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Prior Surveillance Assessment (September 2012):

- All conclusions were up to date

SRC Literature Analysis:

- No new research was found

Reviewer Questions:

1. Are the original report conclusions still supported by the current evidence?

Click here to enter text.

2. Are there any published or unpublished studies that you know of that we may have overlooked?

Click here to enter text.

Original Review Conclusions and Literature Analysis

Title of Original Review: Comparative Effectiveness of Pain Management Interventions for Hip Fracture

Link to Report Link to Surveillance

The conclusions from the original report, conclusions from a prior surveillance assessment and an analysis of recent literature identified by the Scientific Resource Center (SRC) are summarized below. Abstracts are provided for included literature at the end of the document.

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
Key Question 1: In older adults (≥50 years) admitted to the hospital following acute hip fracture, what is the effectiveness of pharmacologic and/or nonpharmacologic pain management interventions for controlling acute (up to 30 days postfracture) and chronic pain (up to 1 year postfracture) compared with usual care or other interventions in all settings?		
Systemic Analgesia		
3 RCTs (n=214) evaluated different types of systematic analgesia. The mean age ranged from 77.2 to 78.5 years; most patients were female. All three trials reported acute pain. Acute pain was measured using the 10cm Visual Analogue Scale (VAS); the mean baseline measure was 6.5cm. One trial (n=90) comparing parecoxib intravenous (IV) vs. diclofenac intramuscular (IM) ± merperidine IM found a significant difference in favor of parecoxib IV (MD -0.70; 95% CI -1.04, -0.36; p<0.0001). Another trial (n=30) compared intrathecal isotonic clonidine vs. intrathecal hypertonic clonidine reported a significant difference in favor of isotonic clonidine	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
(MD -1.69; 95% CI -2.01, -1.37; p<0.00001). The third trial (n=94) comparing lysine clonixinate vs. metamizole found no significant difference (MD -0.43; 95% CI -1.30, 0.44; p=0.33).		
Anesthesia		
Twenty-one RCTs and one nRCT (n=1,062) evaluated anesthesia including neuraxial (i.e., continuous vs. single administration) or neuraxial versus general anesthesia, or another form of anesthesia (i.e., spinal or regional); sample sizes ranged from 20 to 90. Additionally, eight cohort studies (n=3,086) provided additional data. The mean age of participants ranged from 70 to 86 years; most were female. Acute pain was measured using different scales (numbering rating score [1-5] and 10cm VAS). The studies were grouped as follows: spinal versus epidural or general anesthesia (n=10); neuraxial anesthesia: addition of clonidine, fentanyl, merperidine, morphine, or sufentanil (n=14);	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
neuraxial anesthesia: different doses or modes of administration (continuous vs. single administration) (n=13). The average baseline VAS pain score was 4.7. Spinal versus general anesthesia: One RCT (n = 30) reported a statistically significant difference of additional pain relief in favor of spinal anesthesia (MD = -0.86; 95% CI -1.30, -0.42; p = 0.0001). The strength of the evidence was rated as insufficient. Neuraxial anesthesia: addition of clonidine, fentanyl, meperidine, morphine, or sufentanil: Three RCTs compared additional fentanyl (n = 40), morphine (n = 40), and sufentanil (n = 50) versus standard spinal anesthesia. In the studies comparing the addition of fentanyl or sufentanil, no patients reported feeling pain following the procedure. In the study comparing the addition of morphine, there was no significant difference between groups (MD = -0.36; 95% CI -1.11, 0.39; p = 0.35). One RCT and one nRCT (n = 80) comparing additional fentanyl reported acute pain on day 1 and found no significant difference between groups (OR 1.24; 95% CI 0.34, 4.48; p = 0.75).		
Complementary and Alternative Medicine:		
Two RCTs (n = 98) evaluated the administration of CAM interventions versus no or sham intervention. The mean age ranged from 76.8 to 86.3 years; most were female. One trial (n = 38) compared acupressure versus	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
sham control delivered preoperatively. Acute pain was measured using the 10cm VAS; the baseline measure was 6.5cm. The second trial (n = 60) compared the Jacobson relaxation technique (a two-step process of contracting and relaxing specific muscles) versus no intervention. Pain was measured using a 10-point verbal scale; the baseline measure was not reported.		
Acupressure reduced pain versus a sham intervention (MD -3.01; 95% CI -4.53, -1.49; p <0.0001). Relaxation also showed a reduction in pain versus no relaxation (MD -1.10; 95% CI -1.43, -0.77; p <0.00001). The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found
Multimodal Pain Management:		
Two cohort studies (n = 226) evaluated multimodal pain management versus standard care. These studies described the use of multiple pain management strategies (sequential or in parallel) as part of the clinical pathway for patients with hip fractures. The mean age was not reported; most participants were female. One study compared a formal postoperative protocol of IV and oral tramadol plus acetaminophen versus standard care. The second compared a formal preoperative protocol of skin traction, morphine and acetaminophen versus standard care.	Up-to-date	No new research was found
No data were reported.	Up-to-date	No new research was found
Nerve Blocks:		
Twenty-nine RCTs (n = 1,757) evaluated nerve blocks, including 3-in-1 (neurostimulation [NS]/ultrasoundguided [US]), combined lumbar/sacral plexus, fascia iliaca compartment, femoral, lumbar	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
plexus plus sciatic nerve, posterior lumbar plexus, psoas compartment, obutarator, and epidural nerve blocks. These were compared with placebo/standard care, or a different method of nerve blocks. Additionally, three cohort studies (n = 696) evaluated 3-in-1, femoral, and lumbar plexus plus sciatic nerve blocks versus analgesia, or comparing different analgesic medications in femoral lumbar plexus plus sciatic blocks. The mean age of participants ranged from 59.2 to 85.9 years; most were female. Acute pain was measured using different scales (i.e., numeric rating scales and 10cm VAS). Eight studies using the VAS reported mean baseline scores from 1.4cm to 7.3cm. The studies were grouped as follows: nerve blocks versus standard care/placebo; nerve blocks versus neuraxial anesthesia; nerve blocks–ropivacaine versus bupivacaine; nerve blocks–addition of clonidine; and nerve blocks		
Nerve blocks versus no block: Acute pain was reported in 13 RCTs (n = 942). There was significant heterogeneity between the study results (I2 = 92 percent) and so pooled results are not reported. Even so, subgroup analyses showed significant results in favor of individual nerve blocks, except 3-in-1 block. Also preoperative nerve blocks seemed to be more effective than postoperative administration. One trial (n = 50) reported a significant difference in postoperative pain on day 1 favoring nerve blocks (OR 0.10; 95% CI 0.03, 0.36; p = 0.0005). The strength of the evidence was rated as moderate.	Up-to-date	No new research was found
Nerve blocks versus neuraxial anesthesia: Acute pain was reported in three RCTs (n = 109). There was no significant difference between groups (MD -0.35; 95% CI -1.10, 0.39; p = 0.35). The strength of the evidence	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
was rated as low.		
Neurostimulation:		
Two RCTs (n = 123) evaluated transcutaneous electrical neurostimulation (TENS) versus sham control. One trial administered the TENS preoperatively, and the other postoperatively. The mean age of participants ranged from 71.2 to 80.5 years; most were female. Pain was measured using the VAS; the mean baseline measure was 8.4 to 8.8.	Up-to-date	No new research was found
Two RCTs (n = 123) found a significant difference in additional pain relief in favor of TENS (MD -2.79; 95% CI -4.95, -0.64; p = 0.01). Pain on movement was reported in one trial (n = 60) and found a significant difference in favor or TENS (MD -3.90; 95% CI -6.22, -1.58; p = 0.001). The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found
Rehabilitation:		
One RCT (n = 37) evaluated physical therapy (stretching and strengthening of spinal and psoas muscles) versus standard care. The mean age was 67.1; all participants were female. Pain was measured using the 10cm VAS; the mean baseline measure was 7.9cm.	Up-to-date	No new research was found
There was a significant difference in additional pain relief following physical therapy (MD -1.39; 95% CI -2.27, -0.51; p = 0.002). The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found
Traction:		

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
Nine RCTs, four nRCTs, and one cohort study evaluated skin or skeletal traction versus no intervention or other interventions. Sample sizes ranged from 60 to 311. The mean age ranged from 74.0 to 81.0; most participants were female.	Up-to-date	No new research was found
Acute pain was measured using the 10cm VAS; the mean baseline measure ranged from 0.3 to 6.9cm. Eight trials compared skin traction (n = 498) versus no traction (n = 594) and found no significant difference between groups. The strength of the evidence was rated as low. One trial (n = 78) compared skin traction versus skeletal traction and found no difference between groups. The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found
Key Question (KQ) 2: In older adults (≥50 years) admitted to the hospital following acute hip fracture, what is the effectiveness of pharmacologic and/or nonpharmacologic pain management interventions on other outcomes up to 1 year postfracture compared with usual care or other interventions in all settings? Other outcomes include: **a. Mortality (30-day and up to 1 year postfracture)** **b. Functional status** **c. Pain medication use; change in type and quantity** **d. Mental status** **e. Health-related quality of life** **f. Quality of sleep in the hospital** **g. Ability to participate in rehabilitation** **h. Return to prefracture living arrangements** **i. Health services utilization**		
Systemic Analgesia		
Additional pain medication use was reported in one trial comparing lysine clonixinate vs. metamizole and reported no significant difference between groups (OR 3.00; 95% CI 0.30, 29.94; p=0.35).	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
Delerium was reported in one trial comparing lysine clonixinate vs. metamizole and found no significant difference (OR 0.96, 95% CI 0.06, 15.77; p=0.98).		
Anesthesia		
Spinal versus general anesthesia or spinal versus epidural anesthesia: Two RCTs reported 30-day mortality (n = 99) and found no statistically significant difference in mortality rates (OR 1.73; 95% CI 0.53, 5.68; p = 0.36). In two cohort studies (n = 650), pooling was not performed due to marked statistical heterogeneity and conflicting results between the studies. The strength of the evidence was rated as insufficient. Delerium: In one RCT (n = 30) that reported delirium there was no significant difference between groups (OR 0.76; 95% CI 0.18, 3.24; p = 0.71). The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found
Length of stay (LOS) for acute hospitalization: Reported in two RCTs (n = 99). LOS was significantly less in the general anesthesia group (MD 1.69; 95% CI 0.38, 3.01; p = 0.01).	Up-to-date	No new research was found
Neuraxial anesthesia: addition of clonidine, fentanyl, meperidine, morphine, or sufentanil. Additional pain medication use: Reported in six RCTs. In one RCT (n = 40) comparing	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
the addition of lonidine versus standard spinal anesthesia, all participants required additional pain medication. The pooled estimate from three trials examining the addition of fentanyl (n = 102) showed no significant difference between groups (OR 5.51; 95% CI 0.25, 122.08; p = 0.28). There was no significant difference in additional pain medication use in one RCT (n = 40) that compared the addition of morphine (OR 0.27; 95% CI 0.07, 1.04; p = 0.06). Similarly, three RCTs (n = 132) that compared the addition of sufentanil found no difference between groups (Peto's OR 7.39; 95% CI 0.15, 372.38; p = 0.32)		
Delirium: Reported in one RCT (n = 40) comparing the addition of morphine and found no significant difference between groups (OR 3.15; 95% CI 0.12, 82.16; p = 0.49). The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found
Neuraxial anesthesia: different doses and modes of administration (continuous vs. single administration): Three RCTs (n = 163) reported 30-day mortality. In two, there were no deaths. In the third, there was no significant difference between groups (OR 0.46; 95% CI 0.07, 3.02; p = 0.42). Additionally, 30-day mortality was reported in one cohort study (n = 291) that found no significant difference between groups (OR 0.96; 95% CI 0.30, 3.00; p = 0.94). The strength of the	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
evidence was rated as low.		
Additional pain medication use: Reported in two RCTs (n = 134); there were no events in either group.	Up-to-date	No new research was found
LOS for acute hospitalization: Reported in two RCTs (n = 89). There was no significant difference between groups (MD = -0.98; 95% CI -2.06, 0.10; p = 0.07). In two RCTs (n = 134) that reported delirium, there was no significant difference between groups (OR 1.27; 95% CI 0.32, 4.99; p = 0.73). The strength of the evidence was rated as low	Up-to-date	No new research was found
Spinal anesthesia (different doses): One cohort study (n = 182) reported that there was no significant difference in 30-day mortality rates between groups (OR 0.49; 95% CI 0.12, 2.02; p = 0.32). The strength of the evidence was rated as insufficient. Another cohort study (n = 60) reported no significant difference in the incidence of delirium (OR 0.46; 95% CI 0.08, 2.75).		No new research was found
Additional pain medication use: One RCT (n = 60) that reported there was no significant difference between groups at different doses (4 vs. 5mg, 4 vs. 6mg, or 5 vs. 6mg).	Up-to-date	No new research was found
Complementary and Alternative Medicine:		
In the RCT that examined relaxation, fewer patients in the relaxation group required additional pain medication (e.g., meperidine or morphine) versus the control group (MD -8.43; 95% CI -15.11, -1.75; p = 0.01).	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
Multimodal Pain Management:		
Mortality: Reported in one study (n = 106). There was no significant difference between groups after 30 days (OR 0.54; 95% CI 0.16, 1.77; p = 0.31), or at 1 year (OR 0.60; 95% CI 0.25, 1.47; p = 0.26). Delerium: Both studies reported delirium and found no significant difference between groups. The strength of the evidence for both outcomes was rated as insufficient.	Up-to-date	No new research was found
Nerve Blocks:		
Nerve blocks versus no block: Four RCTs (n = 228) evaluated 30-day mortality; there was no significant difference between groups (OR 0.28; 95% CI 0.07, 1.12; p = 0.07). The strength of the evidence was rated as low. There was no significant difference in 1-year mortality in two RCTs (n = 112) (OR 0.82; 95% CI 0.25, 2.72; p = 0.74), or in one cohort study (n = 535) (OR 0.73; 95% CI 0.48, 1.10; p = 0.14). Additional pain medication use: Seven RCTs (n = 378) found a significant difference favoring nerve blocks (OR 0.32; 95% CI 0.14, 0.72; p = 0.006). Similarly, one cohort study (n = 99) reported a significant difference favoring nerve blocks (OR 0.03; 95% CI 0.00, 0.44; p = 0.01). Delerium:		No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
Pooled results for four RCTs (n = 461) and two cohort studies (n = 634) that provided data on delirium showed a significant difference favoring nerve blocks (OR 0.33; 95% CI 0.16, 0.66; p = 0.002 [RCTs]; OR 0.24; 95% CI 0.08, 0.72; p = 0.01[cohort studies]). <u>LOS for acute hospitalization:</u> The strength of the evidence was rated as moderate. LOS for acute hospitalization (days) was reported in two cohort studies (n = 634), but the pooled results are not reported due to marked heterogeneity between the original study results. <u>Quality of sleep:</u> Reported in one RCT (n = 77) that found no significant difference (MD 0.30; 95% CI -0.46, 1.06; p = 0.44).		
<u>Nerve blocks versus neuraxial anesthesia:</u> Additional pain medication use was reported in one RCT (n=30); there was no significant difference between groups (OR 2.00; 95% CI 0.38, 10.51; p = 0.41). Delirium was reported in one RCT (n = 29); there was no significant difference between groups (OR 1.20; 95% CI 0.27, 5.40; p = 0.81). The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found
<u>Ropivacaine versus bupivacaine:</u> Additional pain medication use and delirium were reported in one cohort study (n=62). There was no significant difference between groups for either outcome (OR 1.25; 95% CI 0.42, 3.76; p=0.69; OR 1.93; 95% CI 0.17, 22.50; p=0.60, respectively). The strength of the evidence for delirium was rated as insufficient.	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
Nerve blocks versus no block • Respiratory infection: Reported in five RCTs (n=268) and found no significant difference (OR 0.43; 95% CI 0.18, 1.04; p=0.06). There were no significant differences between groups for the following adverse effects: • Cardiac complications (2 RCTs, n=128; 1 cohort study, n=99) • Damage to surrounding structures (3 RCTs, n=224) • Deep venous thrombosis (2 RCTs, n=100) • Myocardial infarction (2 RCTs, n=145; 1 cohort study, n=535); • Nausea/vomiting (6 RCTs, n = 421) • Pulmonary embolism (2 RCTs, n = 128) • Surgical wound infection (2 RCTs, n = 110) • Urinary retention (2 RCTs, n = 62; 1 cohort study, n = 535). There were no reports of infection in two RCTs (n = 184). The remaining reported adverse effects were from single studies and did not demonstrate any significant statistical differences between the pain management interventions.		No new research was found
Nerve blocks versus neuraxial anesthesia, ropivacaine versus bupivacaine and addition of clonidine: The reported adverse effects were from single studies and did not demonstrate any significant statistical differences between the pain management interventions.	Up-to-date	No new research was found
US versus NS:	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
Two RCTs (n = 100) reported no significant difference in damage to surrounding structures (OR 0.16; 95% CI 0.02, 1.30; p = 0.09). The remaining reported adverse effects were from single studies and did not demonstrate any significant statistical differences between the pain management interventions.		
Neurostimulation:		
One RCT (n = 60) provided data on health-related quality of life (HRQOL) and quality of sleep. TENS provided significant improvement in HRQOL (MD -4.30; 95% CI -6.86, -1.74; p = 0.001) and quality of sleep (MD -3.60; 95% CI -575, -1.45; p = 0.001).	Up-to-date	No new research was found
Rehabilitation:		
No other outcomes were reported.	Up-to-date	No new research was found
Traction:		
LOS for acute hospitalization: Reported in two trials (n = 326) comparing skin traction versus no traction and no significant difference was found. Thirty-day mortality: Reported in one RCT (n = 80) that found no difference between skin and skeletal traction versus no traction. Additional pain medication use: Reported in one RCT and one nRCT (n = 352). There was no significant difference between groups.	Up-to-date	No new research was found
Key Question (KQ 3): In older adults (≥50 years) admitted to the hospital following acute hip fracture, what is the nature and frequency of adverse effects that are directly or indirectly associated with pharmacologic and nonpharmacologic pain management interventions up to 1 year postfracture compared with usual care or other interventions in all settings?		

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
Systemic Analgesia		
One trial comparing lysine clonixinate vs. metamizole reported the number of partiicpants with any adverse event and found a significant difference in favor of metamizole (OR 3.50; 95% CI 1.04, 11.84; p=0.04). Similarly, fewer patients in the metamizole group reported any gastrointestinal disturbance (OR 11.84; 95% CI 1.45, 96.75; p=0.02). The remaining reported adverse effects were from single studies and did not demonstrate any significant differences between the pain management interventions.	Up-to-date	One prospective study cohort study of patients >65 who underwent hip fracture without preoperative delirium found no association between the use of any postoperative opioid and incident delirium (P = .61) in participants with (P = .33) and without (P = .40) dementia. Dementia, but not postoperative delirium, was associated with less opioid use (P < .001 for dementia; P = .12 for delirium; P = .04, for their interaction; Wald chi-square = 142.8, df = 7). Opioid dose (P > .59) on Postoperative Days 1 and 2 was not predictive of incident delirium. Dementia (P < .001) and intensive care unit admission (P = .006), not opioid consumption, were the most important predictors of incident postoperative delirium.
Anesthesia		
<u>Spinal versus general anesthesia or spinal versus epidural anesthesia:</u> Two RCTs (n = 73) and one cohort study (n = 335) reported adverse effects. Overall, the RCTs reported no significant differences in the occurrence of hypotension, myocardial infarction, or ST segment depression. The cohort study found no difference in the incidence of headaches and hypotension.	Up-to-date	No new research was found
<u>Neuraxial anesthesia: addition of clonidine, fentanyl, meperidine, morphine, or sufentanil:</u> Eleven RCTs and one nRCT (n = 490) provided data on adverse effects.	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
a) Addition of clonidine. One trial (n = 40) reported no damage to surrounding structures, headaches, or infections. b) Addition of fentanyl. There was no significant difference in the number of participants reporting an allergic reaction in four RCTs (n = 164). There was no significant difference in the number of participants reporting bradycardia in one RCT 6 (n = 42). Seven trials (n = 284) reported the frequency of hypotension. Results were inconsistent across studies and the pooled results are not reported due to high heterogeneity. Five trials (n = 204) reported nausea or vomiting and found no significant difference between groups (OR 1.10; 95% CI 0.06, 20.73; p = 0.95). There were no reports of neurological complications in one RCT (n = 40); no reports of respiratory distress in three RCTs (n = 124); no reports of gastrointestinal symptoms in three RCTs (n = 140); and no reports of headaches in one trial (n = 40). c) Addition of meperidine. There were no reports of headaches in one RCT (n = 34). d) Addition of morphine. One RCT (n = 40) reported no significant difference in the number of participants reporting allergic reactions, gastrointestinal symptoms, or nausea or vomiting. e) Addition of sufentanil. There was no significant difference in the incidence of bradycardia in one trial. Three trials (n = 132) reported a significantly lower incidence of hypotension in participants receiving		

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
sufentanil (OR = 0.05; 95% CI 0.01, 0.34). In one RCT (n = 42) there were no reports of allergic reaction, nausea or vomiting, or respiratory distress.		
Neuraxial anesthesia: different modes of administration: In one cohort study (n = 291), there were no reports of adverse effects. In one RCT (n = 60) there was no significant difference in the occurrence of gastrointestinal symptoms. In two trials (n = 103) that reported on hypotension there was a significant difference between groups in favor of continuous spinal anesthesia (OR 0.12; 95% CI 0.03, 0.51; p = 0.004). Similarly, in one cohort study (n = 291) there was a statistically significant difference in favor of continuous spinal anesthesia (OR 0.08; 95% CI 0.04, 0.14; p < 0.00001). There was no significant difference in myocardial infarction in one trial (n = 29). There was no significant difference in the occurrence ST depression in one trial (n = 29). In one RCT (n = 74) there were no reports of bradycardia, myocardial ischemia, or stroke, and no reports of headache in one trial (n = 60) or one cohort study (n = 291).	Up-to-date	No new research was found
Neuraxial anesthesia: different doses: In one cohort study (n = 182), there were no reports of adverse effects. In one RCT (n = 60) there was no significant difference in the occurrence of allergic reaction for the different doses of bupivacaine. Bradycardia was reported in two trials (n = 120); there was no significant difference among the different doses of bupivacaine or levobupivacaine. Hypotension was reported in four RCTs (n = 190). There was a There was a significant difference following 4mg versus 6mg	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
of bupivacaine (OR 0.03; 95% CI 0.00, 0.58; p = 0.02), but not 5 versus 6mg of bupivacaine (OR 0.31; 95% CI 0.08, 1.13; p = 0.08). Three cohort studies reported hypotension (n = 267) and found a significant difference following 2.5mg versus 5mg of bupivacaine (OR 0.08; 95% CI 0.03, 0.23; p <0.00001), 4 versus 12mg of bupivacaine (OR 0.03; 95% CI 0.01, 0.15; p <0.00001), and 0.125 versus 0.5 percent of bupivacaine (OR 0.15; 95% CI 0.03, 0.87; p = 0.03). One cohort study reported a significant difference in the incidence of hypotension following 4mg versus 12mg (OR 0.03; 95% CI 0.01, 0.15; p <0.00001), but no difference in the incidence of delirium. There were no reports of nausea or vomiting in two trials (n = 100); no reports of residual sensory deficits or motor weakness, respiratory distress, sedation, or urinary retention in one RCT (n = 60); no reports of gastrointestinal symptoms in two trials (n = 100); and no reports of headache in one cohort study (n = 182).		
Complementary and Alternative Medicine:		
No data were reported.	Up-to-date	No new research was found
Multimodal Pain Management:		
Data were reported in one study (n = 106). There were no significant differences between groups.	Up-to-date	No new research was found
Neurostimulation:		
No data were reported.	Up-to-date	No new research was found
Rehabilitation:		
No data were reported.	Up-to-date	No new research was found
Traction:		

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
Seven RCTs (n = 1,043) and one cohort study (n = 134) provided data on adverse effects. The reported adverse effects were from one to two studies, and did not demonstrate any significant statistical differences between the pain management interventions.	Up-to-date	No new research was found
Key Question (KQ 4): In older adults (≥50 years) admitted to the hospital following acute hip fracture, how do the effectiveness and safety of pharmacologic and nonpharmacologic pain management interventions vary in differing subpopulations following acute hip fracture up to 1 year after fracture compared with usual care or other interventions in all settings?		
Systemic Analgesia		
No data were reported	Up-to-date	No new research was found
Anesthesia		
No data were reported	Up-to-date	No new research was found
Complementary and Alternative Medicine:		
No data were reported	Up-to-date	No new research was found
Multimodal Pain Management:		
No data were reported	Up-to-date	No new research was found
Nerve Blocks:		
One RCT recruited patients with pre-existing heart disease. There was a significant reduction in pain favoring nerve blocks (MD -0.55; -0.81, -0.29; p <0.0001). There was no significant difference in 30-day mortality (OR 0.10; 95% CI 0.01, 1.90; p = 0.12) or adverse effects. One RCT recruited participants that were independent prior to their hip fracture. There was no significant difference between nerve blocks versus	Up-to-date	No new research was found

Conclusions From Original Review	Conclusions from Prior Surveillance Assessment (Sept 2012)	SRC Literature Analysis (July 2015)
standard care for 30-day mortality (OR 1.00; 95% CI 0.06, 16.76; p = 1.00).		
Neurostimulation:		
No data were reported	Up-to-date	No new research was found
Rehabilitation:		
All participants were female.	Up-to-date	No new research was found
Traction:		
No data were reported	Up-to-date	No new research was found

Legend: RCT = randomized control trial; nRCT = non-randomized control trial; LOS = length of stay; VAS = visual analog scale; MD = mean difference; CI = confidence intervals; OR = odds ratio

Abstracts from Relevant Literature

Sieber, F. E., Mears, S., Lee, H. and Gottschalk, A. 2011
Postoperative opioid consumption and its relationship to cognitive function in older adults with hip fracture. Journal of the American Geriatrics Society.

OBJECTIVES: To determine the relationship between opioid consumption and cognitive impairment after hip fracture repair.;DESIGN: Prospective study of consecutive patients.;SETTING: Johns Hopkins Bayview Medical Center, Baltimore, Maryland.;PARTICIPANTS: Two hundred thirty-six participants aged 65 and older undergoing hip fracture repair.;MEASUREMENTS: Older adults without preoperative delirium who underwent hip fracture repair between April 2005 and July 2009 were followed for pain, opioid consumption, and postoperative delirium. Participants were tested for delirium using the Confusion Assessment Method preoperatively and midmorning on Postoperative Day 2. The nursing staff assessed pain on a numeric oral scale (range 0-10). Opioid analgesia was provided in response to pain at rest to achieve scores of 3 or less. Opioid consumption was analyzed with respect to the occurrence of incident postoperative delirium, presence of dementia, and other demographic variables.;RESULTS: Of the 236 participants, 66 (28%) had dementia, and 213 (90%) received opioids postoperatively, including 55 (83%) with dementia and 158 (93%) without. There was no association between the use of any postoperative opioid and incident delirium (P = .61) in participants with (P = .33) and without (P = .40) dementia. Dementia, but not postoperative delirium, was associated with less opioid use (P < .001 for dementia; P = .12 for delirium; P = .04, for their interaction; Wald chi-square = 142.8, df = 7). Opioid dose (P > .59) on Postoperative Days 1 and 2 was not predictive of incident delirium. Dementia (P < .001) and intensive care unit admission (P = .006), not opioid consumption, were the most important predictors of incident postoperative delirium.;CONCLUSION: Concern for postoperative delirium should not prevent the use of opioid analgesic therapy

sufficient to achieve a generally accepted level of comfort in individuals with or without preexisting cognitive impairment.

Appendix E. Summary Table*

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
Key Question 1: In older adults (≥50 years) admitted to the hospital following acute hip fracture, what is the effectiveness of pharmacologic and/or nonpharmacologic pain management interventions for controlling acute (up to 30 days postfracture) and chronic pain (up to 1 year postfracture) compared with usual care or other interventions in all settings?				
Systemic Analgesia:				
3 RCTs (n=214) evaluated different types of systematic analgesia. The mean age ranged from 77.2 to 78.5 years; most patients were female. All three trials reported acute pain. Acute pain was measured using the 10cm Visual Analogue Scale (VAS); the mean baseline measure was 6.5cm. One trial (n=90) comparing parecoxib intravenous (IV) vs. diclofenac intramuscular (IM) ± merperidine IM found a significant difference in favor of parecoxib IV (MD -0.70; 95% CI -1.04, -0.36; p<0.0001). Another trial (n=30) compared intrathecal isotonic clonidine vs. intrathecal hypertonic clonidine reported a significant difference in favor of isotonic clonidine (MD -1.69; 95% CI -2.01, -1.37;	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
p<0.00001). The third trial (n=94) comparing lysine clonixinate vs. metamizole found no significant difference (MD -0.43; 95% CI -1.30, 0.44; p=0.33).				
Anesthesia:				
Twenty-one RCTs and one nRCT (n=1,062) evaluated anesthesia including neuraxial (i.e., continuous vs. single administration) or neuraxial versus general anesthesia, or another form of anesthesia (i.e., spinal or regional); sample sizes ranged from 20 to 90. Additionally, eight cohort studies (n=3,086) provided additional data. The mean age of participants ranged from 70 to 86 years; most were female. Acute pain was measured using different scales (numbering rating score [1-5] and 10cm VAS). The studies were grouped as follows: spinal versus epidural or general anesthesia (n=10); neuraxial anesthesia: addition of clonidine, fentanyl, merperidine, morphine, or sufentanil (n=14); neuraxial anesthesia: different	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
doses or modes of administration (continuous vs. single administration) (n=13). The average baseline VAS pain score was 4.7.				
Spinal versus general anesthesia: One RCT (n = 30) reported a statistically significant difference of additional pain relief in favor of spinal anesthesia (MD = -0.86; 95% CI -1.30, -0.42; p = 0.0001). The strength of the evidence was rated as insufficient. Neuraxial anesthesia: addition of clonidine, fentanyl, meperidine, morphine, or sufentanil: Three RCTs compared additional fentanyl (n = 40), morphine (n = 40), and sufentanil (n = 50) versus standard spinal anesthesia. In the studies comparing the addition of fentanyl or sufentanil, no patients reported feeling pain following the procedure. In the study comparing the addition of morphine, there was no significant difference between	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
groups (MD = -0.36; 95% CI -1.11, 0.39; p = 0.35). One RCT and one nRCT (n = 80) comparing additional fentanyl reported acute pain on day 1 and found no significant difference between groups (OR 1.24; 95% CI 0.34, 4.48; p = 0.75).				
Complementary and Alternative Medicine:				
Two RCTs (n = 98) evaluated the administration of CAM interventions versus no or sham intervention. The mean age ranged from 76.8 to 86.3 years; most were female. One trial (n = 38) compared acupressure versus sham control delivered preoperatively. Acute pain was measured using the 10cm VAS; the baseline measure was 6.5cm. The second trial (n = 60) compared the Jacobson relaxation technique (a two-step process of contracting and relaxing specific muscles) versus no intervention. Pain was measured using a 10-point verbal scale; the baseline measure was not reported.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Acupressure reduced pain versus a sham intervention (MD -3.01; 95% CI -4.53, -1.49; p <0.0001). Relaxation also showed a reduction in pain versus no relaxation (MD -1.10; 95% CI -1.43, -0.77; p <0.00001). The	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
strength of the evidence was rated as insufficient.				
Multimodal Pain Management:				
Two cohort studies (n = 226) evaluated multimodal pain management versus standard care. These studies described the use of multiple pain management strategies (sequential or in parallel) as part of the clinical pathway for patients with hip fractures. The mean age was not reported; most participants were female. One study compared a formal postoperative protocol of IV and oral tramadol plus acetaminophen versus standard care. The second compared a formal preoperative protocol of skin traction, morphine and acetaminophen versus standard care.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
No data were reported.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Nerve Blocks:				
Twenty-nine RCTs (n = 1,757) evaluated nerve blocks, including 3-in-1 (neurostimulation [NS]/ultrasoundguided [US]), combined lumbar/sacral plexus, fascia iliaca compartment, femoral, lumbar plexus plus	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
sciatic nerve, posterior lumbar plexus, psoas compartment, obutarator, and epidural nerve blocks. These were compared with placebo/standard care, or a different method of nerve blocks. Additionally, three cohort studies (n = 696) evaluated 3-in-1, femoral, and lumbar plexus plus sciatic nerve blocks versus analgesia, or comparing different analgesic medications in femoral lumbar plexus plus sciatic blocks. The mean age of participants ranged from 59.2 to 85.9 years; most were female. Acute pain was measured using different scales (i.e., numeric rating scales and 10cm VAS). Eight studies using the VAS reported mean baseline scores from 1.4cm to 7.3cm. The studies were grouped as follows: nerve blocks versus standard care/placebo; nerve blocks versus neuraxial anesthesia; nerve blocks–ropivacaine versus bupivacaine; nerve blocks–addition of clonidine; and nerve blocks				
Nerve blocks versus no block: Acute pain was reported in 13 RCTs (n = 942). There was significant heterogeneity between the study results (I2 = 92 percent) and so pooled results are not reported. Even so,	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
subgroup analyses showed significant results in favor of individual nerve blocks, except 3-in-1 block. Also preoperative nerve blocks seemed to be more effective than postoperative administration. One trial (n = 50) reported a significant difference in postoperative pain on day 1 favoring nerve blocks (OR 0.10; 95% CI 0.03, 0.36; p = 0.0005). The strength of the evidence was rated as moderate.				
Nerve blocks versus neuraxial anesthesia: Acute pain was reported in three RCTs (n = 109). There was no significant difference between groups (MD -0.35; 95% CI -1.10, 0.39; p = 0.35). The strength of the evidence was rated as low.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Neurostimulation:				
Two RCTs (n = 123) evaluated transcutaneous electrical neurostimulation (TENS) versus sham control. One trial administered the TENS preoperatively, and the other postoperatively. The mean age of participants ranged from 71.2 to 80.5 years; most were female. Pain was measured using the VAS; the mean baseline measure was 8.4 to 8.8.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Two RCTs (n = 123) found a	Up-to-date	No new research was found	The three experts did not	Original conclusion is

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
significant difference in additional pain relief in favor of TENS (MD -2.79; 95% CI -4.95, -0.64; p = 0.01). Pain on movement was reported in one trial (n = 60) and found a significant difference in favor or TENS (MD -3.90; 95% CI -6.22, -1.58; p = 0.001). The strength of the evidence was rated as insufficient.			know of any additional studies, and either believed the original report to be up to date or did not know.	still valid and this portion of the CER is likely current
Rehabilitation:				
One RCT (n = 37) evaluated physical therapy (stretching and strengthening of spinal and psoas muscles) versus standard care. The mean age was 67.1; all participants were female. Pain was measured using the 10cm VAS; the mean baseline measure was 7.9cm.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
There was a significant difference in additional pain relief following physical therapy (MD -1.39; 95% CI -2.27, -0.51; p = 0.002). The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Traction:				
Nine RCTs, four nRCTs, and one cohort study evaluated skin or skeletal traction versus no intervention or other interventions. Sample sizes ranged from 60 to 311. The	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
mean age ranged from 74.0 to 81.0; most participants were female.				
Acute pain was measured using the 10cm VAS; the mean baseline measure ranged from 0.3 to 6.9cm. Eight trials compared skin traction (n = 498) versus no traction (n = 594) and found no significant difference between groups. The strength of the evidence was rated as low. One trial (n = 78) compared skin traction versus skeletal traction and found no difference between groups. The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Key Question (KQ) 2: In older adults (≥50 years) admitted to the hospital following acute hip fracture, what is the effectiveness of pharmacologic and/or nonpharmacologic pain management interventions on other outcomes up to 1 year postfracture compared with usual care or other interventions in all settings? Other outcomes include: **a. Mortality (30-day and up to 1 year postfracture)** **b. Functional status** **c. Pain medication use; change in type and quantity** **d. Mental status** **e. Health-related quality of life** **f. Quality of sleep in the hospital** **g. Ability to participate in rehabilitation** **h. Return to prefracture living arrangements** **i. Health services utilization**				
Systemic Analgesia				
Additional pain medication use was reported in one trial comparing lysine clonixinate vs. metamizole and reported no significant difference between	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
groups (OR 3.00; 95% CI 0.30, 29.94; p=0.35). Delerium was reported in one trial comparing lysine clonixinate vs. metamizole and found no significant difference (OR 0.96, 95% CI 0.06, 15.77; p=0.98).				
Anesthesia				
Spinal versus general anesthesia or spinal versus epidural anesthesia: Two RCTs reported 30-day mortality (n = 99) and found no statistically significant difference in mortality rates (OR 1.73; 95% CI 0.53, 5.68; p = 0.36). In two cohort studies (n = 650), pooling was not performed due to marked statistical heterogeneity and conflicting results between the studies. The strength of the evidence was rated as insufficient. Delerium: In one RCT (n = 30) that reported delirium there was no significant difference between groups (OR 0.76; 95% CI 0.18, 3.24; p = 0.71). The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Length of stay (LOS) for acute	Up-to-date	No new research was found	The three experts did not	Original conclusion is

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
hospitalization: Reported in two RCTs (n = 99). LOS was significantly less in the general anesthesia group (MD 1.69; 95% CI 0.38, 3.01; p = 0.01).			know of any additional studies, and either believed the original report to be up to date or did not know.	still valid and this portion of the CER is likely current
Neuraxial anesthesia: addition of clonidine, fentanyl, meperidine, morphine, or sufentanil. Additional pain medication use: Reported in six RCTs. In one RCT (n = 40) comparing the addition of lonidine versus standard spinal anesthesia, all participants required additional pain medication. The pooled estimate from three trials examining the addition of fentanyl (n = 102) showed no significant difference between groups (OR 5.51; 95% CI 0.25, 122.08; p = 0.28). There was no significant difference in additional pain medication use in one RCT (n = 40) that compared the addition of morphine (OR 0.27; 95% CI 0.07, 1.04; p = 0.06). Similarly, three RCTs (n = 132) that compared the addition of sufentanil found no difference between groups	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
(Peto's OR 7.39; 95% CI 0.15, 372.38; p = 0.32)				
Delirium: Reported in one RCT (n = 40) comparing the addition of morphine and found no significant difference between groups (OR 3.15; 95% CI 0.12, 82.16; p = 0.49). The strength of the evidence was rated as insufficient.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Neuraxial anesthesia: different doses and modes of administration (continuous vs. single administration): Three RCTs (n = 163) reported 30-day mortality. In two, there were no deaths. In the third, there was no significant difference between groups (OR 0.46; 95% CI 0.07, 3.02; p = 0.42). Additionally, 30-day mortality was reported in one cohort study (n = 291) that found no significant difference between groups (OR 0.96; 95% CI 0.30, 3.00; p = 0.94). The strength of the evidence was rated as low.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Additional pain medication use: Reported in two RCTs (n = 134); there were no events in either group.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
LOS for acute hospitalization: Reported in two RCTs (n = 89). There was no significant	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed	Original conclusion is still valid and this portion of the CER is

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
difference between groups (MD = -0.98; 95% CI -2.06, 0.10; p = 0.07). In two RCTs (n = 134) that reported delirium, there was no significant difference between groups (OR 1.27; 95% CI 0.32, 4.99; p = 0.73). The strength of the evidence was rated as low			the original report to be up to date or did not know.	likely current
Spinal anesthesia (different doses): One cohort study (n = 182) reported that there was no significant difference in 30-day mortality rates between groups (OR 0.49; 95% CI 0.12, 2.02; p = 0.32). The strength of the evidence was rated as insufficient. Another cohort study (n = 60) reported no significant difference in the incidence of delirium (OR 0.46; 95% CI 0.08, 2.75).	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Additional pain medication use: One RCT (n = 60) that reported there was no significant difference between groups at different doses (4 vs. 5mg, 4 vs. 6mg, or 5 vs. 6mg).	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Complementary and Alternative Medicine:				
In the RCT that examined relaxation, fewer patients in the relaxation group required additional pain medication (e.g., meperidine or morphine) versus the control group (MD -8.43;	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
95% CI -15.11, -1.75; p = 0.01).				
Multimodal Pain Management:				
Mortality: Reported in one study (n = 106). There was no significant difference between groups after 30 days (OR 0.54; 95% CI 0.16, 1.77; p = 0.31), or at 1 year (OR 0.60; 95% CI 0.25, 1.47; p = 0.26). Delerium: Both studies reported delirium and found no significant difference between groups. The strength of the evidence for both outcomes was rated as insufficient.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Nerve Blocks:				
Nerve blocks versus no block: Four RCTs (n = 228) evaluated 30-day mortality; there was no significant difference between groups (OR 0.28; 95% CI 0.07, 1.12; p = 0.07). The strength of the evidence was rated as low. There was no significant difference in 1-year mortality in two RCTs (n = 112) (OR 0.82; 95% CI 0.25, 2.72; p = 0.74), or in one cohort study (n = 535) (OR 0.73; 95% CI 0.48, 1.10; p = 0.14). Additional pain medication use:	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
Seven RCTs (n = 378) found a significant difference favoring nerve blocks (OR 0.32; 95% CI 0.14, 0.72; p = 0.006). Similarly, one cohort study (n = 99) reported a significant difference favoring nerve blocks (OR 0.03; 95% CI 0.00, 0.44; p = 0.01). Delerium: Pooled results for four RCTs (n = 461) and two cohort studies (n = 634) that provided data on delirium showed a significant difference favoring nerve blocks (OR 0.33; 95% CI 0.16, 0.66; p = 0.002 [RCTs]; OR 0.24; 95% CI 0.08, 0.72; p = 0.01[cohort studies]). LOS for acute hospitalization: The strength of the evidence was rated as moderate. LOS for acute hospitalization (days) was reported in two cohort studies (n = 634), but the pooled results are not reported due to marked heterogeneity between the original study results. Quality of sleep: Reported in one RCT (n = 77) that found no significant difference (MD 0.30; 95% CI -0.46, 1.06; p = 0.44).				
Nerve blocks versus neuraxial anesthesia:	Up-to-date	No new research was found	The three experts did not know of any additional	Original conclusion is still valid and this

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
Additional pain medication use was reported in one RCT (n=30); there was no significant difference between groups (OR 2.00; 95% CI 0.38, 10.51; p = 0.41). Delirium was reported in one RCT (n = 29); there was no significant difference between groups (OR 1.20; 95% CI 0.27, 5.40; p = 0.81). The strength of the evidence was rated as insufficient.			studies, and either believed the original report to be up to date or did not know.	portion of the CER is likely current
Ropivacaine versus bupivacaine: Additional pain medication use and delirium were reported in one cohort study (n=62). There was no significant difference between groups for either outcome (OR 1.25; 95% CI 0.42, 3.76; p=0.69; OR 1.93; 95% CI 0.17, 22.50; p=0.60, respectively). The strength of the evidence for delirium was rated as insufficient.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Nerve blocks versus no block • Respiratory infection: Reported in five RCTs (n=268) and found no significant difference (OR 0.43; 95% CI 0.18, 1.04; p=0.06). There were no significant differences between groups for the following adverse effects: • Cardiac complications		No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
(2 RCTs, n=128; 1 cohort study, n=99) • Damage to surrounding structures (3 RCTs, n=224) • Deep venous thrombosis (2 RCTs, n=100) • Myocardial infarction (2 RCTs, n=145; 1 cohort study, n=535); • Nausea/vomiting (6 RCTs, n = 421) • Pulmonary embolism (2 RCTs, n = 128) • Surgical wound infection (2 RCTs, n = 110) • Urinary retention (2 RCTs, n = 62; 1 cohort study, n = 535). There were no reports of infection in two RCTs (n = 184). The remaining reported adverse effects were from single studies and did not demonstrate any significant statistical differences between the pain management interventions.				
Nerve blocks versus neuraxial anesthesia, ropivacaine versus bupivacaine and addition of clonidine: The reported adverse effects were from single studies and did not demonstrate any significant	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
statistical differences between the pain management interventions.				
US versus NS: Two RCTs (n = 100) reported no significant difference in damage to surrounding structures (OR 0.16; 95% CI 0.02, 1.30; p = 0.09). The remaining reported adverse effects were from single studies and did not demonstrate any significant statistical differences between the pain management interventions.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Neurostimulation:				
One RCT (n = 60) provided data on health-related quality of life (HRQOL) and quality of sleep. TENS provided significant improvement in HRQOL (MD -4.30; 95% CI -6.86, -1.74; p = 0.001) and quality of sleep (MD -3.60; 95% CI -575, -1.45; p = 0.001).	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Rehabilitation:				
No other outcomes were reported.	Up-to-date	No new research was found	The three experts did not know of any additional studies, and either believed the original report to be up to date or did not know.	Original conclusion is still valid and this portion of the CER is likely current
Traction:				
LOS for acute hospitalization: Reported in two trials (n = 326)	Up-to-date	No new research was found	The three experts did not know of any additional	Original conclusion is still valid and this

Conclusions From CER Executive Summary	Assessment from Most Recent Surveillance Assessment (Sept 2012 – Link to Paper)	Literature Analysis (July 2015)	Expert Opinion	Surveillance Assessment
comparing skin traction versus no traction and no significant difference was found. Thirty-day mortality: Reported in one RCT (n = 80) that found no difference between skin and skeletal traction versus no traction. Additional pain medication use: Reported in one RCT and one nRCT (n = 352). There was no significant difference between groups.			studies, and either believed the original report to be up to date or did not know.	portion of the CER is likely current
Key Question (KQ 3): In older adults (≥50 years) admitted to the hospital following acute hip fracture, what is the nature and frequency of adverse effects that are directly or indirectly associated with pharmacologic and nonpharmacologic pain management interventions up to 1 year postfracture compared with usual care or other interventions in all settings?				
Systemic Analgesia				
One trial comparing lysine clonixinate vs. metamizole reported the number of partiicpants with any adverse event and found a significant difference in favor of metamizole (OR 3.50; 95% CI 1.04, 11.84; p=0.04). Similarly, fewer patients in the metamizole group reported any gastrointestinal disturbance (OR 11.84; 95% CI 1.45, 96.75; p=0.02). The remaining reported adverse effects were from single studies	Up-to-date	One prospective study[3] cohort study of patients >65 who underwent hip fracture without preoperative delirium found no association between the use of any postoperative opioid and incident delirium (P = .61) in participants with (P = .33) and without (P = .40) dementia. Dementia, but not postoperative delirium, was associated with less opioid use (P < .001 for dementia; P = .12 for delirium; P =	One reviewer suggested a study examining the relationship of NSAIDs to endoprosthetic loosening.[13] The study reported results related to component loosening or failure and clinical outcomes in 100 total hip joint arthoplasties with a mean follow up of 7.3 years. No evidence of prosthetic loosening was identified.	Original conclusion is still valid and this portion of the CER is likely current