International Journal of Research in Orthopaedics
Singapanga RS et al. Int J Res Orthop. 2025 Jul;11(4):854-861
http://www.ijoro.org

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20251761

Systematic Review

Surgical drains following arthroplasty: a systematic review and summary of evidence based on available systematic reviews

Rupin S. Singapanga*, Rayeez Ahmed, Ajay N. Samuel

Department of Orthopaedics, Sri Ramachandra Institute of Higher Education and Research, Porur, Chennai, Tamil Nadu, India

Received: 15 May 2025
Accepted: 03 June 2025

***Correspondence:**
Dr. Rupin S. Singapanga,
E-mail: rups1996@gmail.com

ABSTRACT

The use of surgical drains following arthroplasty is an age-old practice, but has declined in popularity in recent times. Various aspects pertaining to their safety and efficacy have been studied in the past, in focused studies and systematic reviews. The present research aimed to review and summarize the high-quality evidence on the subject. A described methodological framework for conducting a "systematic review of systematic reviews" was chosen, and reporting was performed in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines. Following a search in the PubMed/Medline and PubMed Central indexing databases, a total of 34 systematic reviews with or without meta-analyses were included. Our research unequivocally indicates that routine drain application is not associated with a reduction in the incidence of postoperative hematoma formation or limb swelling, though it unambiguously results in a significant reduction in the incidence of surgical site erythema and ecchymoses, and the need to change wound dressings postoperatively. This benefit, however, comes at the expense of the possibility of increased blood loss, transfusion requirement, and time to functional recovery, as well as the deterrence to a full implementation of the principles of "enhanced recovery after surgery" protocols and day-care surgery. Where drains are deemed inevitable, the practice of intermittent clamping can mitigate the magnitude of blood loss, while autologous re-transfusion drains may reduce blood transfusion requirements.

Keywords: Surgical drain, Closed suction drain, Arthroplasty, Systematic review, Review of reviews

INTRODUCTION

Arthroplasty, commonly known as "joint replacement", is one of the most commonly performed orthopedic surgeries. The use of surgical wound drains following arthroplasty has long been common practice among orthopedic surgeons, although it has been declining in popularity in recent times. Drains aim to encourage fluid drainage from the surgical wound, thereby theoretically reducing the incidence of postoperative hematoma or seroma formation, delayed wound healing, or surgical site infections.[1,2] On the other hand, they act as a conduit with the external environment, thereby raising concerns regarding persistent drainage, increased blood loss, retrograde wound contamination, and superficial or deep wound infections.[1,2] Surgical drains involve an additional cost, and potentially carry the risks of inadvertent pullout by the patient, difficulty during removal, and the formation of an unsightly scar when the drain site is left to heal by secondary intention.[3]

The safety and efficacy of surgical drains following arthroplasty have been studied in prior research in terms of a broad range of parameters, such as the incidence of postoperative hematoma formation, blood loss, need for the transfusion of blood or blood products, incidence of wound-related complications and surgical site infections, need for reoperation, risk of postoperative thromboembolic events, joint range of movement, postoperative pain, functional recovery, length of hospital stay, wound soakage requiring a change of dressing, and overall complication rates. A few systematic reviews and

meta-analyses in the literature focusing on one or more of the above variables have presented high-quality evidence within their limited scope. To our knowledge, however, no prior attempt to comprehensively encapsulate the available high-quality evidence pertaining to the use of surgical drains following arthroplasty and spanning a broad range of postoperative outcomes has been undertaken in the past.

The aims of this research were to systematically review and summarize the available high-quality evidence across a broad range of postoperative outcomes among patients undergoing arthroplasty surgery from the available systematic reviews with or without meta-analyses in the literature in terms of: the influence of routine use versus avoidance of surgical drains, the influence of drain clamping vis-à-vis continuous drainage, and the influence of the use of postoperative autologous re-transfusion drains vis-à-vis non-transfusion drains and no drains. We believe that such a synopsis would provide arthroplasty surgeons worldwide with the pros and cons regarding the use of surgical drains – overall, and in the context of clamping and autologous re-transfusion – in a balanced manner by indicating areas of universal consensus versus those where the evidence is equivocal or conflicting, thereby simplifying informed decision-making intraoperatively.

METHODS

Given the variable scope and quality of the literature intended to be summarized and the possibility of multiple reviews pertaining to important aspects of the topic studied, a systematically executed review of systematic reviews with or without meta-analyses was undertaken by the authors to compare and contrast the findings of different systematic reviews, comprehensively summarize the available high-quality evidence on the subject of the use of surgical drains in arthroplasty, and provide surgeons with evidence across a broad spectrum of related outcomes to enable informed decision-making. The methodological framework for conducting a "systematic review of systematic reviews" proposed by Smith et al was therefore chosen for this study, while the reporting was performed in accordance with the updated guidelines in the PRISMA 2020 statement for reporting systematic reviews.[4,5]

Development of the research queries

Based on the aims of this study, the following three research queries were advanced: "What is known from the high-quality evidence in the existing literature regarding the influence of the use of surgical drains vis-à-vis no drainage following arthroplasty on the surgical outcomes?", "What is known from the high-quality evidence in the existing literature regarding the influence of drain clamping vis-à-vis continuous drainage following arthroplasty on the surgical outcomes?", and "What is known from the high-quality evidence in the existing literature regarding the influence of the use of postoperative autologous re-transfusion drains vis-à-vis no drainage or the use of regular non-transfusion surgical drains following arthroplasty on the surgical outcomes?"

Identification of the relevant literature

A literature search was conducted using the "PubMed/Medline" and "PubMed Central" electronic indexing databases. The following search terms and Boolean operators were used for the preliminary identification of relevant abstracts: [{arthroplasty (abstract)} OR {replacement (abstract)}] AND [{drain (abstract)} OR {drains (abstract)} OR {drainage (abstract)}]. The search terminology was intentionally not restricted to specific joints or drain types to permit inclusion of the entire spectrum of the research available on the subject. The search results included research articles indexed until April 2025 in the respective databases, which was the time when the preparation of this review commenced.

The preliminary search results were screened to include only systematic reviews with or without meta-analyses in the English language. Duplicated studies were excluded. All authors screened the remaining abstracts and discussed each search result in an iterative manner to include only those studies that presented outcomes related to arthroplasty and were relevant to the context of the present research. Disagreements pertaining to study selection were resolved through discussion and mutual consensus among the authors. The complete manuscripts of these studies were procured and perused to confirm their scope and relevance. The final list of the studies included for the purpose of the present review was exported to a citation manager (Zotero, version 6.0.36).

Data charting and summarization

The sought surgical outcome measures relevant to each research query were broadly categorized as being related to: swelling, or formation of a hematoma or seroma, blood loss, drop in postoperative hemoglobin values, and the need for transfusion of blood or blood products, surgical site infections including superficial wound related infections and joint infections, and the need for re-operation, clinical and functional outcomes (including postoperative pain, ability to perform active straight leg raising, and active range of movement), and the occurrence of postoperative complications (including venous thromboembolic events), length of hospital stay and costs of hospitalization, and oozing from the surgical site and the need to frequently change wound dressings.

All the included systematic reviews were studied in detail, and the various reported surgical outcome parameters and the corresponding results pertinent to the research queries were manually tabulated across a spreadsheet (Microsoft Excel, Microsoft Corporation, 2007), along with the details of each study. These were then grouped based on the research query they answered. Thematic and narrative qualitative data syntheses were performed to identify the

extent of the available evidence and to assess and collate the available data on each surgical outcome parameter reported in the included literature, respectively. The body of information in the resulting aggregate of evidence was finally summarized for each individual reported parameter.

RESULTS

The preliminary search yielded 3691 and 1155 results in the PubMed/Medline and PubMed Central databases, respectively. After the screening process as described, 34 studies were finally included for this review.[1,6-38] These included 19 reviews exclusively studying the use of regular drains during arthroplasty, 2 reviews studying the use of drains during arthroplasty along with other orthopedic or non-orthopedic surgeries, 3 reviews comparing drain clamping with continuous drainage, 8 reviews on the use of autologous re-transfusion drains, 1 review of available evidence and practice variations in hip and knee arthroplasty, and 1 review on the quality of available systematic reviews on the subject of drainage following primary hip or knee arthroplasty.[6-38] The details of these included studies are summarized in Table 1.

Routine surgical drainage: swelling, or formation of a hematoma or seroma

It was noted in four systematic reviews that there was no difference in the incidence of postoperative swelling of the operated limb with or without the application of surgical drains following arthroplasty surgery.[7,17,20,23] Additionally, four reviews found that there was no difference in the occurrence of postoperative hematomas at the surgical site with or without postoperative surgical drainage.[6,16-17,19] No evidence was available to indicate that the use of surgical drains after arthroplasty favorably or unfavorably affected hematoma formation. This negates the most common conventional supposition of several surgeons supporting routine postoperative wound drainage following arthroplasty, that it can potentially prevent fluid accumulation around the operative site.

Routine surgical drainage: blood loss, drop in postoperative hemoglobin values, and the need for blood transfusion

Among the included systematic reviews, comparable estimated total blood loss following surgery with or without postoperative surgical drainage was noted in five studies, while one noted increased blood loss values when drains were used.[10,15,16,19,21,23] Additionally, four reviews found that the postoperative drop in hemoglobin values remained unaffected by the use of drains.[7,10,13,21] However, several reviews, including some of the above-mentioned, noted increased rates of transfusion of blood or blood products when drains were used, while two noted comparable transfusion requirements.[6,10,13,15-17,21-23] Additionally, Soranoglou et al acknowledged advantageous blood management in single-stage bilateral total knee arthroplasty without drains.[24]

Routine surgical drainage: surgical site infections and the need for re-operation

Li et al found comparable wound healing following arthroplasty with or without drains.[20] Comparable rates of wound-related complications were noted in four of the included systematic reviews, while comparable re-operation rates for wound-related complications were noted in another.[14-15,17,22,23] Chen et al reported a comparable incidence of wound dehiscence with or without drainage.[6] Several studies noted no difference in the occurrence of surgical site infections with or without the use of surgical drains after arthroplasty.[6,13,15-17,19-22] Additionally, Zhang et al and Basilico et al reported similar rates of superficial and deep infections, respectively, with or without the use of drains.[10,23]

In the context of periprosthetic joint infections (PJIs), the available evidence was found to be conflicting. Although Zhang et al reported comparable infection rates with or without the use of drains following arthroplasty, Zhu et al observed that wound drain application was a risk factor for the development of subsequent PJIs, while Kong et al noted that the use of wound drains was protective against PJIs and reduced the odds of their occurrence.[8-10] Based on the available evidence, no definitive conclusion can be drawn regarding the association between wound drain application and the occurrence of PJIs.

Routine surgical drainage: clinical and functional outcomes, and postoperative complications

Zhang et al reported that the use of surgical drains was associated with an increase in the time to regain active straight leg raising.[10] Several among the included systematic reviews noted comparable postoperative joint range of movement with or without drains.[6,7,10,19,22,23] No difference in postoperative pain was noted in two reviews.[19,23] Compagnoni et al and Zhou et al reported comparable functional outcomes with or without drains.[18,21] Matar et al recommended avoidance of routine drain usage for satisfactory long-term outcomes.[11] Numerous systematic reviews found no difference in the rates of deep venous thrombosis following arthroplasty, with or without the use of surgical drains.[6,10,17,19,20,22] Zhou et al reported comparable postoperative complication rates, while Li et al noted an increase in the overall incidence of postoperative complications when drains were used.[20,21]

Routine surgical drainage: length of hospital stays and costs of hospitalization

Among the included systematic reviews, five reported comparable lengths of hospital stay following arthroplasty with or without the use of surgical drains.[7,10,13,17,23] Basilico et al acknowledged that surgical drains involve an

additional expense to the patient; however, none of the included studies compared costs of hospitalization.[23] Nevertheless, this body of evidence needs to be reconsidered in present times in light of the growing universal popularity of "enhanced recovery after surgery" (ERAS) protocols and day-care arthroplasty procedures, which are better served when postoperative drains are not used. The reduction in costs of hospitalization would indeed be significant when the duration of hospital stay is reduced in this context, but no pertinent evidence was found among the reviews included for the purposes of this study in this regard.

Routine surgical drainage: oozing from the surgical site and the need to frequently change wound dressings

The use of surgical drains significantly correlated with a reduction in the need for change of postoperative wound dressings following arthroplasty in three of the included studies.[10,21,22] Likewise, Parker et al reported an increased requirement for changing dressings when drains were not used.[17] Li et al and Zhang et al noted increased erythema and ecchymoses around the surgical site when drains were not used.[20,22] No evidence to the contrary was noted in the body of systematic reviews included for the purposes of the present research.

Routine surgical drainage: miscellaneous evidence

Two systematic reviews studied the influence of the routine application of surgical drains on postoperative outcomes following multiple types of surgery (including arthroplasty).[1,25] Parker et al in their Cochrane Review based on a wide range of orthopedic procedures, including arthroplasty, shoulder surgery, spine surgery, cruciate reconstruction surgery, open meniscectomy, and fracture fixation surgery, concluded that the use of surgical drains resulted in increased transfusion requirements, while avoidance of drains resulted in increased bruising at the surgical site and an increased need to change postoperative wound dressings; they observed comparable rates of wound infection, hematoma formation, wound dehiscence, and reoperation rates with or without drain application.[1] Kosins et al in their research based on a broad spectrum of orthopedic and non-orthopedic surgical procedures, concluded that subcutaneous drains conferred no advantages except for a reduction in the incidence of postoperative surgical site hematoma formation following breast surgery.[25]

Long et al in their review of the best available evidence from 12 systematic reviews on the routine use of surgical drains following total hip and knee arthroplasty, reported that 10 of these studies were of low quality.[38] They concluded that there was insufficient evidence to confidently draw conclusions on whether or not to use surgical drains routinely following total hip or knee arthroplasty. Mayer et al reviewed practice guidelines and variations in surgical practice in the context of hip and knee arthroplasty, and noted that the routine use of surgical drains cannot be recommended following total knee arthroplasty, although it might carry certain benefits following total hip arthroplasty.[37]

Drain clamping versus continuous drainage

Among the body of evidence studied, three studies compared intermittent drain clamping and continuous drainage after arthroplasty.[26-28] Two reviews reported that drain clamping was associated with a significant reduction in the volume of drainage.[26,28] Moreover, two reviews noted reduced drops in postoperative hemoglobin values when intermittent drain clamping was practised.[27,28] Huang et al reported that drain clamping resulted in a significant reduction in the need for blood transfusion, while Tai et al and Li et al found comparable postoperative transfusion rates irrespective of drain clamping.[26,27] Comparable postoperative joint range of movement, and rates of wound-related complications, venous thromboembolic events, and overall postoperative complications have been reported irrespective of drain clamping.[26-28]

Autologous postoperative re-transfusion drains versus regular non-transfusion drains and no drainage

Xie et al reported that autologous postoperative re-transfusion drains resulted in decreased blood loss when compared to closed suction drains.[31] Li et al reported decreased blood loss with the use of these drains in comparison with routine non-transfusion drains as well as when no drains were used.[35] On the other hand, comparable blood loss was noted by Hong et al and Pan et al in relation to suction drains, and by Hong et al in relation to no drainage.[32-34] Numerous systematic reviews reported decreased blood transfusion requirements following autologous re-transfusion drain application in comparison with non-transfusion drains.[29-32,34,36] In a comparison between autologous re-transfusion drain usage and no drainage, Hong et al reported comparable transfusion requirements, while Ji et al noted decreased transfusion requirements with the former.[33,36] Soranoglou et al opined that the volume of salvaged blood being reinfused through the use of these systems could be considerable, but they carry the risks of contamination and coagulopathy nonetheless.[24]

Li et al observed a reduced incidence of superficial wound infections when autologous re-transfusion drains were used, compared to regular or no drainage.[35] However, other reviews noted comparable rates of wound-related complications and surgical site infections in comparison with non-transfusion drains, and comparable infection rates with respect to no drainage.[31-34] No difference in the incidence of deep venous thrombosis was noted in comparison with regular or no drainage in two studies.[34,35] Hong et al reported comparable postoperative joint range of motion following the use of autologous re-transfusion drains and no drains.[33] Markar et al reported a reduction in the duration of hospital stay when autologous

re-transfusion drains were used, compared to regular drains.[29] However, other reviews did not find any difference in length of hospitalization when regular non-transfusion or no drain was used.[31,32,34,35] Li et al reported comparable postoperative pain and overall complication rates following autologous re-transfusion drain application in comparison with regular or no drainage.[35] Two reviews comparing re-transfusion and regular drains noted no difference in the incidence of febrile reactions.[31,34]

Table 1: A summary of the reviews included for the present study.

Authors	Year	Scope of research	Number of studies included
Studies on routine non-transfusion drain usage following arthroplasty			
Chen et al[6]	2014	Closed suction drainage versus no drainage (following hip arthroplasty)	16
Quinn et al[7]	2015	Drainage versus no drainage (following TKA)	6
Zhu et al[8]	2015	Risk factors for PJI (following total joint arthroplasty)	14
Kong et al[9]	2017	Risk factors for PJI (following primary THA and TKA)	24
Zhang et al[10]	2018	Drainage versus no drainage (following primary TKA)	19
Matar et al[11]	2020	Overview of RCTs (pertaining to TKA)	403
Matar et al[12]	2020	Overview of RCTs (pertaining to THA)	312
Migliorini et al[13]	2022	Closed suction drainage versus no drainage (following TKA and THA)	25
Hameed et al[14]	2022	Effect of ancillary operating room techniques on wound healing outcomes (following THA)	13
Lachance et al[15]	2024	Efficacy and safety of closed suction drainage (following revision TKA and THA)	6
Kelly et al[16]	2014	Closed suction drainage versus no drainage (following primary THA)	16
Parker et al[17]	2004	Closed suction drainage versus no drainage (following elective hip and knee arthroplasty)	18
Compagnoni et al[18]	2024	Fast track protocols for shorter hospitalization and lower complication rates (following TKA)	45
Si et al[19]	2016	Closed suction drainage versus no drainage (following primary TKA)	12
Li et al[20]	2015	Drainage versus no drainage (following one-stage bilateral TKA)	3
Zhou et al[21]	2013	Closed suction drainage versus no drainage (following TKA)	20
Zhang et al[22]	2011	Closed suction drainage versus no drainage (following TKA)	15
Basilico et al[23]	2020	Benefits and risks of wound drainage (following TKA)	30
Soranoglou et al[24]	2018	Optimization of blood management (following one-stage bilateral TKA)	94
Studies on routine drain usage following various surgeries (including arthroplasty)			
Kosins et al[25]	2013	Value of subcutaneous surgical wound drainage (following various orthopedic and non-orthopedic surgeries)	52
Parker et al[1]	2007	Effectiveness of closed suction drainage (following various orthopedic surgeries) (Cochrane database review)	36
Studies comparing drain clamping versus immediate continuous drainage			
Tai et al[26]	2010	Intermittent clamping versus immediate release (following elective TKA)	6
Li et al[27]	2014	Non-continuous versus continuous wound drainage (following TKA)	9
Huang et al[28]	2013	Temporary clamping versus no clamping (following TKA)	9
Studies pertaining to autologous re-transfusion drains			
Markar et al[29]	2012	Transfusion drains versus suction drains (following TKA)	8
Haien et al[30]	2013	Efficacy of auto-transfusion drains (following TKA and THA)	6
Xie et al[31]	2016	Safety and efficacy of auto-transfusion drains (following THA)	13
Hong et al[32]	2016	Transfusion drains versus closed suction drains and no drainage (following TKA)	15
Hong et al[33]	2017	Transfusion drains versus no drainage (following TKA)	7
Pan et al[34]	2016	Transfusion drains versus suction drainage (following TKA)	16
Li et al[35]	2014	Transfusion drains versus closed suction drains and no drainage (following primary THA)	12
Ji et al[36]	2017	Ability of transfusion drains to reduce the need for allogenic blood transfusion (following TKA and THA)	17

Continued.

Authors	Year	Scope of research	Number of studies included
Miscellaneous but relevant studies			
Mayer et al[37]	2017	Practice guidelines and variations in acute care processes (pertaining to TKA and THA)	8 (pertaining to drains)
Long et al[38]	2021	Best evidence selection and risk of bias (pertaining to systematic reviews on the use of drains following primary THA and TKA)	12

TKA=Total knee arthroplasty, THA=total hip arthroplasty, PJI=periprosthetic joint infection, RCT=randomized control trial

DISCUSSION

The routine uses of intra-articular closed suction drains following arthroplasty is an age-old practice, but has been questioned in recent times due to a failure to demonstrate any considerable advantages. Proponents of the schools of thought that favor or oppose their use cite several perceived benefits and drawbacks of either practice. On the one hand, hematoma formation following arthroplasty is a matter of concern given the resulting increase in tissue tension that could affect joint mobility and blood perfusion, and the favorable medium it provides for bacterial colonization, which could result in superficial wound infections or PJIs. On the other hand, drains hinder postoperative mobility and might act as a conduit for retrograde contamination and bacterial migration.[10] Several observational studies and reviews in the available literature have focused on specific outcome-related parameters pertaining to routine drain usage. The present study objectively encapsulates the evidence regarding the influence of surgical drain application following arthroplasty across a wide spectrum of these parameters.

Our research unequivocally indicates that routine drain application is not associated with a reduction in the incidence of postoperative hematoma formation or limb swelling, though it unambiguously results in a significant reduction in the incidence of surgical site erythema and ecchymoses, and the need to change wound dressings postoperatively.[6,7,10,16,17,19-23] No findings to the contrary were noted in the body of evidence studied, and no other definite benefits were to be found. Comparable rates of wound healing, wound-related complications, and surgical site infections were noted in numerous systematic reviews.[6,10,13-17,19-23] Conflicting evidence was noted in the specific context of PJIs, however, with evidence from different research indicating comparable, increased, or decreased infection rates with drain usage vis-à-vis no drainage.[8-10] Although drain application and avoidance seem to result in comparable postoperative pain, joint range of movement, overall functional outcomes, and venous thromboembolism, they may prolong the time required to regain active straight leg raising.[6,7,10,17-23] Additionally, the overall complication rates may remain similar or increase when drains are installed, compared to instances where they are avoided.[20,21]

A vast volume of literature indicates that routine usage versus avoidance of drains results in comparable blood loss and drop in postoperative hemoglobin values, although one study reported increased blood loss when drains were used.[7,10,13,15,16,19,21,23] However, a considerably larger number of systematic reviews indicate that drains resulted in increased transfusion requirements, compared to those that reported comparable findings with or without surgical drainage.[6,10,13,15-17,21-23] We believe that increased transfusion rates can be noted even in the presence of comparable blood loss, since some patients with relatively low preoperative hemoglobin values would require blood transfusion despite losing approximately the same volume of blood as those with higher preoperative values. Moreover, the difference in the overall mean drop in postoperative hemoglobin may remain statistically insignificant despite the presence of a few outliers who did require blood transfusion due to relatively excess blood loss.

Although some of the included reviews suggested no increase in lengths of hospital stay with postoperative drain application, several other factors need to be considered while evaluating their impact on healthcare expenditure.[7,10,13,17,23] Drains per se involve an additional cost to the patient. Additionally, they hinder postoperative mobilization and preclude the possibility of day-care arthroplasty.[39] Indeed, avoidance of surgical drains is considered an active component of contemporary ERAS protocols for arthroplasty surgery.[40] The obvious incurrence of additional costs of hospitalization in a set of patients who could otherwise obtain early discharge, and the lack of evidence to indicate any considerable advantage other than a decreased requirement for change of wound dressings would appear to be a deterrent to the routine use of surgical drains following arthroplasty.

The concepts of intermittent drain clamping and autologous re-transfusion drain usage were introduced to circumvent some of the drawbacks of drain usage and attempt to find a compromise between their routine application and complete avoidance. Our research indicates that the former practice results in a reduction in the volume of drainage and drops in postoperative hemoglobin, and a decreased or comparable need for blood transfusion vis-à-vis continuous drainage, while being associated with comparable overall outcomes and complication rates.[26-28] The latter practice may be associated with decreased or comparable blood loss when compared with closed suction drains, and reduced or similar blood loss vis-à-vis no drainage.[31-35] However, it correlates with significantly lower transfusion requirements compared to regular non-transfusion drains, and comparable or lower transfusion rates vis-à-vis no drainage.[29-34,36]

CONCLUSION

Our research systematically summarizes the evidence regarding the influence of the use of regular non-transfusion and autologous re-transfusion drains on several postoperative outcomes following arthroplasty. The principal finding of our research was that the only certain benefit conferred by the routine use of drains following arthroplasty was a reduction in the need to change wound dressings. This benefit came at the expense of the possibility of increased blood loss, transfusion requirement, and time to functional recovery, as well as the deterrence to a full implementation of the principles of ERAS protocols and day-care surgery. Where drains are inevitable, the practice of intermittent clamping can mitigate the magnitude of blood loss, while autologous re-transfusion drains may reduce blood transfusion rates. An inevitable limitation of this research lies primarily in the inherent possibility of bias in the original research studied in the systematic reviews included. A second limitation is the inclusion of research published in the English language alone. The strengths of our study include its systematic approach, broad scope, and inclusion of only high-quality evidence.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Parker MJ, Livingstone V, Clifton R, McKee A. Closed suction surgical wound drainage after orthopaedic surgery. Cochrane Database Syst Rev. 2007;2007(3):CD001825.
2. Savage JW, Anderson PA. An update on modifiable factors to reduce the risk of surgical site infections. Spine J. 2013;13(9):1017-29.
3. Durai R, Ng PC. Surgical vacuum drains: types, uses, and complications. AORN J. 2010;91(2):266-71.
4. Smith V, Devane D, Begley CM, Clarke M. Methodology in conducting a systematic review of systematic reviews of healthcare interventions. BMC Med Res Methodol. 2011;11(1):15.
5. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71.
6. Chen ZY, Gao Y, Chen W, Li X, Zhang YZ. Is wound drainage necessary in hip arthroplasty? A meta-analysis of randomized controlled trials. Eur J Orthop Surg Traumatol. 2014;24(6):939-46.
7. Quinn M, Bowe A, Galvin R, Dawson P, O'Byrne J. The use of postoperative suction drainage in total knee arthroplasty: a systematic review. Int Orthop. 2015;39(4):653-8.
8. Zhu Y, Zhang F, Chen W, Liu S, Zhang Q, Zhang Y. Risk factors for periprosthetic joint infection after total joint arthroplasty: a systematic review and meta-analysis. J Hosp Infect. 2015;89(2):82-9.
9. Kong L, Cao J, Zhang Y, Ding W, Shen Y. Risk factors for periprosthetic joint infection following primary total hip or knee arthroplasty: a meta-analysis. Int Wound J. 2017;14(3):529-36.
10. Zhang Q, Liu L, Sun W, Gao F, Zhang Q, Cheng L, et al. Are closed suction drains necessary for primary total knee arthroplasty?: A systematic review and meta-analysis. Medicine (Baltimore). 2018;97(30):e11290.
11. Matar HE, Platt SR, Gollish JD, Cameron HU. Overview of randomized controlled trials in total knee arthroplasty (47,675 patients): What have we learnt? J Arthroplasty. 2020;35(6):1729-36.e1.
12. Matar HE, Platt SR, Board TN, Porter ML. Overview of randomized controlled trials in primary total hip arthroplasty (34,020 patients): What have we learnt? J Am Acad Orthop Surg Glob Res Rev. 2020;4(8):e20.00120.
13. Migliorini F, Maffulli N, Betsch M, Eschweiler J, Tingart M, Baroncini A. Closed suction drainages in lower limb joint arthroplasty: a level i evidence based meta-analysis. Surgeon. 2022;20(3):e51-60.
14. Hameed D, Dubin JA, Bains SS, Board T, Nunley R, Mont MA. Effect of various ancillary operating room techniques on wound healing outcomes after total hip arthroplasty. Surg Technol Int. 2022;43:289-97.
15. Lachance A, Shahsavarani S, Sogard O, McDonald J, Stilwell M, Lutton J. Suction drain usage has no benefit following revision total hip and knee arthroplasty. Arch Orthop Trauma Surg. 2024;144(8):3565-71.
16. Kelly EG, Cashman JP, Imran FH, Conroy R, O'Byrne J. Systematic review and meta-analysis of closed suction drainage versus non-drainage in primary hip arthroplasty. Surg Technol Int. 2014;24:295-301.
17. Parker MJ, Roberts CP, Hay D. Closed suction drainage for hip and knee arthroplasty. A meta-analysis. J Bone Joint Surg Am. 2004;86(6):1146-52.
18. Compagnoni R, Puglia F, Magnani M, Klumpp R, Ferrua P, Calanna F, et al. Optimised fast-track protocols in total knee arthroplasty determine shorter hospitalisation time and lower perioperative/postoperative complications. Knee Surg Sports Traumatol Arthrosc. 2024;32(4):963-77.
19. Si HB, Yang TM, Zeng Y, Shen B. No clear benefit or drawback to the use of closed drainage after primary total knee arthroplasty: a systematic review and meta-analysis. BMC Musculoskelet Disord. 2016;17:183.
20. Li N, Liu M, Wang D, He M, Xia L. Comparison of complications in one-stage bilateral total knee arthroplasty with and without drainage. J Orthop Surg Res. 2015;10:3.
21. Zhou XD, Li J, Xiong Y, Jiang LF, Li WJ, Wu LD. Do we really need closed-suction drainage in total hip arthroplasty? A meta-analysis. Int Orthop. 2013;37(11):2109-18.
22. Zhang QD, Guo WS, Zhang Q, Liu ZH, Cheng LM, Li ZR. Comparison between closed suction drainage

and nondrainage in total knee arthroplasty: a meta-analysis. J Arthroplasty. 2011;26(8):1265-72.
23. Basilico M, Vitiello R, Liuzza F, Minutillo F, Ruberto P, Matrangolo MR, et al. Efficacy of postoperative drainage in total knee arthroplasty: Review of the literature. Orthop Rev (Pavia). 2020;12(Suppl 1):8663.
24. Soranoglou V, Poultsides LA, Triantafyllopoulos GK, De Martino I, Memtsoudis SG, Sculco TP. Optimizing intraoperative blood management for one-stage bilateral total knee arthroplasty. HSS J. 2018;14(2):202-10.
25. Kosins AM, Scholz T, Cetinkaya M, Evans GRD. Evidence-based value of subcutaneous surgical wound drainage: the largest systematic review and meta-analysis. Plast Reconstr Surg. 2013;132(2):443-50.
26. Tai TW, Yang CY, Jou IM, Lai KA, Chen CH. Temporary drainage clamping after total knee arthroplasty: a meta-analysis of randomized controlled trials. J Arthroplasty. 2010;25(8):1240-5.
27. Li T, Zhuang Q, Weng X, Zhou L, Bian Y. Non-continuous versus continuous wound drainage after total knee arthroplasty: a meta-analysis. Int Orthop. 2014;38(2):361-71.
28. Huang Z, Ma J, Pei F, Yang J, Zhou Z, Kang P, et al. Meta-analysis of temporary versus no clamping in TKA. Orthopedics. 2013;36(7):543-50.
29. Markar SR, Jones GG, Karthikesalingam A, Segaren N, Patel RV. Transfusion drains versus suction drains in total knee replacement: meta-analysis. Knee Surg Sports Traumatol Arthrosc. 2012;20(9):1766-72.
30. Haien Z, Yong J, Baoan M, Mingjun G, Qingyu F. Post-operative auto-transfusion in total hip or knee arthroplasty: a meta-analysis of randomized controlled trials. PLoS One. 2013;8(1):e55073.
31. Xie H, Pan JK, Hong KH, Guo D, Fang J, Yang WY, et al. Postoperative autotransfusion drain after total hip arthroplasty: a meta-analysis of randomized controlled trials. Sci Rep. 2016;6:27461.
32. Hong KH, Pan JK, Yang WY, Luo MH, Xu SC, Liu J. Comparison between autologous blood transfusion drainage and closed-suction drainage/no drainage in total knee arthroplasty: a meta-analysis. BMC Musculoskelet Disord. 2016;17:142.
33. Hong KH, Pan JK, Xie H, Guo D, Yang WY, Su HT, et al. Review: Autologous blood transfusion drainage compared with no drainage in total knee arthroplasty: A meta-analysis and systematic review. Pak J Pharm Sci. 2017;30(6):2321-7.
34. Pan JK, Hong KH, Xie H, Luo MH, Guo D, Liu J. The efficacy and safety of autologous blood transfusion drainage in patients undergoing total knee arthroplasty: a meta-analysis of 16 randomized controlled trials. BMC Musculoskelet Disord. 2016;17(1):452.
35. Li N, Li P, Liu M, Wang D, Xia L. Comparison between autologous blood transfusion drainage and no drainage/closed-suction drainage in primary total hip arthroplasty: a meta-analysis. Arch Orthop Trauma Surg. 2014;134(11):1623-31.
36. Ji W, Lin X, Zhang R, Tang P, Mo J, Teng X, et al. Application of postoperative autotransfusion in total joint arthroplasty reduces allogeneic blood requirements: a meta-analysis of randomized controlled trials. BMC Musculoskelet Disord. 2017;18(1):378.
37. Mayer M, Naylor J, Harris I, Badge H, Adie S, Mills K, et al. Evidence base and practice variation in acute care processes for knee and hip arthroplasty surgeries. PLoS One. 2017;12(7):e0180090.
38. Long H, Li Z, Xing D, Ke Y, Lin J. The usage of drainage after primary total hip or knee arthroplasty: best evidence selection and risk of bias considerations. BMC Musculoskelet Disord. 2021;22(1):1028.
39. Lazic S, Boughton O, Kellett CF, Kader DF, Villet L, Rivière C. Day-case surgery for total hip and knee replacement: How safe and effective is it? EFORT Open Rev. 2018;3(4):130-5.
40. Changjun C, Jingkun L, Yun Y, Yingguang W, Yanjun R, Debo Z, et al. Enhanced recovery after total joint arthroplasty (TJA): a contemporary systematic review of clinical outcomes and usage of key elements. Orthop Surg. 2023;15(5):1228-40.

Cite this article as: Singapanga RS, Ahmed R, Samuel AN. Surgical drains following arthroplasty: a systematic review and summary of evidence based on available systematic reviews. Int J Res Orthop 2025;11:854-61.