Review report of MTG43: PICO negative pressure wound dressings for closed surgical incisions

This medical technology guidance was published in May 2019.

All medical technology guidance is usually reviewed 3 years after publication, unless NICE become aware of significant new information before the expected review date.

This review report summarises new evidence and information that has become available since this medical technology guidance was published, and that has been identified as relevant for the purposes of this report. This report will be used to inform NICE's decision on whether this guidance will be updated, amended, remain unchanged (static list) or withdrawn.

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1. Original objective of guidance

To assess the clinical and cost effectiveness of PICO negative pressure wound dressings for closed surgical incisions

2. Current guidance recommendations

- Evidence supports the case for adopting PICO negative pressure wound dressings for closed surgical incisions in the NHS. They are associated with fewer surgical site infections and seromas compared with standard wound dressings.
- PICO negative pressure wound dressings should be considered as an option for closed surgical incisions in people who are at high risk of developing surgical site infections. Risk factors for surgical site infections are described in section 4.2 [age, obesity, cigarette smoking and diabetes. There are also several surgical situations that increase the risk, such as repeat operations and the need for emergency surgery].
- Cost modelling suggests that PICO negative pressure wound dressings provide extra clinical benefits at a similar overall cost compared with standard wound dressings.

3. Aim of evidence review

The aim of this report was to review the evidence published since the original guidance, and to address the following questions:

a) Considering the new evidence, how effective is PICO in preventing and treating surgical site infections compared with standard dressings? Does the new evidence support the recommendations in the original guidance?

b) Is there new evidence on the efficacy of the PICO dressings for different types of surgery described in MTG43 section 3.5? Is there new evidence on how PICO dressings affect other surgical site complications (such as wound dehiscence, haematoma, delayed healing or excessive scarring)? Does the meta-analysis in the original assessment need to be updated in light of new evidence?

c) PICO negative pressure wound dressings are recommended to be considered as an option for closed surgical incisions in people who are at high risk of developing surgical site infections. Risk factors for surgical site infections are described in section 4.2 of the original guidance. Is there new evidence on the use of PICO dressings in people with risk factors?

d) Is there new evidence on any complications that are associated with the PICO dressings?

e) New evidence from economic studies suggests that using PICO could be a cost saving option for preventing surgical site infections. How could new evidence impact the original guidance recommendations?

f) Is there any usage data available which shows the results of its use in the NHS? In addition to the company's usage data.

4. Methods of review

For this evidence review, the EAG categorised the outcomes of interest defined in the final scope into:

- efficacy (rate of post-surgical wound complications including SSI dehiscence, seroma, hematoma, delayed healing and abnormal scarring, amount of wound exudate, rates of re-operation for wound complications, length of hospital stay as a result of surgical complications, time to heal);
- resource use (number of dressing changes, staff time to apply device, ease of use of the device by the patient), and
- safety (device related adverse events).

However, studies did not clearly report complication or reoperation 'rates' (that is, number of, or proportion of patients experiencing the event, during a specified time period), therefore the EAG presented results for the relevant outcomes, simply as proportions of patients experiencing the event during the study.

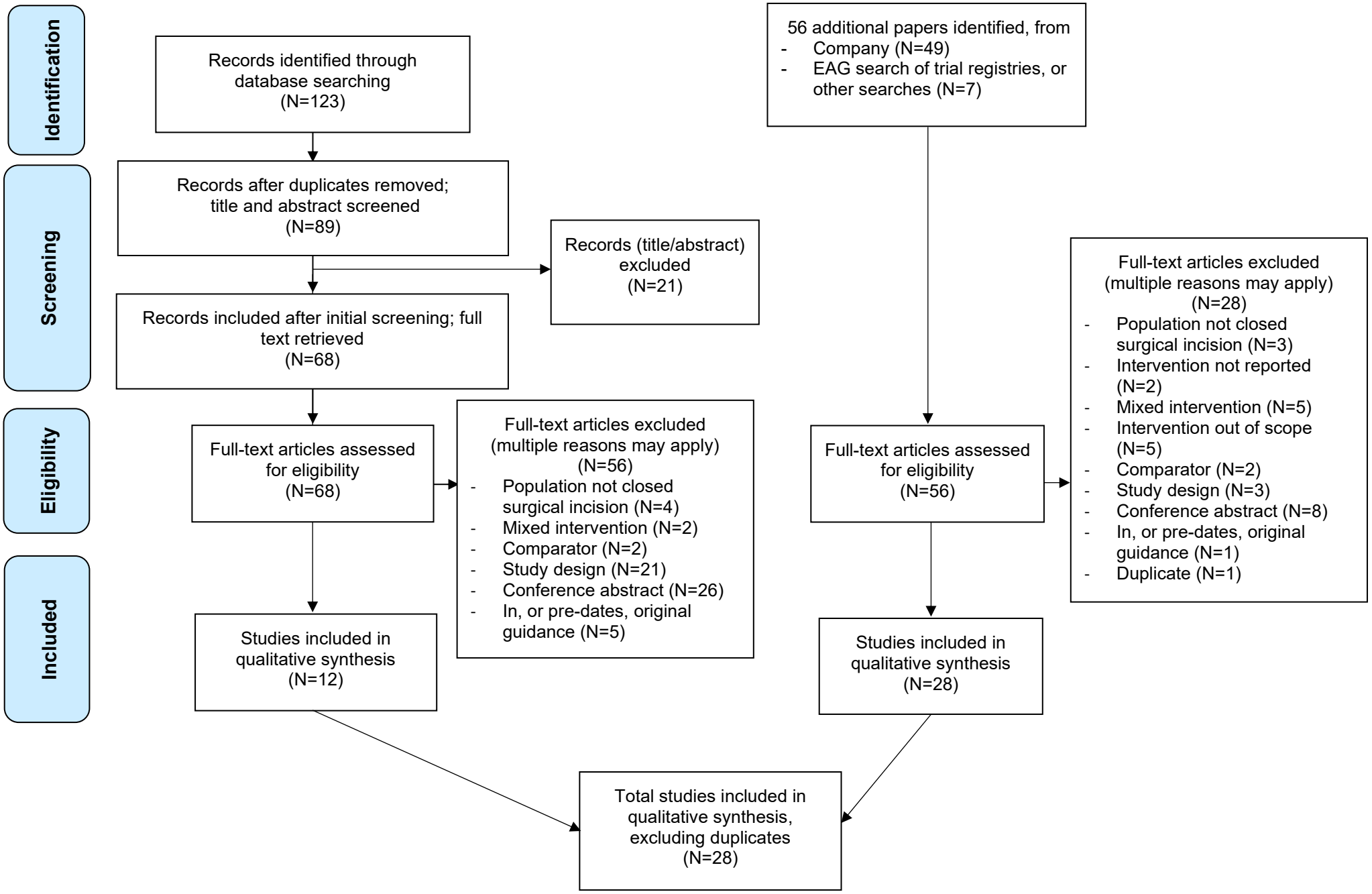
The NICE Information Services (IS) conducted a literature search, limited by date (August 2018 to August 2022), Appendix B. The IS search identified 123 references, reduced to 89 references after deduplication, and shared a reference library with the EAG. The 89 titles and abstracts were sifted by a single reviewer (RO), and 21 were not relevant to the scope (NICE MTG43 Scope, 2019), and therefore excluded. The full text articles were retrieved for the remaining 68 papers and assessed for inclusion against the scope by a single reviewer (RO). Due to poor reporting of levels of wound exudate within the published literature, the EAG included papers which did not explicitly include only patients with low to moderate levels of exudate (as defined in the final scope). In line with the scope, the EAG also excluded studies that did not use PICO for closed surgical incisions; in particular, ostomy reversal surgery that used purse string closure and explicitly stated that a small hole remained. Definition of high-risk of SSI varied across studies, therefore the EAG reviewed each study against procedural and patient risk factors described in the World Union of Wound Healing Societies (WUWHS, 2016) consensus document on "Closed surgical incision management". Additional opinion was sought from clinical experts to determine whether the surgical interventions were deemed high-risk of SSI (Appendix G2), but no responses were received in the time available. Due to the volume of evidence, the EAG did exclude studies reported only in conference abstracts, and any case series studies including 20 or fewer patients. A total of 56 papers were excluded from this search on full text review (Appendix C).

The Company provided 49 references, and the 2 clinical experts did not suggest any studies not already known to the EAG. The EAG considered the ongoing trials identified in the original Assessment Report, and hand searched the reference lists of systematic reviews and meta-analyses, to identify 6 further papers, and 1 more was identified while retrieving full text articles. Each of these 56 references were assessed for inclusion against the scope (NICE MTG43 Scope, 2019) by a single reviewer (RO or KK) (Appendix C), and 28 were considered relevant. All 12 identified by the NICE IS search were

included within this, and therefore a total of 28 papers published after MTG43 have been included in this review.

The literature search is summarised in Figure 1.

Figure 1: PRISMA diagram illustrating EAG literature search (N: number of papers)



5. New evidence

5.1 Changes in technology

The EAG is aware that the PICO device has been replaced by PICO 7, but the company confirmed that there have been no changes to the technology since guidance was published. It is still available in the UK to the NHS, and no new indications have been added, that were not covered by the original guidance.

In addition to the PICO 7 system, the EAG has identified ongoing studies using the PICO 14 system. The Company confirmed (Appendix G1) that PICO 14 launched in the UK in 2020, and that:

- PICO 7 is used for 7 days of therapy, and PICO 14 is used for 14 days therapy, but the function of delivering the therapy is equivalent between systems
- The amount of wound exudate handled by the device is determined by the dressing and not the negative pressure wound therapy pump, and the dressings are the same for both PICO 7 and PICO 14.
- PICO 14 was developed primarily for more complex chronic, open wounds which could need treatment over a longer period, whereas PICO 7 is used routinely for closed surgical incisions.

Additionally, PICO 7Y is a variation of PICO 7, which was developed specifically for bilateral breast surgery to treat 2 incisions simultaneously from one PICO device.

5.2 Changes in care pathways

The NICE IS team provided a list of NICE guidance relevant to this topic area (Appendix A). In 2021, the NICE guidance on caesarean section (NICE NG192) was updated to state that NPWT should be considered for women with a BMI of 35 kg/m^2 or more to reduce the risk of wound infections, and the use of PICO in this way could constitute a change in care pathway. Guidance identified for other technologies, although applicable to surgical site infections, would not be expected to affect the care pathway relating to PICO, as they

are either a prophylactic intervention with a different mode of action, or a treatment used primarily in chronic wounds rather than closed surgical incisions.

One of the Clinical Experts noted that they use PICO less now for closed incisions and 'high-risk' patients than they have done previously, and instead use it more selectively to manage complicated and infected wounds. The other Clinical Expert noted that they were aware of it being used to prevent issues around wound healing, but also when wounds have broken down. Both Clinical Experts were aware of competing devices, including Prevena (NICE MIB173).

5.3 Results from the MTEP research commissioning workstream

No studies have been facilitated by the MTEP research commissioning workstream.

5.4 New studies

The 28 studies eligible for inclusion in this evidence review included 24 clinical studies, and 4 economic studies.

The 24 clinical studies are summarised in Appendix E, and included:

- 12 RCTs (Andrianello et al. 2021, Bueno-Lledo et al. 2021, Flynn et al. 2020, Giannini et al. 2018, Hasselmann et al. 2020, Peterson et al. 2021, Svensson-Björk et al. 2022), including 1 on a pilot basis (Walker 2018), and 4 with stratification (Costa et al. 2020, Gillespie et al. 2021, Masters et al. 2021, O'Neill et al. 2020);
- 1 randomised trial (Fogacci et al. 2020), assumed by the EAG to be uncontrolled;
- 8 cohort studies: 3 prospective (Abadia et al. 2021, Canton et al. 2020, Irwin et al. 2020), 3 retrospective (Chan et al. 2020, Facchin et al. 2021, Ryu et al. 2022), and 2 prospective with a retrospective comparator group (Helito et al. 2020, Myllykangas et al. 2022);
- 3 before and after studies (Tabley et al. 2020, Tormey et al. 2021, Wikkeling et al. 2021).

The 24 clinical studies included a total of 7,790 patients, which ranged in size from 26 patients (Facchin et al. 2021) to 2,035 patients (Gillespie et al. 2021), with PICO wound dressings used in a total of 3,574 patients (Table 1). The EAG notes that this total does not include Irwin et al. (2020) because although they reported the total number of patients recruited, all other results were reported per breast, of which 126 received PICO dressings. 4 clinical studies were conducted in a UK NHS setting.

None of the included studies explicitly reported that they used PICO 7, PICO 7Y or PICO 14 versions of the device.

Twelve studies referred to the comparator as being a standard, conventional, or traditional dressing, 1 study referred to using gauze and a bandage, 1 study used ointment and a foam dressing, and dressings named by the remaining 10 studies included OPSITE (Smith & Nephew), Mepilex Border (Mölnlycke), Mepore-Pro (Mölnlycke), Vitri-Pad (ViTri Medical), Tegaderm (3M), Telfa (Cardinal Health), Farmapore (Farmac-Zabban), and Jelonet (manufacturer not named). The use of sutures, staples and adhesives also differed across the included studies.

The length of time that patients received treatment with PICO, or conventional dressings, also differed and was generally poorly reported. Many studies reported using dressings for seven days, unless the patient was discharged sooner, bleeding or saturation was observed, or at the discretion of staff. Studies reported a generally consistent approach between arms, however, the RCT by Peterson et al. (2021) reported using PICO for 7 days, and that comparator dressings were removed on postoperative day 1, which may introduce bias.

The included studies were conducted across a range of surgical specialties: orthopaedics (N=6), general surgery (N=4), vascular (N=4), breast (N=4), obstetrics (N=2), cardiothoracic (N=2), colorectal (N=1) and plastic and reconstructive (N=1).

Fourteen studies reported that all patients received prophylactic antibiotics (either pre-, peri-, or post-operatively), 6 studies reported prophylactic

antibiotics were given but not necessarily to all patients, and 4 studies did not report on the use of antibiotics.

Most studies (N=17) did not explicitly report on the use of wound drains, 5 studies reported that all patients received wound drains, 1 study reported that some patients received wound drains, and 1 study explicitly reported that patients with wound drains were excluded.

Reviewing each study against the WUWHS criteria, the EAG estimates that 16 studies included exclusively high-risk surgery; considering 13 at high-risk because of the procedure carried out, 1 at high-risk because of the population, and 2 at high-risk because of both the procedure and population. The remaining 8 studies included in this evidence review included patients with risk factors associated with surgical complications, however reporting was limited such that the EAG cannot confirm how many patients would be considered high-risk under the WUWHS criteria.

The EAG identified 4 economic studies (Murphy et al. 2021, Nherera et al. 2021, Png et al. 2020, Svensson-Björk et al. 2021), and cost analysis was reported in 5 of the included clinical studies (Costa et al. 2020, Irwin et al. 2020, Tabley et al. 2020, Tormey et al. 2021, Wikkeling et al. 2021), which are summarised in section 5.7 of this report. Six of the studies reported costs from the perspective of the UK NHS.

Table 1: Cross tabulation of included studies against outcomes

			Efficacy					Resource Use			Safety
Author (year); Country	Study design (number of patients)	Surgical specialty	Post-surgical wound complications	Re-operations for wound complications	Length of hospital stay as a result of surgical complications	Time to heal	Amount of wound exudate	Number of dressing changes	Staff time to apply device	Ease of use of the device by the patient	Device-related adverse events
Fogacci et al. (2020); Italy	Randomised trial (n=100)	Breast surgery	✓			✓					
Irwin et al. (2020); UK	Cohort [prospective] (n=196 patients, n=307 breasts)	Breast surgery	✓	✓	✓†						
Ryu et al. (2022); Korea	Cohort [retrospective] (n=60)	Breast surgery	✓	✓							
Tormey et al. (2021); UK, Ireland	Before and after study (n=162)	Breast surgery	✓								
Myllykangas et al. (2022); Finland	Cohort [prospective with retrospective comparator] (n=952)	Cardiothoracic	✓	✓	✓†					✓	✓
Tabley et al. (2020); France	Before and after study (n=233)	Cardiothoracic	✓		✓†						
Abadia et al. (2021); Spain	Cohort [prospective] (n=200)	Colorectal	✓		✓†						✓
Andrianello et al. (2021); Italy	RCT (n=100)	General surgery	✓		✓†					✓	
Bueno-Lledo et al. (2021); Spain	RCT (n=150)	General surgery	✓	✓	✓†						✓
Flynn et al. (2020); Australia	RCT (n=217)	General surgery	✓								
O'Neill et al. (2020); US	RCT (n=40)	General surgery	✓								
Gillespie et al. (2021); Australia	RCT (n=2,035)	Obstetrics	✓	✓	✓†						✓
Peterson et al. (2021); US	RCT (n=110)	Obstetrics	✓	✓							✓
Canton et al. (2020); Italy	Cohort [prospective] (n=65)	Orthopaedics	✓	✓						✓	✓
Costa et al. (2020); UK	RCT (n=1,629)	Orthopaedics	✓	✓							✓
Giannini et al. (2018); Italy	RCT (n=110)	Orthopaedics	✓					✓			✓
Helito et al. (2020); Brazil	Cohort [prospective with retrospective comparator] (n=296)	Orthopaedics	✓	✓	✓†						✓
Masters et al. (2021); UK	RCT (n=462)	Orthopaedics	✓	✓							
Walker (2018); Australia	Pilot RCT (n=50)	Orthopaedics	✓	✓							
Facchin et al. (2021); Italy	Cohort [retrospective] (n=26)	Plastic and Reconstructive	✓	✓	✓†	✓		✓			✓
Chan et al. (2020); Singapore	Cohort [retrospective] (n=154)	Vascular	✓	✓							
Hasselmann et al. (2020); Sweden	RCT (n=178)	Vascular	✓	✓							✓
Svensson-Björk et al. (2022); Sweden	RCT (n=275)	Vascular	✓	✓						✓	✓
Wikkeling et al. (2021); Netherlands	Before and after study (n=108)	Vascular	✓	✓	✓†					✓	

Key: †overall length of stay of patients (not specific to surgical complications)

Abbreviations: RCT, Randomised controlled trial

Rate of post-surgical wound complications

Surgical site infection (SSI)
A total of 22 studies reported on SSI outcomes (Appendix E2), of which 3 found a significant difference between PICO and standard care dressings, which included 2 RCTs (Bueno-Lledo et al. 2021, Hasselmann et al. 2020) and 1 prospective cohort study (Abadía et al. 2021).

The criteria used to define SSI differed across the included studies. Eleven studies used the CDC definition of SSI, 9 did not report the definition, 1 used the VICNISS criteria, which is based on the CDC definition, and 1 used their own definition of SSI. Of the 12 studies using CDC, or CDC-based, definitions of SSI, the time points used also varied across studies: 6 reported at 30 days, 2 reported at 6 weeks, and because the CDC revised their criteria to include a time point at 90 days while studies were being done, 2 reported at 90 days, and 2 reported at both 30 and 90 days. Six studies reported on the type of SSI (for example, superficial, deep, organ space) separately (Tormey et al. 2021, Myllykangas et al. 2022, Andrianello et al. 2021, Gillespie et al. 2021, Hasselmann et al. 2020, Svensson-Björk et al. 2022). One study reported on any type of surgical site infection (Flynn et al. 2020), 1 study grouped superficial and deep together (O'Neill et al. 2020), 5 reported on superficial infections only (Tabley et al. 2020, Abadía et al. 2021, Bueno-Lledo et al. 2021, Peterson et al. 2021, Chan et al. 2020), and 2 reported on deep infections only (Costa et al. 2020, Masters et al. 2021). Seven studies did not specify the types of SSI being reported (Fogacci et al. 2020, Ryu et al. 2022, Canton et al. 2020, Helito et al. 2020, Walker 2018, Facchin et al. 2021, Wikkeling et al. 2021). The timepoint at which SSI was measured ranged between 30 days and 12 months across the included studies; however the timepoint was not explicitly reported in 7 studies. The CDC definition of SSI within 30 days was reported in 8 studies.

Three studies (Giannini et al. 2018, Hasselmann et al. 2020, Svensson-Björk et al. 2022) used the ASEPSIS score to quantify severity of infection based on wound appearance. One reported a statistical difference in mean ASEPSIS score between PICO and standard care dressings (Giannini et al. 2018) and 2

used a threshold (ASEPSIS score greater than 20) to define SSI and showed a significant difference between PICO and standard dressings (Hasselmann et al. 2020; Svensson-Björk et al. 2022).

When accounting for multiple predictor variables, 2 studies noted that negative pressure wound therapy (NPWT) was significantly associated with a reduction in SSI (Abadía et al. 2021) or any surgical site complications (Helito et al. 2020). Peterson et al. 2021 reported no difference in primary composite outcome (occurrence of at least 1 complication within 6 weeks: superficial, deep or organ space SSI, using CDC criteria, skin blisters, scar separation >1 cm, seroma or haematoma requiring evacuation, wound debridement, hospital readmission, or requirement for reoperation for wound care management) between PICO and standard dressings in patients with a BMI greater than or equal to 40 kg/m^2 undergoing caesarean section.

Although Tabley et al. (2020) did not report overall proportions of patients suffering deep sternal wound infection (DSWI), they did report 1 death related to DSWI, in the standard dressing group 14 days after surgery; no deaths occurred in the PICO group related to deep sternal wound infection.

Dehiscence

Twelve studies reported on the proportions of patients developing wound dehiscence, with 1 reporting dehiscence of the skin and fascia separately (Flynn et al. 2020), Appendix E3. Only 1 study (cohort with retrospective comparator group) reported a significant difference in this outcome between PICO and standard dressings (Helito et al. 2020). However, the EAG notes that no studies were powered for this outcome.

Seroma

Of the 10 studies which reported on the proportion of patients developing seroma (Appendix E4), only 1 RCT (Andrianello et al. 2021) and 1 cohort study (Ryu et al. 2022) reported a significant difference between arms. In addition to reporting the proportions of patients developing seromas, Ryu et al. (2022) also reported significant differences in their mean duration and volume between PICO and standard dressing groups. However, the EAG

notes that none of the included studies were powered to detect differences in this outcome.

Haematoma
Eleven studies reported on haematoma outcomes (Appendix E5). No significant differences were found in any study between PICO and standard care arms; however the EAG notes that none of the included studies were statistically powered to detect a difference in this specific outcome.

Delayed healing
Only 1 study (Giannini et al. 2018) reported on wound healing, and found that under the ASEPSIS criteria, all patients had 'satisfactory healing' (ASEPSIS category: 0 to 10) except 10% (5/50) of control patients, who had a 'disturbance of wound healing' (ASEPSIS category: 11 to 20).

Scarring
3 studies reported on scar appearance using 4 different validated scoring systems [Visual Analogues Scale (VAS), Stony Brook Scar Evaluation Scale (SBSES), Patient and Observer Scar Assessment Scale (POSAS), Vancouver rating scale] at time points ranging between 7 days and 6 months (Appendix E6). Due to heterogeneity in this outcome the EAG is unable to comment on trends.

Other
Helito et al. (2020) reported a statistically significant difference in necrosis complications between PICO and conventional dressings in patients undergoing elective unilateral knee arthroplasty (2.1% versus 8.5%, p=0.04). Conversely, Canton et al. (2020) reported no significant difference in wound edge necrosis between PICO (6.3%, 1/16) and standard dressings (16.3%, 8/49), p=0.43, in patients undergoing open reduction and internal fixation for ankle or distal tibia fracture. Costa et al. (2020) reported no significant difference in wounds being red and inflamed, swollen, painful or tender, complications treated with antibiotic, or fluid leaking wound complications occurring between 30 and 90 days for those without an infection (n=1,088) between PICO and standard dressing arms. Irwin et al. (2020) reported a significant difference in wound breakdown between PICO and standard

dressings (0.8% versus 5.5%, p=0.01), and no significant difference between other minor or major complications.

Re-operation for wound complications

Thirteen studies reported the proportion of patients requiring subsequent reoperation (Appendix E7); 4 of these studies (Irwin et al. 2020, Ryu et al. 2022, Gillespie et al. 2021, Walker 2018) did not explicitly report whether any or all reoperations were related to wound complications. Helito et al. 2020 reported a significant difference in the proportion of patients requiring reoperation between PICO and standard dressings. Ryu et al. 2022 reported a significant difference in the proportion of patients requiring an unplanned return to theatre between PICO and standard dressing groups (2.7% versus 26.1% respectively, p=0.01). Facchin et al. (2021) reported that 1 patient in the comparator group needed surgical revision because of wound dehiscence.

Readmission or re-attendance

Seven studies reported on proportions of patients needing readmission (Appendix E8), however no significant differences between PICO and standard dressing groups were reported. The EAG notes that reasons for readmission were poorly reported, and therefore the EAG was unable to establish whether all readmissions were related to wound complications or other reasons.

Length of hospital stay as a result of surgical complications

Nine studies reported on overall length of hospital stay (Appendix E9). Only 1 cohort study by Facchin et al. 2021 (n=26) found a significant difference between groups, reporting a mean length of stay of 3.07 (SD: 1.14) days in the PICO group (n=14), and 5.33 (SD: 1.49) days in the comparator group (n=12), p<0.05.

Two studies (Abadía et al. 2021, Tabley et al. 2020) compared lengths of stay for patients with and without complications, but did not report them separately for the intervention and comparator groups. Abadía et al. 2021 reported a statistical difference in the mean length of stay of 4.5 days between patients

experiencing a superficial SSI and those not; 16.21 [95%CI 12.73 to 19.70] days versus 11.73 [95%CI 9.73 to 13.74, p<0.01]. Tabley et al. 2020 reported a mean length of stay of 21.4 days in patients with complications and 11.5 days in those without; however no statistical analysis was reported.

Time to heal
Two studies reported time to heal as an outcome measure. Fogacci et al. 2019 reported a smaller mean time of 25.66 days when treated with PICO, than patients treated with a standard dressing (mean of 31.46 days); however no statistical analysis was reported. Facchin et al. (2021) reported 'time to dry' as being 9.36 (SD: 2.15) days for the PICO group, and 17.66 (SD: 4.79) days for the dry dressing group (p<0.05), which the EAG has assumed can be considered a proxy for wound healing.

Amount of wound exudate
None of the included studies reported on this outcome.

Number of dressing changes
Two studies reported on the number of dressing changes.

Facchin et al. (2021) reported that patients treated with PICO needed significantly fewer dressing changes compared with standard dressings; mean (SD) of 2.00 (0.77) versus 4.91 (0.79) respectively, p<0.05. Giannini et al. (2018) also reported a significant difference in number of dressing changes between groups (p<0.001), (Table 2).

Table 2: Number of dressing changes, reported by Giannini et al. (2018)

Number of dressing changes	Proportion of patients in PICO arm	Proportion of patients in comparator arm
1	90% (45/50)	4% (2/50)
2	8% (4/50)	12% (6/50)
3	2% (1/50)	52% (26/50)
4	0% (0/50)	28% (14/50)
5	0% (0/50)	4% (2/50)
Abbreviations: PICO, single use negative pressure wound therapy		

Staff time to apply device
None of the included studies reported on this outcome.

Ease of use of the device by the patient
Five studies reported broadly on ease of using the PICO system.

Andrianello et al. (2021) reported that the proportion of patients with good compliance was not statistically different between PICO and conventional dressings in patients who did not drop out by post-operative day 7; 94.7% (36/38) versus 95.8% (46/48), p=1.000. Canton et al. (2020) reported no incompatibility or conflict with the modified cast (to permit use of PICO device) in patients having open reduction internal fixation for ankle and distal tibia fractures. Myllykangas et al. (2022) reported that in 6.7% (12/180) of patients, treatment with PICO was interrupted before postoperative day 5; in 3 cases the patient removed the device because of postoperative delirium or discomfort, in 3 cases there were technical difficulties (no further detail provided), and in 6 cases no reason was given. One further patient removed the device themselves on postoperative day 5 for an unknown reason, but treatment otherwise lasted 6 to 7 days with no technical difficulties. Svensson-Björk et al. (2022) reported that 9 patients did not tolerate the PICO system and tubing (noting that 6 had postoperative confusion), 1 was disturbed by noise from the pump. Nine patients reported technical problems with PICO; 8 patients experienced leakage,1 patient experienced a lack of suction. In total, 6.0% (11/183) of patients discontinued use of PICO prior to the recommended 7 days of treatment. Walker (2018) reported that there was no difference in the proportion of patients who removed their PICO or standard dressing before day 5.

Although not strictly related to this outcome, Wikkeling et al. (2021) reported that clinicians found the device easy to apply and operate, and noted feedback that patients were happy to receive the PICO system.

Device-related adverse events
Ten of the included studies reported on adverse events.

4 studies (Abadia et al. 2021, Bueno-Lledo et al. 2020, Canton et al. 2020, Hasselmann et al. 2020) reported that there were no adverse events caused by the PICO dressing.

Blistering

Giannini et al. (2018) reported a significant difference in blistering between PICO and standard dressings ($p<0.05$); with both fewer patients experiencing blistering and fewer blisters reported in those treated with PICO. Conversely, Gillepsie et al. 2021 reported a significant increase in the proportion of patients experiencing blistering with PICO when compared with standard dressing (4.0% versus 2.3%, $p=0.03$). Two studies (Helito et al. 2020, Peterson et al. 2021) reported no significant difference in blistering between PICO and conventional dressings. Facchin et al. (2021) reported only blistering on the arm of 1 patient in the conventional dressing group, which was treated with a wet to dry dressing. Canton et al. (2020) reported that no patients receiving PICO dressing for 7 days (n=16) experienced blistering.

Itching, irritation or rash

Three studies (Facchin et al. 2021, Gillespie et al. 2021, Myllykangas et al. 2020) reported on itching, irritation or rash. Facchin et al. (2021) found that 3 patients treated with PICO experienced increased itching, but that there was no need to change the dressing or stop therapy. In their per protocol analysis, Gillespie reported itching or a rash in 1.0% (10/996) of patients treated with PICO, and 0.3% (3/983) of patients treated with a standard dressing; a difference that was not statistically significant. Removal of the device because of skin irritation was reported by Myllykangas et al. (2020) on day 5. Treatment was otherwise considered well tolerated, with no further adverse events, although 1 patient with DSWI removed their device on postoperative day 5 for an unknown reason, and no signs of irritation were seen at dressing removal in the remaining patients with DSWI. Canton et al. (2020) reported that no patients receiving PICO dressing for 7 days (n=16) experienced rash or itching.

Discomfort or pain

Facchin et al. (2021) reported that there was no discomfort associated with either type of dressing, and Svensson-Björk et al. (2022) reported that 2 patients using PICO experienced pain or discomfort. Canton et al. (2020)

reported that no patients receiving PICO dressing for 7 days (n=16) experienced pain or discomfort.

Other

Costa et al. (2020) reported serious adverse events related to surgery in 1.2% (9/750) of patients in the intervention arm, and 1.6% (12/750) of patients in the comparator arm, but did not explicitly define them, and indicated that these would be reported separately as part of a longer term follow up. The EAG notes that the numbers of patients with data available for this outcome are not reported, and has therefore calculated 750 patients based on the percentages and numbers of adverse events reported. Gillespie et al. (2021) also reported other adverse events related to surgery, including neonatal death, admissions to ICU, and a life-threatening condition, but these were not considered to be because of the wound dressings used.

Patient reported outcomes

Costa et al. (2020) reported no difference between PICO and standard dressings in terms of the Disability Rating Index between 3 and 6 months after surgery, and Health-Related Quality of Life (EQ-5D-utility) at 6 months after surgery. Giannini et al. (2018) reported a significant difference in pain, measured by VAS, between PICO (mean 2.6; median [range] 2.0 [1.0 to 6.0]) and standard dressings (4.8; 5.0 [2.0 to 7.0], p<0.001) at dressing change.

5.5 Meta-analysis

The EAG, within the original Assessment Report (NICE MTG43 Assessment Report, 2019), reported meta-analysis of surgical site infection outcome combining results from 19 studies and 4,473 patients (from 8 RCTs and 11 observational studies) comparing PICO wound dressings with standard dressings. The EAG reported that PICO was associated with a significant reduction in SSI (OR 0.39 [95%CI 0.29 to 0.52], p<0.00001). However because of the time constraints of this evidence review, the Newcastle EAG has not attempted to replicate this previous meta-analysis, and has not reviewed the primary evidence that was included within it.

Based on the new evidence published since MTG43, the EAG would consider it appropriate to combine results from 8 studies (including 6 RCTs: Andrianello et al. 2020, Costa et al. 2020, Flynn et al. 2020, Gillespie et al. 2021, Masters et al. 2021, O'Neill et al. 2020; and 2 cohort studies: Abadía et al. 2021, Chan et al. 2020), which all reported SSI outcomes as defined by the CDC within 30 or 90 days. However, without a full review, the Newcastle EAG is unable to determine which studies from the previous meta-analysis are consistent with this, and therefore suitable for inclusion in an updated meta-analysis.

Within this evidence review, the EAG identified a total of 10 systematic reviews (Appendix D):

- Seven of these (Almansa-Saura et al. 2021; Elhage et al. 2021; Guo et al. 2022; Meyer et al. 2020; Shiroky et al. 2020; Svensson-Bjork et al. 2019; Wells et al. 2019) reported meta-analysis and aggregated other NPWT technologies (VAC Therapy, PREVENA, VSD, unspecified device) with PICO NPWT within the intervention arm.
- Two of these systematic reviews reported evidence from PICO NPWT technology only (Saunders et al. 2021; Strugala and Martin 2017), and both were funded by the Company (Smith & Nephew). The most recently published of the 2 incorporated evidence from 29 studies (5 conference abstracts and 24 peer-reviewed studies, of which 11 were RCTs and 13 observational) and reported that PICO was associated with a significant reduction in SSI (OR [95%CI 0.28 to 0.50]), wound dehiscence (OR 0.70 [0.53 to 0.92]), seroma (OR 0.23 [95%CI 0.11 to 0.45]) and mean length of hospital stay (-1.75 [95%CI -2.69 to -0.81] days]), when compared to standard care. The Newcastle EAG has not critiqued or replicated either meta-analysis within this evidence review.
- An additional systematic review reported studies using PICO as a subgroup (Singh et al. 2019). This included 8 RCTs and found no difference in SSI rates between PICO and standard care (OR 1.70 [0.94 to 3.08], p=0.08). However, the EAG notes that conflicts of interest were declared for several authors for their association with KCI

or Acelity (manufacturer of a competitor NPWT device, VAC Therapy). The Newcastle EAG has not critiqued or replicated this meta-analysis within this evidence review.

5.6 Ongoing trials

From the search conducted by NICE IS team, 10 recruiting studies and 3 studies not yet recruiting (Appendix F) were identified; 2 in obstetric surgery, 4 orthopaedic, 2 gastrointestinal, 2 vascular, 1 breast surgery, 1 cardiology and 1 dermatology (skin graft). 1 ongoing study has reported interim results (NCT01913132, Hasselmann et al. 2020 and Svensson-Björk et al. 2022) and was included in this evidence review report. Seven completed studies with no publication of results were identified; 3 were conducted in a UK setting (NCT04102865, NCT03835845, NCT03698968) and all 3 were sponsored by the Company (Smith & Nephew Inc).

Three terminated studies were identified (NCT02492854, NCT03010137, NCT05234632); 2 were sponsored by the Company, and 1 was out of scope as it included a mixed population of chronic and closed incision wounds. One study was withdrawn before starting (NCT03450616) because of funding and the principal investigator leaving the organisation.

5.7 Changes in cost case

The Company confirmed the updated pricing of PICO wound care system, Table 3, and later also provided costs for PICO 14. The Company also provided an estimated use by speciality: [redacted]

Table 3: Updated costs of PICO wound care system

Device	Previous costs (2018)	Updated costs (2022) from NHS Supply Chain, excluding VAT
PICO (single-use pump and 2 dressings), excluding VAT	£127.06 to £145.68	[redacted]
PICO (single-use pump and 1 dressings), excluding VAT	N/A	[redacted]

PICO 7Y (intended for bilateral breast surgery), excluding VAT	N/A	[redacted]
PICO 14, excluding VAT	N/A	[redacted] (EAG assumes company list price)

The EAG identified 9 papers which reported economic outcomes, including 6 from a UK NHS perspective (Costa et al. 2020 and Png et al. 2020 reporting on the same study, Irwin et al. 2020, Murphy et al. 2021, Nherera et al. 2021, and Tormey et al. 2021 which included UK and Ireland), Appendix E10. The remaining studies were done in France (Tabley et al. 2020), the Netherlands (Wikkeling et al. 2021), and Sweden (Svensson-Björk et al. 2021) and have not been tabulated because they are not generalisable to the UK.

Four studies showed NPWT with PICO dressings to be *cost saving* when compared with standard dressings (Irwin et al. 2020, Murphy et al. 2021, Nherera et al. 2021, and Tormey et al. 2021). Two studies also showed PICO to be *cost-effective* when compared with standard dressings; 1 (Nherera et al. 2021) across all closed surgical incisions with subgroup analysis reported for different surgery types (orthopaedic, colorectal, caesarean section, breast surgery, vascular, cardiothoracic), and 1 (Murphy et al. 2021) in breast reconstruction surgery, reporting costs associated with reconstruction failure (implant loss, removal, and reimplantation).

Only 1 study (reported in both Costa et al. 2020 and Png et al. 2020) showed NPWT to be significantly cost-incurring when compared to conventional dressings. This focused on fractures following major trauma to the lower limb and found no difference in deep SSIs in surgical incisions between NPWT and conventional dressing arms at 30 or 90 days, and no difference in disability, quality of life or appearance at 3 or 6 months between arms. The incremental cost-effectiveness ratio (ICER) in the base-case was £396,531 per QALY, with the authors concluding it was very unlikely to be cost-effective in this population. However, the EAG notes that this study reported only on deep SSI, and not total SSI (superficial, deep, organ or space).

The EAG notes that the two Clinical Experts held different opinions on the potential of PICO to be cost saving.

5.8 Other relevant information

Safety information

The NICE IS team, identified a total of 273 adverse event records, 5 pre-market notifications and 0 recalls from the Manufacturer and User Facility Device Experience (MAUDE) database.

The NICE IS team (on 24 August 2022) did not identify any field safety notices for PICO wound dressings on the Medicines & Healthcare products regulatory Agency (MHRA) database.

Real world evaluation

The Company shared a list of [redacted] *ongoing* real-world evaluation (RWE) Quality Improvement Audits being conducted within the UK. Due to their ongoing status, the results of these RWEs have not been considered within this evidence review. When published and peer-reviewed, this additional evidence could be considered within future meta-analysis.

Objectives

a) Considering the new evidence, how effective is PICO in preventing and treating surgical site infections compared with standard dressings? Does the new evidence support the recommendations in the original guidance?

The original guidance supported the case for adopting PICO for closed surgical incisions in the NHS because they were associated with fewer surgical site infections and seromas, compared with standard wound dressings. Most of the studies (N=22) included in this evidence review reported the proportion of patients experiencing SSI, although as noted previously, there was heterogeneity in how this was defined and the time period over which it was evaluated. Only 2 RCTs (Bueno-Lledo et al. 2021, Hasselmann et al. 2020) and 1 prospective cohort study (Abadía et al. 2021) found significantly fewer patients experienced SSI when treated with PICO; all

other studies reported equivocal results for this outcome. An updated meta-analysis could be used to better answer this question. However, to reduce heterogeneity in outcomes, the EAG considers that meta-analysis should be restricted to studies reporting SSI within 30 or 90 days, in line with the CDC definition. This includes 6 RCTs (Andrianello et al. 2020, Costa et al. 2020, Flynn et al. 2020, Gillespie et al. 2021, Masters et al. 2021, O'Neill et al. 2020) and 2 cohort studies (Abadía et al. 2021, Chan et al. 2020).

b) Is there new evidence on the efficacy of the PICO dressings for different types of surgery described in MTG43 section 3.5? Is there new evidence on how PICO dressings affect other surgical site complications (such as wound dehiscence, haematoma, delayed healing or excessive scarring)? Does the meta-analysis in the original assessment need to be updated in light of new evidence?

The range of specialities and quantity of evidence is similar between this evidence review (N=24 studies) and that reported in the original assessment report (N=23 peer-reviewed studies), Table 4. One observational study in plastic surgery (brachioplasty; Facchin et al. 2020) was identified in this evidence review, but no evidence in this speciality (other than mammoplasty, which has been categorised as breast surgery) was available in the original assessment report. The EAG would also consider separating any meta-analysis by surgical specialty.

Table 4: Summary of evidence using PICO system by surgical speciality

	Original assessment report* (2018)		Evidence review (2022)	
Specialty	RCT	Observational	RCT	Observational
Orthopaedic	3	5	4	2
Breast	2	2	1	3
Colorectal	1	2	0	1
General surgery	1	2	4	0

	Original assessment report* (2018)		Evidence review (2022)	
Obstetric	2	1	2	0
Plastic	0	0	0	1
Vascular	1	1	2	2
Cardiothoracic	1	0	0	2
Total	**11**	**12†**	**13**	**11**

*from Table 5 & Table 6 of assessment report (excluding conference abstracts)
†one study reported results from colorectal and breast subgroups separately
Abbreviations: RCT, Randomised Controlled Trial

The EAG concludes that there is not enough new evidence for the use of PICO in different types of surgery, and that any updated meta-analysis should be limited to that identified under objective a). The definition and time points of measurement of other outcomes, including seroma (N=10 studies), dehiscence (N=12), haematoma (N=11), delayed healing (N=1), and scarring (N=3) also varied across the included studies. The EAG notes that none of these studies were powered to detect a difference in these outcomes, and any meta-analysis would be exploratory only.

c) PICO negative pressure wound dressings are recommended to be considered as an option for closed surgical incisions in people who are at high risk of developing surgical site infections. Risk factors for surgical site infections are described in section 4.2 of the original guidance. Is there new evidence on the use of PICO dressings in people with risk factors?

All 24 clinical studies included within this evidence review included patients with risk factors for surgical site complications. In reviewing the procedural and patient characteristics against the World Union of Wound Healing Societies (WUWHS, 2016), the EAG has considered that 16/24 (7 RCTs, 7 cohort studies, and 2 before and after studies) included exclusively high risk surgeries, either because of the procedure itself (N=13), the population (N=1), or both (N=2). Clinical Expert opinion was sought to verify this, but not received within the timeframe of this evidence review, and it is unclear to the EAG whether the experts would be willing to comment on specialties outside of their own areas of expertise. Overall, the EAG would consider that the included evidence is not reported well enough to separately consider the

efficacy of PICO dressings by risk factor (particularly as patients may have more than one risk factor). Of note, only one study (Myllykangas et al. 2022) considered subgroups, reporting infections in those with diabetes and obesity.

d) Is there new evidence on any complications that are associated with the PICO dressings?

There is limited evidence of device-related adverse events associated with PICO; 4/10 studies reporting on adverse events documented no events caused by the PICO dressing.

- Two studies found a significant difference in blistering between the 2 groups, with Gillespie et al. (2021) reporting more blistering in the PICO group, and Giannini et al. (2018) reporting fewer patients experiencing blisters and fewer blisters overall in the PICO group.
- Three studies (Facchin et al. 2021, Gillespie et al. 2021, Myllykangas et al. 2020) reported non-statistically significant increased itching, irritation or rash associated with PICO, but only Myllykangas et al. (2020) reported that treatment was stopped because of this, and only in 1 patient.
- Facchin et al. (2021) reported no difference in pain or discomfort between PICO and standard dressings, and Svensson-Björk et al. (2022) reported pain in two patients treated with PICO.
- Two studies reported no difference in compliance between PICO and standard dressings (Andrianello et al. 2021, Walker 2018), and 2 studies reported issues with patient acceptability of PICO (Svensson-Björk et al. 2022, Myllykangas et al. 2020), leading to termination of treatment. Svensson-Björk et al. (2022) reported these in relation to delirium or confusion, device noise, or presence of additional tubing. Myllykangas et al. (2020) reported them in relation to technical difficulties or undefined reasons.

  The EAG considers that the reported adverse events are not of great clinical significance, and should not impact on the guidance recommendations or use of PICO.

e) New evidence from economic studies suggests that using PICO could be a cost saving option for preventing surgical site infections. How could new evidence impact the original guidance recommendations?

The EAG identified a total of 9 economic papers, with 6 from a UK NHS perspective. Four showed PICO to be cost-saving, with 2 of these also demonstrating cost-effectiveness and only 2 (reporting on the same study) cost-incurring when compared with conventional dressings. However, the EAG notes that the latter study reported only on deep SSI following surgical repair of major trauma fractures to the lower limb, and not total SSI (superficial, deep, organ or space). The economic model comparing PICO with standard dressings should be updated to use results from an updated meta-analysis, as described under objective a).

f) Is there any usage data available which shows the results of its use in the NHS? In addition to the company's usage data.

The evidence suggests that PICO is being used in the UK across a range of specialties, as a total of 4 clinical and 6 economic studies have been published since MTG43 in a UK setting. The Company has also shared a list of an additional [redacted] ongoing real-world Quality Improvement Audits which are being done within the UK.

Other

The EAG recommends changing the title of MTG43 to "PICO single use negative pressure wound therapy system for closed surgical incisions", and the Company would welcome this change to title (Appendix G1).

6. Conclusion

The EAG identified 9 new economic studies, and 24 new clinical studies (5 of which also reported cost analysis) published since MTG43 (2019). This included: 12 RCTs, 1 randomised trial (uncontrolled), 8 cohort studies (3 prospective, 3 retrospective, 2 prospective with a retrospective comparator),

and 3 before and after studies. There is substantial heterogeneity among the studies included in this evidence review, in terms of surgical specialty, population, inclusion of and definition of high-risk patients, the criteria used to define outcomes and the time point at which they were measured.

Given that few studies report statistically significant results for any outcome, the EAG considers that updating the previous meta-analysis to include newly identified studies would be appropriate. However, this should be done following a full review of the previously included studies, to make sure they consistently report SSI outcome as defined by the CDC within 30 or 90 days. The EAG notes that no new studies were statistically powered to detect differences in other surgical site complications (for example, seroma, dehiscence), and therefore further meta-analysis on these outcomes would be of limited value. Unfortunately, there is insufficient evidence, reported separately, for the EAG to comment on the efficacy of PICO for specific patient risk-factors of SSI. However, additional meta-analysis by surgical specialty may be appropriate.

The cost of PICO has changed slightly since the original guidance was published, but this alone is unlikely to change the recommendations made. However, the economic model should be updated to include the results of any updated meta-analysis. The new economic studies identified still broadly report cost savings or cost-effectiveness when using PICO instead of standard dressings, with the exception of Costa et al. (2020) and Png et al. (2020), who studied deep SSI only, which is a rarer outcome than superficial or combined SSI reported in other studies.

Overall, the results presented in this evidence review are inconclusive, and further work is needed to update the meta-analysis before a recommendation regarding guidance review is made.

Appendix A – Relevant guidance

Appendix A1: NICE guidance – published

NICE guidelines (clinical, public health, social care, medicine practice guidelines, safe staffing)

Caesarean birth (2021) NICE guideline NG192

Surgical site infections: prevention and treatment (2020) NICE guideline NG125

Hypothermia: prevention and management in adults having surgery (2008, updated 2016) NICE guideline CG65

Pressure ulcers: prevention and management (2014) NICE guideline CG179

Healthcare-associated infections: prevention and control (2011) NICE guideline PH36

NICE quality standards

Healthcare-associated infections (2016) NICE quality standard 113

Surgical site infection (2013) NICE quality standard 49

NICE technology appraisals and highly specialised technologies

None

NICE interventional procedures, medical technologies or diagnostics guidance

Prontosan for treating acute and chronic wounds (2022) NICE medical technologies guidance 67

Plus Sutures for preventing surgical site infection (2021) NICE medical technologies guidance 59

Leukomed Sorbact for preventing surgical site infection (2021) NICE medical technologies guidance 55

The VAC Veraflo Therapy system for acute infected or chronic wounds that are failing to heal (2021) NICE medical technologies guidance 54

UrgoStart for treating diabetic foot ulcers and leg ulcers (2019) NICE medical technologies guidance 42

The Debrisoft monofilament debridement pad for use in acute or chronic wounds (2019) NICE medical technologies guidance 17

Negative pressure wound therapy for the open abdomen (2013) NICE interventional procedures guidance 467

The MIST Therapy system for the promotion of wound healing (2011) NICE medical technologies guidance 5

All other NICE guidance and advice products - MedTech, ESNM / Evidence Summary, ESUOM, Key Therapeutic Topic, QOF Indicator, and NICE CKS

Granulox for managing chronic non-healing wounds (2022) NICE Medtech innovation briefing 296

WoundExpress to manage lower leg wounds (2021) NICE Medtech innovation briefing 296

NATROX oxygen wound therapy for managing diabetic foot ulcers and complex or chronic non-healing wounds (2020) NICE Medtech innovation briefing 208

LQD Spray for treating acute and chronic wounds (2019) NICE Medtech innovation briefing 202

Prevena incision management system for closed surgical incisions (2019) NICE Medtech innovation briefing 173

EpiFix for chronic wounds (2018) NICE Medtech innovation briefing 139

TopClosure Tension Relief System for wound closure (2017) NICE Medtech innovation briefing 97

Chronic wounds: advanced wound dressings and antimicrobial dressings (2016) NICE evidence summary ESMPB2

Appendix A2: NICE guidance – in development

NICE technology appraisals and highly specialised technologies

Oleogel-S10 for treating skin wounds associated with epidermolysis bullosa ID1505

NICE technology appraisal guidance. Publication date TBC

Appendix A3: Guidance from other professional bodies

None

Appendix B – Literature search strategy

Appendix B1: Adverse events sources

FDA Medical Devices

MAUDE database
Premarket Notifications (510(k)s)
Recalls of Medical Devices

Search Date	24 August 2022

Results

274 results for PICO 7 (latest version) in Maude

Pre-market notifications

pico 7 single use negative pressure wound therapy system, pico 14 single use negative pressure wound therapy system, pico fluid management packs[17]	K211318[18]	01/05/2022
pico single use negative pressure wound therapy system, pico 7 single use negative pressure wound therapy system, pico 7y single use negative pressure wound therapy system, pico 14 single use negative pressure wound therapy system[19]	K203716[20]	12/14/2021
pico 7 single use negative pressure wound therapy system, pico 7y single use negative pressure wound therapy system, pico 14 single use negative pressure wound therapy system, pico fluid management pack[21]	K202157[22]	10/30/2020
pico 7y single use negative pressure wound therapy system[23]	K182323[24]	01/18/2019
pico 7 single use negative pressure wound therapy system[25]	K180698[26]	08/21/2018

No recall notices found

MHRA

Search Date	**24 August 2022**

Results

Nothing found

Appendix B2: Trial sources

Search Date	**25 August 2022**

Ongoing studies

Title: The Effect of Negative Pressure Wound Therapy on Wound Healing in Major Amputations of the Lower Limb
Study number: NCT04618406
No. of patients: 160
Status: Recruiting
Start date: November 2021
Primary completion date: Not stated
Location: Denmark
Included by the EAG

Title: Negative Pressure Wound Therapy-PICO: Cosmesis in Repeat C-Sections
Study number: NCT05266053
No. of patients: 100
Status: Recruiting
Start date: July 2022
Primary completion date: Not stated
Location: United States
Included by the EAG

Title: Evaluation of the PICO Negative Pressure Dressing System on the Fibula Free Flap Donor Site's Skin Graft.
Study number: NCT04628416
No. of patients: 112
Status: Recruiting
Start date: January 2021
Primary completion date: Not stated
Location: France
Included by the EAG

Title: PICO- Single-use Negative Pressure Wound Therapy System
Study number: NCT05064696
No. of patients: 150
Status: Recruiting
Start date: August 2021
Primary completion date: September 2024
Location: United States
Included by the EAG

Title: NPWT in Patients Undergoing Surgical Procedures for Management of GI Malignancies
Study number: NCT04955730
No. of patients: 300
Status: Recruiting
Start date: August 2021
Primary completion date: Not stated
Location: United States

Included by the EAG

Title: PICO Above Incisions After Vascular Surgery
Study number: NCT01913132
No. of patients: 644
Status: Recruiting
Start date: November 2013
Primary completion date: June 2023
Location: Sweden
Included by the EAG [Additional note: protocol published in Rezk et al. 2019). Provisional results published (Hasselman et al. 2020, Svensson-Björk et al. 2022).

Title: PICO Negative Pressure Wound Therapy in Obese Women Undergoing Elective Cesarean Delivery.
Study number: NCT03414762
No. of patients: 400
Status: Recruiting
Start date: April 2019
Primary completion date: April 2022
Location: United States
Included by the EAG

Title: Efficacy of Negative Pressure Wound Therapy After Total Ankle Arthroplasty
Study number: NCT03886818
No. of patients: 48
Status: Recruiting
Start date: March 2019
Primary completion date: March 2022
Location: France
Included by the EAG

Title: Effect of the Negative Pressure Therapy Dressing Compared With Hydrogel Dressing.
Study number: NCT04265612
No. of patients: 304
Status: Recruiting
Start date: November 2019
Primary completion date: July 2021
Location: Spain
Included by the EAG [Additional note: protocol published in Garrido-Martin et al. 2022)

Title: Negative Pressure Wound Therapy for Wound Healing After Stoma Reversal
Study number: NCT03781206
No. of patients: 100
Status: Recruiting
Start date: July 2019
Primary completion date: March 2021
Location: Italy
Included by the EAG

Title: PICO 7 vs PICO 14 in Revision Hip and Revision Knee Surgery.
Study number: NCT05389410
No. of patients: 100

Status: Not yet recruiting
Start date: September 2022
Primary completion date: October 2023
Location: NA
Included by the EAG

Title: Prophylactic Negative Wound Pressure Therapy (PICO-7) Following Groin Incisions in Vascular Surgery (PICO-Vasc Study)
Study number: NCT04840576
No. of patients: 132
Status: Not yet recruiting
Start date: April 2021
Primary completion date: April 2022
Location: Spain
Included by the EAG

Title: EvaLuating negAtive pressUre Wound theRapy in brEast coNserving Surgery
Study number: NCT05509829
No. of patients: 300
Status: Not yet recruiting
Start date: September 2022
Primary completion date: September 2023
Location: Netherlands
Included by the EAG

Completed studies

Title: The Use of Post-operative NPWT Dressing in the Prevention of Infectious Complications After Ostomy Reversal Surgery
Study number: NCT04088162
No. of patients: 75
Status: Unknown status
Start date: January 2016
Primary completion date: January 2021
Location: Poland
Trial registration last updated 12 September 2019. Excluded because of mixed intervention (3 different NPWT dressings by KCI, Smith & Nephew and Gynadyne). Publication identified (Wierdak et al. 2021)

Title: Performance, Safety and Efficacy of NPWT Device
Study number: NCT04102865
No. of patients: 90
Status: Active, not recruiting
Start date: July 2019
Primary completion date: July 2022
Location: United Kingdom
Status on 01/11/2022: completed. No publication of results identified by the EAG

Title: A Clinical Study to Assess the Safety and Clinical Performance of a New Dressing (PICO7Y) in Breast Surgery Patients
Study number: NCT03835845
No. of patients: 40
Status: Completed

Start date: March 2019
Primary completion date: February 2020
Location: United Kingdom
Trial registration last updated 21 June 2022. No publication of results identified by the EAG.

Title: Performance, Safety and Efficacy of PICO Device.
Study number: NCT03698968
No. of patients: 50
Status: Completed
Start date: November 2018
Primary completion date: June 2019
Location: Switzerland, United Kingdom
Trial registration last updated 18 September 2019. No publication of results identified by the EAG.

Title: Single-Use Negative Pressure Wound Therapy for Free Flap Donor Sites
Study number: NCT03340025
No. of patients: 20
Status: Completed
Start date: June 2018
Primary completion date: April 2020
Location: United States
Trial registration last updated 30 July 2021. Protocol and statistical analysis plan available. Results shared within trial registration (limitations noted by authors: small sample size, missing data, single centre, confounded by surgeon technique). No peer-reviewed publication of results identified by the EAG.

Title: Negative Pressure Wound Therapy to Prevent Wound Complications Following Cesarean Section in High Risk Patients
Study number: NCT03082664
No. of patients: 154
Status: Completed
Start date: June 2015
Primary completion date: March 2019
Location: United States
Trial registration last updated 26 September 2022. Protocol and statistical analysis plan available. Results shared within trial registration (limitations noted by authors: small sample size, missing data, single centre, confounded by surgeon technique). No peer-reviewed publication of results identified by the EAG.

Title: Antimicrobial Barrier Dressing Versus Closed-incision Negative Pressure Therapy in the Obese Primary Total Joint Arthroplasty
Study number: NCT03345771
No. of patients: 230
Status: Completed
Start date: November 2017
Primary completion date: April 2021
Location: United States
Trial registration last updated 22 April 2022. Protocol and statistical analysis plan available. Results shared within trial registration. No peer-reviewed publication of results identified by the EAG.

Title: Efficacy of NPWT in Reducing the Incidence of Wound Infection After Pancreatic Surgery
Study number: NCT03700086
No. of patients: 100
Status: Completed
Start date: July 2018
Primary completion date: October 2019
Location: Italy
Trial registration last updated 08 May 2020. No publication of results identified by the EAG.

Unknown Status / terminated studies

Title: Study to Evaluate the PICO 14 Negative Pressure Wound Therapy System in the Management of Acute and Chronic Wounds
Study number: NCT05234632
No. of patients: 70
Status: Terminated
Start date: September 2020
Primary completion date: April 2023
Location: Germany, United Kingdom
Trial registration last updated 06 October 2022. Excluded by EAG (mixed population including chronic wounds and closed surgical incision). Terminated because of enrolment issues.

Title: Incisional Negative Pressure Wound Therapy in High Risk Patients Undergoing Panniculectomy: A Prospective Randomized Controlled Trial
Study number: NCT03010137
No. of patients: 30
Status: Terminated
Start date: NA
Primary completion date: March 2019
Location: United States
Trial registration last updated 09 June 2020. Terminated because of lack of staff resources to properly consent and enroll patients into the study.

Title: Standard Versus PICO Dressings in Lower-Extremity Bypass Patients
Study number: NCT02492854
No. of patients: 8
Status: Terminated
Start date: July 2015
Primary completion date: January 2021
Location: United States
Trial registration last updated 04 November 2021. Terminated as PI decided not to proceed with the major amendment and switching to the new generation of the device because of a lack of funding.

Title: Negative Pressure Wound Therapy for Prevention of Groin Infection Following Vascular Surgery
Study number: NCT03460262
No. of patients: 160
Status: Unknown status
Start date: March 2018
Primary completion date: November 2019

Location: Belgium
Trial registration last updated 09 March 2018. No publication of results identified by EAG

Title: Negative Pressure Wound Therapy Compared to Traditional Care After Skin Grafting
Study number: NCT03649308
No. of patients: 160
Status: Unknown status
Start date: September 2018
Primary completion date: December 2021
Location: Finland
Trial registration last updated 12 August 2020. No publication of results identified by EAG

Title: Efficacy of Negative Pressure Wound Closure Therapy by PICO System in Prevention of Complications of Femoral Artery Exposure
Study number: NCT04453319
No. of patients: 250
Status: Unknown status
Start date: January 2020
Primary completion date: January 2021
Location: Egypt
Trial registration last updated 01 July 2020. No publication of results identified by EAG

Title: POstoperative Negative-pressure Incision Therapy Following LIver TRANSplant:a Randomized Controlled Trial
Study number: NCT04039659
No. of patients: 110
Status: Unknown status
Start date: February 2019
Primary completion date: July 2021
Location: Spain
Trial registration last updated 31 July 2019. No publication of results identified by EAG

Title: Negative Pressure Wound Therapy in Groin Dissection
Study number: NCT02408835
No. of patients: 22
Status: Unknown status
Start date: NA
Primary completion date: Not stated
Location: United Kingdom
Trial registration last updated 06 April 2015. No publication of results identified by EAG

Title: A Prospective, Randomized, Comparative Study to Assess the Prevention of Surgical Site Infection (SSI's) in Revision Total Joint Arthroplasty Patients Treated With Single-Use Negative Pressure Wound Therapy (PICO) or Standard Care Dressings (AQUACEL Ag SURGICAL Dressing).
Study number: NCT03180346
No. of patients: 494
Status: Unknown status
Start date: March 2017

Primary completion date: March 2020
Location: United States
Trial registration last updated 08 June 2017. No publication of results identified by EAG

Title: A Comparative Study to Assess the Prevention of Surgical Site Infection (SSI's) in Revision Total Joint Arthroplasty Patients Treated With Single-Use Negative Pressure Wound Therapy (PICO™) or Standard Care Dressings (AQUACEL Ag SURGICAL Dressing)
Study number: NCT02664168
No. of patients: NA
Status: Unknown status
Start date: June 2016
Primary completion date: February 2020
Location: United States
Trial registration last updated 12 April 2018. No publication of results identified by EAG

Title: Pilot Study Comparing Negative Pressure Dressings to Conventional Dressings
Study number: NCT03450616
No. of patients: 0
Status: Withdrawn
Start date: NA
Primary completion date: Not stated
Location: United States
Trial registration last updated 29 May 2019. Withdrawn as unable to begin study because of a lack of funding, PI left organization.

Title: Negative Pressure Wound Therapy Registry
Study number: NCT02467998
No. of patients: 50000
Status: Unknown status
Start date: January 2005
Primary completion date: January 2020
Location: United States
Trial registration last updated 01 May 2018. Patient registry (case-control). Excluded because of mixed intervention (multiple NPWT dressings). 3 publications published prior to MTG43: Fife et al. 2004, Fife et al. 2008, Fife et al. 2012.

Appendix B3: Database searches

Databases*	Date searched	No retrieved	Version/files
MEDLINE All (Ovid)	25/08/2022	26	1946 to August 24, 2022
EMBASE (Ovid)	25/08/2022	47	1974 to 2022 August 24
Embase Conference (OVID)	25/08/2022	36	1974 to 2022 August 24
Econlit (OVID) (for economic searches)	25/08/2022	0	1886 to August 18, 2022
CDSR (Wiley)	25/08/2022	0	Issue 8 of 12, August 2022
CENTRAL (Wiley)	25/08/2022	5	Issue 7 of 12, July 2022
CENTRAL conferences	25/08/2022	5	Issue 7 of 12, July 2022
HTA database (CRD)	n/a	-	No new records added in period searched
HTA database (INAHTA)	25/08/2022	0	-
** NHS EED (CRD)	n/a	-	No new records added in period searched
Epistemonikos	25/08/2022	4	-
Total		*123*	
Total after deduplication		89	

From January 2015 no new records/commentaries will be added to DARE or NHS EED.

Database strategies:

Database: **Ovid MEDLINE(R) ALL** <1946 to August 24, 2022>
Search Strategy:
---
1 ("negative pressure wound therap*" or "negative-pressure wound therap*").ti,ab. (2776)
2 ("negative pressure dress*" or "negative-pressure dress*").ti,ab. (196)
3 (topic* adj4 (negative pressure or negative-pressure) adj4 therap*).ti,ab. (152)
4 npwt.ti,ab. (1488)
5 ("vacuum assisted closure*" or "vacuum-assisted closure*").ti,ab. (1479)
6 Negative-Pressure Wound Therapy/ (3759)
7 or/1-6 (5616)
8 Surgical Wound/ (1486)
9 ((postoperative or "post operative" or post-operative or surgical or surgery or closed) and (wound* or incision)).ti,ab. (118724)
10 or/8-9 (119286)
11 7 and 10 (2626)
12 pico.ti,ab. (3441)
13 "smith & nephew".ti,ab,in. (804)
14 12 or 13 (4227)
15 11 and 14 (56)
16 limit 15 to ed=20180801-20220825 (19)
17 limit 15 to dt=20180801-20220825 (24)
18 16 or 17 (26)

Database: **Embase** <1974 to 2022 August 24>
Search Strategy:
---
1 ("negative pressure wound therap*" or "negative-pressure wound therap*").ti,ab. (3444)
2 ("negative pressure dress*" or "negative-pressure dress*").ti,ab. (289)
3 (topic* adj4 (negative pressure or negative-pressure) adj4 therap*).ti,ab. (185)
4 npwt.ti,ab. (2006)
5 ("vacuum assisted closure*" or "vacuum-assisted closure*").ti,ab. (1890)
6 vacuum assisted closure/ (8999)
7 or/1-6 (9986)
8 surgical wound/ (8487)
9 ((postoperative or "post operative" or post-operative or surgical or surgery or closed) and (wound* or incision)).ti,ab. (170375)
10 or/8-9 (173704)
11 7 and 10 (4141)
12 pico.ti,ab,dv. (4841)
13 "smith & nephew".ti,ab,in,dm. (1012)
14 12 or 13 (5813)
15 11 and 14 (128)
16 limit 15 to dc=20180801-20220825 (83)
17 (conference abstract* or conference review or conference paper or conference proceeding).db,pt,su. (5285383)
18 16 not 17 (47)
19 16 and 17 (36)

Database: **Econlit** <1886 to August 18, 2022>
Search Strategy:
---
1 ("negative pressure wound therap*" or "negative-pressure wound therap*").ti,ab. (0)
2 ("negative pressure dress*" or "negative-pressure dress*").ti,ab. (0)
3 (topic* adj4 (negative pressure or negative-pressure) adj4 therap*).ti,ab. (0)
4 npwt.ti,ab. (0)
5 ("vacuum assisted closure*" or "vacuum-assisted closure*").ti,ab. (0)
6 or/1-5 (0)
7 ((postoperative or "post operative" or post-operative or surgical or surgery or closed) and (wound* or incision)).ti,ab. (6)
8 6 and 7 (0)
12 pico.ti,ab. (20)
13 "smith & nephew".ti,ab,in. (3)
14 12 or 13 (23)
15 11 and 14 (0)

Cochrane (CDSR/CENTRAL)

#1 ("negative pressure wound therapy" or "negative-pressure wound therapy" or "negative pressure wound therapies" or "negative-pressure wound therapies"):ti,ab 607
#2 ("negative pressure dressing" or "negative-pressure dressing" or "negative pressure dressings" or "negative-pressure dressings"):ti,ab 64

#3 (topic* near/4 (negative pressure or negative-pressure) near/4 (therapy or therapies)):ti,ab 33
#4 npwt:ti,ab 412
#5 ("vacuum assisted closure" or "vacuum-assisted closure" or "vacuum assisted closures" or "vacuum-assisted closures"):ti,ab 170
#6 MeSH descriptor: [Negative-Pressure Wound Therapy] this term only 261
#7 {OR #1-#6} 887
#8 MeSH descriptor: [Surgical Wound] this term only 349
#9 ((postoperative or "post operative" or post-operative or surgical or surgery or closed) and (wound* or incision)):ti,ab 23424
#10 {OR #8-#9} 23516
#11 #7 AND #10 554
#12 pico:ti,ab 313
#13 "smith & nephew":ti,ab 168
#14 {OR #12-#13} 461
#15 #11 and #14 with Cochrane Library publication date Between Aug 2018 and Aug 2022, in Cochrane Reviews, Cochrane Protocols 0
#16 #11 and #14 with Publication Year from 2018 to 2022, in Trials 23
#17 (clinicaltrials or trialsearch):so 407924
#18 #16 not #17 10
#19 "conference":pt 201017
#20 #18 and #19 5
#21 #18 not #19 5

INAHTA

(("smith & nephew")[Title] OR ("smith & nephew")[abs]) OR ((pico)[Title] OR (pico)[abs]))
AND
((((((postoperative or "post operative" or post-operative or surgical or surgery or closed) and (wound* or incision)))[Title] OR (((postoperative or "post operative" or post-operative or surgical or surgery or closed) and (wound* or incision)))[abs]) OR ((Surgical Wound)[mh]))
AND
(((Negative-Pressure Wound Therapy)[mh]) OR (("vacuum assisted closure*" or "vacuum-assisted closure*")[Title] OR ("vacuum assisted closure*" or "vacuum-assisted closure*")[abs]) OR ((npwt)[Title] OR (npwt)[abs]) OR (((topic* AND (negative pressure or negative-pressure) AND therap*))[Title] OR ((topic* AND (negative pressure or negative-pressure) AND therap*))[abs]) OR ((("negative pressure dress*" or "negative-pressure dress*"))[Title] OR (("negative pressure dress*" or "negative-pressure dress*"))[abs]) OR ((("negative pressure wound therap*" or "negative-pressure wound therap*"))[Title] OR (("negative pressure wound therap*" or "negative-pressure wound therap*"))[abs])))

Epistemonikos

(title:((title:((("vacuum assisted closure*" OR "vacuum-assisted closure*") OR (npwt) OR (topic* AND (negative pressure OR negative-pressure) AND therap*) OR ("negative pressure dress*") OR ("negative pressure wound therap*" OR "negative-pressure wound therap*"))) OR abstract:((("vacuum assisted closure*" OR "vacuum-assisted closure*") OR (npwt) OR (topic* AND (negative pressure OR negative-pressure) AND therap*) OR ("negative pressure dress*") OR ("negative pressure wound therap*" OR "negative-pressure wound therap*"))))) OR

abstract:((title:((("vacuum assisted closure*" OR "vacuum-assisted closure*") OR (npwt) OR (topic* AND (negative pressure OR negative-pressure) AND therap*) OR ("negative pressure dress*") OR ("negative pressure wound therap*" OR "negative-pressure wound therap*"))) OR abstract:((("vacuum assisted closure*" OR "vacuum-assisted closure*") OR (npwt) OR (topic* AND (negative pressure OR negative-pressure) AND therap*) OR ("negative pressure dress*") OR ("negative pressure wound therap*" OR "negative-pressure wound therap*")))))) AND (title:((title:(((postoperative OR "post operative" OR post-operative OR surgical OR surgery OR closed) AND (wound* OR incision))) OR abstract:(((postoperative OR "post operative" OR post-operative OR surgical OR surgery OR closed) AND (wound* OR incision))))) OR abstract:((title:(((postoperative OR "post operative" OR post-operative OR surgical OR surgery OR closed) AND (wound* OR incision))) OR abstract:(((postoperative OR "post operative" OR post-operative OR surgical OR surgery OR closed) AND (wound* OR incision)))))) AND (title:((title:((("smith & nephew") OR (pico))) OR abstract:((("smith & nephew") OR (pico))))) OR abstract:((title:((("smith & nephew") OR (pico))) OR abstract:((("smith & nephew") OR (pico)))))))

Conferences:

Search Date	**25 August 2022**
Conferences were identified during searches in Embase and CENTRAL. Search numbers are shown in the table above and the results are included in the Eppi review. These can be filtered in or out when sifting in Eppi using the sources option in the filters.	

Search Notes:

Added some extra lines and pluralisations based on scope note for Negative-Pressure Wound Therapy/

Appendix C – Details of excluded studies

#	Source	Study reference	Reason for exclusion
1.	Updated NICE literature search;	Almansa-Saura et al. (Surg Infect [Larchmt], 2021; 854-863)	Study design: systematic review or meta-analysis
2.	Updated NICE literature search;	World Union of Wound Healing Societies [WUWHS] (Wounds International, 2016)	Study design: consensus document
3.	Updated NICE literature search;	Ascuitto et al. (In Vivo, 2020; 3511-3517)	Study design: case series with 20 or fewer patients
4.	Updated NICE literature search;	Baker et al. (BJOG, 2019; 92)	Study design: conference abstract
5.	Updated NICE literature search; Company search;	Canadas Molina et al. (Int J Gynecol Cancer, 2021; A372)	Study design: conference abstract
6.	Updated NICE literature search; Company search;	Carrano et al. (BJS Open, 2021; 1-8);	Population: not closed surgical incision
7.	EAG search;	Cheung et al. (Diseases of the Colon & Rectum, 2022; 767-776)	Intervention: not PICO
8.	Updated NICE literature search;	Cuomo et al. (J Invest Surg, 2021; 335-343)	Population: not closed surgical incision
9.	Updated NICE literature search;	Curchod et al. (Scientific Reports, 2022; 1-5);	Comparator: not explicitly only conventional wound dressings, may have included surgical glue
10.	Updated NICE literature search; Company search;	Darwisch et al. (Thorac Cardiovasc Surg, 2020; S1-S72)	Study design: conference abstract
11.	Updated NICE literature search;	Delhougne et al. (Ostomy Wound Manage, 2018; 26-33)	Population: not closed surgical incision
12.	Updated NICE literature search;	Delhougne et al. (Value in Health, 2019; S215)	Study design: conference abstract
13.	Updated NICE literature search;	Dudek et al. (Colorectal Disease, 2019; P225)	Study design: conference abstract; case series with 20 or fewer patients
14.	Updated NICE literature search;	Egorkin et al. (Journal of Wound Care, 2017; 385)	Study design: conference abstract; case series with 20 or fewer patients

#	Source	Study reference	Reason for exclusion
15.	Updated NICE literature search;	Elhage et al. (Health Science Reports, 2022; e425)	Study design: systematic review or meta-analysis
16.	Updated NICE literature search; Company search;	Elmistekawy et al. (Innovations: Technology and Techniques in Cardiothoracic and Vascular Surgery, 2020; 38s-39s)	Study design: conference abstract
17.	Updated NICE literature search;	Fabrizio et al. (Journal of Wound Care, 2020; 257)	Study design: conference abstract
18.	EAG search;	Fife et al. (Ostomy Wound Manage, 2004; 28-31)	Intervention: not PICO
19.	EAG search;	Fife et al. (Int Wound J, 2008; 17-22)	Intervention: not PICO
20.	EAG search;	Fife et al. (Wounds, 2012; 10-17)	Intervention: not PICO
21.	Updated NICE literature search;	Fleming et al. (J Hosp Infect, 2018; 75-80)	Already considered in original MTG43 Assessment Report
22.	Updated NICE literature search;	Galiano et al. (Plast Reconstr Surg Glob Open, 2018; e1560)	Already considered in original MTG43 Assessment Report
23.	Updated NICE literature search; Company search;	Gonzalez et al. (Reproductive Sciences, 2020; 136a-137a)	Study design: conference abstract
24.	Updated NICE literature search;	Grimstad et al. (Dermatol Ther, 2022; e15483)	Study design: case series with 20 or fewer patients
25.	Updated NICE literature search;	Guo et al. (Int J Surg, 2022; 106216)	Study design: systematic review or meta-analysis
26.	Company search;	Gupta et al. (Am Surg, 2017; 1166-1169)	Intervention: not reported
27.	Updated NICE literature search; Company search;	Hadawi et al. (BJOG, 2021; 80)	Study design: conference abstract
28.	Updated NICE literature search;	Holford (Expert Review of Medical Devices, 2020; 1017-1019);	Study design: key paper review of Tanaydin et al. 2018 (considered in original MTG43 Assessment Report)
29.	Company search;	Holford et al. (Pacific Health Dialog, 2022; 587-595)	Intervention: mixed interventions
30.	Updated NICE literature search;	Hsiao et al. (Journal of Urology, 2021; e171)	Study design: conference abstract
31.	Updated NICE literature search;	Hyldig et al. (BJOG, 2019; 619-627)	Already considered in original MTG43 Assessment Report

#	Source	Study reference	Reason for exclusion
32.	Updated NICE literature search;	Hyldig et al. (BJOG, 2019b; 628-635)	Already considered in original MTG43 Assessment Report
33.	Updated NICE literature search;	Irwin et al. (European Journal of Surgical Oncology, 2018; 909-910)	Study design: conference abstract
34.	Updated NICE literature search;	Jaimes et al. (Journal of Wound Care, 2020; 173)	Study design: conference abstract
35.	Updated NICE literature search;	Janssen et al. (J Thorac Dis, 2022; 43-53)	Study design: systematic review or meta-analysis
36.	Updated NICE literature search;	Jo et al. (Thorac Cardiovasc Surg, 2022; 56-64)	Study design: case series with 20 or fewer patients
37.	Updated NICE literature search;	Kawakita et al. (American Journal of Obstetrics and Gynecology, 2018; S323)	Study design: conference abstract
38.	Company search;	Keeney et al. (J Arthroplasty, 2019; 723-728)	Already considered in original MTG43 Assessment Report
39.	Updated NICE literature search;	Khouqeer et al. (Ann Vasc Surg, 2020; 292-297)	Intervention: mixed interventions as bundle of measures to prevent SSI, unable to determine impact of PICO
40.	Company search;	Kojima et al. (BMC Surgery, 2021; 442)	Population: not fully closed surgical incision
41.	Company search;	Lawrence et al. (J Am Coll Surg, 2019; 595-601)	Intervention: mixed interventions
42.	Updated NICE literature search;	Luciani et al. (Journal of Wound Care, 2017; 156)	Study design: conference abstract
43.	Company search;	Ma et al. (Colorectal Disease, 2020; 9-57)	Study design: conference abstract
44.	Updated NICE literature search;	Martin et al. (HPB, 2019; S26-S27)	Study design: conference abstract
45.	Updated NICE literature search;	Meyer et al. (Int J Colorectal Dis. 2021; 19-26)	Study design: systematic review or meta-analysis
46.	Updated NICE literature search;	Miyahara et al. (Acta Ortop Bras, 2018; 300-304)	Study design: case series with 20 or fewer patients
47.	Updated NICE literature search; Company search;	Mullapudi et al. (European Journal of Surgical Oncology, 2020; E47)	Study design: conference abstract
48.	Updated NICE literature search; Company search;	Myllykangas et al. (Scandinavian Journal of Surgery, 2021; 1-7);	Intervention: mixed intervention (NPWT used before and after surgery, but not before surgery in relevant comparator arm)

#	Source	Study reference	Reason for exclusion
49.	Updated NICE literature search; Company search;	Ng et al. (British Journal of Surgery, 2020; 76-77)	Study design: conference abstract
50.	Updated NICE literature search;	Nherera et al. (J Cardiothorac Surg. 2018; 103)	Already considered in original MTG43 Assessment Report
51.	Updated NICE literature search;	Nherera et al. (Value in Health, 2022; S319)	Study design: conference abstract
52.	Updated NICE literature search;	Nyman et al. (J Patient Exp, 2022; 23743735221112595)	Study design: case series with 20 or fewer patients
53.	Updated NICE literature search; Company search;	Obeid et al. (Int J Colorectal Dis, 2020; 161-167)	Population: not fully closed surgical incision
54.	Company search;	O'Donnell et al. (BMJ Open, 2019; e024853)	Intervention: not reported
55.	Updated NICE literature search; Company search;	Saunders et al. (BJS Open, 2021)	Study design: systematic review or meta-analysis
56.	Updated NICE literature search;	Shah et al. (British Journal of Surgery, 2019; 50)	Study design: conference abstract
57.	Updated NICE literature search; Company search;	Shah et al. (Journal of Hospital Infection, 2020; 332-335);	Comparator: partially out of scope with results not reported separately, and too few patients in intervention arm to consider as single arm study
58.	Updated NICE literature search;	Sharma et al. (Colorectal Disease, 2019; 8)	Study design: conference abstract
59.	Updated NICE literature search;	Shiroky et al. (Surgery, 2020; 1001-1009)	Study design: systematic review or meta-analysis
60.	Company search;	Singh et al. (Plast Reconstr Surg Glob Open, 2019; e2259)	Study design: systematic review or meta-analysis Intervention: mixed interventions
61.	Updated NICE literature search;	Strugala et al. (Wounds International, 2018; 28-33)	Study design: systematic review or meta-analysis
62.	Updated NICE literature search;	Svensson-Björk et al. (Br J Surg, 2019; 310-318)	Study design: systematic review or meta-analysis
63.	Updated NICE literature search;	Svensson-Björk et al. (European Journal of Vascular & Endovascular Surgery, 2019; E354-E355)	Study design: conference abstract
64.	Company search;	Timmermans et al. (Br J Surg, 2021; 925-933)	Comparator: not wound dressing

#	Source	Study reference	Reason for exclusion
65.	Updated NICE literature search;	Tormey et al. (European Journal of Surgical Oncology, 2019; 917)	Study design: conference abstract
66.	Updated NICE literature search;	Tryliskyy (2022)	Study design: conference abstract
67.	Updated NICE literature search;	Tyrer et al. (Wounds UK, 2019; 86-89)	Study design: case series with 20 or fewer patients
68.	Company search;	Wells et al. (World J Surg, 2019; 2779-2788)	Study design: systematic review or meta-analysis
69.	EAG search;	Wierdak et al. (Techniques in Coloproctology, 2021; 185-193)	Intervention: not PICO
70.	Updated NICE literature search;	Wikkeling et al. (European Journal of Vascular and Endovascular Surgery, 2019; E805)	Study design: conference abstract
71.	Updated NICE literature search;	Wikkeling et al. (Journal of Vascular Surgery, 2019; E172)	Study design: conference abstract

Appendix D – Published systematic reviews

Author (year); country	Country	Study Design (n patients)	Surgery type	Considered within original guidance (2019)	Almansa-Saura *et al.* (2021) +N=4	Elhage *et al.* (2021) N=3	Guo et al. (2022) N=1	Meyer et al. (2020) N=1	Saunders et al. (2021) N=24†	Singh et al. (2019) N=8	Shiroky et al. (2020) N=13	Strugala and Martin (2017) N=16	Svensson-Björk et al. (2019) N=1	Wells et al. (2019) N=3	EAG notes
Adogwa et al. (2014); p2911-2917	US	rCohort (n=160)	Orthopaedic	✓					✓			✓			
Bueno-Lledo et al. (2021); p1081-1086	Spain	RCT (n=146)	General				✓								Included in 2022 evidence review
ǂCaswell et al. (2015) 98	NR	Before-and-after (n=221)	General	✓											
Chaboyer et al. (2014); p417-428	Australia	RCT (n=87)	Obstetric	✓					✓	✓	✓	✓		✓	
Dingemans et al. (2018); p747-753	Netherlands	pCohort (n=94)	Orthopaedic	✓					✓						
Fleming et al. (2017); p75-80	Ireland	rCohort (n=151)	Vascular	✓					✓						
Flynn et al. (2020); p231-238	Australia	RCT (n=188)	General, colorectal		✓										Included in 2022 evidence review
ǂGaliano et al. (2014)	NR	RCT	Breast surgery									✓			Abstract (likely overlap with Galiano et al. 2018a)
Galiano et al. (2018a); e1560	US, France, South Africa, Netherlands	RCT (n=200)	Breast surgery	✓					✓	✓	✓				
Giannini et al. (2018) p520-525	Italy	RCT (n=100)	Orthopaedic			✓					✓				Included in 2022 evidence review
Gillespie et al. (2015); p488-495	Australia	RCT (n=70)	Orthopaedic	✓		✓			✓	✓	✓	✓			
Gupta et al. (2017); p1166-1169	US	rCohort (n=61)	General						✓						Excluded: Intervention not reported
ǂHackney et al. (2017); S60	UK	Cohort (n=71)	General	✓											
Hasselmann et al (2015); p562-571	Sweden	RCT (n=304)	Vascular									✓	✓		Excluded: Study design (protocol)
Hester et al. (2015); p247324	UK	rCohort (n=36)	Orthopaedic	✓					✓			✓			
Hickson et al. (2015); p174-177	US	pCohort (n=1948)	Obstetric	✓					✓						
Holt & Murphy (2015); p217-223	UK	rCohort (n=24)	Breast surgery	✓					✓			✓			
ǂHyldig 2016	Denmark	RCT (interim results)	Obstetric									✓			Abstract (likely overlap with Hyldig et al. 2019)
Hyldig et al. (2019); p628-635	Denmark	RCT (n=876)	Obstetric	✓					✓		✓			✓	
ǂIrwin et al. (2018); p909-910	UK	Controlled audit (n=254)	Breast reconstruction	✓											
Karlakki et al. (2016) p328-337	UK	RCT (n=209)	Orthopaedic	✓		✓			✓	✓	✓	✓			
ǂKawakita et al. (2018); S323	US	rCohort	Obstetric	✓											

Author (year); country	Country	Study Design (n patients)	Surgery type	Considered within original guidance (2019)	Almansa-Saura *et al.* (2021) +N=4	Elhage *et al.* (2021) N=3	Guo et al. (2022) N=1	Meyer et al. (2020) N=1	Saunders et al. (2021) N=24†	Singh et al. (2019) N=8	Shiroky et al. (2020) N=13	Strugala and Martin (2017) N=16	Svensson-Björk et al. (2019) N=1	Wells et al. (2019) N=3	EAG notes
Keeney et al. (2019); p723-728	US	RCT (n=398)	Orthopaedic	✓[Consultation]							✓				
Luciani et al. (2016); p156	Italy	RCT (n=100)	Orthopaedic	✓											
Matsumoto et al. (2015); p787-794	US	rCohort (n=74)	Orthopaedic	✓					✓			✓			
Nordmeyer et al. (2016); p1176-1179	Germany	RCT (n=10)	Orthopaedic	✓					✓		✓				
O'Leary et al. (2017); p1082-1086	Ireland	RCT (n=50)	General surgery	✓	✓				✓	✓	✓	✓		✓	
Pellino et al. (2014a); p204-212	Italy	RCT (n=30)	Colorectal	✓					✓						
Pellino et al. (2014b); pS64–S68.	Italy	pCohort (n=50)	Colorectal	✓	✓				✓			✓			
		pCohort (n=50)	Breast surgery	✓					✓			✓			
Prakash et al. (2020); Online ahead of print	New Zealand	Case report (n=1)	Vascular												Excluded: study design (<20 patients)
Selvaggi et al. (2014); p83-89	Italy	RCT (n=50)	Colorectal	✓					✓			✓			
Svensson-Bjork et al. (2018); p77-86	Sweden	RCT (n=33)	Vascular	✓					✓						
Tan et al. (2017); p386-390	Singapore	rCohort (n=42)	Vascular	✓					✓						
Tanaydin et al. (2018); p927-935	Netherlands	RCT (n=32)	Breast surgery	✓					✓		✓				
ŧTuuli et al. (2017); s245	US	RCT (n=120)	Obstetric	✓						✓	✓	✓			
Uchino et al. (2016); p449-454	Japan	RCT (n=59)	Colorectal	✓					✓	✓		✓			
van der Valk et al. (2017); p425–429	Netherlands	Before-and-after (n=20)	Colorectal	✓	✓			✓	✓						
Witt-Majchrzak et al. (2015); p456-465	Poland	RCT (n=80)	Cardiothoracic	✓					✓	✓	✓				
ŧZotes et al. (2015); S51	Mexico	RCT (n=20)	Cardiothoracic	✓							✓	✓			

*Raised and considered at consultation; †includes 2 subgroups from same paper, also this SR included both prophylactic and reactive use of PICO; ŧconference abstract
Abbreviations: RCT, randomised controlled trial; pCohort, prospective cohort; rCohort, retrospective cohort;

Appendix E – Included studies

Appendix E1: Study characteristics (N=24 clinical studies)

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
Abadía et al. (2021); Spain	Study design: cohort [prospective], recruited consecutively (n=200) Intervention (n=100): NPWT (PICO, Smith & Nephew) ☑ Comparator (n=100): standard of care using fully occlusive wound dressing (OPSITE, Smith & Nephew) ☑ Intervention and comparator dressings kept in place for 7 days, until SSI diagnosis, or until outpatient clinic visit if discharged before 7 days. Funding: No funding or grants were received, no commercial support was received from any company, and the design of the study did not have any commercial input.	Inclusion criteria: aged over 18 years, elective colorectal procedures (open or laparoscopic with an incision of at least 8 cm) with incisions covered with intervention or comparator dressing, and ability to understand written informed consent ☑ Exclusion criteria: emergency surgery, laparoscopic approach without extraction site or with incisions less than 8 cm long, patients undergoing additional abdominal wall repair with subcutaneous drain or mesh placement, and patients who did not complete 30-day follow up ☑ Recruitment period: January 2017 to December 2018	Primary: incidence of SSI, using CDC criteria, within 30 days ☑ Secondary: risk factors for developing SSI, hospital stay reduction, adverse events ☑☒	Sample size calculation provided (SSI within 30 days), needing 100 patients in each arm (assuming 10% loss to follow-up); however analysis only included 97 in each arm. SSI not categorised as superficial or deep. Organ space SSI not considered as an SSI. Intervention and comparator assigned at discretion of surgeon. *Antibiotic prophylaxis:* given to all patients at anaesthetic induction. *Drain:* patients with subcutaneous drain or mesh placement were excluded. EAG assumes **exclusively** in high-risk population or procedure. Risk factors (procedural): • 100% (200/200) undergoing colorectal surgery: 73

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		Setting: university hospital (N=1 centre, 6 surgeons)		contaminated-open, 104 contaminated-laparoscopic, 20 dirty-open, 3 dirty-laparoscopic; colectomy conducted in 97% (194/200) Risk factors (patient): The number of patients with 2 or more risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • 27.5% (55/200) age >75 years • 19.5% (39/200) BMI >30 kg/m^2 • 34.0% (68/200) ASA >II • 17.0% (34/200) diabetes mellitus • 5.5% (11/200) immunosuppression • 13.0% (26/200) chemoradiotherapy • 12.0% (24/200) smoker
Andrianello et al. (2021); Italy NCT03700086	Study design: RCT (n=100); 1:1 randomisation using computer-generated list, investigators blinded	Inclusion criteria: patients scheduled for major clean-contaminated surgical procedures for periampullary neoplasms	Primary: incidence of superficial and deep SSI, using CDC criteria, (within 7 and 30 days) ☑	Sample size calculation provided (SSI within 30 days), needing 47 in each arm (before loss to follow-up applied); analysis included 46 and 49 in

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
	Intervention (n=50): portable NPWT device (PICO, Smith & Nephew), with dressing changed on postoperative day 3, and treatment stopped at postoperative day 7 ☑ Comparator (n=50): sterile gauze, changed for sterile standard dressing (OPSITE, Smith & Nephew) on postoperative day 3, and then according to clinical judgement ☑ Wounds of both groups disinfected with 5% iodine povidone or chlorhexidine at postoperative day 3 dressing change, skin staples removed on or after postoperative day 10 according to clinical judgement. Funding: Associazione Italiana per la Ricerca sul Cancro (AIRC n.12182 and n.17132); the Italian Ministry of Health (FIMPCUP_J33G13000210001); and the FP7 European Community Grant Cam-Pac (n. 602783). Funding agencies had no role in the collection, analysis, and interpretation of data or in the writing of the manuscript. Smith & Nephew provided devices for the study, but was not involved in the analysis of the trial.	(pancreaticoduodenectomy, total pancreatectomy or gastro-jejunal and biliary bypass). After wound closure each patient was assessed for the presence of at least 1 high-risk factor for SSI: BMI≥30 kg/m^2, diabetes mellitus, chronic steroid use, neoadjuvant therapy, ASA score ≥ 3, Charlson comorbidity index ≥ 1, time of surgery ≥ 360 minutes, estimated blood loss ≥ 1 litre) ☑ Exclusion criteria: previous abdominal surgery ☑ Recruitment period: 25 July 2018 to 10 October 2019 Setting: university hospital (N=1)	<u>Secondary:</u> incidence of haematomas, seromas, compliance with device, aesthetic results of midline incision (VAS, SBSES) at 7 and 30 days, complications (POPF, DGE, PPH, Clavien-Dindo classification), length of hospital stay ☑☒	intervention and comparator arms respectively. Intention to treat and per-protocol analysis reported. *Antibiotic prophylaxis:* given to all patients at anaesthetic induction. *Drain:* not explicitly reported, however evidence of surgical drains through definition of organ-space SSI (diagnosed through radiological examination or cultures on fluid collected from surgical drains). <u>Risk factors (procedural):</u> 100% major clean-contaminated surgical procedures for periampullary neoplasms (pancreaticoduodenectomy, total pancreatectomy or gastro-jejunal and biliary bypass) <u>Risk factors (patient):</u> Patients were needed to have at least 1 risk factor as per inclusion criteria (BMI ≥30, diabetes mellitus, chronic use of steroids, neoadjuvant therapy, ASA ≥3, Charlson comorbidity index ≥1, time of surgery ≥360

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				minutes, estimated blood loss ≥1 litre). • 18.9% (18/95) smoker • 3.2% (3/95) COPD (class NR) • 25.3% (24/95) diabetes • 29.5% (28/95) ASA ≥3 • 49.5% (47/95) neoadjuvant therapy • Median [IQR] surgery time of 441 (130) minutes for intervention, and 469 (171) for comparator The number of patients with 2 or more risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document.
Bueno-Lledó et al. (2021); Spain NCT03576222	Study design: RCT (n=150); 1:1 randomisation using online generator, with allocation concealed using closed envelopes, surgeon, nurse and wound assessment (at day 30 in outpatient clinic) not blinded.	Inclusion criteria: male and female patients, age >18 years, with incisional hernia type W2 (transverse hernia defect with 4 to 10 cm) or W3 (traverse hernia defect >10 cm), undergoing elective midline repair via laparotomy ☑	Primary: SSO development (for example, seroma, SSI, hematoma, wound dehiscence) within 30 days ☑ Secondary: length of hospital stay, adverse	Sample size calculation reported (surgical site occurrence, for example, seroma, SSI, haematoma, wound dehiscence, within 30 days). Combination of meshes used for all reconstructions.

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	Intervention (n=72): single-use NPWT (PICO, Smith & Nephew), used for 6 days (EAG assumes removed on day 7) ☑ Comparator (n=74): conventional dressing (Mepore Pro, Mölnlycke), (duration of use not explicitly reported, however EAG assumes it was used for 6 days and removed on day 7) ☑ All dressings applied in operating room, under sterile conditions. Patients assessed at day 12 (wound clip removal) and day 30 in an outpatient clinic. Funding: Authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.	Exclusion criteria: age <18 years, unable to give written consent, abdominal surgery reintervention within 30 days prior to hernia repair, emergency hernia surgery, pregnancy, hepatic cirrhosis, incisional hernia not involving midline ☑ Recruitment period: May 2017 to January 2020 Setting: university hospital (N=1)	events, risk factors for SSI development ☑☒	*Antibiotic prophylaxis:* given to all patients (EAG assumes at anaesthetic induction). *Drain:* 2 aspirative drainage tubes used in all cases, maintained for 3 to 4 days after hernia repair and removed when output decreased (<20 ml in 24 hours) <u>Risk factors (procedure details):</u> incisional hernia type W2 (transverse hernia defect with 4 to 10 cm) or W3 (traverse hernia defect >10 cm), undergoing elective midline repair via laparotomy <u>Risk factors (patient):</u> The number of patients with 2 or more patient risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • 25.3% (37/146) BMI >30 kg/m^2 • 39.0% (57/146) smoker • 28.8% (42/146) diabetes • 18.5% (27/146) COPD (class NR)

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				• 10.3% (15/146) immunosuppression • 52.7% (77/146) ASA>II
Canton et al. (2020); Italy	Study design: cohort [prospective] (n=65) Intervention (n=16): incisional NPWT (PICO, Smith & Nephew) for 7 days, followed by standard sterile dressing until suture removal ☑ Comparator (n=49): sterile gauze and cotton bandage until suture removal ☑ Sponsor/Funder: NR	Inclusion criteria: patients treated with open reduction internal fixation for ankle and distal tibial fractures, with at least 1 risk factor for surgical wound healing (age over 65 years, age under 65 years but smoker, BMI>30, or diabetic) ☑ Exclusion criteria: NR Recruitment period: March 2018 to April 2019 Setting: hospital (N=1)	Delay or complication (dehiscence, necrosis, SSI) in wound healing (major, requiring surgical treatment, and minor), device malfunction, incompatibility or conflict with cast, patient reported outcomes (pain, discomfort, intolerance, rash, itching and blisters) after 7 days of PICO positioning, risk factors for complications ☑☒	*Antibiotic prophylaxis:* given to all patients before surgery. *Drain:* NR EAG assumes **exclusively** in high-risk population or procedure. Risk factors (procedural): 100% use of internal fixation (open reduction internal fixation for ankle and distal tibial fractures) Risk factors (patient), patients were needed to have at least 1 risk factor as per inclusion criteria (age >65 years, age <65 years and smoker or BMI >30, or diabetes) • 23.1% (15/65) obesity • 9.2% (6/65) diabetes • 30.7% (20/65) smokers • 56.9% (37/65) aged >65

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				The number of patients with 2 or more risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document.
Chan et al. (2020); Singapore	Study design: cohort [retrospective] (n=117), 1:2 propensity score matching (for age, BMI, smoking status, ASA class, type 2 diabetes mellitus, metastatic cancer, chronic steroid use, recent sepsis, urgency of operation, length of operation, type of wound, type of anaesthesia, and need for secondary procedure). All patients identified from electronic records. Intervention (n=39): incisional NPWT (PICO, Smith & Nephew), removed after 7 days at dialysis centre ☑ Comparator (n=78): conventional wound therapy (OPSITE, Smith & Nephew), removed after 5 days at dialysis centre or earlier if soaked ☑ All patients received prophylactic antibiotics. All patients had a 10 French surgical drain placed in the dissection	Inclusion criteria: patients undergoing one stage, or second stage of a two stage brachiobasilic transposition arteriovenous fistula creation ☑ Exclusion criteria: NR Recruitment period: January 2010 to December 2017 Setting: tertiary university-affiliated teaching hospital (N=1)	Incidence of SSI, using CDC criteria (30 days), haematoma, need for hospitalisation, 30-day readmission, 30-day mortality ☑☒	*Antibiotic prophylaxis:* given to all patients perioperatively *Drain:* all patients had a surgical drain placed in the dissection bed, with the drain removed the following day. EAG assumes **exclusively** in high-risk population or procedure. Risk factors (procedural): 1 stage, or second stage of a 2 stage brachiobasilic transposition arteriovenous fistula creation Risk factors (patient), propensity matched cohort: All patients had end-stage renal failure requiring haemodialysis. • 12.8% (15/117) smoker • 70.9% (83/117) diabetes

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	bed, which was removed the following day. Sponsor/Funder: NR			• median (IQR) ASA class: 3 (3 to 3) • 2.6% (3/117) chronic steroid use
Costa et al. (2020); UK ISRCTN12702354	Study design: RCT (n=1,548); 1:1 randomisation via secure web-based service using minimisation, stratified by recruitment centre, open or closed fracture, ISS (≤15 versus ≥16) Intervention (n=785): incisional NPWT (PICO, Smith & Nephew), with redressing on the ward at discretion of clinical team ☑ Comparator (n=763): standard dressing with non-adhesive layer applied directly to wound, and covered by sealed dressing or bandage (exact materials used at the discretion of treating surgeon, in line with routine practice) ☑ Funding: National Institute for Health Research Health Technology Assessment programme. Smith & Nephew provided incisional NPWT dressings (PICO Single Use Negative Pressure Wound Therapy System) to recruiting centres for the purposes of the trial, but had no part in the design, conduct or reporting of the trial.	Inclusion criteria: aged ≥16 years, presenting to hospital within 72 hours of injury, had major trauma injury or injury defined by eligibility for the UK TARN databases, had a lower-limb fracture requiring surgical incision ☑ Exclusion criteria: open fracture not suitable for primary closure, evidence of patient being unable to adhere to trial procedures or complete questionnaires. For patients with more than 1 lower-limb injury, only the most severe wound (surgeon's discretion) was included in the trial. ☑☒ Recruitment period: September 2016 to April 2018 Setting: specialist major trauma centres (N=24)	Primary: deep SSI, using CDC criteria (within 30 and 90 days) ☑ Secondary: health related quality of life (Disability Rating Index, EQ-5D), wound healing and scar (Patient and Observer Scar Assessment Scale), chronic pain, further surgical interventions and complications, health resource use, adverse events ☑☒	Noted after recruiting 90.7% of patients that minimisation had not been applied correctly, and was corrected for the remaining recruits. Treating surgeons not blinded, but those assessing wound at follow-up were blinded. CDC criteria for deep SSI in fracture fixations involving implants updated during trial to 90 days. Intention to treat and per-protocol analysis reported. Includes economic analysis. *Antibiotic prophylaxis:* given in 96.7% of patients, timing NR. *Drain:* NR. EAG assumes **exclusively** in high-risk population or procedure. Risk factors (procedural):

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				100% (1,547/1,547) involvement of implant when fixing the associated fracture: • 33.4% nail; • 47.9% plate and screws; • 1.4% wires or tension band wires; • 1.6% external half-pin; • 0.1% external fine wire; • 15.1% other; • 0.6% NR. Risk factors (patient): The number of patients with 2 or more patient risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document.. • 28.1% (434/1,547) smoker • 9.6% (148/1,547) diabetes
Facchin et al. (2021); Italy	Study design: cohort [retrospective] (n=26) Intervention (n=14): bilateral portable incisional NPWT (PICO, Smith & Nephew), changed after 7 days ☑ Comparator (n=12): traditional dry dressings, changed every 3 days ☑	Inclusion criteria: female patients with massive weight loss of 7 points BMI (post weight loss surgery or diet reduction), with stable weight a metabolic and nutritional homeostasis for at least 6 months ☑	Presence of postoperative complications (blistering, haematoma, serosa, hypertrophic or hyperchromic scars), number of postoperative dressing changes, length of hospital stay, wound complications (dehiscence, skin	Patient demographics were not significantly different between groups (p>0.05), although BMI loss was numerically higher in the NPWT group. *Antibiotic prophylaxis:* NR *Drain:* all patients had a drain placed in each arm.

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	Both groups wore compressive garments for 30 days after treatment. Funding: Open Access funding provided by Universita` degli Studi di Padova. No funding received in support of the paper.	Exclusion criteria: unstable weight loss, previous arm surgery, allergy to glue and tape, neurologic, psychiatric or vascular disorders of the upper extremity, lymphedema of the arms, unrealistic patient expectations, Raynaud's disease, connective tissue disorders or advanced rheumatoid arthritis ☑ Recruitment period: June 2018 to March 2020 Setting: university hospital (N=1)	necrosis or infection) calculated per arm using Clavien-Dindo classification, scar assessment using the Vancouver Scar Scale, at 90 day follow up ☑☒	Risk factors (procedure details): • Brachioplasty + lipoplasty • Brachoplasty + Mastopexy • Brachioplasty + Liposuction + Mastopexy • Brachioplasty alone Risk factors (patient): The number of patients with 2 or more patient risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • 26.9% (7/26) smoker • 30.7% (8/26) BMI >30 kg/m^2
Flynn et al. (2020); Australia	Study design: RCT (n=217); block randomisation using pre-prepared envelopes. Intervention (n=109): negative pressure dressing (PICO, Smith & Nephew) ☑ Comparator (n=108): standard dressing ☑ All dressings remained in place for 7 days, or until discharge if this was sooner, or if there was suspicion of infection, the dressing was soaked or leaking	Inclusion criteria: adult patients undergoing laparotomy for at least clean-contaminated surgery, with at least 1 risk factor for SSI (BMI>25, diabetes, contaminated surgery [perforation or abscess], non-elective clean-contaminated surgery, primary closure of incision) ☑	Primary: incision infection, using VICNISS definition (based on CDC criteria) ☑ Secondary: risk factors associated with incision breakdown (incision length, height, weight, BMI, comorbidities including diabetes), skin dehiscence ☑☒	Sample size calculation reported (SSI) and recruitment sufficient, although authors acknowledge lower numbers of infections than expected which may lead to study being underpowered. Most patients recruited pre-operatively, but some who converted from laparoscopic to open surgery were recruited within 24 hours postoperatively, and if allocated to intervention

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	Funding: Trial was funded by Smith and Nephew, who received ongoing updates of all findings but did not have any active input or editorial power over the study protocol, day-to-day running of the trial or reporting of findings.	Exclusion criteria: mini-laparotomy, relook surgery, pregnancy ☑ Recruitment period: 1 March 2015 to 30 September 2017 Setting: NR		arm, had dressing changed for PICO at that time. *Antibiotic prophylaxis:* given to all patients at start of surgery. *Drain:* not reported. EAG assumes **exclusively** in high-risk population or procedure. <u>Risk factors (procedural):</u> 100% (188/188) laparotomy and bowel resection: • 42.6% rectum • 23.4% right colon • 16.5% left colon • 13.8% colostomy • 3.7% small bowel <u>Risk factors (patient):</u> Patients needed to have at least 1 risk factor as per inclusion criteria (BMI >25, diabetes, and other factors relating to procedure). • Mean (SD) BMI 30.3 (6.2) in intervention arm and 30.4 (5.7) in comparator arm • 26.1% (49/188) diabetes

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				The number of patients with 2 or more patient risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document.
Fogacci et al. (2020); Italy	Study design: randomised trial (n=100); method of randomisation not reported. Intervention: PICO (Smith & Nephew) used for 7 days, followed by standard adhesive dressing until completely healed ☑ Comparator: standard adhesive dressing (Farmapore, Farmac-Zabban) changed every 3 days until completely healed ☑ Sponsor/Funder: NR	Inclusion criteria: patients undergoing quadrantectomy, mastectomy, or breast reduction, with 1 or more risk factors for surgical site complications (obesity, diabetes mellitus, smoking, previous radiotherapy on affected breast, predisposing comorbidities [collagen pathologies, vasculopathies, previous neo-adjuvant chemotherapy]) ☑ Exclusion criteria: NR Recruitment period: April 2017 to June 2018 Setting: hospital (N=1)	Wound or subcutaneous complications (infection, ischaemia, seroma), time to healing, hospital resource usage ☑☒	*Antibiotic prophylaxis:* not reported *Drain:* NR, but date of last drainage removal recorded, suggesting drains were used. Risk factors (procedure): Patients undergoing quadrantectomy, mastectomy, or breast reduction. • 16% lumpectomy and SNB • 18% lumpectomy and SNB and IORT • 5% lumpectomy and AD • 16% mastectomy and SNB • 12% skin-sparing mastectomy and SNB • 4% nipple-sparing mastectomy and SNB • 15% mastectomy and AD • 6% skin-sparing mastectomy and AD • 4% reductive mastoplasty • 4% switch skin expander prosthesis

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				Risk factors (patient): Patients needed to have at least 1 risk factor as per inclusion criteria (BMI >29.9, diabetes, smoking,previous radiotherapy on affected breast, collagen pathologies, vasculopathies, previous neoadjuvant chemotherapy). • 19% (19/100) BMI >29.9 • 33% (33/100) smoker • 32% (32/100) diabetes • 14% (14/100) previous radiotherapy • 41% (41/100) other The number of patients with 2 or more patient risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document.
Giannini et al. (2018); Italy	Study design: RCT (n=110); randomised in permuted blocks using independent web-based service. Intervention (n=58): single-use NPWT (PICO, Smith & Nephew), applied on first postoperative day and changed if	Inclusion criteria: patients aged 40 to 80 years, indicated for hip or knee revision through same surgical approach as primary surgery (hip: direct lateral approach, knee: medial parapatellar approach), with	Primary: difference in ASEPSIS score between groups ☑ Secondary: pain (VAS) at each dressing change, number of blisters, number of dressing	Sample size calculation reported (based on 5-point reduction in ASEPSIS score), and study sufficiently powered. *Antibiotic prophylaxis:* given to all patients perioperatively.

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	dressing completely saturated with fluids ☑ Comparator (n=52): traditional povidone-iodine gauze and patch wound dressing (Rays Spa, with Hypafix dressing retention tape), applied on first postoperative day and changed depending on wound leakage ☑ Postoperative physiotherapy was identical for both groups. Funding: Financially supported by Smith & Nephew.	suspected diagnosis of aseptic loosening of the prothesis, and at least 1 risk factor that may impact wound healing (age ≥65 years, diabetes, smoking, pulmonary disease, vascular disease, BMI ≥30 kg/m^2, hypertension). ☑ Exclusion criteria: revision surgery because of periprosthetic fracture or prosthetic joint infection, antibiotic therapy within last month, declined participation, septic loosening of the prosthesis following microbiology and histology examination. ☑ Recruitment period: February 2013 to June 2015 Setting: hospital (N=1)	changes during 7 days after surgery, adverse events ☑☒	*Drain:* all patients received 1 surgical drain placed under the closed facia in the deep area of the wound, removed on first postoperative day before applying intervention and comparator dressings. EAG assumes **exclusively** in high-risk population or procedure. <u>Risk factors (procedure):</u> 100% of patients had prosthetic. <u>Risk factors (patient):</u> Patients needed to have at least 1 risk factor as per inclusion criteria (age ≥65 years, diabetes, smoking, pulmonary disease, vascular disease, BMI ≥30, hypertension). 62.7% (69/110) had ≥2 risk factors. • 9.1% (10/110) diabetes • 15.5% (17/110) smoker • 24.5% (27/110) BMI ≥30 kg/m^2 • 15.5% (17/110) pulmonary disease, type and class NR • 12.7% (14/110) vascular disease

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				Not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document.
Gillespie et al. (2021); Australia ACTRN12615000286549 Protocol published in Gillespie et al. 2015	Study design: RCT (n=2,035); 1:1 randomisation using web-based service, stratified by hospital in random block sizes of 4, 6 and 8, outcome assessors, statistician and principal investigators were blinded to group allocation. Intervention (n=1017): closed incision NPWT dressing (PICO, Smith & Nephew) reinforced with adhesive tape around each edge, used for around 5 to 7 days ☑ Comparator (n=1018): standard hospital dressing, at discretion of treating obstetrician (for example, hydrocolloid or transparent), used for 5 to 7 days ☑ Methods of wound closure, and layers closed, not controlled (obstetrician preference); however appear similar across groups. Funding: Funded by a competitive peer reviewed grant (APP1081026) from the Australian National Health and Medical Research Council. The funders had no role in considering the study design or in	Inclusion criteria: women booked for elective or semi-urgent caesarean section, with pre-pregnancy BMI ≥30, and able to provide written informed consent ☑ Exclusion criteria: women who needed urgent caesarean section, had an infection in hospital including during labour or immediately before caesarian section, had participated in the trial in a previous pregnancy, or were unable to speak or understand English with no interpreter present ☑ Recruitment period: 26 October 2015 to 1 November 2019 Setting: tertiary hospital (N=4)	Primary: cumulative incidence of SSI at 30 days after surgery, using CDC criteria ☑ Secondary: type of SSI (superficial, deep, organ or body space), any type of wound complication (dehiscence, haematoma, seroma, bleeding), type and number of individual wound complications, length of hospital stay, number of wound related hospital admissions within 30 days of surgery, dressing related adverse events (rash, itchiness, blistering), serious adverse events (maternal death, admission to intensive care unit, life threatening condition) ☑☒	Sample size calculation reported (cumulative SSI at 30 days), and sufficiently powered. Additional analysis (intention to treat, complete case analysis, per-protocol, and logistic regression to identify risk factors for SSI) reported in supplementary material. *Antibiotic prophylaxis:* given pre-incision 96.3%, post-incision 2.7%, and not given in 1.0%. *Drain:* NR Risk factors (procedure): Elective or semi-urgent caesarean section Risk factors (patient): The number of patients with 2 or more risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document.

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	the collection, analysis, or interpretation of data, the writing of the report, or the decision to submit the article for publication.			• 100% BMI ≥30 kg/m^2 (21% with BMI ≥40 kg/m^2) • 10.7% (218/2,035) smoker • 28.5% (580/2,035) gestational diabetes, 3.8% (77/2,035) diabetes mellitus • 8.9% (182/2,035) anaemia in third trimester • 0.4% (9/2,035) immunosuppression • 28.9% (589/2,035) ASA>2
Hasselmann et al. (2020); Sweden NCT01913132 Protocol reported in Hasselmann et al. 2015. Partial results also reported in economic study by Svensson-Björk et al. (2021).	Study design: RCT (n=178); 1:1 allocation, using opaque randomisation envelopes (25 twice-folded allocations to each arm, and new randomisation envelopes prepared when needed). Randomisation result applied directly to unilateral incisions, but in the case of bilateral incisions, applied to right incision, with opposite dressing applied to the left. Wound assessors (outpatient clinic) were blinded to allocation. Intervention (n=99; 75 unilateral, 24 bilateral): NPWT (PICO, Smith & Nephew) ☑ Comparator (n=103; 79 unilateral, 24 bilateral): conventional dressing (Vitri-Pad, ViTri Medical or OPSITE Post-Op Visible, Smith & Nephew). ☑	Inclusion criteria: adult patients scheduled for elective vascular surgery with inguinal incisions ☑ Exclusion criteria: patients unable to comprehend the study, give written consent, or with infections in the inguinal area ☑ Recruitment period: November 2013 to October 2018 Setting: tertiary referral vascular centre (N=1 centre, N=10 surgeons)	Primary: development of SSI, using revised CDC criteria and modified ASEPSIS score criteria and definitions, or other inguinal wound complications in the inguinal area within 90 days ☑ Secondary: adverse events attributable to NPWT dressing ☑	Sample size calculation reported (SSI), and sufficiently powered. Vitri-Pad used as conventional dressing for all vascular surgeries before 1 March 2017, and OPSITE Post-Op Visible from then onwards. *Antibiotic prophylaxis:* given preoperatively in 5.0% and intraoperatively in 94.2%, assumed not given in 1 patient. *Drain:* NR Risk factors (procedure): Elective vascular surgery • 43.9% femoral thrombendarterectomy

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	All dressings applied by nursing staff under sterile conditions in theatre. Funding: From public Swedish funds, an unconditional research grant and a donation of 100 PICO dressings by Smith and Nephew in 2013.			• 23.0% femoropopliteal bypass • 29.5% femoral thrombendarterectomy and iliac artery stent • 1.4% aortobifemoral bypass • 1.4% pseudoaneurysm repair • 0.7% axillounifemoral bypass Inguinal incision • 94.9% longitudinal • 5.1% transverse <u>Risk factors (patient):</u> The number of patients with 2 or more risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • 29.5% (41/139) smoker • 31.7% (44/139) diabetes • 41.7% (58/139) anaemia • 11.5% (16/139) transfusion of >2 units packed red blood cells • 100% (139/139) ASA>2

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
Helito et al. (2020); Brazil	Study design: cohort [prospective] consecutively recruited, with comparator [retrospective] (n=296) Intervention (n=97): portable NPWT (PICO, Smith & Nephew), used for 7 days unless dressing was saturated ☑ Comparator (n=199): conventional dressings, changed after 7 days unless dressing was saturated with blood ☑ Sutures were removed between 14 and 21 days after surgery in outpatient setting. Funding: Reported by authors as "not applicable"	Inclusion criteria: patients of any age with primary or secondary knee osteoarthritis, undergoing elective unilateral arthroplasty ☑ Exclusion criteria: patients with previous knee, femur or tibia surgeries on the side of arthroplasty, with previous osteomyelitis in the femur or tibia ipsilateral to the operated knee, or needing revision implants in the tibia or femur because of severe deformity or previous ligament instability, and patients unable to perform weekly postoperative evaluation in person ☑ Recruitment period: January 2016 to December 2017 (prospective cohort), January 2013 to December 2015 (retrospective comparator) Setting: NR	Surgical wound healing complications (haematoma, persistent drainage, hyperaemia, skin necrosis, dehiscence, blisters), postoperative infection, any complication, length of hospital stay, need for reintervention, incidence of deep venous thrombosis ☑☒	Univariate, and multivariate analysis with logistic regression applied to determine risk factors. Post-hoc power calculation reported, giving power of 91.2%. *Antibiotic prophylaxis:* given to all patients for 24 hours. *Drain:* used for a maximum of 24 hours. EAG assumes **exclusively** in high-risk population or procedure. Risk factors (procedure): 100% with primary or secondary knee osteoarthritis, undergoing elective unilateral arthroplasty (with implant) Risk factors (patient): Two or more risk factors reported in 15.5% of intervention group, and 10.5% of comparator group, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • 24.0% obese • 17.2% diabetes

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				• 7.4% smoker • 17.2% rheumatoid arthritis
Irwin et al. (2020); UK	Study design: cohort [prospective], (n=196 patients, n=307 breasts), consecutively recruited, data extracted from implant database. Intervention (n=126): NPWT (PICO, Smith & Nephew) ☑ Comparator (n=181): standard transparent waterproof dressing with absorbent pad (Opsite, Smith & Nephew) ☑ Use of NPWT dressing was not controlled (based on availability). All incisions were closed with sutures and glue. Sponsor/Funder: NR	Inclusion criteria: patients undergoing ADM-assisted prepectoral immediate breast reconstruction, with either complete ADM cover or a combination of ADM and dermal sling cover ☑ Exclusion criteria: NR Recruitment period: January 2013 to June 2018 Setting: breast centre (N=1 centre; 2 surgeons)	Length of stay, implant revision, minor complication (for example, seroma), major complication (requiring change in management, for example, prescription of antibiotics, change in dressings, prolonged wound healing), wound breakdown, implant loss, cost analysis ☑☒	Includes economic analysis. *Antibiotic prophylaxis:* NR *Drain:* NR EAG assumes **exclusively** in high-risk population or procedure Risk factors (procedure): 100% patients underwent a skin-sparing or skin-reducing mastectomy with immediate prepectoral implant reconstruction. Risk factors (patient): EAG unable to comment, as study reports demographics per breast, not per patient.
Masters et al. (2021); UK ISRCTN55305726	Study design: RCT (n=462); 1:1 computer generated randomisation, stratified by recruitment centre. Wound assessors blinded.	Inclusion criteria: patients aged > 65 years, undergoing surgery for a hip fracture ☑ Exclusion criteria: patients with an undisplaced	Deep SSI within 30 and 90 days, further hip surgery, complications (wound infection, respiratory infection, urinary tract infection,	No sample size calculation reported (authors note this is because numbers of SSIs expected can vary widely). Only intention to treat analysis reported.

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
Protocol published in Masters et al. 2018	Intervention (n=232): NPWT (PICO, Smith & Nephew) ☑ Comparator (n=230): standard sterile dressing, according to local routine care ☑ Sponsor/Funder: National Institute for Health Research	intracapsular fracture treated with cannulated screws (because of small incisions needed for this procedure) ☑ Recruitment period: July 2017 to February 2018 Setting: hospital (N=5).	venous thromboembolism, cerebrovascular accident, cardiac event, failure of fixation, dislocation, blood transfusion), or death within 120 days, and health related quality of life (EQ-5D-5L), mobility status, and residential status at baseline and 120 days	*Antibiotic prophylaxis:* given intraoperatively according to local hospital policy. *Drain:* NR EAG assumes **exclusively** in high-risk population or procedure Risk factors (procedure): 100% implant surgery: • 51.3% hemiarthroplasty • 4.5% arthroplasty • 6.1% arthroplasty hybrid • 38.1% internal fixation Risk factors (patient): The number of patients with 2 or more risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • Median [IQR] age 85.2 [77 to 90] in intervention group, and 84.9 [77 to 89] in comparator group • 71% (328/462) ASA >2 • 7.8% (36/462) smoker • 12.6% (58/462) diabetes

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
Myllykangas et al. (2022); Finland	Study design: cohort [prospective] consecutively recruited, with comparator [retrospective] (n=952), propensity matched (n=348) based on age, gender, type of original heart surgery, presence of unstable angina pectoralis, diabetes, diabetes type 1, kidney disease, chronic lung disease, peripheral artery disease, smoking, previous myocardial infarction, BMI, and EuroSCORE II value. Intervention (n=174): single-use incisional NPWT (PICO, Smith & Nephew), used for 6 to 7 days depending on length of hospital stay and removed before discharge, with dressing changed on postoperative day 3 ☑ Comparator (n=174): conventional wound dressing (multiple manufacturers), removed on postoperative day 3 unless indicated sooner, for example, because of bleeding ☑ Funding: Supported by the Orion Research Foundation and Oiva Vaittinen fund.	Inclusion criteria: high risk (BMI>30 or diabetes) patients undergoing CABG.☑ Exclusion criteria: patients undergoing immunosuppression, not capable of giving informed consent ☑ Recruitment period: 2018 to 2020 (prospective cohort), 2012 to 2017 (retrospective comparator) Setting: university hospital (N=1)	Deep and superficial sternal wound infections, using CDC criteria within 6 weeks, interruptions of treatment, adverse events ☑☒	Outcomes collected from records of single hospital (outcomes treated in other hospitals or community would not be captured); but applies equally to both groups. *Antibiotic prophylaxis:* given to all patients for 48 hours *Drain:* NR, but authors note in the discussion that drains should be placed further from the wound when using NPWT, which implies they were used. EAG assumes **exclusively** in high-risk population or procedure. Risk factors (procedure): 100% CABG; 19.3% CABG with composite graft Risk factors (patient): The number of patients with 2 or more risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document.

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				• 76.4% (266/348) diabetes • 8.0% (28/348) kidney disease • 17.8% (62/348) lung disease • 9.5% (33/348) smoker • Mean (SD) BMI 31.4 (4.8) in intervention group, 30.5 (5.2) in comparator group.
O'Neill et al. (2020); US	Study design: pilot RCT (n=40); 1:1 allocation, stratified by organ of resection. Intervention (n=20): incisional NPWT (PICO, Smith & Nephew) covering the full length of the incision, used for 7 days even if discharged in this time ☑ Comparator (n=20): sterile island dressing ☑ All patients had skin closed with staples. Funding: PICO used in this study were provided Smith & Nephew.	Inclusion criteria: age ≥18 years, consented to open or laparoscopic hepatic or pancreatic resection, and were medically fit for major resection ☑ Exclusion criteria: NR Recruitment period: 1 October 2017 to 1 September 2018 Setting: hospital (N=1)	Wound complications and type of SSI (superficial or organ space infection) assessed on days 3, 7, 15 and 30, using CDC criteria ☑	Sample size calculation reported (SSI), and sufficiently powered. Subgroup analyses stratified by organ of resection. Univariate and binomial logistic regression conducted to identify risk factors of SSI. *Antibiotic prophylaxis:* given to all patients 30 minutes before procedure. *Drain:* placed in at least 28/37 (75.7%) cases Risk factors (procedure): Open or laparoscopic hepatic or pancreatic resection Midline incision 82.5% Subcostal incision 17.5% Risk factors (patient): The number of patients with 2 or more risk factors not reported,

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • Mean BMI: 31.7 • 32.5% (13/40) diabetes • 82.5% (33/40) anaemia • 17.5% (7/40) smoker • 27.5% (11/40) chemotherapy within previous 60 days • 95% (38/40) ASA >2
Peterson et al. (2021); US NCT02799667	Study design: RCT (n=110); 1:1 internet-based randomisation in permuted blocks of 4, 6 and 8, using opaque envelopes for concealment of allocation (created by personnel not involved in enrolling or randomisation). Randomised at time of fascial closure. Staff involved with assessing follow-up appointments blinded to allocation. Intervention (n=55): NPWT (PICO, Smith & Nephew) applied at skin closure, and used for 7 days, with dressing changed at wound evaluation on postoperative day 3 or 4 before hospital discharge, or earlier if indicator light suggested dressing was no longer working ☑	Inclusion criteria: patients having planned delivery at institution, BMI≥40 undergoing caesarean delivery (scheduled or unscheduled) ☑☒ Exclusion criteria: patients aged <18 years, had an active infection in location of Pfannenstiel skin incision before surgery, had a planned caesarean hysterectomy, or who were not willing to attend an in-person postoperative visit at 2 weeks ☑	Primary: composite outcome of occurrence of at least 1 complication (superficial, deep or organ space SSI, using CDC criteria, skin blisters, scar separation >1 cm, seroma or haematoma requiring evacuation, wound debridement, hospital readmission, or requirement for reoperation for wound care management) ☑ Secondary: identical to primary composite outcome, excluding less severe complications	Sample size calculation reported (primary composite wound outcome). Trial terminated after publication of larger trials and unplanned interim analysis showed no benefit of NPWT in reducing wound complications in this population, recruitment was slow (authors report that a number of eligible patients declined participation as they did not wish to return to the referral centre for follow-up). EAG notes duration of dressings different across arms. Intention to treat analysis reported only. Kaplan-Meier analysis reported.

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
	Comparator (n=55): sterile non-adherent wound dressing (Telfa, Cardinal Health), sterile abdominal gauze pad, sterile transparent adhesive film (Tegaderm, 3M), removed on postoperative day 1 ☑☒ Surgical techniques, including skin closure technique, at discretion of the primary surgeon. Sponsor/Funder: NR	Recruitment period: 22 May 2016 to 4 January 2019 Setting: urban academic tertiary care centre with level III neonatal ICU (N=1)	(skin blisters, scar separation >1 cm), individual wound complications (superficial SSI, skin blisters, scare separation >1cm, seroma evacuation, haematoma evacuation, wound debridement, hospital readmission, reoperation, wound debridement with placement of wound vacuum device) ☑	*Antibiotic prophylaxis:* given to all patients before skin incision. *Drain:* Not reported. **Exclusively** in high-risk population Risk factors (procedure): Primary closure after caesarean delivery with high BMI Skin incision • 94.5% pfannenstiel • 4.5% vertical • 0.9% supraumbilical transverse 60.9% unscheduled delivery Risk factors (patient): All patients at high risk due to BMI ≥40, and additional risk factors • 45.5% (50/110) diabetes • 5.5% (6/110) smoker • 0.9% (1/110) chronic steroid use • 1.8% (2/110) chorioamnionitis
Ryu et al. (2022);	Study design: cohort [retrospective] (n=60)	Inclusion criteria: immediate prepectoral breast	Major seroma, SSI, mastectomy skin flap	Multiple univariate analysis reported to determine predictors

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
Korea	Intervention (n=37): incisional NPWT (PICO, Smith & Nephew), changed on postoperative days 3 and 7, unless bleeding or oozing was observed sooner ☑ Acellular dermal matrix used in all patients: CG CryoDerm (58.3%), MegaDerm (8.3%), BellaCell HD (33.3%). Comparator (n=23): ointment and foam dressing ☑ Sponsor/Funder: NR	reconstruction, undergoing skin- or nipple-sparing mastectomies, allogenic ADMs >2 mm thick ☑ Exclusion criteria: NR Recruitment period: February 2017 to July 2019 Setting: hospital (N=1)	necrosis, wound dehiscence, capsular contracture grade 3 or 4, haematoma, implant extrusion, unplanned return to theatre, duration of seroma, volume of seroma ☑☒	of any complication, unplanned return to theatre, duration of seroma, volume of seroma. *Antibiotic prophylaxis:* NR *Drain:* NR EAG assumes **exclusively** in high-risk population or procedure <u>Risk factors (procedure):</u> Immediate prepectoral breast reconstruction • 76.7% textured implant 23.3% smooth implant Type of mastectomy • 58.3% skin-sparing • 41.7% nipple-sparing <u>Risk factors (patient):</u> The number of patients with 2 or more risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • 1.7% (1/60) BMI>30kg/m^2 • 0.0% (0/60) smoker • 0.0% (0/60) diabetes

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				• 30% (18/60) adjuvant chemotherapy
Svensson-Björk et al. (2022); Sweden NCT01913132 Possible overlap with Hasselmann et al. (2020)	Study design: RCT (n=275); 1:1 allocation, using opaque randomisation envelopes conducted independently by nurses in outpatient clinic. Randomisation result applied directly to unilateral incisions, but in the case of bilateral incisions, applied to right incision, with opposite dressing applied to the left. Intervention (n=246; 23 unilateral, 223 bilateral): NPWT (PICO, Smith & Nephew), used for 7 days, and changed if fully saturated with fluids ☑ Comparator (252; 29 unilateral, 223 bilateral): standard dressing (Vitri-Pad, ViTri Medical; Tegaderm + pad, 3M; OPSITE Post-Op, Smith & Nephew; or Mepilex Border, Mölnlycke), changed if fully saturated with fluids or at day of discharge ☑ All dressings applied by nursing staff under sterile conditions in theatre. Sponsor/Funder: Open access funding provided by Lund University. Research funds were received from the Swedish medical research council (2019–00435), the Hulda Almroth Foundation, Skane	Inclusion criteria: patients undergoing elective EVAR (including fenestrated EVAR and thoracic EVAR) procedures ☑ Exclusion criteria: inability to understand study instructions and purpose, aged <18 years, inability to give informed consent, ongoing inguinal infection, no inguinal incision made, incorrect allocation of dressings, withdrawn consent, reoperation with an inguinal incision for bleeding, peripheral ischaemia, stent-graft reintervention, or non-incisional related mortality within 90 postoperative days ☑☒ Recruitment period: November 2013 to December 2020 Setting: university hospital (N=2)	Primary: incidence of SSI, using ASEPSIS score and CDC criteria, at 90 days postoperatively ☑ Secondary: incidence of SSI, using ASEPSIS score and CDC criteria, at 1 year postoperatively, other wound complications (haematoma, wound dehiscence, seroma, lymphatic complications) at 90 days, and 1 year postoperatively, adverse events ☑	Sample size calculation reported (SSI), and authors acknowledge that total number of incisions was sufficient, although not necessarily distributed across unilateral and bilateral as intended. EAG notes difference in dressing duration between arms. *Antibiotic prophylaxis:* given to all patients preoperatively. *Drain:* NR EAG assumes **exclusively** in high-risk population or procedure <u>Risk factors (procedure):</u> All via groin incisions • 61.7% EVAR • 19.6% fenestrated EVAR • 12.0% thoracic EVAR • 6.7% redo surgery. 17.7% (37/209) transfusion with >2 units packed red blood cells. <u>Risk factors (patient):</u>

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
	University hospital, Region Skane, the Swedish government under the ALF agreement and Smith & Nephew (2013) which also provided 100 PICO dressings. The funding sources were not involved in study design, analysis, interpretation, writing or submission of the manuscript.			The number of patients with 2 or more risk factors not reported, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • 19.6% (41/209) diabetes • 23.0% (48/209) smoker • 4.3% (9/209) dual antiplatelet treatment • 11.5% (24/209) steroid treatment • 7.2% (15/209) peripheral artery disease • 88.0% (184/209) ASA>2 • 35.4% (74/209) anaemia • 17.7% (37/209) previous vascular surgery

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
Tabley et al. (2020); France	Study design: before and after study (n=233) Intervention (n=142): single-use NPWT (PICO, Smith & Nephew), used immediately postoperatively ☑ Comparator (n=91): conventional dressings ☑ Sponsor/Funder: NR	Inclusion criteria: cardiac surgery patients with at least 2 risk factors for SSI through median sternotomy ☑ Exclusion criteria: NR Recruitment period: January 2015 to June 2017; standard care group created using the 6 months before introduction to PICO group. Unclear whether January 2015 was the start of use of PICO, or if this accounts for the 6 month 'before' period. Setting: university hospital (N=1 centre; 4 surgeons)	Superficial SSI, mediastinitis, other complications (undefined), length of hospital stay, death, economic analysis ☑	Authors acknowledge small comparator cohort. Complication rates also reported stratified by risk factors (BMI, diabetes, BIMA procedure, EuroSCORE, peripheral arterial disease, COPD, smoking, radiotherapy to chest, chronic renal failure). Includes economic analysis. *Antibiotic prophylaxis:* given to all patients. *Drain:* NR. **Exclusively** in high-risk population or procedure Risk factors (procedure): 100% cardiac surgery through median sternotomy Risk factors (patient): All patients had at least 2 risk factors as per inclusion criteria. • 36.5% (85/233) aged ≥70 years • 50.6% (118/233) BMI≥30 • 3.9% (9/233) BMI <18.5 • 22.7% (53/233) COPD

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				• 3.4% (8/233) chest radiation therapy • 6.4% (15/233) chronic renal failure • 46.4% (108/233) diabetes • 6.9% (16/233) ejection fraction <40% • 14.2% (33/233) peripheral arterial disease • 48.9% (114/233) smoker
Tormey et al. (2021); UK, Ireland	Study design: before and after study (n=162); data extracted from hospital records Intervention (n=93): single-use NPWT (PICO, Smith & Nephew), with sutures (n=92) or steri-strips (n=1). Placed in theatre (91/93) or on the ward within 24 hours of surgery (2/93). ☑ Comparator (n=69): standard care dressings, with sutures, plus glue or staples, as appropriate ☑ Sponsor/Funder: NR	Inclusion criteria: patients at risk of surgical site complications following breast surgery ☑ Exclusion criteria: NR Recruitment period: 2017 to 2019 (historical comparator group with overlapping time periods) Setting: NR (N=4)	Complications (superficial SSI, deep SSI, wound dehiscence, organ space SSI, necrosis, other), major complications (superficial SSI, deep SSI, wound dehiscence) ☑	No formal participant matching undertaken, due to small sample sizes. Authors report some differences in treatment of patients in each cohort, which may confound results. Includes economic analysis. *Antibiotic prophylaxis:* given to 96.7% in intervention group and 89.9% in comparator group during surgery. *Drain:* NR. Risk factors (procedure): All breast surgery:

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				• 1.9% augmentation • 1.9% axillary clearance • 4.9% delayed reconstruction • 18.5% mastectomy • 5.6% mastopexy • 11.1% reduction • 21.6% simple mastectomy • 6.8% therapeutic mammoplasty • 17.3% wide local excision • 10.5% other Incision type: • 11.7% circumareola • 57.4% transverse • 6.8% vertical • 21.0% wise pattern <u>Risk factors (patient):</u> Mean number of risk factors were 1.16 in intervention group and 1.00 in comparator group, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • 15.5% (25/162) age >70 years • 38.9% (63/162) BMI>30 • 1.2% (2/162) BMI<18.5

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				• 1.2% % (2/162) steroids • 22.2% (36/162) smoker • 9.9% (16/162) diabetes • 9.9% (16/162) neoadjuvant chemotherapy • 5.6% (9/162) previous chemotherapy • 4.3% (7/162) previous radiotherapy • 14.8%% (24/162) other recent operation
Walker (2018); Australia	Study design: pilot RCT (n=50); randomisation using sealed envelopes Intervention (n=25): NPWT (PICO, Smith & Nephew) ☑ Comparator (n=25): conventional dressing (Jelonet, followed by a wool bandage and firm crepe bandage) ☑ All wounds closed with sutures. All dressings removed for wound inspection on postoperative day 5, after which conventional dressings were used, at discretion of consultant. Sponsor/Funder: NR	Inclusion criteria: patients scheduled to undergo a major lower limb amputation ☑ Exclusion criteria: patients who were unwilling to consent ☑ Recruitment period: 30 months (dates NR) Setting: small tertiary referral, teaching hospital (N=1)	Primary: need for surgical revision within 3 months ☑ Secondary: whether dressing was left intact for 5 days following surgery, and wound infection, death ☑☒	No sample size calculation reported, as pilot trial only. EAG notes a significant difference in the proportion of patients with diabetes between groups. *Antibiotic prophylaxis:* given to all patients pre- and postoperatively (according to undefined hospital protocol) *Drain:* NR Risk factors (procedure): 100% underwent major lower limb amputation (above or below knee). Risk factors (patient): The number of patients with 2 or more risk factors not reported, and not enough detail to identify

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments

				patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document.
				• 36.0% (18/50) diabetes
				• Indication for surgery:
				  • 16.0% (8/50) gangrene
				  • 20.0% (10/50) infection and gangrene
				  • 46.0% (23/50) infection only
				• 18.0% (9/50) pain

Wikkeling et al. (2021); Netherlands	Study design: before and after study (n=108) Intervention (n=44): single-use NPWT (PICO, Smith & Nephew) ☑ Comparator (n=64): standard postoperative dressings ☑ All wounds closed with staples or sutures. Surgeons used consistent incision methods (transverse) for all patients. Sponsor/Funder: NR	Inclusion criteria: consecutive patients undergoing femoral endarterectomy ☑ Exclusion criteria: NR Recruitment period: January 2013 to December 2019; NPWT system introduced from August 2016, and patients before this were treated with standard dressings. Setting: (N=1 centre; 2 surgeons)	Wound complications (at discharge and during follow-up), wound dehiscence, seroma, haematoma, SSI, other, length of hospital stay, readmission, frequency of outpatient appointments after discharge ☑☒	No formal participant matching undertaken, due to small sample sizes. Includes economic analysis. *Antibiotic prophylaxis:* documented as given in 84.1% of patients in intervention group, and 90.6% in standard care group. *Drain:* NR EAG assumes **exclusively** in high-risk population or procedure Risk factors (procedure): 100% femoral endarterectomy

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
				Risk factors (patient): Number of risk factors 1.8 in intervention group and 1.9 in comparator group, and not enough detail to identify patients with a single risk factor placing them at high risk according to the WUWHS Consensus Document. • 9.3% (10/108) anaemia • 13.0% (14/108) COPD or asthma • 26.9% (29/108) diabetes • 11.1% (12/108) kidney insufficiency • 0.9% (1/108) previous chemotherapy • 0.9% (1/108) previous radiotherapy • 38.0% (41/108) smoker • 2.8% (3/108) steroids • ASA score 2.8 in intervention group and 2.7 in comparator group (unclear whether this is mean or median)
Abbreviations: ADM, acellular dermal matrix; AD, axillary dissection; ASA, American Society of Anesthesiologists; ASEPSIS, Additional treatment, Serous discharge, Erythema, Purulent exudate, Separation of deep tissues, Isolation of bacteria, Stay as inpatient prolonged over 14 days; BBT-AVF, brachiobasilic transposition arteriovenous fistula; BMI, body mass index; CABG, coronary artery bypass grafting; CDC, US Centers for Disease Control and Prevention; DGE, delayed gastric emptying; DSWI, deep sternal wound infection; EQ-5D EuroQol-5 Dimensions; EVAR, endovascular aneurysm repair; ICU, intensive				

Author (year); location	Design and intervention(s)	Participants and Setting	Outcomes	EAC comments
care unit; IORT, intraoperative radiation therapy; ISS, Injury Severity Score; NPWT, negative pressure wound therapy; NR, not reported; POPF, post-operative pancreatic fistula; PPH, post-pancreatectomy haemorrhage; RCT, randomised controlled trial; SBSES, Stony Brook Scar Evaluation Scale; SNB, sentinel node biopsy; SSI, surgical site infection; SSO, surgical site occurrence; TARN, Trauma Audit and Research Network; VAS, visual analogue scale; VICNISS, Victorian Hospital Acquired Infection Surveillance System;				

Appendix E2: Surgical Site Infection (N=22 studies)

				SSI				
Specialty	Author (year); country	Study design (n)	Surgery	Definition [timepoint]	Type	Proportion of patients in PICO arm	Proportion of patients in comparator arm	p-value
Breast surgery	Fogacci et al. (2020); Italy	RCT (n=100)	Quadrantectomy, mastectomy, or breast reduction	NR	NR	0.0% (0/50)	10.0% (5/50)	NR
	Ryu et al. (2021); Korea	Retrospective Cohort (n=60)	Prepectoral immediate breast reconstruction	NR	NR	0.0% (0/37)	0.0% (0/23)	NR
	Tormey et al. (2021); UK, Ireland	Before and after study (n=162)	Mixed breast surgery	NR	Superficial	4.3% (4¥/93)	13.0% (9¥/69)	NR
					Deep	0.0% (0¥/93)	4.3% (3¥/69)	NR
					Organ space	4.3% (4¥/93)	0.0% (0¥/69)	NR
Cardiothoracic	Myllykangas et al. (2022); Finland	Cohort with retrospective comparator (n=952)	CABG	CDC [6 weeks]	Any	10.0% (18/180) †10.3% (18/174)	7.1% (55/772) †6.9% (12/174)	0.19 †0.25
					Superficial (sternal)	2.2% (4/180)	0.8% (6/772)	NR
					Deep	3.9% (7/180) †4.0% (7/174)	3.1% (24/772) †3.4% (6/174)	0.59 0.78
	Tabley et al. (2020); France	Before and after study (n=233)	Cardiac surgery through median sternotomy	NR	Superficial	2.1% (3¥/142)	3.3% (3¥/91)	0.68
Colorectal	Abadía et al. (2021); Spain	Prospective Cohort (n=200)	right/left colectomy, abdomenoperineal resection, lowe anterior resection, subtotal colectomy, segmentary colectomy, colostomy closure	CDC [30 days]	Superficial	9.0% (9/100)	19.0% (19/100)	0.02
General surgery	Andrianello et al. (2020); Italy	RCT (n=100)	Whipple, total pancreatectomy	CDC [30 days]	Superficial	*8.7% (4/46) 12.5% (4/32)	*6.1% (3/49) 7.5% (3/40)	*0.71 0.69
					Deep	*2.2% (1/46)	*6.1% (3/49)	*0.62

				SSI				
Specialty	Author (year); country	Study design (n)	Surgery	Definition [timepoint]	Type	Proportion of patients in PICO arm	Proportion of patients in comparator arm	p-value
						3.1% (1/32)	7.5% (3/40)	0.62
					Organ space	*46.7% (21/46) 37.5% (12/32)	*43.8% (21/49) 35.0% (14/40)	*0.84 1.00
	Bueno-Lledo et al. (2021); Spain	RCT (n=150)	Incisional hernia repair	Infection at incision site or in organ space [30 days]	Superficial	0.0% (0/72)	8.1% (6/74)	0.002
	Flynn et al. (2020); Australia	RCT (n=217)	Laparotomy incisions after clean-contaminated surgery	VICNISS, based on CDC [30 days]	Any	13.5% (13/96)	15.2% (14/92)	0.73
	O'Neill et al. (2020); US	RCT (n=40)	Open of laparoscopic hepatic or pancreatic resection	CDC [30 days]: *Liver*	Any	9.1% (1/11)	27.3% (3/11)	NR
					Superficial or deep	9.1% (1/11)	18.2% (2/11)	NR
					Organ space	0.0% (0/0)	9.1% (1/11)	NR
				CDC [30 days]: *Pancreas*	Any	22.2% (2/9)	33.3% (3/9)	NR
					Superficial or deep	0.0% (0/9)	0.0% (0/9)	N/A
					Organ space	22.2% (2/9)	33.3% (3/9)	NR
Obstetrics	Gillespie et al. (2021); Australia	RCT (n=2,035)	Caesarean section	CDC [30 days]	Any	*7.4% (75/1,017) 7.4% (74/996)	*9.7% (99/1,018) 10.0% (98/983)	*0.06 0.05
					Superficial	*6.9%¥ (70/1,017) 6.9%¥ (69/996)	*9.1%¥ (93/1,018) 9.4%¥ (92/983)	*0.72 0.72
					Deep	*0.4 %¥ (4/1,017) 0.4%¥ (4/996)	*0.6%¥ (6/1,018) 0.6%¥ (6/983)	*0.72 0.72
					Organ	*0.1%¥ (1/1,017) 0.1%¥ (1/996)	*0.0%¥ (0/1,018) 0.0%¥ (0/983)	*0.50 0.07
	Peterson et al. (2021); US	RCT (n=110)	Caesarean section	CDC [6 weeks]	Superficial	13.0% (7/55)	13.0% (7/55)	1.00

				SSI				
Specialty	Author (year); country	Study design (n)	Surgery	Definition [timepoint]	Type	Proportion of patients in PICO arm	Proportion of patients in comparator arm	p-value
Orthopaedics	Canton et al. (2020); Italy	Prospective cohort (n=65)	Open reduction internal fixation for ankle and distal tibia fractures	NR	NR	0.0% (0/16)	8.2% (4/49)	0.56
	Costa et al. (2020); UK	RCT (n=1,548)	Lower limb surgery for major trauma	CDC [30 days]	Deep	*5.8% (45/770) 6.1% (41/668)	*6.7% (50/749) 6.6% (48/731)	*0.52 0.76
				CDC [90 days]	Deep	*11.4% (72/629)	*13.2% (78/590)	*0.32
	Helito et al. (2020); Brazil	Before and after study (n=296)	Total knee arthroplasty	NR [12 months]	NR	0.0% (0/97)	3.5% (7¥/199)	1.00
	Masters et al. (2021); UK	RCT (n=462)	Hip fracture surgery	CDC [30 days]	Deep	*1.9% (4/214) 2.8% (4/144)	*6.4% (14/218) 6.7% (11/163)	NR NR
				Revised CDC [90 days]	Deep	*2.3% (5/214)	*6.4% (14/218)	NR
	Walker (2018); Australia	Pilot RCT (n=50)	Below or above knee amputation	NR	NR	16.0% (4/25)	28.0% (7/25)	0.31
Plastic and Reconstructive	Facchin et al. (2021); Italy	Cohort (n=26)	Post-bariatric brachioplasty after weight loss	NR [90 days]	NR	0.0% (0/14)	0.0% (0/12)	N/A
Vascular	Chan et al. (2020); Singapore	Retrospective cohort (n=154)	Brachiobasilic transposition arteriovenous fistula creation	CDC [30 days]	Superficial	2.1% (1/47) †2.6% (1/39)	13.1% (14/107) †11.5% (9/78)	0.03 †0.10
	Hasselmann et al. (2020); Sweden	RCT (n=178)	Inguinal incisions for open vascular surgery	Revised CDC [90 days]: *Unilateral*	Any	11.9% (7/59)	27.9% (17/61)	0.04
					Superficial	10.2%¥ (6/59)	21.3%¥ (13/61)	NR
					Deep	1.7%¥ (1/59)	3.3%¥ (2/61)	NR
					Organ	0.0%¥ (0/59)	3.3%¥ (2/61)	NR
					Any	5.3% (1/19)	26.3% (5/19)	0.12

				SSI				
Specialty	Author (year); country	Study design (n)	Surgery	Definition [timepoint]	Type	Proportion of patients in PICO arm	Proportion of patients in comparator arm	p-value
				Revised CDC [90 days]: *Bilateral*	Superficial	5.3%¥ (1/19)	26.3%¥ (5/19)	NR
					Deep	0.0%¥ (0/19)	0.0%¥ (0/19)	NR
					Organ	0.0%¥ (0/19)	0.0%¥ (0/19)	NR
				ASEPSIS: *Unilateral*	Any	11.9% (7/59)	29.5% (18/61)	0.024
				ASEPSIS: *Bilateral*	Any	5.3% (1/19)	26.3% (5/19)	0.125
	Svensson-Björk et al. (2022); Sweden	RCT (n=275)	EVAR	Revised CDC [90 days]: *Unilateral*	Any	13.3% (2/15)	1.5% (3/26)	1.00
					Superficial	0.0% (0/15)	0.0% (0/26)	N/A
					Deep	13.3% (2/15)	11.5% (3/26)	NR
					Organ	0.0% (0/15)	0.0% (0/26)	N/A
				Revised CDC [90 days]: *Bilateral*	Any	1.8% (3/168)	4.8% (8/168)	0.18
					Superficial	0.6% (1/168)	2.4% (4/168)	NR
					Deep	1.2% (2/168)	2.4% (4/168)	NR
					Organ	0.0% (0/168)	0.0% (0/168)	N/A
				ASEPSIS [90 days]: *Unilateral*	Any	13.3% (2/15)	11.5% (3/26)	1.00
				ASEPSIS [90 days]: *Bilateral*	Any	1.8% (3/168)	4.8% (8/168)	0.18
	Wikkeling et al. (2021); Netherlands	Before and after study (n=108)	Femoral endarterectomy	NR	NR	4.5% (2/44)	4.7% (3/64)	NR

Key: *Intention to treat, †propensity matched cohort, ¥Calculated by EAG
Abbreviations: CABG, coronary artery bypass graft; EVAR, endovascular aneurysm repair; N/A not applicable; NR, not reported; RCT, randomised controlled trial; SSI, surgical site infection; VICNISS, Victorian Hospital Acquired Infection Surveillance System

ASEPSIS Score

- **Giannini et al. (2018)** included hip and knee revision surgeries (n=110) and found a statistically significant difference in ASEPSIS score between the intervention group (mean (SD) 5.1 (3.89); median [range] 3.9 [1 to 17.7]), and control group (3.0 (1.89); 2.4 [0 to 9], p<0.001); however the authors noted that this difference was not clinically significant. A statistically significant difference was also noted between groups for those with 1 risk factor (p<0.002), 2 risk factors (p<0.05), and at least 3 risk factors (p<0.0005), although the authors reported that only the highest risk category was clinically relevant. In this category, the mean (SD) ASEPSIS score was 5.4 (1.7), median [range] 5 [2 to 9] in the intervention group, and 10.5 (3.6), 9.7 [5.8 to 17.7] in the control group. When considering hip and knee surgery subgroups separately, the difference remained statistically significant only for patients having knee surgery.
- **Hasselmann et al. (2020)** reported the combined analysis of bilateral and unilateral incisions, and found a statistically significant reduction in SSIs at 90 days when using PICO for inguinal incisions for open vascular surgery, using both CDC criteria (p=0.03) and ASEPSIS score (p=0.02) when compared to standard dressings.
- **Svensson-Björk et al. (2022)** reported no statistically significant differences between intervention and control groups for either bilateral or unilateral incisions, across ASEPSIS categories of infection, or when all categories were combined. When using either the ASEPSIS score, or CDC criteria to define SSI, Svensson-Björk et al. (2022) reported no statistically significant difference between groups at either 90 days (p=0.49) or 1 year (p=0.65). They noted that all SSIs were reported between 4 and 23 days after surgery. In 1 case of bilateral incisions which healed without complications within 30 days, an aortic stent graft infection developed around 5 months after surgery, although the source of this was not determined.

Other

- **Hasselmann et al. (2020)** reported a shorter median time to SSI (15.4 days versus 17.0 days) between PICO and standard dressings for those with unilateral incisions. For those with bilateral incisions, a longer median time to SSI (14.0 days versus) was reported between PICO and the standard dressing group, however no statistical analysis was reported.

Appendix E3: Dehiscence (N=12 studies)

Specialty	Author (year)	Study design (n)	Surgery	Timepoint	Proportion of patients developing wound dehiscence (Intervention)	Proportion of patients developing wound dehiscence (Comparator)	p-value
Breast surgery	Tormey et al. (2021)	Before and after study (n=162)	Mixed breast surgery	NR	4.3% (¥ 4/93)	7.2% (¥ 5/69)	NR
General surgery	Bueno-Lledo et al. (2021)	RCT (n=150)	Incisional hernia repair	30 days	2.8% (2/72)	5.4% (4/74)	0.32
	Flynn et al. (2020)	RCT (n=217)	Laparotomy incisions after clean-contaminated surgery	NR	6.3%¥ (6/96) [skin] 1.0%¥ (1/96) [fascia]	8.7%¥ (8/92) [skin] 1.1%¥ (1/92) [fascia]	NR NR
Obstetrics	Gillespie et al. (2021)	RCT (n=2,035)	Caesarean section	30 days	*10.6% (108/1,017) 10.5% (105/996)	*10.1% (103/1,018) 10.5% (103/983)	*0.71 0.96
	Peterson et al. (2021)	RCT (n=110)	Caesarean section	†6 weeks	3.6%¥ (2/55)	12.7%¥ (7/55)	0.08
Orthopaedics	Canton et al. (2020)	Prospective cohort (n=65)	Open reduction internal fixation for ankle and distal tibia fractures	NR	12.5% (2/16)	28.6% (14/49)	0.32
	Costa et al. (2020)	RCT (n=1,548)	Lower limb surgery for major trauma	30 days	0.3% (2/714)	1.0% (7/687)	0.11
				30 to 90 days without infection	0.4% (2/563)	0.4% (2/525)	NR
	Helito et al. (2020)	Before and after study (n=296)	Total knee arthroplasty	12 months	3.1% (3¥/97)	10.1% (20¥/199)	0.03

Specialty	Author (year)	Study design (n)	Surgery	Timepoint	Proportion of patients developing wound dehiscence (Intervention)	Proportion of patients developing wound dehiscence (Comparator)	p-value
Plastic and Reconstructive	Facchin et al. (2021)	Cohort (n=26)	Post-bariatric brachioplasty after weight loss	NR	0.0%¥ (0/14)	8.3%¥ (1/12)	NR
Vascular	Hasselmann et al. (2020)	RCT (n=178)	Inguinal incisions for open vascular surgery	90 days	Unilateral: 20.3% (12/59) Bilateral: 10.5% (2/19)	Unilateral: 11.5% (7/61) Bilateral: 10.5% (2/19)	NR NR
	Svensson-Björk et al. (2022)	RCT (n=275)	EVAR	90 days	Unilateral: 13.3% (2/15) Bilateral: 2.4% (4/168)	Unilateral: 11.5% (3/26) Bilateral: 3.6% (6/168)	1.0 0.73
	Wikkeling et al. (2021)	Before and after study (n=108)	Femoral endarterectomy	NR	9.1% (4/44)	32.8% (21/64)	NR

Key: *Intention to treat, ¥Calculated by EAG, †defined as scar separation>1cm
Abbreviations: EVAR, endovascular aneurysm repair; NR, not reported; RCT, randomised controlled trial;

Appendix E4: Seroma (N=10 studies)

Specialty	Author (year)	Study design (n)	Surgery	Timepoint	Proportion of patients developing seroma (Intervention)	Proportion of patients developing seroma (Comparator)	p-value
Breast surgery	Ryu et al. (2022)	Cohort (n=60)	Prepectoral immediate breast reconstruction	NR	16.2% (6/37)	43.5% (10/23)	0.02
General surgery	Andrianello et al. (2021)	RCT (n=100)	Whipple, total pancreatectomy	30 days	*0.0% (0/46) 0.0% (0/32)	*12.2%% (6/49) 15.0% (6/40)	*0.03 0.03
	Bueno-Lledo et al. (2021)	RCT (n=150)	Incisional hernia repair	30 days	12.5 % (9/72)	13.5% (10/74)	0.23
	Flynn et al. (2020)	RCT (n=217)	Laparotomy incisions after clean-contaminated surgery	NR	0.0%¥ (0/96)	1.1%¥ (1/92)	NR
Obstetrics	Gillespie et al. (2021)	RCT (n=2,035)	Caesarean section	30 days	*2.7% (27/1,017) 2.6% (26/996)	*2.6% (26/1,018) 2.5% (25/983)	*0.89 0.93
	Peterson et al. (2021)	RCT (n=110)	Caesarean section	†6 weeks	3.6%¥ (2/55)	1.8%¥ (1/55)	0.56
Plastic and Reconstructive	Facchin et al. (2021)	Cohort (n=26)	Post-bariatric brachioplasty after weight loss	NR	0.0%¥ (0/14)	8.3%¥ (1/12)	NR
Vascular	Hasselmann et al. (2020)	RCT (n=178)	Inguinal incisions for open vascular surgery	90 days	Unilateral: 22.0% (13/59) Bilateral: 15.8% (3/19)	Unilateral: 23.0% (14/61) Bilateral: 21.1% (4/19)	NR NR
	Svensson-Björk et al. (2022)	RCT (n=275)	EVAR	90 days	Unilateral: 0.0% (0/15) Bilateral: 1.8% (3/168)	Unilateral: 3.8% (1/26) Bilateral: 4.8% (8/168)	1.0 0.29
	Wikkeling et al. (2021)	Before and after study (n=108)	Femoral endarterectomy	NR	4.5% (2/44)	10.9% (7/64)	NR

Key: * Intention to treat , ¥Calculated by EAG, †seroma evacuation
Abbreviations: EVAR, endovascular aneurysm repair; NR, not reported; RCT, randomised controlled trial;

- **Ryu et al. 2022** reported a mean duration of major seroma of 21.87 (SD: 5.23) days for PICO, and 61.70 (SD: 14.91) days (p=0.018) for conventional dressings. Mean seroma volumes were reported as 53.89 (SD: 15.27) cm^3 for PICO, and 189.65 (SD: 51.94) cm^3 (p=0.019) for conventional dressings.

Appendix E5: Haematoma (N=11 studies)

					Proportion of patients developing hematoma		
Specialty	Author (year)	Study design (n)	Surgery	Timepoint	Intervention	Comparator	p-value
General surgery	Andrianello et al. (2021)	RCT (n=100)	Major clean-contaminated surgical procedures for periampullary neoplasms (pancreaticoduodenectomy, total pancreatectomy or gastro-jejunal and biliary bypass)	30 days	*4.3% (2/46) 3.1% (1/32)	*2.0%% (1/49) 2.5% (1/40)	*0.61 1.00
	Bueno-Lledo et al. (2021)	RCT (n=150)	Incisional hernia repair	30 days	1.4% (1/72)	2.7% (2/74)	0.33
	Flynn et al. (2020)	RCT (n=217)	Laparotomy incisions after clean-contaminated surgery	NR	0.0%¥ (0/96)	2.2%¥ (2/92)	NR
Obstetrics	Gillespie et al. (2021)	RCT (n=2,035)	Caesarean section	30 days	*1.1% (11/1,017) 1.1% (11/996)	*0.6% (6/1,018) 0.6% (6/983)	*0.22 0.23
	Peterson et al. (2021)	RCT (n=110)	Caesarean section	ł6 weeks	1.8%¥ (1/55)	0.0% (0/55)	0.32
Orthopaedics	Helito et al. (2020)	Before and after study (n=296)	Total knee arthroplasty	12 months	2.1% (2¥/97)	5.0% (10¥/199)	0.34
Plastic and Reconstructive	Facchin et al. (2021)	Cohort (n=26)	Post-bariatric brachioplasty after weight loss	NR	14.3%¥ (2/14)	8.3%¥ (1/12)	NR
Vascular	Chan et al. (2020)	Retrospective cohort (n=154)	Brachiobasilic transposition	NR	17.0% (8/47) †20.5% (8/39)	22.4% (24/107) †21.8% (17/78)	0.45 †0.87

					Proportion of patients developing hematoma		
Specialty	Author (year)	Study design (n)	Surgery	Timepoint	Intervention	Comparator	p-value
			arteriovenous fistula creation				
	Hasselmann et al. (2020)	RCT (n=178)	Inguinal incisions for open vascular surgery	90 days	Unilateral: 1.7% (1/59) Bilateral: 0.0% (0/19)	Unilateral: 6.6% (4/61) Bilateral: 0.0% (0/19)	NR NR
	Svensson-Björk et al. (2022)	RCT (n=275)	EVAR	90 days	Unilateral: 20.0% (3/15) Bilateral: 9.5% (16/168)	Unilateral: 19.2% (5/26) Bilateral: 8.9% (15/168)	1.0 1.0
	Wikkeling et al. (2021)	Before and after study (n=108)	Femoral endarterectomy	NR	6.8% (3/44)	25.0% (16/64)	NR
Key: * Intention to treat, †propensity matched cohort, ¥ Calculated by EAG, ǂ haematoma evacuation Abbreviations: EVAR, endovascular aneurysm repair; NR, not reported; RCT, randomised controlled trial;							

Appendix E6: Scarring (N=3 studies)

				Mean (SD) or Median [IQR]		
Author (year)	Surgery	Assessment tool	Time period	Intervention	Comparator	p-value
Andrianello et al. (2021)	Whipple, total pancreatectomy	VAS	7 days	8 [2]	7 [2]	0.03
			30 days	8 [2]	8 [2]	0.76
		SBSES	7 days	3.2 (0.9)	2.5 (1.1)	0.01
			30 days	3.2 (0.9)	2.5 (1.1)	0.63
Costa et al. (2020)	Lower limb surgery for major trauma	POSAS total score	30 days	21.4 (11.4)	22.9 (11.6)	0.07
			3 months	23.1 (12.9)	23.4 (12.4)	0.61
			6 months	21.4 (12.5)	21.2 (11.8)	0.84
		POSAS overall opinion	30 days	4.4 (2.6)	4.6 (2.6)	0.22
			3 months	4.7 (2.8)	4.9 (2.7)	0.51
			6 months	4.6 (2.8)	4.5 (2.7)	0.52
Facchin et al. (2021)	Post-bariatric brachioplasty after weight loss	Vancouver rating scale	6 months	4.07 (2.49)	4.17 (1.99)	>0.05
Abbreviations: IQR, interquartile range; POSAS, Patient and Observer Scar Assessment Scale; SBSES, Stony Brook Scar Evaluation Scale; SD, standard deviation; VAS, visual analogue scale;						

- **Andrianello et al. (2021)** reported significantly better scores using both VAS (p=0.03) and SBSES (p=0.01) at 7 days, but no difference at 30 days. However, the EAG notes that the outcome at 30 days was reported in 6 fewer patients in the intervention arm, and 8 fewer patients in the comparator arm.

- **Walker (2018)** noted in their discussion that wounds treated with PICO looked superior to wounds treated with conventional wool and crepe dressing, on dressing removal. However, they did not anticipate this prior to the trial and noted that it was a subjective observation, and therefore did not report it formally in their results.

- **Facchin et al. (2021)** also reported that 50% (7/14) patients in the intervention group (none in the standard dressing arm) developed a hyperchromic scar at 90 days, which subsided at follow up visits at 6 and 12 months.

Appendix E7: Re-operation for wound complications (N=12 studies)

Specialty	Author (year)	Study design (n)	Surgery	Time period	Reason for reoperation	Proportion of patients having further surgery (Intervention)	Proportion of patients having further surgery (Comparator)	p-value
Breast surgery	Irwin et al. (2020)	Cohort (n=196)	Prepectoral immediate breast reconstruction	90 days	Implant revision	2.4% (3/126)	1.7% (3/181)	0.38
	Ryu et al. (2022)	Cohort (n=60)	Prepectoral immediate breast reconstruction	NR	Unplanned return to theatre	2.7% (1/37)	26.1% (6/23)	0.01
Cardiothoracic	Myllykangas et al. (2022)	Cohort with retrospective comparator (n=952)	High-risk CABG	NR	Superficial infection or DSWI	6.1% (11/180) †6.3% (11/174)	3.9% (30/772) †4.0% (7/174)	0.19 †0.33
General surgery	Bueno-Lledo et al. (2021)	RCT (n=150)	Incisional hernia repair	30 days	Surgical wound revision after discharge	1.4% (1/72)	2.8% (2/74)	0.10
				30 days	Need for open vacuum assisted closure	0.0% (0/72)	4.0% (3/74)	0.09
Obstetrics	Gillespie et al. (2021)	RCT (n=2,035)	Caesarean section	30 days	NR[α]	*0.4% (4/1,017) 0.4% (4/996)	*0.5% (5/1,018) 0.5% (5/983)	*0.75 0.75
	Peterson et al. (2021)	RCT (n=110)	Caesarean section	6 weeks	Wound care management	1.8% (1/55)	0.0% (0/55)	0.32
Orthopaedics	Canton et al. (2020)	Prospective cohort (n=65)	Open reduction internal fixation for ankle and	NR	Major wound complication requiring surgical treatment	6.3% (1/16)	4.1% (2/49)	1.00

Specialty	Author (year)	Study design (n)	Surgery	Time period	Reason for reoperation	Proportion of patients having further surgery (Intervention)	Proportion of patients having further surgery (Comparator)	p-value
			distal tibia fractures					
	Costa et al. (2020)	RCT (n=1,548)	Lower limb surgery for major trauma	30 days	Surgeon deliberately opened wound	0.3% (2/715)	0.3% (2/688)	0.96
				30 days	Trial wound complications treated surgically	0.2% (1/573)	0.3% (2/575)	0.47
	Helito et al. (2020)	Before and after study (n=296)	Total knee arthroplasty	12 months	Any reason related to arthroplasty	2.0% (2¥/97)	8.5% (17¥/199)	0.001
	Walker (2018)	Pilot RCT (n=50)	Below or above knee amputation	3 months	Surgical revision of stump	12.0%¥ (3/25)	8.0%¥ (2/25)	0.64
Vascular	Hasselmann et al. (2020)	RCT (n=178)	Inguinal incisions for open vascular surgery	90 days	Surgical wound revision	Unilateral: 3.4% (2/59) Bilateral: 5.3% (1/19)	Unilateral: 6.6% (4/61) Bilateral: 5.3% (1/19)	NR NR
	Svensson-Björk et al. (2022)	RCT (n=275)	EVAR	90 days	Incision needed additional treatment	Unilateral: 13.3% (2/15) Bilateral: 1.2% (2/168)	Unilateral: 11.5% (3/26) Bilateral: 1.8% (3/168)	NR NR
Key: †propensity matched cohort, ¥ Calculated by EAG, α the EAG notes that 5 reoperations were explicitly reported as being for wound complications before discharge Abbreviations: DSWI, deep sternal wound infection;								

- **Bueno-Lledo et al. (2021)** reported that of the 6 superficial infections in the control arm, 3 needed reoperation and open vacuum-assisted therapy, and the others resolved with 10 days of intravenous antibiotics.

- **Helito et al. (2020)** reported 2 reinterventions in the PICO arm (1 for aspiration of a haematoma and 1 for superficial cleaning of the surgical wound with placement of a new PICO dressing) and in 17 reinterventions in the standard dressing arm (5 cases of aspiration or drainage of a haematoma, 4 cases of interventions of non-infected wounds with dehiscence, 7 cases of surgical cleaning with polyethylene insert exchange because of infection, and 1 case of washing and closing of a fistula at the surgical drain site).
- **Masters et al. (2021)** reported that surgical debridement occurred in 2.3% (7/305) of patients and revision surgery within 120 days in 1.0% (3/313) of patients, however the authors did not report these events separately for PICO and standard dressing arms.
- M**yllykangas et al. (2022)** reported the number of operations needed for deep sternal wound infections between PICO and standard dressing groups (mean [SD] of 4.6 [3.1] versus 5.2 [7.8]); however no statistical analysis was reported.
- **Peterson et al. (2021)** reported no significant difference in wound debridement, or wound debridement with placement of wound vacuum device between PICO and standard dressing arms.
- **Svensson-Björk et al. 2022** reported that in patients with bilateral incisions, 2.4% (4/168) of the intervention group, and 6.5% (11/168) of the comparator group received additional treatment for their wounds, but this was not defined (p=0.07). For unilateral incisions, 13.3% (2/15) of the intervention group, and 15.4% (4/26) of the comparator group received additional treatment (p=1.00). No patient died or needed an amputation because of an incisional wound complication.

Appendix E8: Readmission (N=7 studies)

Specialty	Author (year)	Study design (n)	Surgery	Time period	Proportion of patients having further surgery (Intervention)	Proportion of patients having further surgery (Comparator)	p-value
General surgery	Bueno-Lledo et al. (2021)	RCT (n=150)	Incisional hernia repair	30 days	2.8% (2/72)	8.1% (6/74)	0.22
Obstetrics	Gillespie et al. (2021)	RCT (n=2,035)	Caesarean section	30 days	*2.3% (23/1,0.17) 2.2% (22/996)	*1.3% (13/1,018) 1.3% (13/983)	*0.09 0.14
	Peterson et al. (2021)	RCT (n=110)	Caesarean section	6 weeks	1.8%¥ (1/55)	1.8%¥ (1/55)	1.00
Vascular	Chan et al. (2020)	Retrospective cohort (n=154)	Brachiobasilic transposition arteriovenous fistula creation	30 days	21.3% (10/47) †20.5% (8/39)	26.2% (28/107) †24.4% (19/78)	0.52 †0.64
	Hasselmann et al. (2020)	RCT (n=178)	Inguinal incisions for open vascular surgery	30 days	Unilateral: 16.9% (10/59) Bilateral: 15.8% (3/19)	Unilateral: 8.2% (5/61) Bilateral: 10.5% (2/19)	NR NR
	Svensson-Björk et al. (2022)	RCT (n=275)	EVAR	90 days	Unilateral: 0% (0/15) Bilateral: 0% (0/168)	Unilateral: 0% (0/26) Bilateral: 1.2% (2/168)	NR NR
	Wikkeling et al. (2021)	Before and after study (n=108)	Femoral endarterectomy	NR	6.8% (3¥/44)	7.8% (5¥/64)	NR

* Intention to treat, †propensity matched cohort, ¥ Calculated by EAG, ŧreadmission without surgery

- **Fogacci et al. (2019)** reported that the mean number of outpatient attendances in patients receiving the PICO dressing was lower (mean 3.8, range 2.0 to 8.0) than those receiving a standard dressing (mean 4.2, range 2.0 to 14.0); however no statistical analysis was reported.
- **Svensson-Björk et al. (2022)** also reported the proportion of patients with an extra outpatient visit, between PICO and standard dressing groups (3.6% versus 0.5%); however no statistical analysis was reported.
- **Wikkeling et al. (2021)** reported the mean number of post-discharge outpatient visits between PICO and standard dressings groups (0.4 versus 1.0); however no statistical analysis was reported.

Appendix E9: Length of hospital stay (N=9 studies)

				Hospital stay, days Mean (SD) or [95% CI], or Median {IQR}		
Specialty	Author (year)	Study design (n)	Surgery	Intervention	Comparator	p-value
Breast surgery	Irwin et al. (2020)	Cohort (n=196)	Prepectoral immediate breast reconstruction	0.78 {0.0 to 2.0}	0.71 {0.0 to 3.0}	0.44
Colorectal	Abadía et al. (2021)	Prospective Cohort (n=200)	Right/left colectomy, abdomenoperineal resection, lowe anterior resection, subtotal colectomy, segmentary colectomy, colostomy closure	12.3 [9.6 to 15.0]	12.4 [10.0 to 14.8]	0.82
Cardiothoracic	Myllykangas et al. (2022)	Cohort with retrospective comparator (n=31 with deep sternal wound infection)	CABG	28.0 (10.8)	36.7 (31.7)	NR
General surgery	Andrianello et al. (2021)	RCT (n=100)	Whipple, total pancreatectomy	15.0 {22.0}	13.0 {23.0}	0.64
	Bueno-Lledo et al. (2021)	RCT (n=150)	Incisional hernia repair	6 (2.1)	7 (2.3)	0.15
Obstetrics	Gillespie et al. (2021)	RCT (n=2,035)	Caesarean section	*3.0 {2.0 to 4.0} 3.0 {2.0 to 4.0}	*3.0 {2.0 to 4.0} 3.0 {2.0 to 4.0}	*0.32 0.29
Orthopaedics	Helito et al. (2020)	Before and after study (n=296)	Total knee arthroplasty	3 {1}	3 {1}	0.56

				Hospital stay, days Mean (SD) or [95% CI], or Median {IQR}		
Specialty	Author (year)	Study design (n)	Surgery	Intervention	Comparator	p-value
Plastic and Reconstructive	Facchin et al. (2021)	Cohort (n=26)	Post-bariatric brachioplasty after weight loss	3.07 (1.14)	5.33 (1.49)	<0.05
Vascular	Wikkeling et al. (2021)	Before and after study (n=108)	Femoral endarterectomy	5.60 (NR)	6.74 (NR)	NR
Key: *Intention to treat, † propensity matched cohort, ¥ Calculated by EAG						

- **Myllykangas et al. 2022** also reported length of ICU stay between PICO and standard dressing groups (mean 3.9 [SD: 5.6] days versus 8.5 [SD: 9.0] days) in patients undergoing CABG surgery and requiring treatment for a deep sternal wound infection; however no statistical analysis was reported.

- **Wikkeling et al. (2021)** also reported the mean length of stay for those readmitted between PICO and standard dressing groups (0.64 days versus 0.92 days) in patients undergoing femoral endarterectomy; however no statistical analysis was reported.

Appendix E10: Economic studies (N=6 studies reporting outcomes from a UK NHS perspective)

Subgroup	Author (year); country	Study design	Setting	Key outcomes	EAG comments
Surgical incisions associated with factures following major trauma to the lower limb	Costa et al. (2020) and Png et al. (2020) UK [ISRCTN12702354]	RCT: subset of the WHiST trial (n=1,540) Intervention (n=781): incisional NPWT (PICO, Smith & Nephew) Comparator (n=759): standard dressing	Specialist trauma hospitals representing the UK Major Trauma Network (N=24). Follow up: baseline to 6 months Recruitment period: Patients randomised between September 2016 and April 2018.	Mean (SD) costs between baseline and discharge: Standard care: £4834.11 (£4631.24) Intervention: £5317.07 (£5562.50) Mean difference: £482.96 [95% CI -£25.54 to £993.70] Mean (SD) costs between baseline and 6 months: Standard care: £8443.70 (£14,266.17) Intervention: £10,202.01 (£16,285.05) Mean difference: £1758.32 [95% CI £268.31 to £3344.51] No difference in EQ-5D utility between standard dressing and incisional NPWT group at any time point, mean (SD) QALY gain was: 0.41 (0.24) compared with 0.40 (0.22), p=0.49. ICER (£ per QALY) Base case: £396,531 Societal perspective: £679,482 NHS and PSS perspective: £454,903 Authors conclude that incisional NPWT is highly unlikely to be cost-effective in the studied population.	Protocol published (Achten et al. 2018): study powered to detect a 6% reduction (15% to 9%) in deep SSI using CDC definition: wound infection involving the tissues deep to the skin that occurs within 30 days of injury. Cost of NPWT: £149.52 (from supplementary material).
Breast reconstruction	Irwin et al. (2020); UK	Prospective cohort (n=196 patients, 307 breasts).	NHS breast centre (N=1) Recruitment period: January 2013 to June	Cost per patient Standard care: £573.14 Intervention: £147.06 Difference: -£426.08	Single centre, 2 surgeons. Decision to use NPWT limited by availability. Costs

Subgroup	Author (year); country	Study design	Setting	Key outcomes	EAG comments
		Intervention (n=126 breasts): NPWT (PICO, Smith & Nephew) Comparator (n=181 breasts): transparent waterproof dressing with absorbent pad (Opsite, Smith & Nephew) 2018/19 HRG costs were monitored for 7 patients who experienced reconstruction failure (all in the comparator arm). Costs included were admissions, outpatient appointments and A&E visits. Costs associated with routine care (1 outpatient visit for dressing change and 2 for review with consultant) were subtracted from costs. Calculations assumed 1 NPWT system per incision.	2018. Follow up at 1 week, 2 weeks, and 90 days after surgery.		based on reconstruction failure (implant loss) and not specific to wound infection. Cost of NPWT: £147.06

Subgroup	Author (year); country	Study design	Setting	Key outcomes	EAG comments
Breast reconstruction	Murphy et al. (2021); UK	Decision tree model Intervention: single use NPWT (PICO, Smith & Nephew) Comparator: standard dressings (including transparent waterproof dressings with an absorbent pad)	NHS perspective. Time horizon: 48 months (to reflect consequences of reconstruction failure).	Cost per patient: Standard care: £1,936.63 Intervention: £230.34 Difference: -£1,706.29 QALY: Standard care: 2.5524 Intervention: 2.5711 Difference: 0.0187 PSA: NPWT cost saving £1,539 per patient (95% CI not reported). 99.94% of 10,000 simulations were cost saving.	Costs based on reconstruction failure (implant loss requiring removal, insertion of tissue expanders and reimplantation) and not specific to wound infection. Relative risk of reconstruction failure taken from Irwin et al. (2020) but varied in sensitivity analysis. Analysis includes one-way sensitivity analysis, PSA, scenario and threshold analysis. Cost of NPWT: £147.06
Closed surgical incisions (multiple surgical specialties: orthopaedics, colorectal, caesarean section, breast surgery, vascular, cardiothoracic)	Nherera et al. (2021); UK & US	Decision tree model Intervention: single use NWPT (PICO, Smith & Nephew) Comparator: standard postoperative dressings	NHS and US perspective. Time horizon: 12 weeks.	Cost per patient Standard care: £565.78 Intervention: £460.52 Difference: -£105.26 QALY Standard care: 0.632 Intervention: 0.635 Difference: 0.003 Surgery type (incremental costs for NPWT) All surgery: -£105.26	Modelled complications avoided (surgical site infection and dehiscence) from hospital and community care using data from meta-analysis. Subgroup analysis on risk factors and surgery type. Costs applied to dehiscence outcomes were the same as SSI.

Subgroup	Author (year); country	Study design	Setting	Key outcomes	EAG comments
				Orthopaedic: £25.04 (£8,729 per QALY) Colorectal: -£657.00 C-section: £57.64 (£12,257 per QALY) Breast surgery: £68.11 (£22,958 per QALY) Vascular: -£28.39 Cardiothoracic: -£311.95 Risk factor (incremental costs for NPWT) Base case: -£105.26 ASA ≥3: £252.27 Diabetes: -£252.15 BMI ≥30: -£334.89 PSA analysis indicated that NPWT was superior to standard care in 93% of cases.	Mean cost of NPWT: £130.00 (range: £97.50 to £162.50)
Breast surgery	Tormey et al. (2021); UK and Ireland	Before and after study (n=162) Intervention (n=93): single use NPWT (PICO, Smith & Nephew) with sutures in 98.9% of patients Comparator (n=69): standard care dressings with sutures, plus glue or staples (as appropriate)	Multi-centre (N=4) Recruitment period: between 2017 and 2019.	Cost per patient Standard care: £559.82 Intervention: £342.58 Difference: £217.25 Modelling indicated that NPWT could avoid 15 major complications per 100 patients, and reduce total bed-day use by 45 days.	Used costs and length of stay from Jenks et al. 2014. Non-randomised, imbalance of patient numbers between arms. Cost of NPWT: £118.64

Subgroup	Author (year); country	Study design	Setting	Key outcomes	EAG comments
Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; CDC, US Centers for Disease Control and Prevention; ICER, incremental cost-effectiveness ratio; NPWT, negative pressure wound therapy; QALY, quality-adjusted life years; SSI, surgical site infection					

Appendix F – Ongoing trials

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
Orthopaedic	The Effect of Negative Pressure Wound Therapy on Wound Healing in Major Amputations of the Lower Limb [NCT04618406]; Denmark Sponsor: University of Southern Denmark	Study design: RCT (PICO14 versus standard care: surgical silicone foam dressing) Status: Recruiting (last updated 30 August 2022) Study start date: November 2021 Estimated primary completion date: December 2023 Estimated completion date: December 2023	Estimated enrolment: 160 participants Inclusion criteria: Patients undergoing transfemoral, knee disarticulations and transtibial amputations by non-traumatic indication; uni- or bilateral amputations or re-amputations. Exclusion criteria: patients undergoing traumatic amputations; unwilling or unable to provide informed consent; inability to comply with planned study procedures; amputations because of malignancy.	Change in the number of wound complications [5 days, 2, 3 and 6 weeks]	Number of participants requiring re-surgery [within the first 6 weeks after surgery]; Number of participants requiring re-amputation [within the first 6 weeks after surgery]
Obstetric	Negative Pressure Wound Therapy-PICO: Cosmesis in Repeat C-Sections [NCT05266053]; US Sponsor: Indiana University	Study Design: RCT (PICO7 versus standard wound dressing) Status: Recruiting (last updated 03 August 2022) Study start date: July 2022 Estimated primary completion date: May 2023	Estimated enrolment: 100 participants Inclusion criteria: scheduled or non-labour repeat caesarean delivery; one or more prior caesarean section(s) with prior pfannenstiel incision scar; gestational age > 23 weeks; age 18 and older. Exclusion criteria: patients with malignancy in the wound bed or margins of the wound; non-enteric and unexplored fistulas; necrotic tissue with eschar	Subjective cosmetic result [week 6]	Patient satisfaction with wound appearance [week 6]

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
		Estimated study completion date: July 2023	present; exposed arteries, veins, nerves or organs; exposed anastomotic sites; cellulitis or evidence of active infection; known allergy to adhesive tape; patient unwilling to follow-up; contraindication to NPWT (bleeding disorder, therapeutic anticoagulation, allergy to any component of the dressing, prior irradiated skin)		
Plastic Surgery	Evaluation of the PICO Negative Pressure Dressing System on the Fibula Free Flap Donor Site's Skin Graft. (PICOFLAP) [NCT04628416]; France Sponsor: University Hospital, Montpellier	Study design: RCT (PICO dressing versus conventional dressing) Status: Recruiting (last updated 22 January 2021) Study start date: January 2021 Estimated primary completion date: January 2024 Estimated study completion date: December 2024	Estimated enrolment: 12 participants Inclusion criteria: patients over 18 years old; any patient requiring a fibula free flap with skin paddle; theoretical need of a skin graft for the closure of the donor site (evaluated by the surgeon in charge of the patient at the time of inclusion) and done at the same time as the fibula flap; signature of informed consent. Exclusion criteria: contraindication to making a fibula free flap (anaesthetic contraindication, atheroma in the leg arteries obstructing more than 60% of the arterial lumen objectified by CT angiography of lower limbs); contraindication to the setting up of a negative pressure therapy (allergy to one of the PICO components; infection in the donor area; cutaneous lesions of the lower limb preventing the placement of an occlusive dressing or making it	The percentage of failure of skin grafting (surface on which the skin graft did not take) [day 10 post-op, +/- 2 days]	Delay between the day of the operation and the complete healing of the donor site of the fibula flap (in days) [through complete healing, maximum 1 year]; Rate of other surgery because of a problem on the skin grafted area [through complete healing, maximum 1 year]; Tendon exposure rate evaluated by the surgeon during hospitalization or in consultation if the patient is discharged [day 10 (+/- 2 days) and day 20 (+/- 2 days)];

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
			impossible to seal the device); no affiliation to a social security scheme; ,inor or major patients who are protected or unable to give their consent (according to article L1121-8 of the Public Health Code (PHC)); pregnant or lactating women (according to article L1121-5 of the PHC); vulnerable people (according to article L1121-6 of the PHC)		Rate of infection of the grafted site evaluated by the surgeon during hospitalization or in consultation if the patient is discharged [day 10 (+/- 2 days) and day 20 (+/- 2 days)]; Evolution of the quality of life (assessed by Short Form-12 Health Survey Version 2) [1 month (+/- 4 days)]; Rate of patients for whom during of hospitalization was lengthened exclusively because of a problem with the skin graft [at 12 months]; Evaluation of patient discomfort related to dressing (scale 0-100) [day 10]; Treatment tolerance evaluation, measured with rate

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
					of adverse reaction [day 20]; Cost-effectiveness ratio [12 months].
Orthopaedic	PICO- Single-use Negative Pressure Wound Therapy System [NCT05064696]; US Sponsor: named surgeon from MedStar Health, Smith & Nephew Inc.	Study design: RCT (PICO versus non-stick gauze dressing) Status: Recruiting (last updated 03 June 2022) Study start date: August 2021 Estimated primary completion date: September 2024 Estimated study completion date: September 2025	Estimated enrolment: 150 participants Inclusion criteria: patient ≥18 years old; subjects undergoing total ankle arthroplasty or uncomplicated revision total ankle arthroplasty; subjects able to provide informed consent; subjects who are able to understand and comply with study visit schedule and procedures. Exclusion criteria: history of previous deep infection or history of wound complication necessitating plastic surgery intervention; allergy to products used in the study; pregnant and breastfeeding women because of anesthesia risks; subjects with a known history of poor compliance with medical treatment; subjects who decline participation in this research study; prisoners	To determine presence or absence of wound complications at the follow-up visits. [12 weeks after surgery, or until 3-month post-op visit is completed]	None listed.
Gastrointestinal/Oncology	NPWT in Patients Undergoing Surgical Procedures for Management of GI Malignancies [NCT04955730];	Study design: RCT (PICO versus standard care wound therapy) Status: Recruiting (last updated 28 July 2022)	Estimated enrolment: 300 participants Inclusion criteria: scheduled surgical procedure for the management of gastrointestinal cancer; scheduled surgical procedure planned for incision that will result in wound >5cm; scheduled	SSI - superficial incisional [30 days post-op]; SSI - deep incisional [30 days post-op];	Return to intended oncologic therapy [up to 12 months post-op]; Time to initiation of planned oncologic

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
	US Sponsor: Moffitt Cancer Centre and Research Institute	Study start date: August 2021 Estimated primary completion date: December 2022 Estimated study completion date: December 2023	surgical procedure planned for skin wound that will be closed by primary intention with either: Staples covered by sterile Telfa and Tegaderm or Medipore OR Dermal or subcuticular sutures covered by Octil; provision of signed and dated informed consent form; stated willingness to comply with all study procedures and availability for the duration of the study. Exclusion criteria: scheduled surgical procedure where wound considered dirty; scheduled surgical procedure for wound left for closure by secondary intention; emergency surgery; pregnancy; history or current diagnosis of any medical or psychological condition that in the Investigator's opinion, might interfere with the subject's ability to participate in the study or the inability to obtain informed consent because of psychiatric or complicating medical problems	SSI – organ/space incisional [30 days post-op]	therapy [up to 12 months post-op]
Breast	EvaLuating negAtive pressUre Wound theRapy in brEast coNserving Surgery (LAUREN) [NCT05509829]; The Netherlands	Study design: non-randomised (PICO14 versus retrospective cohort without PICO14) Status: Not yet recruiting (29 August 2022)	Estimated enrolment: 300 participants Inclusion criteria: aged ≥18 years; female sex; indication for breast conserving surgery, with or without sentinel lymph node biopsy.	Surgical complications [3 months post-op]	Need for re-intervention [3 months after surgery]; Number of unscheduled visits to the emergency department or

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
	Sponsor: Zuyderland Medisch Centrum	Estimated study start date: September 2022 Estimated primary completion date: September 2023 Estimated study completion date; December 2023	Exclusion criteria: undergoing mastectomy or modified radical mastectomy; undergoing direct breast reconstruction; patients with a pacemaker, intra cardiac defibrillator (ICD) or other medical device in the proximity of the wound area, because of the magnet in the PICO device; unable to comprehend implications and extent of the study and/or unable to sign for informed consent; participation in another breast cancer surgery related clinical trial.		outpatient clinic [3 months after surgery]; A numeric rating of pain during NPWT [1 week after surgery]
Vascular	PICO Above Incisions After Vascular Surgery [NCT01913132]; Sweden Sponsor: Skane University Hospital Interim Analysis: available in Hasselmann et al. 2020	Study design: RCT (PICO versus standard dressing, endovascular versus open aortic repair) Status: Recruiting (last updated 04 May 2022) Study start date: November 2013 Estimated primary completion date: June 2023 Estimated study completion date: December 2024	Estimated enrolment: 644 participants Inclusion criteria: aged ≥18 years; elective vascular surgery; inguinal incision (transverse or longitudinal); capable of understanding the study information and giving written informed consent. Exclusion criteria: emergency surgery; ongoing infection in inguinal area.	Wound infection rate [3 month follow-up post-op]	Overall costs of treatment [3 month follow-up post-op]
Vascular	Prophylactic Negative Wound Pressure Therapy	Study design: RCT (PICO7 versus conventional dressing)	Estimated enrolment: 132 participants	Surgical wound infection rate [30 days post-op]	Surgical wound complication rate [30 days];

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
	(PICO-7) Following Groin Incisions in Vascular Surgery (PICO-Vasc Study) (PICO-Vasc) [NCT04840576]; Spain Sponsors: Corporacion Parc Tauli, 5 named individuals	Status: Not yet recruiting (last updated 15 April 2021) Estimated study start date: April 2021 Estimated primary completion date: April 2022 Estimated study completion date: October 2022	Inclusion criteria: age 18-90 years; undergoing elective revascularisation surgery (Rutherford clinical categories 4-6 / Fontaine III and IV) requiring a longitudinal inguinal approach (a longitudinal inguinal incision is defined as the one that runs from the inguinal ligament to the femoral bifurcation, done with the intention of approaching the vascular bundle); surgery done by investigator and co-investigators: Vascular Surgeons of the Vascular Surgery Department at the Parc Taulí Hospital; patients must be able to understand the study and sign the specific informed consent before surgery. Exclusion criteria: urgent surgery; interventions in which transverse groin wounds; presence of active groin infection that prevents primary closure; paediatric patients, pregnant women or patients with impaired higher functions who cannot understand the study or collaborate with its protocolized follow-up.		Seroma or lymphocele rate [30 days]; Surgical wound dehiscence rate [30 days]; Rate of haematoma [30 days] Rate of lymphorrhagia [30 days]; Extended hospital admission rate [30 days]; Post-operative mortality rate [30 days]; Surgical wound infection-related mortality rate [30 days]; Level of post-operative pain [7 days]
Obstetrics	PICO Negative Pressure Wound Therapy in Obese Women Undergoing	Study design: RCT (PICO versus standard dressing) Status: Recruiting (last updated 23 July 2021)	Estimated enrolment: 400 participants Inclusion criteria: provision of signed and dated informed consent form; stated willingness to comply with all study	Surgical site occurrence [42 days post caesarean delivery]	Surgical incision intervention [42 days post caesarean delivery]

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
	Elective Caesarean Delivery [NCT03414762]; US Sponsor: Northwell Health	Study start date: April 2019 Estimated primary completion date: April 2022 Estimated study completion date: July 2022	procedures and availability for the duration of the study; willing and able to return for all scheduled and needed study visits; female, aged 18 - 55 years; BMI ≥ 35 kg/m2 in the 42 days prior to surgery; in good general health as evidenced by medical history with a 24 - 41 weeks gestational age pregnancy scheduled for caesarean delivery for any routine indication (repeat procedure, breech presentation, abnormal placentation, uterine anomaly, maternal medical condition, or elective); surgical skin site preparation with chlorhexidine gluconate solution (ChloraPrep); received preoperative surgical prophylaxis antibiotics as per protocol; surgical incision that can be covered completely by the NPWT skin system; pre-operatively assessed to undergo a procedure with a CDC Wound Classification of clean or clean-contaminated; wound haemostasis has been achieved Exclusion criteria: caesarean delivery before fetal viability (24 0/7 weeks gestational age); unplanned Cesarean delivery; intrauterine fetal demise; known allergic reactions to components of the PICO NPWT system; systemic bacterial		

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
			or fungal infection at the time of surgery; diagnosis of systemic or remote-site skin infections at time of delivery; treatment with another investigational drug or other intervention within 7 days prior to cesarean delivery or 42 +/- 10 days after cesarean delivery; delivery for suspected intrauterine infection (defined as maternal fever plus one clinical criteria); critical illness or immune-compromising disease (eg acquired immunodeficiency syndrome); chronic steroid use; pre-operatively assessed to have a CDC Wound Classification of contaminated or dirty-infected, high-risk for anesthesia (American Society of Anesthesiologists [ASA] class P4 - P6); intra-operative hemorrhage requiring blood transfusion, disseminated-intravascular coagulopathy (DIC) or any other medical or surgical condition during the Caesarean section deemed by the investigator to pose a prohibitively high risk for surgical re-exploration; unable to speak or understand English, with no interpreter available.		

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
Orthopaedics	Efficacy of Negative Pressure Wound Therapy After Total Ankle Arthroplasty (PICO-PTC) [NCT03886818]; France Sponsor: Hospices Civils de Lyon	Study design: RCT (PICO versus standard dressings) Status: Recruiting (last updated 29 June 2021) Study start date: March 2019 Estimated Primary Completion Date: March 2022 Estimated Study Completion Date: March 2022	Estimated enrolment: 48 participants Inclusion criteria: aged ≥18 years; patient for whom a total ankle arthroplasty has been scheduled; patient affiliated to a national health insurance scheme or similar; patient who have signed an informed consent form for its participation in the study. Exclusion criteria: patient with contraindication to use of the PICO device; patient participating in another study including an exclusion period in progress; patient participating in another interventional study that may interfere with this research; adult patient protected by law, under guardianship or tutorship; pregnant or breastfeeding women.	Number of days from suture removal to achieve complete wound healing [day 21 after surgery]	Rate of technical failures of the PIC device, and type of failure [baseline to day 7 post-op]; Number and type of adverse effects related to the PICO device [baseline to day 7 post-op]; Rate of wound healing complications [21 days, 6 weeks, 4 and 12 months post-op]; Rate of SSI [30 days post-op to 12 months]; Rate of surgical review for wound healing complications [baseline to 12 months post-op]; ICER between 2 dressing strategies [12 months]
Cardiology	Effect of the Negative Pressure Therapy Dressing Compared With	Study design: RCT (PICO versus hydrogel dressing)	Estimate enrolment: 304 participants Inclusion criteria: undergoing elective or emergency cardiac surgery with	Incidence of infection of the sternal surgical wound [1-3 months]	None listed.

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
	Hydrogel Dressing. (PICO/2019) [NCT04265612]; Spain Sponsor: Hospital Universitario de Canarias	Status: Recruiting (last updated 12 February 2021) Study start date: November 2019 Estimated primary completion date: July 2021 Estimated study completion date: July 2021	extracorporeal circulation heart surgery who will have a median sternotomy; who signs Informed Consent after agreeing to participate in the microbiological study. Exclusion criteria: patients undergoing emergency cardiac surgery that does not time to randomization and/or coding; patients with immunocompromised haematological diseases; patients who are allergic or present some hypersensitivity to the dressing or excipient; patients who are participating in another experimental study; patients who, because of their fragility or comorbidity, the surgeon considers that they should not undergo randomization.		
Gastrointestinal	Efficacy of Negative Pressure Wound Therapy (NPWT) for Prevention of Wound Infection and Improvement of Wound Healing After Stoma Reversal (NESTOR) [NCT03781206]; Italy	Study design: RCT (PICO7 versus standard adhesive dressing) Status: Recruiting (last updated 05 February 2021) Study start date: July 2019 Estimated primary completion date: March 2021	Estimated enrolment: 100 participants Inclusion criteria: age >18 years, any sex; patients who underwent elective open or laparoscopic rectal resection ostomy construction (loop/end ileostomy; loop/end colostomy) for either oncological and Inflammatory Bowel Disease (IBD) indications; normal water contrast enema prior to surgery; both neo-adjuvant and adjuvant treatment are allowed for cancer patients; both immunosuppressant and biological medications are allowed for IBD patients.	SSI rate [7 days and 30 days post-op]	Wound healing time [30 days post-op]; Quality of life [7, 30, 90, 180 days post-op]; Pain assessment [7, 30, 90, 180 days post-op]

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
	Sponsor: Smith & Nephew, Istituto Clinico Humanitas	Estimated study completion date: June 2021	Exclusion criteria: patients age at screening < 18 years; pregnant or breastfeeding women; neurodegenerative disorders or psychiatric diseases; contraindications or hypersensitivity to the use of the investigational product or its components; patients with skin features (for example, tattoos, pre-existing scarring) which could interfere with the study assessments; patients with post-operative bleeding (to be assessed 24 hours after surgery).		
Orthopaedic	PICO 7 vs PICO 14 in Revision Hip and Revision Knee Surgery [NCT05389410]; UK Sponsor: Smith & Nephew, Robert Jones and Agnes Hunt Orthopaedic and District NHS Trust (RJAH)	Study design: RCT (PICO7 versus PICO14) Status: Not yet recruiting (last updated 25 May 2022) Estimated start date: September 2022 Estimated primary completion date: October 2023 Estimated study completion date: November 2023	Estimated enrolment: 100 participants Inclusion criteria: participants aged >18 years, undergoing aseptic revision hip or aseptic revision knee surgery procedure (a single stage revision procedure), willing and able to make all the needed study visits to be seen by the research team at the Outpatients department at RJAH, able to follow instructions. Exclusion criteria: revisions for infection, where the nature of the infection has a significant influence on the wound healing, discharge, and length of stay; subjects with a history of poor compliance with medical treatment; subjects with contraindications (as per	Extent of wound exudate graded 1-4 [within first 2 weeks of surgery]; Late wound dehiscence or wound discharge (when PICO dressing has been discontinued) [study duration up to 6 weeks post-surgery]; Observance of the formation of wound complications, specifically superficial wound infection and deep	Wound appearance documented by photographs [before dressing applied, for study duration, up to 6 weeks post-surgery]

Surgical specialty	Study title [reference]; country, sponsor	Status, estimated completion	Population (n)	Primary outcome measure(s) [Timeframe]	Secondary outcome measure(s) Timeframe]
			the PICO Instructions for use) or hypersensitivity to the use of the NPWT PICO dressing product or its components, for example, silicone adhesives, polyurethane films, acrylic adhesives, polyethylene fabrics and super- absorbent powders (polyacrylates) contained within the dressing.	wound infection [study duration up to 6 weeks post-surgery]	

Key:
Abbreviations: ICER, Incremental cost-effectiveness ratio; NPWT, negative pressure wound therapy; PHC, Public Health Code; RCT, randomised controlled trial; SSI, surgical site infection; CDC, Centre for Disease Control,

Appendix G – Correspondence Log

Appendix G1 – Communication with Company

#	Question	Answer (responses received 18/11/2022)
1.	The EAG has identified some ongoing studies using PICO14 system. a) Is this functionally equivalent to the PICO and PICO7 systems? (For example, are the results generalisable across all studies using any version of the PICO system) b) Is PICO14 widely used in the UK NHS? c) If it is functionally equivalent, can you please share costing information for PICO14?	a) Yes. In simple terms the key difference is PICO7 is for 7 days therapy and PICO14 for 14 days therapy. The functional means of delivering the therapy is equivalent. b) It was launched in the UK in 2020 so at a peak time of COVID19 which has hampered its promotion, particularly in surgery. PICO14 currently represents [redacted] of the PICO use in the past year, about [redacted] units, [redacted]. c) [redacted] per kit and therefore more cost effective over a 14-day period than 2 x PICO7's
2.	The EAG has identified PICO ONBOARD system. Is this within scope of MTG43? If so, one completed study sponsored by Smith & Nephew used this system (NCT04102865), however no published results have been identified. Can you share status of this publication?	Onboard study is a pre-reg study on a non-cleared device. The study has completed but is still to report out. Onboard is 100% out of scope because we don't intend to clear this device through the regulatory authorities in its current form and there is still a developmental pathway ahead for this concept.
3.	Within the original economic model is it assumed that one single PICO device would be used for 7 days, and then be replaced with another PICO device? Or that after the initial 7 days, the patient would use standard dressings only? Or no further dressings?	The model assumed only one PICO was sufficient with the 2 dressings that comes with it and the committee accepted this proposition. This is even more appealing given the PICO 14, such that, one PICO over 2 weeks if need be.
4.	The EAG has noted that the title of the guidance is 'PICO negative pressure wound dressings for closed surgical incisions', but as the dressing would not be used alone without the system, wonders if 'PICO negative pressure wound system for closed surgical incisions' would be more appropriate. Could you confirm if you would be happy for us to suggest that NICE update the title?	We welcome the suggested title amendment to "wound system" this aligns with changes we have made to our own promotional & non promotional (IFUs) materials.
	Question (asked 18/11/2022)	Answer
	What is the approximate maximum amount of exudate each PICO device	The amount of exudate is determined by the dressing not the negative pressure device, the

#	Question	Answer (responses received 18/11/2022)
	can absorb, and does it differ for PICO, PICO 7 and PICO 14?	dressings are the same for both PICO 7 and PICO 14. PICO 14 was developed with more complex chronic, open wounds in mind which could require longer duration of treatment. PICO 7 is the device routinely used for closed surgical incision indication.

Appendix G2 – Communication with Clinical Experts

Sent to 2 Clinical Experts on 17 November 2022, no responses received.

1. Regarding the duration of use of PICO7: typically if used for 7 days is the dressing replaced for another PICO7 dressing, or would a standard (or no) dressing be used after the initial 7 days?

2. The paper by Bueno-Lledo et al. 2021 states that PICO has the capacity to absorb approximately 200ml of wound exudate, in some surgical wounds the dressing may become saturated and lose function, as is the case with some larger hernia repairs. Are there some surgical wounds which are “typically” more likely to result in 200ml of wound exudate?

3. MTG43 focuses on patients deemed high-risk of surgical site infections. The EAG has identified a total of 24 new studies using PICO (Smith & Nephew) which have been published since MTG43. The EAG has reviewed their procedure and patient information against the World Union of Wound Healing Societies [WUWHS] (Consensus document 2016) to determine whether the study can be classified as being conducted in exclusively a high-risk or high-consequence of SSI population. Please can you add any comments to the final column in the below table to help confirm whether each study should be considered as including a high-risk of SSI?

#	Author (year)	Procedural details	Patient characteristics*	High-risk† of SSI
1.	Abadía et al. (2021); Spain	• 100% (200/200) undergoing colorectal surgery: 73 contaminated-open, 104 contaminated-laparoscopic, 20 dirty-open, 3 dirty-laparoscopic; colectomy conducted in 97% (194/200)	• 27.5% (55/200) age >75 years • 19.5% (39/200) BMI >30 kg/m^2 • 34.0% (68/200) ASA >II • 17.0% (34/200) diabetes mellitus • 5.5% (11/200) immunosuppression • 13.0% (26/200) chemotherapy • 12.0% (24/200) smoker	Yes (procedure)
2.	Andrianello et al. (2021); Italy	• major clean-contaminated surgical procedures for periampullary neoplasms (pancreaticoduodenectomy, total pancreatectomy or gastro-jejunal and biliary bypass	Patients needed to have at least one risk factor as per inclusion criteria (BMI≥30 kg/m^2, diabetes mellitus, chronic steroid use, neoadjuvant therapy, ASA score ≥ 3, Charlson comorbidity index ≥ 1, time of surgery ≥ 360 minutes, estimated blood loss ≥ 1 litre); the number of patients with 2 or more risk factors not reported.	Yes (procedure)
3.	Bueno-Lledó et al. (2021); Spain	• incisional hernia type W2 (transverse hernia defect with 4 to 10 cm) or W3 (traverse hernia defect >10 cm), undergoing elective midline repair via laparotomy	The number of patients with 2 or more patient risk factors not reported. • 25.3% (37/146) BMI >30 kg/m^2 • 39.0% (57/146) smoker • 28.8% (42/146) diabetes • 18.5% (27/146) COPD • 10.3% (15/146) immunosuppression • 52.7% (77/146) ASA>II	Yes (procedure)
4.	Canton et al. (2020); Italy	100% use of internal fixation (open reduction internal fixation for ankle and distal tibial fractures)	Patients needed to have at least one risk factor as per inclusion criteria (age over 65 years, age under 65 years but smoker, BMI>30, or diabetic)	Yes (procedure)
5.	Chan et al. (2020); Singapore		The number of patients with 2 or more patient risk factors not reported.	Not exclusively?

#	Author (year)	Procedural details	Patient characteristics*	High-risk† of SSI
		100% one stage, or second stage of a 2 stage brachiobasilic transposition arteriovenous fistula creation	• 12.8% (15/117) smoker • 70.9% (83/117) diabetes • 3 (3-3) median (IQR) ASA class	
6.	Costa et al. (2020); UK	Lower-limb fracture requiring surgical incision. 100% (1547/1547) involvement of implant when fixing the associated fracture; nail 33.4%, plate and screws 47.9%, wire/tension band wires 1.4%, external half-pin 1.6%, external fine wire 0.1%, other 15.1%, not recorded 0.6%).	The number of patients with 2 or more patient risk factors not reported. • 28.1% (434/1547) smoker • 9.6% (148/1547) diabetes	Yes (procedure)
7.	Facchin et al. (2021); Italy	• Brachioplasty + lipoplasty • Brachoplasty+Mastopexy • Brachioplasty+Liposuction+Mastopexy • Brachioplasty alone	The number of patients with 2 or more patient risk factors not reported. • 26.9% (7/26) smoker • 30.7% (8/26) BMI >30 kg/m^2 • Diabetes status not reported	Not exclusively?
8.	Flynn et al. (2020); Australia	Laparotomy for at least clean-contaminated surgery. • 100% (188/188) laparotomy and bowel resection: rectum 42.6%, right colon 23.4%, left colon 16.5%, colostomy 13.8%, small bowel 3.7%	Patients needed to have at least one risk factor as per inclusion criteria. • Mean BMI 30.3 and 30.4 in intervention and comparator arms • 26.1% (49/188) diabetes	Yes (procedure)
9.	Fogacci et al. (2020); Italy	Patients undergoing quadrantectomy, mastectomy, or breast reduction. • Lumpectomy+SNB 16%, lumpectomy+SNB+IORT 18%, lumpectomy+AD 5%,	Patients needed to have at least one risk factor as per inclusion criteria (obesity, diabetes mellitus, smoking, previous radiotherapy on affected breast, predisposing comorbidities [collagen	Not exclusively?

#	Author (year)	Procedural details	Patient characteristics*	High-risk† of SSI
		mastectomy+SNB 16%, skin-sparing mastectomy+SNB 12%, nipple-sparing mastectomy+SNB 4%, mastectomy+AD 15%, skin-sparing mastectomy+AD 6%, reductive mastoplasty 4%, switch skin expander prosthesis 4%	pathologies, vasculopathies, previous neo-adjuvant chemotherapy]); the number of patients with 2 or more patient risk factors not reported.	
10.	Giannini et al. (2018); Italy	100% hip or knee revision through same surgical approach as primary surgery (hip: direct lateral approach, knee: medial parapatellar approach); implant needed	Patients needed to have at least 1 risk factor as per inclusion criteria; the number of patients with 2 or more risk factors not reported. • 9.1% (10/110) diabetes • 15.5% (17/110) smoker • 24.5% (27/110) BMI ≥30 kg/m^2 • 15.5% (17/110) Pulmonary disease, class not specified	Yes (procedure)
11.	Gillespie et al. (2021); Australia	Elective or semi-urgent caesarean section	The number of patients with 2 or more risk factors not reported. • 100% BMI ≥30 kg/m2 (21% with BMI ≥40 kg/m2) • 10.7% (218/2035) smoker • 28.5% (580/2035) gestational diabetes, 3.8% (77/2035) diabetes mellitus • 8.9% (182/2035) anaemia in third trimester • 0.4% (9/2035) immunosuppression • 28.9% (589/2035) ASA>II	Yes (procedure, patient)

#	Author (year)	Procedural details	Patient characteristics*	High-risk† of SSI
12.	Hasselmann et al. (2020); Sweden	Elective vascular surgery with inguinal incisions. • Femoral thrombendarterectomy (43.9%, 61/139), femoropopliteal bypass (23.0%, 32/139), femoral thrombendarterectomy and iliac artery stent (29.5%, 41/139), aortobifemoral bypass (1.4%, 2/139), pseudoaneurysm repair (1.4%, 2/139), axillounifemoral bypass (0.7%, 1/139) • Inguinal incision longitudinal (150/158), transverse (8/158)	The number of patients with 2 or more risk factors not reported. • 29.5% (41/139) smoker The number of patients with 2 or more risk factors not reported. • 31.7% (44/139) diabetes • 41.7% (58/139) anaemia • 11.5% (16/139) >2 units packed red blood cells transfused • 100% (139/139) ASA>II	Yes (patient)
13.	Helito et al. (2020); Brazil	100% with primary or secondary knee osteoarthritis, undergoing elective unilateral arthroplasty (implant needed)	The number of patients with 2 or more risk factors not reported. • 24.0% obese • 17.2% diabetes • 7.4% smoking	Yes (procedure)
14.	Irwin et al. (2020); UK	100% patients underwent a skin-sparing or skin-reducing mastectomy with immediate prepectoral implant reconstruction.	EAG unable to comment: study reports demographics on per-breast basis, not per-patient.	Yes (procedure)
15.	Masters et al. (2021); UK	Patients undergoing surgery for hip fracture. 100% implant surgery: hemiarthroplasty 51.3%, arthroplasty 4.5%, arthroplasty hybrid 6.1%, internal fixation 38.1%	The number of patients with 2 or more risk factors not reported. • Median age 85.2 in intervention and 84.9 in comparator arm. • 71% (328/462) ASA>II • 13.4% (62/462) residential care or nursing home • 7.8% (36/462) smoker • 12.6% (58/462) diabetes •	Yes (procedure, patient?)

#	Author (year)	Procedural details	Patient characteristics*	High-risk† of SSI
16.	Myllykangas et al. (2022); Finland	100% CABG: CABG with composite (19.3%, 67/348) •	The number of patients with 2 or more risk factors not reported. • 76.4% (266/348) diabetes • 8.0% (28/348) kidney disease • 17.8% (62/348) lung disease • 9.5% (33/348) smoker • Mean BMI 31.4 in intervention arm, 30.5 in comparator arm.	Yes (procedure, patient?)
17.	O'Neill et al. (2020); US	Open of laparoscopic hepatic or pancreatic resection. • Midline incision 82.5% • Subcostal incision 17.5%	The number of patients with 2 or more risk factors not reported. • Mean BMI: 31.7 • 32.5% (13/40) diabetes • 82.5% (33/40) anaemia • 17.5% (7/40) smoker • 27.5% (11/40) chemotherapy within previous 60 days • 95% (38/40) ASA>II	Yes (patient)?
18.	Peterson et al. (2021); US	Primary closure of caesarean delivery • Skin incision pfannenstiel 94.5%, vertical 4.5%, supraumbilical transverse 0.9% • Unscheduled delivery 60.9%	The number of patients with 2 or more risk factors not reported. • Mean BMI 49.3 in intervention arm and 47.8 in comparator arm • 45.5% (50/110) diabetes • 5.5% (6/110) smoker • 0.9% (1/110) chronic steroids • 1.8% (2/110) chorioamnionitis	Yes (procedure)
19.	Ryu et al. (2022); Korea	• Immediate prepectoral breast reconstruction (textured implant 76.7%, smooth implant 23.3%) • Type of mastectomy: skin-sparing (58.3%) or nipple-sparing (41.7%)	The number of patients with 2 or more risk factors not reported. • 1.7% (1/60) BMI>30kg/m^2 • 0% (0/60) smoker • 0% (0/60) diabetes • 30% (18/60) adjuvant chemotherapy	Yes (procedure)

#	Author (year)	Procedural details	Patient characteristics*	High-risk† of SSI
20.	Svensson-Björk et al. (2022); Sweden	• EVAR 61.7%, fenestrated EVAR 19.6, thoracic EVAR 12.0%, redo surgery 6.7%. • 17.7% (37/209) >2 units packed red blood cells. •	The number of patients with 2 or more risk factors not reported. • 19.6% (41/309) diabetes • 23.0% (48/209) smoker • 4.3% (9/209) dual antiplatelet • 11.5% (24/209) steroid treatment • 7.2% (15/209) peripheral artery disease • 88.0% (184/209) ASA>II • 35.4% (74/209) anaemia • 17.7% (37/209) previous vascular surgery	Not exclusively?
21.	Tabley et al. (2020); France	• 100% cardiac surgery through median sternotomy: bypass with 2 internal mammary arteries 36.5%, bypass with aortic monovalve 24.5%, Bentall 8.2%, bypass with 1 internal mammary artery 7.7% • Bilateral internal mammary artery bypass 40.8%	All patients had at least 2 risk factors as per inclusion criteria. • 36.5% (85/233) aged >70 years • 41.6% (97/233) BMI>30 • 22.7% (53/233) COPD • 3.4% (8/233) chest radiation therapy • 6.4% (15/233) chronic renal failure • 46.4% (108/233) diabetes • 6.9% (16/233) ejection fraction <40% • 14.2% (33/233) peripheral arterial disease • 48.9% (114/233) smoker	Yes (procedure, patient)

#	Author (year)	Procedural details	Patient characteristics*	High-risk† of SSI
22.	Tormey et al. (2021); UK, Ireland	Breast surgery: • Augmentation 1.9%, axillary clearance 1.9%, delayed reconstruction 4.9%, mastectomy 18.5%, mastopexy 5.6%, reduction 11.1%, simple mastectomy 21.6%, therapeutic mammoplasty 6.8%, wide local excision 17.3%, other 10.5% • Incision circumareola 11.7%, transverse 57.4%, vertical 6.8%, 21.0%	Mean number of risk factors were 1.16 in intervention group and 1 in comparator group • 15.4% (25/162) age >70 years • 38.9% (63/162) BMI>30 • 1.4% (2/162) BMI<18.5 • 1.2% % (2/162) steroids • 22.2 % (36/162) smoker • 9.9% (16/162) diabetes • 9.9% (16/162) neoadjuvant chemotherapy • 5.6% (9/162) previous chemotherapy • 4.3% (7/162) previous radiotherapy • 14.8%% (24/162) other recent operation	Not exclusively?
23.	Walker (2018); Australia	100% underwent major lower limb amputation (above or below knee).	The number of patients with 2 or more risk factors not reported. • 36.0% (18/50) diabetes • Indication for surgery: gangrene 16% (8/50), infection and gangrene 20% (10/50), infection only 46% (23/50), pain 18% (9/50)	Not exclusively?
24.	Wikkeling et al. (2021); Netherlands	100% femoral endarterectomy	Number of risk factors 1.8 in intervention arm and 1.9 in comparator. • 9.3% (10/108) anaemia • 13.0% (14/108) COPD/asthma • 26.9% (29/108) diabetes • 11.1% (12/108) kidney insufficiency	Not exclusively?

#	Author (year)	Procedural details	Patient characteristics*	High-risk† of SSI
			• 0.9% (1/108) previous chemotherapy • 0.9% (1/108) previous radiotherapy • 38.0% (41/108) smoker • 2.8% (3/108) steroids • ASA score 2.8 in intervention arm and 2.7 in comparator (not clear whether this is mean or median)	

Appendix H – References

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