# **Supplemental Table 1.** Search strategy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Concept | Medline-Ovid | Embase | Cinahl | Keywords |
| Orthopedic OR  arthroplasty | exp Orthopedics/  OR exp Orthopedic Procedures/ OR  exp Arthroplasty/ | exp orthopedics/  OR exp orthopedic surgery/OR  exp arthroplasty/  OR exp arthropathy/ | (MH "Orthopedic Surgery+") OR  (MH "Arthroplasty+") | orthopedic surger\* OR  orthopaedic surger\* OR  Arthroplast\* OR  Knee Replacement\* OR  Joint replacement\* OR  Hip replacement\* OR  Knee arthroplast\*  OR  Hip arthroplas\* OR  Joint arthroplast\* |
| Staples OR sutures | suture techniques/ OR surgical stapling/ OR Surgical Staplers/ OR  exp sutures/ | exp suturing method/ OR exp surgical stapling/  OR exp suture/ | (MH "Surgical Stapling+") OR  (MH "Suture Techniques+")  OR  (MH "Sutures") | Suture technic\* OR  Suture technique\* OR  Surgical stapl\*  OR surgical sutur\* OR  skin clip\*  OR  suture\* OR  staple\* surgical |
| Wound closure | wound healing/OR cicatrix/ OR re-epithelialization/ | exp wound healing/ OR  exp wound closure/ OR exp scar/ | (MH "Wound Healing+") OR (MH "Cicatrix") | Wound healing  OR wound closure OR cicatri\* OR re-epithelializ\* OR skin closur\* |

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| --- | --- |
| Date searched: October 17, 2017 to October 18, 2017 | Total studies captured |
| Medline-Ovid | 502 |
| Embase-Ovid | 983 |
| Cinahl | 60 |
| Cochrane | 281 |
| World Health Organization | 178 |
| Thesis database | 0 |
| Web of Science | 362 |
| Biosis Previews | 20 |
| Gray literature report | 0 |
| Google/Google Scholar | 6 |
| Total | 2392 |

# **Supplemental Table 2.** List of studies excluded during full-text study characteristics

|  |  |
| --- | --- |
| Excluded studies | Reason |
| Ando M, Tamaki T, Yoshida M, Sasaki S, Toge Y, Matsumoto T, Maio K, Sakata R, Fukui D, Kanno S, Nakagawa Y, Yamada H. Surgical site infection in spinal surgery: a comparative study between 2-octyl-cyanoacrylate and staples for wound closure. *Eur Spine J*. 2014;23:854-862. | Wrong intervention |
| Campbell AL, Patrick DA, Jr., Liabaud B, Geller JA. Superficial wound closure complications with barbed sutures following knee arthroplasty. *J Arthroplasty*. 2014;29:966-969. | Wrong intervention |
| Chawla H, van der List JP, Fein NB, Henry MW, Pearle AD. Barbed suture is associated with increased risk of wound infection after unicompartmental knee arthroplasty. *J Arthroplasty*. 2016;31:1561-1567. | Wrong intervention |
| Cirocchi R, Randolph JJ, Montedori A, Cochetti GG, Arezzo A, Mearini EE, Abraha I, Trastulli S. Staples versus sutures for surgical wound closure in adults. The Cochrane Library. 2014. | Wrong study design |
| Dignon A, Arnett N. Which is the better method of wound closure in patients undergoing hip or knee replacement surgery: sutures or skin clips? *J Perioper Pract*. 2013;23:72-76. | Wrong study design |
| Dunbar MJ, Richardson G. Minimizing infection risk: fortune favors the prepared mind. *Orthopedics*. 2011;32:665-665. | Wrong study design |
| Fisher DA, Bengero LL, Clapp BC, Burgess M. A randomized, prospective study of total hip wound closure with resorbable subcuticular staples. *Orthopedics*. 2010;33:665. | Wrong intervention |
| Gillanders S, Sheehan E. 24th Sylvester O’Halloran Perioperative Scientific Symposium. *Ir J Med Sci* (1971 -). 2016;185:57-137. | Wrong intervention |
| Glennie RA, Korczak A, Naudie DD, Bryant DM, Howard JL. Monocryl and Dermabond vs staples in total hip arthroplasty performed through a lateral skin incision: a randomized controlled trial using a patient-centered assessment tool. *J Arthroplasty*. 2017;32:2431-2435. | Wrong intervention |
| Goldberg JA. Skin-suturing techniques in orthopaedic surgery. *Tech Orthop*. 1995;10:109-113. | Wrong study design |
| Jahng KH, Bas MA, Rodriguez JA, Cooper HJ. Risk factors for wound complications after direct anterior approach hip arthroplasty. *J Arthroplasty*. 2016;31:2583-2587. | Wrong study design |
| Kadota Y, Nishida K, Hashizume K, Nakahara R, Kanazawa T, Ozawa M, Nasu Y, Harada R, Machida T, Ozaki T. FRI0284 preoperative use of biologic agents is not an independent risk factor for SSI and delayed wound healing in patients with rheumatoid arthritis. *Ann Rheum Dis*. 2014;73:486. | Wrong study design |
| Ko JH, Yang IH, Ko MS, Kamolhuja E, Park KK. Do zip-type skin-closing devices show better wound status compared to conventional staple devices in total knee arthroplasty? *Int Wound J*. 2016;14:250-254. | Wrong intervention |
| Livesey C, Wylde V, Descamps S, Estela CM, Bannister GC, Learmonth ID, Blom AW. Skin closure after total hip replacement: a randomised controlled trial of skin adhesive versus surgical staples. *J Bone Joint Surg Br*. 2009;91:725-729. | Wrong intervention |
| Malla HA, Singh M, Mahajan K, Raina P, Sharma R, Ahmad S. Skin stapler vs sutures in bipolar hemiarthroplasty. *Int J Adv Res*. 2016;4:476-481. | Wrong study design |
| Miller AG, Swank ML. Dermabond efficacy in total joint arthroplasty wounds. *Am J Orthop* (Belle Mead NJ). 2010;39:476-478. | Wrong intervention |
| Mondini A, Bianchi L, Zagra L. Wound closure and wound monitoring in total hip arthroplasty. An overview. *Hip Int*. 2012;22:15-18. | Wrong study design |
| Moore DC, Sellers MH, Archer KR, Schwartz HS, Holt GE. Staples equal sutures for skin closure after soft tissue tumor resection. *Clin Orthop Relat Res*. 2013;471:899-904. | Wrong study design |
| Mudd CD, Boudreau JA, Moed BR. A prospective randomized comparison of two skin closure techniques in acetabular fracture surgery. *J Orthop Traumatol*. 2014;15:189-194. | Wrong intervention |
| Newman JT, Morgan SJ, Resende GV, Williams AE, Hammerberg EM, Dayton MR. Modality of wound closure after total knee replacement: are staples as safe as sutures? A retrospective study of 181 patients. *Patient Saf Surg*. 2011;5:26-26. | Wrong study design |
| Patel RM, Cayo M, Patel A, Albarillo M, Puri L. Wound complications in joint arthroplasty: comparing traditional and modern methods of skin closure. *Orthopedics*. 2012;35:e641-e646. | Wrong study design |
| Sadik K, Flener J, Gargiulo J, Graves M, Nunley R, Post Z, Wurzelbacher S, Sutton N, Hogan A, Hollmann S. A US hospital budget impact analysis of skin closure system compared with standard of care in hip and knee arthroplasty. *Clinicoecon Outcomes Res*. 2018; 17: 1-11 | Wrong study design |
| Sadowski K, Emery SE, Ahn NU, Furey CG. Complex dural defects complicating lumbar spinal stenosis surgery. *Spine J*. 2016;16:S329. | Wrong study design |
| Schepers T, Den Hartog D, Vogels LMM, Van Lieshout EMM. Extended lateral approach for intra-articular calcaneal fractures: an inverse relationship between surgeon experience and wound complications. *J Foot Ankle Surg*. 2013;52:167-171. | Wrong study design |
| Shantz JA, Vernon J, Leiter J, Morshed S, Stranges G. Sutures versus staples for wound closure in orthopaedic surgery: a randomized controlled trial. *BMC Musculoskelet Disord*. 2012;13:89. | Protocol for included study |
| Singh B, Mowbray MAS, Nunn G, Mearns S. Closure of hip wound, clips or subcuticular sutures: does it make a difference? *Eur J Orthop Surg Traumatol*. 2006;16:124-129. | Wrong study design |
| Sinnett T, Fang Y, Nattfogel E, O’Gorman A, Charalambides C. Suture fixation of an Akin osteotomy: A cost effective and clinically reliable technique. *Foot Ankle Surg*. 2017;23:40-43. | Wrong study design |
| Syed KA, Gandhi R, Davey JR, Mahomed NN. Risk of wound infection is greater after skin closure with staples than with sutures in orthopaedic surgery. *J Bone Joint Surg Am*. 2010;92:2732. | Wrong study design |
| Uçkay I, Agostinho A, Belaieff W, Toutous-Trellu L, Scherer-Pietramaggiori S, Andres A, Bernard L, Vuagnat H, Hoffmeyer P, Wyssa B. Noninfectious wound complications in clean surgery: epidemiology, risk factors, and association with antibiotic use. *World J Surg*. 2011;35:973-980. | Wrong study design |
| Yuenyongviwat V, Iamthanaporn K, Hongnaparak T, Tangtrakulwanich B. A randomised controlled trial comparing skin closure in total knee arthroplasty in the same knee: nylon sutures versus skin staples. *Bone Joint Res*. 2016;5:185-190. | No surgical site infection data |

## **Supplemental Table 3.** Inclusion and exclusion criteria of included studies

|  |  |  |
| --- | --- | --- |
| Study | Inclusion criteria | Exclusion criteria |
| Buttaro et al., 2015 [3] | “…all patients with a primary elective THA…” | “…revision surgery, arthroscopies and patients with a femoral neck fracture.” |
| Clayer and Southwood, 1991 [5] | “All patients undergoing operative procedures on a hip joint were included for study…” | “…(i) revision hip surgery; (ii) wound less than l0 cm long; and (iii) any approach other than lateral.” |
| Kazemian et al., 2014 [16] | Patients with intertrochanteric fractures treated with dynamic hip screw | No specific details given |
| Mallee et al., 2016 [abstract] [23] | Patients undergoing THA | “Patients were excluded if they had previous surgery on the ipsilateral hip or had known skin diseases.” |
| Rui et al., 2017 [26] | “Inclusion criteria were:  (i) aged more than 18 years old; (ii) underwent primary THA through posterolateral approach.” | “Exclusion criteria were: (i) history of keloid scar formation; (ii) long-term of corticosteroid use; (iii) uncontrolled diabetes; (iv) previous hip surgery;  (v) malignancy; (vi) developmental dysplasia of hip (DDH); (vii) connective tissue disease including rheumatoid arthritis (RA), systemic lupus erythematous (SLE), psoriatic arthritis (PA); (viii) other diseases or conditions known to affect wound healing.” |
| Shetty et al., 2004 [28] | Patients with femoral neck fracture treated with “hemiarthroplasty, dynamic hip screw, or cannulated hip screw” | No specific details given |
| Eggers et al., 2011 [8] | “Inclusion criteria included 18 years or older, TKA scheduled without a bilateral planned within 1 week of the initial surgery, and willingness to attend prescribed physical therapy 3 times per week.” | “Exclusion criteria included medical conditions or personal circumstances that would prevent participation and completion of physical therapy and follow-up visits; current participation in another clinical trial; preoperative systemic infections; uncontrolled diabetes; diseases or conditions known to effect the wound healing process; known hypersensitivity to cyanoacrylate, formaldehyde, or the dye D&C Violet #2 (Aesculap Inc, Center Valley, PA, USA); prior knee hardware fixation devices; prior knee incisions greater than 9 cm, and arthrofibrosis as evidence by limited ROM of 80°or higher.” |
| Graham et al., 2000 [12] | “…patients undergoing routine knee replacement surgery for osteoarthritis…” | No specific details given |
| Hlubek et al., 2014 [15] | Patients undergoing TKA | No specific details given |
| Wyles et al., 2016 [39] | “Inclusion criteria were patients aged ≥ 18 years undergoing primary TKA.” | “Exclusion criteria were previous surgery about the knee and therefore a previous incision, a history of smoking within 1 year, diabetes mellitus (Type I and II), peripheral arterial disease, long-term corticosteroid use (≥ 1 month; intranasal and inhaled excluded), long-term anticoagulation use (≥ 1 month; low-dose aspirin excluded), infection (HIV, syphilis, hepatitis), and iodine allergy (contraindication to LA-ICGA).” |
| Gohiya et al., 2015 [11] | “Inclusion criteria: (1) Age > 18 years and < 80 years; (2) All elective open orthopedic surgeries; (3) Incision size > 5 cms; (4) Healthy patients with no co-morbidities; (5) HB > 10 gm%”  Note: closed fractures were also included | “Exclusion criteria: (1) Open fractures; (2) Active infections (any site); (3) Immunocompromised patients; (4) Foot surgery (any site); (5) Hand surgery (any site); (6) Minimal invasive surgeries (closed nailing, pinning, percutaneous screw fixation, Arthroscopic procedures)” |
| Khan et al., 2006 [17] | Patients undergoing THA or TKA | “Those who were having a revision or with a previous incision in the operative field, a history of keloid formation, allergy to superglue, regular anticoagulation therapy or had an underlying malignancy were excluded.” |
| Chaudhary et al., 2015 [4] | “The inclusion criteria was patients undergoing elective orthopedic surgery.” | “The exclusion criteria were open fractures, pathological fractures, co-morbid conditions, spine operation.” |
| Liew and Haw, 1993 [22] | Patients undergoing orthopaedic surgery | “Patients were eliminated if the treating surgeon preferred a specific type of closure. This decision was made before the surgeon knew which type of closure was to be used.” |
| Murphy et al., 2004 [24] | Patients undergoing orthopaedic surgery | “Compound or infected cases were excluded.” |
| Shantz et al., 2013 [27] | “Patients were included if they were to undergo an orthopedic procedure requiring a wound greater than two centimeters in length.” | “Exclusion criteria included, open fractures, procedures of the foot or hand, arthroscopic procedures and chemotherapy or radiation therapy treatment.” |
| Singh et al., 2017 [29] | Patients undergoing orthopaedic surgery | “Patients with open fracture, known nickel allergy, active infection (any site), chemotherapy during study period (1 month prior until end of followup), radiation therapy to surgical site (1 month prior until end of followup), foot surgery (any site), hand surgery (including carpal surgery), revision surgery or with a previous incision in the operative field, and with history of keloid formation were excluded from the study.” |
| Stockely and Elson, 1987 [34] | “patients undergoing elective or emergency hip and knee surgery, with incisions longer than 18 cm, were assessed. Only those wounds closed by the authors were included in an attempt to ensure a standard technique.” | No specific details given |

## **Supplemental Table 4.** Surgical approach for wound closure among included studies

|  |  |
| --- | --- |
| Study | Surgical approach for wound closure (directly quoted from each study) |
| Buttaro et al., 2015 [3] | “All the wounds were closed by the 4 staff surgeons using Vicryl 0 (Ethicon, Inc. Somerville, New Jersey, USA) for deep fascia and deep subcutaneous fat tissue. An additional subcuticular Vicryl 2-0 (Ethicon, Inc. Somerville, Nueva Jersey, USA) was used to close the superficial soft tissues in the group where staples were used. This step was not carried out in the cases where intradermal non-absorbable polypropylene suture (Prolene™ 0, Ethicon Inc. Somerville, New Jersey, USA) was used, as a more superficial layer was directly closed with polypropylene.” |
| Clayer and Southwood, 1991 [5] | No specific details provided |
| Kazemian et al., 2014 [16] | No specific details provided |
| Mallee et al., 2016 [abstract] [23] | No specific details provided |
| Rui et al., 2017 [26] | “All patients received identical continuous closure of the deep fascia using 1-0 absorbable Vicryl (Ethicon Inc.) and interrupted suture with 2-0 absorbable Vicryl sutures (Ethicon Inc.) for superficial fascia and deep dermal layer in order to reduce skin tension and align the wound edges (14, 15). In the sutures group, superficial skin incisions were closed with a running subcuticular 4-0 Vicryl suture (Ethicon, Inc.). In the other group, wounds were closed with metallic skin staples (Johnson & Johnson Inc.).” |
| Shetty et al., 2004 [28] | No specific details provided |
| Eggers et al., 2011 [8] | “Cohort C involved Quill SRS sutures for capsule closure, Vicryl 2-0 sutures placed at 1.0/cm for subcutaneous closure, and Weck staples (Teleflex Corp, Limerick, Pa) for cutaneous closure. Cohort D Involved Quill SRS sutures for capsule closure, Vicryl 2-0 sutures placed at 1.0/cm for subcutaneous closure, and Monocryl 4-0 sutures (Ethicon) for cutaneous closure.” |
| Graham et al., 2000 [12] | No specific details provided |
| Hlubek et al., 2014 (Google translate was used) [15] | “After implantation of the endoprosthesis, a turnstile is allowed and, after stopping the bleeding, the joint case is then closed with a simple follow-on suture of PDS plus antibacterial 1. The subcutaneous tissue is closed by Vicryl plus antibacterial sutures 0. The suture of the skin was subsequently completed according to the previous instructions of Donati's autotaping sequencing Ethilon 2-0 (Fig. 1) or metal clips using the Skin Stapler Leukosan (Figure 2).” |
| Wyles et al., 2016 [39] | “Each closure was performed identically to the extent possible in three layers as follows. All patients received closure of the arthrotomy and deep fascia with 0-Vicryl (Ethicon, Cincinnati, OH, USA) applied in a simple interrupted fashion. Furthermore, each patient received closure of the subcutaneous layer with 2-0 Monocryl (Ethicon) also applied in a simple interrupted fashion. The superficial skin wound closure differed based on treatment assignment. One group received 3-0 Monocryl (Ethicon) applied with a running subcuticular technique. The second group received superficial closure with 2-0 nylon suture (Ethicon) applied with a vertical mattress technique. The final group received superficial closure with PROXIMATE fixed-head skin staples (Ethicon).” |
| Gohiya et al., 2015 [11] | “At the completion of surgery closure of wound done in layers by absorbable sutures till subcutaneous layer and skin was closed by either monofilament nylon or metallic staples as per randomization.” |
| Khan et al., 2006 [17] | “Once randomised, all patients remained within the group to which they were allocated to wound closure with OCA (Dermabond, Johnson and Johnson, New Brunswick, New Jersey), continuous 3.0 subarticular absorbable poliglecaprone suture (Monocryl, Johnson and Johnson) or skin staples…The deep tissues were closed in a standard manner using continuous 1-vicryl for the deep fascia and 2.0-vicryl for the deep dermal layer in order to remove skin tension and align the wound edges.” |
| Chaudhary et al., 2015 [4] | No specific details provided |
| Liew and Haw, 1993 [22] | “Four surgeons allowed the skin closure in all their operative patients to be randomized to staples (Ethicon), tapes (steri-strips), or interrupted 3/0 nylon (Ethicon) skin closure…A ‘standard’ wound closure method was adopted. Deep closure was nominated by the surgeon responsible. Subcutaneous closure in all wounds was with interrupted undyed 20 dexon.” |
| Murphy et al., 2004 [24] | No specific details provided |
| Shantz et al., 2013 [27] | “After completion of the procedure, deep tissues were closed with absorbable braided suture (Polysorb, Covidien, Mansfield, MA). In all patients the subcutaneous tissue was also closed with an absorbable braided suture. Patients allocated to the sutures intervention had their wounds closed using the suture material chosen by the primary surgeon. The primary surgeon also decided on the most appropriate technique of closure. Those allocated to the staples group were closed using a commercially-available stapler (Weck Visistat 35W, Limerick, PA).” |
| Singh et al., 2017 [29] | “This study included 90 patients (57 men and 33 women; age >18yrs.), undergoing orthopedic surgical procedures in whom, surgical wound closure was done either by skin suture (nylon or silk) or skin staples, during the period from Dec 2014 to August 2016…The deep tissues were closed in a standard manner using vicryl no. 1 for the deep fascia and subcutaneous tissue, in order to remove skin tension and align the wound edges.” |
| Stockely and Elson, 1987 [34] | No specific details provided |

## **Supplemental Table 5.** Baseline characteristics for included trials

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study | Country | World Bank income  classification | Surgical population | Surgery type | Suture type | | Wounds | | BMI (kg/m2 [SD]) | | Age (years), mean (SD) | | Sex (male) | | Postoperative wound inspection | Suture/staple removal (days) |
| Sutures | Staples | Sutures | Staples | Sutures | Staples | Sutures | Staples |
| Buttaro et al., 2015 [3] | Argentina | Upper middle income | Elective | THA | NAB | Continuous 3-0 intradermal polypropylene suture | 119 | 112 | - | - | - | - | - | - | Wounds inspected every day during hospitalization and then at 2 and 6 weeks | 15 |
| Clayer and Southwood, 1991 [5] | Australia | High income | Elective/trauma/NOS | THA, Austin-Moore hemiarthroplasty, compression hip screw and plate, gamma nail | NAB | 2-0 subcuticular polypropylene suture | 33 | 33 | - | - | 75 (13) | 76 (10) | 11 | 10 | Wounds inspected every day for 1 week postoperatively and then at 8 and 12 weeks | 10-14 |
| Eggers et al., 2011 [8] | USA | High income | Elective | TKA | AB | Monocryl 4-0 sutures | 19 | 19 | 30 (5) | 31 (6) | 67 (7) | 71 (10) | - | - | Wounds inspected at 24 hours, 3 weeks, and 6 weeks | - |
| Gohiya et al., 2015 [11] | India | Lower middle income | Elective/trauma/NOS | Closed fractures and all elective orthopaedic surgery | NAB | Nylon sutures | 262 | 241 | - | - | - | - | - | - | Wounds assessed on days 2, 5, and 8 | 11-14 |
| Graham et al., 2000 [12] | UK | High income | Elective | TKA | AB | Subcuticular 4-0 Vicryl Suture | 10 | 10 | - | - | - | - | 1 | 1 | Wounds inspected on day 3 and week 1 | - |
| Hlubek et al., 2014 [15] | Czech Republic | High income | Elective | TKA | NAB | Ethilon 2-0 | 33 | 39 | 29 (7) | 30 (4) | 69 (9) | 69(13) | 10 | 11 | Wounds inspected on days 2, 5, and 12 and 6 weeks | 12 |
| Kazemian et al., 2014 [16] | Iran | Upper middle income | Trauma | Intertrochanteric fracture correction | - | - | 30 | 30 | - | - | 52 (12) | 50 (13) | 17 | 21 | Wounds inspected every 24 hours for first 2 days and then weekly until suture/staple removal | >14 |
| Khan et al., 2006 [17] | Australia | High income | Elective and  elective/trauma/NOS | THA and TKA | AB | Continuous 3-0 subarticular absorbable poliglecaprone suture | 64 | 63 | 28 (6) | 27 (5) | 71 (10) | 69 (11) | 30 | 33 | Wounds inspected within 24 hours during dressing change and then followed between weeks 8 and 12 | 10 |
| Liew and Haw, 1993 [22] | Australia | High income | Elective/trauma/NOS | No details provided | NAB | Interrupted 3-0 nylon suture | 23 | 23 | - | - | - | - | - | - | Wound inspected at months 1 and 3 | - |
| Mallee et al., 2017 [abstract] [23] | Netherlands | High income | Elective | THA | - | - | 254 | 249 | - | - | - | - | - | - | - | - |
| Murphy et al., 2004 [24] | Ireland | High income | Trauma | Fracture fixation of ankle, tibia, patella, femur, forearm, olecranon, and humerus | NAB | Interrupted nylon suture | 29 | 31 | - | - | - | - | - | - | Wounds inspected at day 13 | 13 |
| Rui et al., 2017 [26] | China | Upper middle | Elective/trauma/NOS | THA | AB | Running 4-0 subcuticular Vicryl suture | 82 | 83 | 27.0 (4.0) | 27.0  (4.0) | 58 (11) | 56 (11) | 39 | 36 | Wounds inspected every day after the first 72 hours of hospital stay until wound was dry and then at 3 months and 1 year | 10-14 |
| Shantz et al., 2013 [27] | Canada | High income | Elective/trauma/NOS | Arthroplasty, IM nail, ORIF, soft tissue, and other | AB and NAB | - | 97 | 93 | 28 (8) | 28 (7) | 52 (19) | 52 (19) | - | - | Wounds inspected during hospitalization and then at weeks 2 and 6 | 14 |
| Shetty et al. 2004 [28] | UK | High income | Trauma | Cemented hemiarthroplasty, dynamic hip screw, cannulated hip screw | AB | 3-0 subcuticular undyed Vicryl suture with Steri-strips | 47 | 54 | - | - | 82 (12) | 84 (9) | 7 | 13 | Wounds inspected at 5 and 10 days | 10 |
| Singh et al. 2017 [29] | India | Lower middle income | Elective/trauma/NOS | Open reduction and internal plating, open reduction and internal fixation with tension band wiring, internal fixation with cannulated screws, THA, and TKA | NAB | Nylon OR silk suture | 60 | 30 | - | - | - | - | - | - | Wound inspected on Day 2 and up to 1 month thereafter | 12 |
| Stockely and Elson, 1987 [34] | UK | High income | Elective/trauma/NOS | Arthroplasty, hip osteotomy, internal fixation of femoral neck, internal fixation of supracondylar fracture and tibial plateau fracture | NAB | Nylon suture | 129 | 129 | - | - | - | - | - | - | Wounds inspected on Day 3, 1 week, 2 weeks, and between 9 months and 1 year thereafter | 10-16 |
| Wyles et al. 2016 [39] | USA | High income | Elective | TKA | AB and NAB | Running subcuticular 3-0 Monocryl suture OR vertical mattress 2-0 nylon suture | 30 | 15 | 32 (6) | 36 (9) | 71 (8) | 69 (11) | 10 | 5 | Patients followed for a minimum of 3 months with a mean of 7 (range, 3-12) | 14 |

BMI = body mass index; NOS = not otherwise specified; IM = intramedullary; ORIF = open reduction and internal fixation; NAB = nonabsorbable; AB = absorbable.

## **Supplemental Table 6.** Summary of prophylactic antibiotic use during surgery

|  |  |  |
| --- | --- | --- |
| Study | Prophylactic antibiotics | Comments (directly quoted from each trial) |
| Buttaro et al., 2015 [3] | Yes | “A cephazolin 1 g IV for 24 hs was used in 214 cases and alternative antibiotics were used in 5 cases who had a betalactamic allergy.” |
| Clayer and Southwood, 1991[5] | Yes | “All patients received prophylactic cephalosporin antibiotic therapy which was continued postoperatively as per individual unit protocol.” |
| Kazemian et al., 2014 [16] | Unclear | Not reported |
| Mallee et al., 2016 [abstract] [23] | Unclear | Not reported |
| Rui et al., 2017 [26] | Yes | “Half an hour before surgery, routine antibiotics (2nd generation cephalosporins) were used and discontinued within 24 hours of the THA procedures to prevent infection” |
| Shetty et al., 2004 [28] | Unclear | Not reported |
| Eggers et al., 2011 [8] | Unclear | Not reported |
| Graham et al., 2000 [12] | Unclear | Not reported |
| Hlubek et al., 2014 (Google translation) [15] | Yes | “… all patients received cefuroxime or amoxclaves for 24-48 hours perioperatively.” |
| Wyles et al., 2016 [39] | Unclear | Not reported |
| Gohiya et al., 2015 [11] | Yes | “Each patient was given same intravenous antibiotic till 5th postoperative day” |
| Khan et al., 2006 [17] | Yes | “The same pre- and post-operative programmes of care were applied to all patients including perioperative antibiotic cover.” |
| Chaudhary et al., 2015 [4] | Unclear | Not reported |
| Liew and Haw, 1993 [22] | Unclear | Not reported |
| Murphy et al., 2004 [24] | Unclear | Not reported |
| Shantz et al., 2013 [27] | Unclear | Not reported |
| Singh et al., 2017 [29] | Yes | “The same pre and postoperative protocol of care was applied to all patients including per-operative antibiotic cover and thromboprophylaxis, during their inpatient stay.” |
| Stockely and Elson, 1987 [34] | Yes | “Antibiotic prophylaxis was intravenous ampicillin and flucloxacillin given for a varying period perioperatively.” |

# **Risk of bias**

**Supplemental Table 7.** Randomization and allocation

|  |  |  |  |
| --- | --- | --- | --- |
| Study | Randomization sequence | Allocation concealment | Comments |
| Buttaro et al., 2015 [3] | Low | High | Randomized using a computer-generated method (p 564); no indication that this was concealed before operation |
| Clayer and Southwood, 1991 [5] | High | High | Nonrandom method of sorting based on previous unit record number; no indication of concealment |
| Kazemian et al., 2014 [16] | Low | High | Used a “random numbers table” indicated that they spoke to patients about “methods of implementation” of treatment |
| Mallee et al., 2016 [abstract] [23] | Unclear | Unclear | Abstract does not report how randomization is performed or if it was concealed |
| Rui et al., 2017 [26] | Unclear | Low | Randomization indicated, but not described; concealment using opaque envelopes |
| Shetty et al., 2004 [28] | Low | Low | Randomization using random distribution of sealed envelopes; concealment using sealed envelopes |
| Eggers et al., 2011 [8] | Low | Low | Randomized using number generator algorithm; indicated that surgeon was blinded to allocation, but did not indicate how, or if the patient was |
| Graham et al., 2000 [12] | Unclear | High | Randomization indicated, but not described; no concealment mentioned |
| Hlubek et al., 2014 [15] | High | High | Randomization based on date of birth; allocation was not concealed |
| Wyles et al., 2016 [39] | Low | Low | Block randomization; concealed envelopes |
| Khan et al., 2006 [17] | Low | Low | Computer-generated method/opaque envelopes; allocation done in operating room by lead author |
| Chaudhary et al., 2015.[4] | Unclear | High | Randomization inferred but not described; no concealment mentioned |
| Gohiya et al., 2015 [11] | Low | High | Generated randomized number sequence; concealment not mentioned |
| Liew and Haw, 1993 [22] | Unclear | High | Randomization indicated but not described; concealment not indicated |
| Murphy et al., 2004 [24] | Unclear | High | Randomization indicated but not described; concealment not indicated |
| Shantz et al., 2013 [27] | Low | Low | Randomization by randomization sequence through Excel; concealment using opaque envelopes |
| Singh et al., 2017 [29] | Unclear | High | Randomization indicated but not described; concealment not mentioned |
| Stockely and Elson, 1987 [34] | High | High | Randomization by birth year; concealment not mentioned |

## **Supplemental Table 8.** Blinding

|  |  |  |  |
| --- | --- | --- | --- |
| Study | Blinding of outcomes (from participants) | Blinding of outcomes (from outcome assessors) | Comments |
| Buttaro et al., 2015 [3] | High | High | No indication of blinding for either; participant blinding not possible |
| Clayer and Southwood, 1991 [5] | High | High | No indication of blinding for either; participant blinding not possible |
| Kazemian et al., 2014 [16] | High | High | No indication of blinding for either; participant blinding not possible |
| Mallee et al., 2016 [abstract] [23] | Unclear | Unclear | Abstract |
| Rui et al., 2017 [26] | High | High | No indication of blinding for either; participant blinding not possible |
| Shetty et al., 2004 [28] | High | High | No indication of blinding for either; participant blinding not possible |
| Eggers et al., 2011 [8] | High | High | No indication of blinding for either; participant blinding not possible |
| Graham et al., 2000 [12] | High | High | No indication of blinding for either; participant blinding not possible |
| Hlubek et al., 2014 [15] | High | Unsure | Google translation: “Both files were subsequently evaluated statistically as independent.” |
| Wyles et al., 2016 [39] | High | High | No indication of blinding for either; participant blinding not possible |
| Khan et al., 2006 [17] | Low | Low | “The patients and assessors remained  blinded to the treatment allocated until the dressings were  changed, prior to discharge.” |
| Chaudhary et al., 2015. [4] | High | High | No indication of blinding for either |
| Gohiya et al., 2015 [11] | High | Low | Blinded statistician used; blinded patients were not |
| Liew and Haw, 1993 [22] | High | Unclear | Indicated “independent observer” was present for long-term followup but did not specify if they were actually blinded; participant blinding not suggested |
| Murphy et al., 2004 [24] | High | High | Indicate nonblinding by outcome assessors and by patients (in abstract) |
| Shantz et al., 2013 [27] | Low | High | Use bandage to cover patient treatment arms |
| Singh et al., 2017 [29] | High | High | No indication of blinding |
| Stockely and Elson, 1987 [34] | High | High | No indication of blinding |

## **Supplemental Table 9.** Incomplete outcome data

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| --- | --- | --- |
| Study | Incomplete outcome data | Comments |
| Buttaro et al., 2015 [3] | Low | “all patients remained in within the group to which they were allocated” |
| Clayer and Southwood, 1991 [5] | Unclear | Did not report number of participants allocated versus number treated in each arm |
| Kazemian et al., 2014 [16] | Low | 60 patients analyzed with none lost to followup |
| Mallee et al., 2016 [abstract] [23] | Unclear | Abstract |
| Rui et al., 2017 [26] | Low | No patients lost to followup (p 2) |
| Shetty et al., 2004 [28] | Low | Only lost 9 patients to followup with 54 versus 47 subtotals in treatment arms; loss was the result of death |
| Eggers et al., 2011[8] | Low | Recruited 90 patients, excluded 15, not correlating to any treatment arm |
| Graham et al., 2000 [12] | Low | Recruited and used 20 patients |
| Hlubek et al., 2014 [15] | Low | 72 patients; no mention of attrition |
| Wyles et al., 2016 [39] | Low | Only 9 patients, of 55, lost to attrition; cohorts were still balanced |
| Khan et al., 2006 [17] | Low | “No deviation from trial protocol” (p 239) |
| Chaudhary et al., 2015. [4] | High | Loss to followup made unclear by nonsense numbering |
| Gohiya et al., 2015 [11] | Low | Loss to followup was only 10 (N = 513), without heavy variance between groups |
| Liew and Haw, 1993 [22] | Low | Loss to followup was 6 of 68 with nearly even groups (p 132) |
| Murphy et al., 2004 [24] | Low | No attrition noted |
| Shantz et al., 2013 [27] | High | Randomized 190 and lost 42 to followup, 28 in one arm, 14 in other |
| Singh et al., 2017 [29] | Unclear | Did not disclose participants allocated versus treated |
| Stockely and Elson, 1987 [34] | Low | Implies that no loss to attrition occurs among 129 patients |

## **Supplemental Table 10.** Selective reporting

|  |  |  |
| --- | --- | --- |
| Study | Selective reporting | Comments |
| Buttaro et al., 2015 [3] | Low | Temporal protocol of when to collect outcomes; outcomes collected were usually binary (eg, presence of infection); note: error in reporting (results; p = 1.7) |
| Clayer and Southwood, 1991 [5] | Low | Temporal protocol of when to collect outcomes; outcomes collected were usually binary (eg, presence of infection) |
| Kazemian et al., 2014 [16] | Low | Temporal protocol of when to collect outcomes; outcomes collected were usually binary (eg, presence of infection) or patient-reported |
| Mallee et al., 2016 [abstract] [23] | Unclear | Abstract |
| Rui et al., 2017 [26] | Low | Temporal protocol; easy binary outcomes, plus use of validated scale |
| Shetty et al., 2004 [28] | Low | Temporal protocol; easy binary outcomes |
| Eggers et al., 2011 [8] | Low | Very detailed protocol on measurement throughout methods |
| Graham et al., 2000 [12] | Low | Temporal protocol and specific measurements of outcomes to areas of knee |
| Hlubek et al., 2014 [15] | Unsure | Google translate unable to translate information related to these criteria |
| Wyles et al., 2016 [39] | Low | Temporal protocol; very detailed specific protocol to measure outcomes |
| Khan et al., 2006 [17] | Low | Temporal protocol; detailed measures of easy binary outcomes |
| Chaudhary et al., 2015 [4] | Low | Temporal protocol; plus use of trained professionals on easy outcomes |
| Gohiya et al., 2015 [11] | Low | Temporal protocol with use of validated scales and easy binary outcomes |
| Liew and Haw, 1993 [22] | Low | Temporal protocol; specific validated scales used |
| Murphy et al., 2004 [24] | Low | Temporal protocol; specific validated scales used |
| Shantz et al., 2013 [27] | Low | Fairly simple outcomes to measure |
| Singh et al., 2017 [29] | Low | Fairly precise protocol for easy measures |
| Stockely and Elson, 1987 [34] | Low | Temporal protocol; simple outcomes |

|  |  |  |
| --- | --- | --- |
| Study | Other biases | Comments |
| Buttaro et al., 2015 [3] | Low | No red flags to report |
| Clayer and Southwood, 1991 [5] | Low | No red flags to report |
| Kazemian et al., 2014 [16] | Low | No red flags to report |
| Mallee et al., 2016 [abstract] [23] | Unclear | Abstract |
| Rui et al., 2017 [26] | Low | No red flags to report |
| Shetty et al., 2004 [28] | Low | No red flags to report |
| Eggers et al., 2011[8] | Low | No red flags to report |
| Graham et al., 2000 [12] | low | No red flags to report |
| Hlubek et al., 2014 [15] | Unclear | Google translate unable to properly translate for these criteria |
| Wyles et al., 2016 [39] | Low | No red flags to report |
| Khan et al., 2006 [17] | Low | No red flags to report |
| Chaudhary et al., 2015 [4] | High | Inconsistent numeracy throughout article; poor writing synthesis (grammar, punctuation, and spelling) |
| Gohiya et al., 2015 [11] | High | Inconsistencies in data reporting pertaining to infection rates; possible predatory journal |
| Liew and Haw, 1993 [22] | Low | No red flags to report |
| Murphy et al., 2004 [24] | Low | No red flags to report |
| Shantz et al., 2013 [27] | Low | No red flags to report |
| Singh et al., 2017 [29] | Low | No red flags to report |
| Stockely and Elson, 1987 [34] | Low | No red flags to report |

## **Supplemental Table 11.** Other biases