interested the patient); the nurse also provided nutritional assistance (oral care, assisted feeding if necessary). | Delirium at discharge: HELP: 0/102 (0%) Control: 12/77 (15.6%) OR = 0.03 (95% CI: 0.001-0.44) P<0.001 | External: None mentioned Organizational Characteristics: Urban medical hospital (2,200 beds, 36-bed gastrointestinal ward) Leadership: Researchers designed program and led the study Teamwork: Not reported Culture: Not reported Implementation tools: A full-time trained HELP nurse, blinded to the study hypothesis and not an outcomes assessor, implemented the program. | Not reported | Not reported | High |
HELP provides skilled interdisciplinary staff and trained volunteers to conduct intervention protocols targeted toward 6 delirium risk factors: orientation, therapeutic activities, early mobilization, vision and hearing protocols, oral volume repletion, and sleep enhancement; it has been shown to be effective for delirium prevention.

HELP was first implemented in one 40-bed medical unit in 2002; by 2008 it had spread to 6 units with a total of 184 beds; The project director initially worked with hospital leadership to determine metrics for measuring success; initial success in the proposed metrics was demonstrated, so the hospital agreed to continue funding and allowed expansion to additional units; before starting in a new unit, the project director solicited input from each nursing unit director; the project director worked with the Chief Nursing Director to identify subsequent units to target; as patient volume increased, paid HELP staff and volunteers were added; one Elder Life Specialist became the lead volunteer coordinator; weekly meetings of staff were held to maintain quality and document modifications to the original HELP protocols.

Delirium rate:
- Pre-HELP (2001): 41%
- HELP (2002): 26%
- HELP (2005): 16%
- HELP (2008): 18%

Nurse satisfaction:
Nurses and nurses aides reported benefit and satisfaction with HELP and agreed with a questionnaire item that their job was “more satisfying due to HELP.”
Inouye et al. 2003(7), 1999(10) USA

**HELP for prevention of delirium in elderly patients**

<table>
<thead>
<tr>
<th>Prospective matched CBA study</th>
<th>Delirium has been associated with several risk factors; the HELP targets 6 of these risk factors (cognitive impairment, sleep deprivation, immobility, visual impairment, hearing impairment, and dehydration)</th>
</tr>
</thead>
<tbody>
<tr>
<td>852 patients at least 70 years old admitted to general medicine floor (later study included 422 patients from the HELP arm of the study)</td>
<td>With oversight by a geriatric nurse specialist and geriatrician, the Elder Life specialists implemented 6 interventions: orientation, therapeutic activities, mobility, sleep, hearing or vision, and volume repletion (for dehydration); they were assisted by trained volunteers; all patients were assigned orientation, therapeutic activities, and mobility; other protocols were targeted to a subgroup of patients with the identified risk factor.</td>
</tr>
</tbody>
</table>

**External:** None mentioned

**Organizational Characteristics:** Urban teaching hospital (900 beds)

**Teamwork:** Interdisciplinary team including a geriatric nurse-specialist, two Elder Life specialists, a certified therapeutic-recreation specialist, a physical therapy consultant, a geriatrician, and trained volunteers.

**Leadership:** Not reported

**Culture:** Not reported

**Implementation tools:** All staff and volunteers underwent quarterly standardization to ensure consistent application of all intervention protocols

In the earlier publication, incident delirium was significantly lower in the intervention group vs. the usual care group (9.9% vs. 15%, OR: 0.60 (95% CI: 0.39–0.92); P = 0.02

Not reported

**Adherence (each 1 point increase):**

- OR: 0.69 (95% CI: 0.56-0.87)
- P = 0.001

**Moderate**

Downloaded From: http://annals.org/pdfaccess.ashx?url=/data/journals/aim/926462/ on 08/06/2018
Multifactorial intervention including pre-hospital and perioperative treatment and care of patients with hip fracture. Components include supplemental oxygen 3-4l/min, IV fluid supplementation and extra nutrition, increased monitoring of vital physiological parameters, adequate pain relief, avoid delay in transfer logistics, daily delirium screening using Organic Brain Syndrome (OBS) scale, avoid polypharmacy, and perioperative/anesthetic period protocol.

Authors cite prior multifactorial intervention studies; they added pre-hospital component because prior studies have identified preop risk factors for delirium.

Patients underwent pre-hospital care, nurse assessment immediately after admission, orthopedic surgeon assessment 30 min before referral to X-ray department, then transfer to orthopedic ward, then surgery for hip fracture with general or spinal anesthesia. Delirium was assessed by researchers within 4 hrs of admission and 8 hr after the end of anesthesia.

Post-op delirium:
- **Intervention**: 28/131 (21.4%)
- **Control**: 44/132 (33.3%)
- OR = 0.54 (0.31-0.95)
- P = 0.03

Any complications:
- **Intervention**: 66/131 (50.4%)
- **Control**: 70/132 (53.0%)
- P = 0.67

Prospective CBA study
263 patients aged ≥65 years with hip fracture

Exclusions:
- None mentioned

Organizational Characteristics:
Academic hospital, also pre-hospital ambulance care

Leadership:
Researchers were in charge

Teamwork:
Nurses and orthopedic surgeons were part of the team

Culture:
Not reported

Implementation tools:
Two of the authors were in charge of implementation
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Type</th>
<th>Setting</th>
<th>Sample size</th>
<th>Intervention</th>
<th>Control</th>
<th>Results</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needham et al. 2010(12) USA</td>
<td>USA</td>
<td>Structured quality improvement (QI) model with components including: understanding the problem within the larger healthcare system, creating a multi-disciplinary improvement team, enlisting all stakeholders to identify barriers to change and appropriate solutions, and creating a change in practice through engagement, education, execution, and evaluation</td>
<td>CBA study (historical control)</td>
<td>57 patients with acute respiratory failure</td>
<td>The QI model was based on a &quot;4 Es&quot; model (engage, educate, execute, and evaluate). Previous studies have shown that early physical medicine and rehabilitation (PM&amp;R) in the ICU provides benefits for critically ill patients, and the QI model applied this evidence to patients in the medical ICU (MICU).</td>
<td>None mentioned</td>
<td>Incident delirium: QI period: 125/482 (28%) MICU patient days Pre-QI period: 107/312 (36%) MICU patient days P = 0.003</td>
<td>Not reported</td>
</tr>
<tr>
<td>Vidán et al. 2009(14) Spain</td>
<td>Spain</td>
<td>Education measures and specific actions in 7 risk areas (orientation, sensory impairment, sleep, mobilization, hydration, nutrition, drug use), with daily monitoring of</td>
<td>Controlled clinical trial</td>
<td>542 patients aged ≥70 years admitted to a geriatric acute care unit and two internal medicine wards</td>
<td>Authors discuss the HELP program as inspiration, but the new protocol was designed to be implemented in daily practice without extra staff (unlike</td>
<td>None mentioned</td>
<td>New delirium episodes: Intervention: 20/170 (11.7%) Usual care: 69/372 (18.5%) OR = 0.59 (95% CI: 0.34-1.00) P = 0.05</td>
<td>Not reported</td>
</tr>
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</table>

Incident delirium: QI period: 125/482 (28%) MICU patient days Pre-QI period: 107/312 (36%) MICU patient days P = 0.003

New delirium episodes: Intervention: 20/170 (11.7%) Usual care: 69/372 (18.5%) OR = 0.59 (95% CI: 0.34-1.00) P = 0.05

Unexpected events: QI period: 4 cases of rectal or feeding tube removal, without any significant complications Pre-QI period: No unexpected events P>0.99

High

Standardized MICU admission modified to change default activity from "bed rest" to "as tolerated," change in sedation practice from continuous intravenous infusions to "as needed" bolus doses; establishing guidelines for PT and OT consultation; developing safety-related guidelines for PM&R-related consultation; including a full-time PT and OT and a part-time rehab assistant; consulting a physiatrist; and increasing consultations to neurologists for MICU patients with severe or prolonged muscle weakness.

External: None mentioned
Organizational Characteristics: Academic hospital with 16-bed MICU
Leadership: The lead author was the project leader. Researchers were in charge.
Teamwork: A multidisciplinary QI team with representatives from each relevant clinician group in the MICU and PM&R
Culture: Not reported
Implementation tools: Education and training of nurses, physical therapists, occupational therapists, and respiratory therapists to obtain specific skills related to rehab of mechanically ventilated patients.

External: None mentioned
Organizational Characteristics: Academic hospital
Leadership: A specialist geriatric nurse coordinated the intervention and monitored adherence.
Teamwork: Intervention implemented within first 24 hours of admission to geriatric ward by geriatricians, residents, and nurses. A specialist geriatric nurse coordinated the intervention and monitored adherence.

New delirium episodes: Intervention: 20/170 (11.7%) Usual care: 69/372 (18.5%) OR = 0.59 (95% CI: 0.34-1.00) P = 0.05

Unexpected events: QI period: 4 cases of rectal or feeding tube removal, without any significant complications Pre-QI period: No unexpected events P>0.99

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Organizational Characteristics: Academic hospital with 16-bed MICU
Leadership: The lead author was the project leader. Researchers were in charge.
Teamwork: A multidisciplinary QI team with representatives from each relevant clinician group in the MICU and PM&R
Culture: Not reported
Implementation tools: Education and training of nurses, physical therapists, occupational therapists, and respiratory therapists to obtain specific skills related to rehab of mechanically ventilated patients.
A multidisciplinary QI team including geriatricians, residents and nurses who worked in the geriatric ward.

Culture:
Not reported

Implementation tools:
Educational program aimed at changing the patient care approach of geriatric ward staff.

Harari et al. 2007(15) U.K.

Proactive care of older people undergoing surgery (POPS); multidisciplinary preoperative comprehensive geriatric assessment (CGA) service with post-operative follow-through

CBA study (historical control) 108 patients aged ≥65 years undergoing elective surgery

The authors hypothesized that preoperative CGA “incorporating prediction of adverse outcomes combined with targeted interventions, would reduce post-operative complications and hence length of stay (LOS) in older people undergoing elective surgery.” This strategy did not target delirium alone, but any factor that might contribute to complications or longer LOS.

External:
None mentioned

Organizational Characteristics:
Urban teaching hospital

Leadership:
Not reported

Teamwork:
A multidisciplinary QI team including a consultant geriatrician, nurse specialist in older people, occupational therapist, physiotherapist and social worker

Culture:
Not reported

Implementation tools:
Geriatrician and nurse provided staff education in post-op early detection and treatment of medical complications, The multidisciplinary QI team implemented POPS. Most patients received pre-op home visits from occupational therapist and physiotherapy. Social worker provided inputs if needed. Patients were educated in optimizing post-op recovery. The geriatrician and nurse reviewed patients in surgical wards and provided staff education in post-op early detection and treatment of medical complications, early mobilization, pain management, bowel-bladder function, nutrition and discharge planning. Follow-up therapy home visits were provided to those with functional difficulties, and outpatient clinical review in those with moderate to high functional difficulties.

Post-op delirium:
POPS: 3/54 (5.6%)
Pre-POPS: 10/54 (18.5%)

OR = 0.26 (0.07-1.00)
P = 0.036

Only reported complications were related to surgery, not POPS

Not reported

High
<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention</th>
<th>Design</th>
<th>Patients</th>
<th>Outcomes</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lundström et al. 2007(4)</strong>&lt;br&gt;Sweden</td>
<td>Postoperative multifactorial intervention to reduce delirium and improve outcomes in patients with femoral neck fractures</td>
<td>RCT</td>
<td>199 patients aged ≥70 years with femoral neck fractures</td>
<td>Early mobilization, pain management, bowel-bladder function, nutrition and discharge planning.</td>
<td>After education, all team members (except dietician) assessed each patient, usually within 24 hours after admission; team planning of individual rehab performed twice a week; assessment of patients with delirium for precipitating factors; prevention and treatment of complications (infection, anemia, embolism); assessment of bowel/bladder function; treatment of sleep apnea; prevention and treatment of decubitus ulcers; prevention and treatment of post-op pain; ensure oxygen saturation during first post-op day; measure blood pressure for first 2 post-op days; ensure adequate nutrition; mobilization within first post-op day; and secondary prevention of falls and fractures.</td>
</tr>
<tr>
<td><strong>Lundström et al. 2005(16)</strong>&lt;br&gt;Sweden</td>
<td>Education program and reorganization of nursing and medical care</td>
<td>Quasi-RCT</td>
<td>400 patients aged ≥70 years admitted to two wards (intervention and usual)</td>
<td></td>
<td>All nursing and medical staff members attended a 4-day course in caring, rehabilitation, teamwork, and medical knowledge.</td>
</tr>
</tbody>
</table>

**Post-op delirium:**
- **Intervention:** 56/102 (54.9%)
- **Control:** 73/97 (75.3%)
- **OR:** 0.40 (0.22-0.73)
- **p:** 0.003

**Days with post-op delirium:**
- **Intervention:** 5.0 ±7.1 days
- **Control:** 10.2±13.3 days, **p = 0.009**

**Prevalent delirium within 24 hrs of admission:**
- **Intervention:** 63/200 (31.5%)
- **Control:** 62/200 (31%)
were the leaders of the program.

Teamwork: A multidisciplinary team including all staff in the intervention ward.

Culture: Not reported

Implementation tools:

All nursing and medical staff members attended a 2-day course focusing on dementia and delirium in geriatric patients. Staff was also trained in the caregiver-patient interaction.

Nursing care was reorganized to support individualized care, and nursing staff received guidance once a month by a supervisor observing a nursing action.

P = 0.91

Delirium on Day 7:

Intervention: 19/63 (30.2%)
Control: 37/62 (59.7%)
OR = 0.29 (0.14-0.61)
P = 0.001

Tabet et al. 2005(13); 2006(23) U.K.

Educational package for medical and nursing staff to reduce incidence of delirium in hospitalized elderly patients; a control ward did not receive the educational package and performed usual practice.

CBA study (concurrent control) 250 patients aged ≥70 years admitted to two acute admission wards

The authors cite prior studies of educational programs directed at staff that have influenced nursing practice in relation to mental health issues in elderly people.

External: None mentioned

Organizational Characteristics:
Two acute admission wards in an inner-city teaching hospital

Teamwork: Geriatric psychiatrist educated staff, who altered their practice based on the education.

Leadership: The lead investigator (a geriatric psychiatrist) supervised the project.

Culture: Not reported

Implementation tools:
Education program

The educational package, which highlighted delirium risk factors, was delivered on site and at various times to ensure all staff were involved. There was an initial 1 hr formal presentation, written information on guidelines for delirium prevention and management, and regular follow-up meetings to reinforce learning; researchers did not intervene in day-to-day management or provide specific advice pertaining to specific patients.

Point prevalence of delirium:

Intervention ward: 12/122 (9.8%)
Usual care ward: 25/128 (19.5%)
OR: 0.45 (95% CI: 0.21-0.94, P<0.05)

Not reported

The educational package was found to more effectively prevent delirium in men (OR: 0.17, 95% CI: 0.05-0.65) than in women (OR: 1.04, 95% CI: 0.38-2.81).

High
Delirium education for hospital staff plus recommendations by geriatric registrar for up to 10 possible targeted intervention strategies to prevent delirium after hip fracture

CBA study (historical control) 99 patients aged >50 years with hip fracture admitted to a general orthopedic unit

This strategy had been successfully used at a U.S. hospital in a previously published study; targeted recommendations include regulation of bladder and bowel function, early detection/treatment of major complications, correction of fluid and electrolyte imbalance, discontinuation of unnecessary medications, provision of oxygen, severe pain treatment, agitated delirium treatment, use of appropriate environmental stimuli, adequate nutritional intake, and early mobilization and rehabilitation.

External: None mentioned
Organizational Characteristics: Urban teaching hospital (460 beds)
Teamwork: Multidisciplinary committee with medical, nursing, and allied health members of the orthopedic, geriatric, and anesthetic depts.
Leadership: The lead investigator supervised the project.
Culture: Not reported
Implementation tools: The leader educated frontline staff (interns, ward nurses, and allied health staff) on delirium every 10 weeks

The lead investigator educated staff, supervised data collection and assessed patients; the project team met fortnightly to supervise the program; the intervention was implemented over a 3-month period; the major barrier was a high turnover of nursing staff that was partly overcome by the nurse manager of the orthopedic unit ensuring that all nursing staff attended the tutorials and received education about the use of the CAM.

Incident delirium: None reported
Pre-intervention: 10/28 (37.5%)
Intervention: 9/71 (12.7%)
OR = 0.26 (95% CI: 0.09-0.74)
P = 0.012
Marcantoni et al. 2001(8) USA

Proactive geriatrics consultation with target recommendations based on a structured protocol for patients after hip fracture (target recommendations same as in Wong et al. 2005)

| Single-blind RCT | Not clearly stated, other than that geriatrics consultation is easily implementable and that a targeted, proactive strategy with intervention on defined outcomes has shown effectiveness, although it is not clear whether it has shown prior effectiveness in delirium prevention.
| External: None mentioned | A geriatrician evaluated patients preoperatively or within 24 hours postop, performed daily visits for duration of hospitalization and made targeted recommendations. The orthopedics team (surgeons and nurses) implemented the recommendations (adherence rate: 77%).
| Organizational Characteristics: Academic tertiary medical center | The usual care group received management by the orthopedics team, including internal medicine or geriatric consults on a reactive rather than proactive basis.
| Teamwork: Geriatrician and orthopedics team worked together | Post-op delirium:
| Leadership: Not reported | Consult:
| Culture: Not reported | Usual care:
| Implementation tools: Not reported | 32/64 (50%)
| | P = 0.04
| | However, when adjusted for baseline imbalances the effect size was no longer statistically significant: OR: 0.6 (95% CI: 0.3-1.3)
| | No significant between-group difference in days of delirium per episode

External: None mentioned
Organizational Characteristics: Academic tertiary medical center
Teamwork: Geriatrician and orthopedics team worked together
Leadership: Not reported
Culture: Not reported
Implementation tools: Not reported

A geriatrician evaluated patients preoperatively or within 24 hours postop, performed daily visits for duration of hospitalization and made targeted recommendations. The orthopedics team (surgeons and nurses) implemented the recommendations (adherence rate: 77%).

Post-op delirium:
Consult:
20/62 (32%)
Usual care:
32/64 (50%)
P = 0.04
However, when adjusted for baseline imbalances the effect size was no longer statistically significant: OR: 0.6 (95% CI: 0.3-1.3)
No significant between-group difference in days of delirium per episode

Palliative care centers (dedicated hospital units and/or stand-alone hospices)

Consultation showed a trend toward being more effective among patients without prefracture dementia or ADL impairment, but the differences were not statistically significant.
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Intervention Details</th>
<th>Study Design</th>
<th>Sample Size</th>
<th>Delirium Incidence</th>
<th>Discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gagnon et al. 2012</td>
<td>Canada</td>
<td>Multi-component intervention to prevent delirium in terminal cancer patients; intervention included a patient/physician component</td>
<td>Controlled clinical trial</td>
<td>1516 patients admitted to seven palliative care centers for terminally-ill patients</td>
<td>Delirium incidence: Intervention: 49.1% Usual care: 43.9%</td>
<td>When adjusted for confounding variables, no between-group difference was found for delirium incidence (OR 0.94, p=0.66).</td>
</tr>
</tbody>
</table>

**External:**
None mentioned

**Organizational Characteristics:**
Palliative care centers

**Teamwork:**
Physicians, nurses, and family members worked together to implement the intervention

**Leadership:**
Principal investigators led the project; a research staff nurse oversaw study procedures in every participating center

**Culture:**
Not reported

**Implementation Tools:**
Bedside nurses attended training sessions on screening and monitoring for delirium symptoms using the Confusion Rating Scale.

The multicomponent intervention was implemented at 2 of the 7 palliative care centers; the others provided usual care. At all centers, bedside nurses assessed the presence and intensity of symptoms at the end of each 8-hour shift. For the intervention, the research nurse recorded patient risk factors for delirium on a form that was sent to the physician so they could determine what further steps to take. Nurses also oriented the patient as early as possible in the nurse shift. Bedside nurses educated the closest family member about delirium and provided them with the American College of Physicians recommendations for avoiding symptoms of confusion in patients with advanced cancer.

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<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Intervention Details</th>
<th>Study Design</th>
<th>Sample Size</th>
<th>Delirium Incidence</th>
<th>Discussion</th>
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<tr>
<td>Lapane et al. 2011</td>
<td>USA</td>
<td>Pharmacist-led Geriatric Risk Assessment MedGuide (GRAM) reports and automated monitoring plans focusing on medication</td>
<td>Quasi-RCT:</td>
<td>3,202 patients (2003) 3,321 patients (2004) 25 nursing homes were</td>
<td>Potential delirium indicator: In home 2003/04: Adjusted hazard ratio: 0.93 (0.80-1.09) New admits 2004: Adjusted hazard</td>
<td>No significant difference between groups for potential adverse-event related hospitalization, falls, or death</td>
</tr>
</tbody>
</table>

**External:**
None mentioned

**Organizational Characteristics:**
25 nursing homes (each with 50 or more geriatric beds). All nursing homes had stable contracts with

GRAM was designed to assist healthcare professionals with expertise in geriatric pharmaco-therapy in problem

After training in 2003, GRAM database for falls and delirium was integrated in January 2004 into the pharmacies’ commercial pharmacy software system for the intervention homes. Reports were

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monitoring phase to prevent potential adverse drug events (falls and delirium) in nursing homes

identified when evaluating complex medication regimens of older adults to identify, resolve, and prevent medication-related problems, aid in evaluation of medications as a cause or aggravating factor contributing to an older adult's physical, cognitive, or functional decline, and facilitate incorporation of medication monitoring information into the older adult's plan of care.

Omnicare and had few short stay residents

**Teamwork:** Pharmacists shared reports with facility nurses.

**Leadership:** Consultant pharmacists

**Culture:** Not reported

**Implementation tools:** The ASCP Foundation developed and delivered in-service programs for nursing staff and consultant pharmacists. Two of the authors were instructors.

generated on medications that contribute to falls and delirium, as well as medication monitoring care plans and flow records. Facility nurses received reports within 24 h of admission for new admissions; consultant pharmacists did on-site reviews of drug regimens for each resident once every 30 days.

ACE – Acute care for elders
ADL – Activities of daily living
CAM – Confusion assessment method
CBA – Controlled before-after
CGA – Comprehensive geriatric assessment
GRAM – Geriatric risk assessment medguide
HELP – Hospital elder life program
ICU – Intensive care unit
IGCT – Inpatient geriatric consultation team
LOS – Length of stay
LPN – Licensed practical nurse
MICU – Medical ICU
OR – Odds ratio
OT – Occupational therapist
PM&R – Physical medicine and rehabilitation
POPS – Proactive care of older people
PT – Physical therapist
QI – Quality improvement
RCT – Randomized controlled trial
RN – Registered nurse
RR – Relative risk
Figure. Study flow diagram.

PSP = patient safety practice.