National Institute for Health and Care Excellence

Guideline version (Draft)

Surgical site infection: prevention and treatment

[D] Evidence reviews for the effectiveness of closure materials and techniques in the prevention of surgical site infection

NICE guideline CG74

Evidence reviews

[Month Year]

Draft for Consultation

These evidence reviews were developed by NICE Guideline Updates Team

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ISBN:

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Effectiveness of closure materials and techniques in the prevention of surgical site infection

Review question

Which closure methods are clinically effective in the prevention of a surgical site infection?

Introduction

During surgery, different materials can be used to close wounds. These include suture materials such as absorbable antibacterial sutures, and non-suture materials such as staples and adhesive glue. Additionally, continuous suturing techniques or interrupted suturing techniques can also be used to secure the wound. The aim of this review is to identify closure material and techniques that may reduce the risk of surgical site infection.

The 2008 NICE guideline on the prevention and treatment of surgical site infection did not develop recommendations on closure methods due to insufficient evidence. The topic was reviewed in 2017 by NICE's surveillance team and new evidence was identified which examined the use of antibacterial coated sutures and risk of surgical site infection, and thus prompted a partial update to review new evidence.

During the development of the review protocol, the committee identified the need to examine the evidence on suturing techniques and the risk of surgical site infection. Therefore, suturing technique has also been considered in this review.

This review identified studies that fulfilled the conditions specified in PICO table. For full details of the review protocol, see appendix A.

Table 1 PICO table: Which closure methods are clinically effective in the prevention of a surgical site infection?

Population	People of any age undergoing any surgery, including minimally invasive surgery (arthroscopic, thoracoscopic and laparoscopic surgery)
Interventions	Closure of the skin and closure of internal layers using the following materials: Suture materials: • Traditional sutures including coated polyglactin sutures • Absorbable antibacterial coated and impregnated sutures (including triclosan coated sutures) • Other absorbable sutures (including polydioxanone and polyglyconate monofilament) • Non- absorbable sutures, including polypropylene and polyamide monofilament Non-suture materials: • Staples • Tissue adhesives (including butylcyanoacrylate and octylcyanoarcylate) • Adhesive tapes Closure of the skin and internal layers using the following techniques:

	• Continuous suturing (including subcuticular suturing, running closure, running lock suturing and purse string suturing) • Interrupted suturing (including simple sutures, vertical mattress and horizontal mattress)
Comparator	For skin closure and closure of the internal layers: • Absorbable antibacterial coated and impregnated sutures compared to traditional sutures • Other absorbable sutures versus traditional sutures • Staples compared with sutures • Tissues adhesives compared with adhesive tapes Comparison of suture techniques: • Running closure compared with running lock suturing • Simple sutures compared with vertical mattress • Continuous technique compared with interrupted technique.
Outcomes	Surgical site infection (including SSIs up to 30 days and 1 year) defined using appropriate criteria such as CDC SSI criteria. Wound dehiscence (superficial/ partial dehiscence and complete wound dehiscence) Mortality post-surgery Length of hospital stay Postoperative antibiotic use Hospital readmission

Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual (2014). Methods specific to this review question are described in the review protocol in appendix A and methods in Appendix B.

Declarations of interest were recorded according to NICE's 2018 conflicts of interest policy.

A search strategy was used to identify all studies that compared different closure methods or techniques and examined their effects on SSI (outlined in Table 1). Randomised controlled trials (RCTs) with more than 200 subjects and systematic reviews of RCTs were considered for inclusion. The review protocol specified that in the event of less than 5 RCTs being identified, quasi randomised trials and trials with fewer than 200 subjects would also be considered for inclusion.

Studies were also excluded if they:

- Examined closure of the subcutaneous layer
- Examined the use of drains during closure
- Included patients undergoing a surgical procedure that does not involve a visible incision and therefore does not result in the presence of a conventional surgical wound
- Were not in English
- Were not full reports of the study (for example, published only as an abstract)

There was one deviation from the protocol. The original search strategy was devised to match the other review questions, with no date limit included. However, minimal changes were made in comparison to the original protocol for this question in 2008. It

was therefore decided that the 47 studies included in the original guideline would be reviewed for the update and the literature search would be conducted for literature published from 2008 onwards.

Data on overall SSI was extracted. Where possible, data on superficial, deep and organ/space SSI were also examined. . According to the Centres for Disease Control and Prevention (CDC) an SSI is defined as an infection occurring within 30 days after operation. A deep SSI is defined as an infection which occurs within 30 days after the operation if no implant is left in place, or within 1 year if an implant is inserted. Therefore SSI is reported within 30 days and 1 year were prioritised in this review.

The studies included in the review reported a number of different follow up periods. Due to this the evidence statements were stratified by follow up time, with articles grouped by those reporting outcomes up to 30 days and those reporting outcomes between 30 days and one year.

Clinical evidence

Included studies

From a database of 3,584 studies, 239 studies were identified from the literature search as being potentially relevant. Four additional studies were identified as being potentially relevant from the previous NICE guideline.

Following full text review of the 239 studies, 33 RCTs were included which examined the following outcomes:

- SSI
- Wound dehiscence
- Mortality post-surgery
- Length of hospital stay
- Postoperative antimicrobial use
- Hospital readmission

Twenty nine of the 33 RCTs compared different materials for wound closure, 3 compared different techniques of wound closure and 2 examined both materials and technique.

Excluded studies

A list of papers excluded at full text, with reasons for exclusion, is given in Appendix I.

Summary of clinical studies included in the evidence review

The included studies are summarised in Table 2, 3 and 4 below. See appendix E for full evidence tables.

Table 2 Summary table of included studies: Materials

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
Baracs (2011)	Surgical site infections after abdominal closure in colorectal	• Study location *Hungary* • Study setting *Multicentre study* • Study dates	• Absorbable antibacterial coated/ impregnated sutures	• Non-absorbable sutures *Running looped PDS*	• SSI • Superficial SSI • Wound

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
	surgery using triclosan-coated absorbable suture (PDS Plus) vs. uncoated sutures (PDS II): a randomized multicenter study	*December 2009 - November 2010* • Duration of follow-up *30 days* • Sources of funding *Not reported*	*Running looped triclosan-coated PDS Plus (polydioxanone) suture*	*(polydioxanone) suture*	dehiscence
Basha (2010)	Randomized controlled trial of wound complication rates of subcuticular suture vs staples for skin closure at cesarean delivery	• Study location *USA* • Study setting *Community hospital* • Study dates *March 2008 - May 2009* • Duration of follow-up *2-4 weeks* • Sources of funding *Not reported*	• Non-suture material: Staples *Stainless steel staples*	• Other absorbable sutures *Subcuticular 4-0 Monocryl sutures*	• Length of hospital stay • Hospital readmission • Postoperative antibiotic use • Wound dehiscence
Bloemen (2011)	Randomized clinical trial comparing polypropylene or polydioxanone for midline abdominal wall closure	• Study location *Netherlands* • Study setting *Single centre study* • Study dates *October 2001 - January 2005* • Duration of follow-up *30 days* • Sources of funding *Not reported*	• Other absorbable sutures *Slowly absorbable monofilament polydioxanone sutures*	• Non-absorbable sutures *Nonabsorbable polypropylene (Prolene) sutures*	• SSI *CDC criteria*
Buresch (2017)	Comparison of Subcuticular Suture Type for Skin Closure After Cesarean Delivery: A Randomized Controlled Trial	• Study location *USA* • Study setting *Single centre study* • Study dates *May 2015 - August 2016* • Duration of follow-up *30 days* • Sources of funding *Not reported*	• Other absorbable sutures *Subcuticular using slow absorbing sutures (Poliglecapro ne 25)*	• Other absorbable sutures *Subcuticular closure using fast absorbing sutures (Polyglactin 910)*	• SSI *CDC criteria* • Wound dehiscence
Buttaro (2015)	Skin staples versus intradermal	• Study location *Argentina* • Study setting	• Non-suture material: Staples	• Non-absorbable sutures	• Deep SSI • Wound

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
	wound closure following primary hip arthroplasty: A prospective, randomised trial including 231 cases	*Single centre study* • Study dates *September 2011 - May 2012* • Duration of follow-up *45 days* • Sources of funding *None reported*	*Skin staples (Leukosan SkinStapler PTW-35). Vicryl 0 used for deep fascia and deep subcutaneous fat tissue. Subcuticular used to close superficial soft tissues*	*Polypropelene suture (Prolene, Ethicon) intradermal sutures Vicryl 0 used for deep fascia and deep subcutaneous fat tissue.*	dehiscence
Cameron (1987)	A randomised comparison of polydioxanone (PDS) and polypropylene (Prolene) for abdominal wound closure.	• Study location *UK study* • Study setting *Kings College Hospital* • Study dates *10 month period. Dates not reported* • Duration of follow-up *Early follow up: Up to 1 month Late follow up: Minimum 12 months (mean 14.7 months)* • Sources of funding *Not reported*	• Other absorbable sutures *Polydioxanone 1*	• Non-absorbable sutures *Polypropylene 1*	• SSI • Wound dehiscence
Diener (2014)	Effectiveness of triclosan-coated PDS Plus versus uncoated PDS II sutures for prevention of surgical site infection after abdominal wall closure: the randomised controlled PROUD trial	• Study location *Germany* • Study setting *Multicentre study* • Study dates *April 2010 - October 2012* • Duration of follow-up *30 days* • Sources of funding *Johnson & Johnson Medical Limited*	• Absorbable antibacterial coated/ impregnated sutures *Abdominal wall closure using triclosan-coated polydioxanone sutures (PDS Plus)*	• Other absorbable sutures *Abdominal wall closure using standard polydioxanone sutures (PDS II)*	• Superficial SSI *CDC criteria* • Deep SSI *CDC criteria* • Mortality post surgery • Length of hospital stay • Wound dehiscence
Figueroa (2013)	Surgical staples compared with subcuticular suture for skin closure after cesarean	• Study location *USA* • Study setting *University Hospital, Birmingham,*	• Non-suture material: Staples	• Other absorbable sutures *4-0 Monocryl*	• SSI *Purulent drainage, cellulitis, abscess or wound*

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
	delivery: a randomized controlled trial	*Alabama* • Study dates *August 2009 - November 2010* • Duration of follow-up *3-4 days 4-6 weeks* • Sources of funding *NIH Women's Reproductive Health Research*			*requiring drainage, debridement and antibiotics associated with a clinical diagnosis of infection* • Wound dehiscence *Subcutaneous or fascial dehiscence*
Galal (2011)	Impact of using triclosan-antibacterial sutures on incidence of surgical site infection	• Study location *Egypt* • Study setting *Cairo University Hospital* • Study dates *Not reported* • Duration of follow-up *Most surgery: 30 days (weekly) Prosthetic surgery: 1 year (monthly)* • Sources of funding *Not reported*	• Absorbable antibacterial coated/ impregnated sutures *Triclosan-coated polyglactin 910* antibacterial *suture (Vicryl Plus)*	• Other absorbable sutures *Polyglactin 910 suture (Vicryl)*	• SSI • Length of hospital stay
Ichida (2018)	Effect of triclosan-coated sutures on the incidence of surgical site infection after abdominal wall closure in gastroenterological surgery: a double-blind, randomized controlled trial in a single center	• Study location *Japan* • Study setting *De partment of Surgery, Saitama Medical Center, Jichi Medical University, Japan* • Study dates *March 2014 - March 2017* • Duration of follow-up *30 days* • Sources of funding *Not reported*	• Absorbable antibacterial coated/ impregnated sutures *Abdominal fascia and peritoneum closure: Interrupted polyglactin 910* antibacterial *sutures coated with tri- closan (Vicryl Plus) Skin closure: Interrupted subcutaneous sutures using poly-dioxanone* antibacterial	• Other absorbable sutures *Abdominal fascia and peritoneum closure: Interrupted uncoated polyglactin 910* antibacterial *sutures (Vicryl Skin closure: Interrupted subcutaneous sutures using poly-dioxanone sutures (PDS II)*	• Superficial SSI *CDC criteria* • Deep SSI *CDC criteria*

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
			sutures coated with triclosan (PDS Plus)		
Imamura (2016)	Randomized Comparison of Subcuticular Sutures Versus Staples for Skin Closure After Open Abdominal Surgery: a Multicenter Open-Label Randomized Controlled Trial	• Study location *Japan* • Study setting *Three Tokyo Metropolitan institutions in Japan* • Study dates *September 2010 - August 2015* • Duration of follow-up *30 days* • Sources of funding *Tokyo Metropolitan Government*	• Other absorbable sutures *Interrupted subcuticular sutures with 4–0 monofilament*	• Non-suture material: Staples *Metallic skin staples at 10-15 mm intervals*	• Superficial SSI *Purulent discharge; microorganisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision; and at least one of the following symptoms of infection: pain or tenderness, localized swelling, redness or heat, and a superficial incision deliberately opened by the surgeon provided the incision was not culture negative* • Length of hospital stay
Isik (2012)	Efficiency of antibacterial suture material in cardiac surgery: a double-blind randomized prospective study	• Study location *Turkey* • Study setting *Private hospital, Istanbul* • Study dates *April 2008 - September 2009* • Duration of follow-up *30 days (every 10 days)* • Sources of funding	• Absorbable antibacterial coated/ impregnated sutures *Polyglactin 910 triclosan-coated suture*	• Other absorbable sutures *Polyglactin 910 traditional suture*	• SSI *Including subgroup: diabetes*

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
		Not reported			
Justinger (2013)	Surgical-site infection after abdominal wall closure with triclosan-impregnated polydioxanone sutures: results of a randomized clinical pathway facilitated trial (NCT00998907)	• Study location *Germany* • Study setting *Single centre* • Study dates *September 2009 - September 2011* • Duration of follow-up *2 weeks* • Sources of funding *Johnson&Johnson, Summerville, NJ*	• Absorbable antibacterial coated/ impregnated sutures *Fascia closed with atriclosan impregnated 2-0 polydioxanone loop (PDS Plus, 150 cm)*	• Other absorbable sutures *Fascia closed with 2-0 polydioxanone loop (PDS II, 150 cm)*	• SSI *CDC criteria*
Kobayashi (2015)	Randomized clinical trial of skin closure by subcuticular suture or skin stapling after elective colorectal cancer surgery	• Study location *Japan* • Study setting *Multicentre study* • Study dates *August 2012 - April 2012* • Duration of follow-up *30 days* • Sources of funding *Ministry of Health, Labour and Welfare of Japan*	• Non-suture material: Staples *Skin staples with the dermis attached at intervals of 10-15 mm*	• Other absorbable sutures *Dermal layers attached using 4/0 or 5/0 absorbable monofilament sutures*	• Superficial SSI • Length of hospital stay • Wound dehiscence
Leaper (1985)	Abdominal wound closure: a controlled trial of polyamide (nylon) and polydioxanone suture (PDS).	• Study location *UK* • Study setting *Two centres* • Study dates *10 months. Dates not reported* • Duration of follow-up *6 months* • Sources of funding *Not reported*	• Other absorbable sutures *Polydioxanone absorbable suture (PDS)*	• Non-absorbable sutures *No 1 (BPC) polyamide (Nylon) sutures*	• SSI • Wound dehiscence
Mackeen (2014)	Suture compared with staple skin closure after cesarean delivery: a	• Study location *USA* • Study setting *Multicentre study* • Study dates *2010 - 2012*	• Non-suture material: Staples *Closure of skin with stainless steel*	• Other absorbable sutures *Skin closure with subcuticular*	• SSI • Length of hospital stay • Hospital readmission • Wound

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
	randomized controlled trial	• Duration of follow-up *6 weeks* • Sources of funding *Not reported*	*staples*	*continuous 4-0 sutures*	dehiscence
Maehara (2017)	Impact of intra-abdominal absorbable sutures on surgical site infection in gastrointestinal and hepato-biliary-pancreatic surgery: results of a multicenter, randomized, prospective, phase II clinical trial	• Study location *Japan* • Study setting *Multicentre study* • Study dates *February 2009 - June 2010* • Duration of follow-up *30 days* • Sources of funding *Japan Surgical Society Clinical Investigation Progect Award Health Labour Science Research Grant*	• Other absorbable sutures *Polyglactin 910 or polydioxanone sutures*	• Non-absorbable sutures *Silk sutures*	• SSI *CDC criteria* • Superficial SSI *CDC criteria* • Deep SSI *CDC criteria* • Organ/space SSI *CDC criteria* • Length of hospital stay
Mattavelli (2015)	Multi-Center Randomized Controlled Trial on the Effect of Triclosan-Coated Sutures on Surgical Site Infection after Colorectal Surgery	• Study location *Italy* • Study setting *Four university hospitals* • Study dates *January 2010 - March 2013* • Duration of follow-up *30 days* • Sources of funding *None reported*	• Absorbable antibacterial coated/ impregnated sutures *Peritoneum: triclosan-coated polyglactin 910 (0 Vicryl Plus) Skin: triclosan-coated polydiaxanone (PDS Plus)*	• Other absorbable sutures *Peritoneum: Polyglactin 910 (Vicryl) Skin: polydiaxanone (PDS II)*	• Superficial SSI *Infection occurring within 30 days and involving only skin or subcutaneous tissue. Purulent drainage, pain or tenderness, localised swelling, redness or heat* • Deep SSI *Occurring within 30 days and involving deep soft tissues (fascial and muscle layers). Purulent drainage from the*

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
					incision but not from organ/space, spontaneous dehiscence or deliberate incision by surgeon when fever is present, localised pain or tenderness • Length of hospital stay
Nakamura (2013)	Triclosan-coated sutures reduce the incidence of wound infections and the costs after colorectal surgery: a randomized controlled trial	• Study location *Japan* • Study setting *Single centre study* • Duration of follow-up *30 days* • Sources of funding *Not reported*	• Absorbable antibacterial coated/ impregnated sutures *Wound closed with Triclosan-caoted polyglactin 910 sutures (Vicryl Plus). Skin closure with staples*	• Other absorbable sutures *Would closure with Polyglactin 910 sutures (Vicryl). Skin closure with staples*	• SSI *CDC criteria up to 30 days* • Organ/space SSI • Length of hospital stay
Orr (2003)	Continuous abdominal fascial closure: a randomized controlled trial of poly(L-lactide/glycolide).	• Study location *USA* • Study setting *Multi-centre study* • Study dates *June 1999 - June 2000* • Duration of follow-up *6 months* • Sources of funding *Ethicon, Inc.*	• Other absorbable sutures *No 1 poly (L-lactide/glycolide) using running mass technique*	• Non-absorbable sutures *No 1 permanent monofilament suture (Prolene) using running mass technique*	• SSI *Definition not provided* • Wound dehiscence
Pandey (2013)	A Prospective Randomized Study Comparing Non-absorbable Polypropylene (Prolene) and Delayed Absorbable Polyglactin 910 (Vicryl) Suture Material in Mass Closure of	• Study location *India* • Study setting *Rajindra Hospital, Patiala, Punjab, India* • Study dates *September 2009 - August 2011* • Duration of follow-up	• Absorbable antibacterial coated/ impregnated sutures *Mass closure using polyglactin 910 (Vicryl) sutures*	• Non-absorbable sutures *Mass closure using polypropylene (prolene) sutures*	• Wound dehiscence

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
	Vertical Laparotomy Wounds	*90 days* • Sources of funding *Not reported*			
Renko (2016)	Triclosan-containing sutures versus ordinary sutures for reducing surgical site infections in children: a double-blind, randomised controlled trial	• Study location *Finland* • Study setting *Oulu University Hospital* • Study dates *September 2010 - December 2014* • Duration of follow-up *30 days* • Sources of funding *The Alma and K A Snellman Foundation*	• Absorbable antibacterial coated/ impregnated sutures *Triclosan sutures*	• Other absorbable sutures *Standard absorbable sutures*	• SSI • Superficial SSI *CDC criteria* • Deep SSI *CDC criteria* • Wound dehiscence
Seiler (2009)	Interrupted or continuous slowly absorbable sutures for closure of primary elective midline abdominal incisions: a multicenter randomized trial (INSECT: ISRCTN24023541)	• Study location *Germany* • Study setting *Multi-centre trial* • Study dates *July 2004 - September 2006* • Duration of follow-up *1 year* • Sources of funding *BBD-Aesculap, GmbH Johnson & Johnson Covidien Healthcare Deutschland GmbH*	• Continuous suturing technique *Fascial closure using slowly absorbable monofilament materials. 2 groups: 1 - with longitudinal elasticity (Monoplus USP 1) 2 - no longitudinal elasticity (PDS II USP 1) No subcutaneous suture or drainage inserted. Skin closed with staples*	• Interrupted suturing technique *Fascial closure using absorbable braided material (Vicryl USP 2) No subcutaneous suture or drainage inserted. Skin closed with staples*	• SSI *Redness, wound dehiscence with secretion of putrid fluid or requiring antibiotic treatment or surgical intervention* • Wound dehiscence *Fascial dehiscence after completed superficial wound healing with or without a prolapse of abdominal organs*
Seim (2012)	Triclosan-coated sutures do not reduce leg wound infections after coronary artery bypass grafting	• Study location *Norway* • Study setting *Oslo University Hospital* • Study dates *September 2009 - September 2011* • Duration of	• Absorbable antibacterial coated/ impregnated sutures *Triclosan-cated Vicryl Plus suture*	• Other absorbable sutures *Conventional Vicryl suture*	• SSI

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
		follow-up *4 weeks* • Sources of funding *Not reported*			
Steingrimsson (2015)	Triclosan-coated sutures and sternal wound infections: a prospective randomized clinical trial	• Study location *Sweden* • Study setting *University Hospital* • Study dates *March 2009 - February 2012* • Duration of follow-up *60 days* • Sources of funding *Vastra Gothaland Healthcare Region Ethicon, Inc.*	• Absorbable antibacterial coated/ impregnated sutures *Fascia & subcutaneous tissue closed with 2-0 Vicryl Plus Intracutaneously closed with 4-0 Monocryl Plus*	• Other absorbable sutures *Fascia & subcutaneous tissue closed with 2-0 Vicryl Intracutaneously closed with 4-0 Monocryl*	• SSI *CDC criteria within 60 days* • Superficial SSI *CDC criteria within 60 days* • Deep SSI *CDC criteria within 60 days* • Postoperative antibiotic use
Talpur (2011)	Closure of elective abdominal incisions with monofilament, non-absorbable suture material versus polyfilament absorbable suture material	• Study location *Pakistan* • Study setting *Multi-centre* • Study dates *January 2005 - October 2009* • Duration of follow-up *6 months* • Sources of funding *Not reported*	• Absorbable antibacterial coated/ impregnated sutures *Abdominal wall closed with polyfilament absorbable co-polymer of polyglycolide with Polyactide (Vicryl) No 1*	• Non-absorbable sutures *Abdominal wall closed with monofilament non-absorbable polypropylene (Prolene) suture No 1*	• Superficial SSI • Wound dehiscence
Tanaka (2014)	Randomized controlled trial comparing subcuticular absorbable suture with conventional interrupted suture for wound closure at elective operation of colon cancer	• Study location *Japan* • Study setting *Tokai University Hospital* • Study dates *November 2007 - November 2011* • Duration of follow-up *30 days* • Sources of funding *Not reported*	• Other absorbable sutures *Interrupted subcuticular absorbable 4-0 polydiaxonne suture*	• Non-absorbable sutures *Interrupted transdermal 3-0 nylon suture*	• Superficial SSI *CDC definition* • Organ/space SSI *CDC definition*

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
Thimour-Bergstrom (2013)	Triclosan-coated sutures reduce surgical site infection after open vein harvesting in coronary artery bypass grafting patients: a randomized controlled trial	• Study location *Sweden* • Study setting *Sahlgrenska University Hospital* • Study dates *March 2009 - February 2012* • Duration of follow-up *30 days, 60 days* • Sources of funding *Västra Götaland Healthcare Region Ethicon, Inc.*	• Absorbable antibacterial coated/ impregnated sutures *Subcutaneous layer closed with 3.0 monofilament polyglactin suture coated with triclosan (Vicryl Plus®) Intracutaneous layer closed with 4.0 triclosan-coated monofilament polyglecaprone suture (Monocryl Plus®)*	• Other absorbable sutures *Subcutaneous layer closed with 3.0 monofilament polyglactin suture (Vicryl) Intracutaneous layer closed with 4.0 monofilament polyglecaprone suture (Monocryl)*	• Superficial SSI *CDC criteria* • Deep SSI *CDC criteria affecting fascia or muscle layers* • Wound dehiscence *Non-infectious leg-wound dehiscence*
Tsujinaka (2013)	Subcuticular sutures versus staples for skin closure after open gastrointestinal surgery: a phase 3, multicentre, open-label, randomised controlled trial	• Study location *Japan* • Study setting *24 centres* • Study dates *June 2009 - February 2012* • Duration of follow-up *30 days* • Sources of funding *Johnson & Johnson*	• Non-suture material: Staples *Metallic skin staples 10-15 mm apart*	• Other absorbable sutures *Interrupted subcuticular sutures with 3-0 or 4-0 mono filament absorbable suture (polydioxanone)*	• Superficial SSI *Within 30 days. CDC criteria.* • Wound dehiscence
Turtiainen (2012)	Effect of triclosan-coated sutures on the incidence of surgical wound infection after lower limb revascularization surgery: a randomized controlled trial	• Study location *Finland* • Study setting *Multicentre* • Study dates *Not reported* • Duration of follow-up *Minimum 30 days* • Sources of funding *Not reported*	• Absorbable antibacterial coated/ impregnated sutures *Subcutaneous sutures: 2-0 Vicryl Plus Continuous intracutaneous sutures: 3-0 Monocryl Plus*	• Other absorbable sutures *Subcutaneous sutures: 2-0 Vicryl Continuous intracutaneous sutures: 3-0 Monocryl*	• SSI *CDC criteria* • Superficial SSI *CDC criteria* • Deep SSI *CDC criteria*

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Table 3 Summary table of included studies: Techniques of wound closure

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
Gililland (2014)	Barbed versus standard sutures for closure in total knee arthroplasty: A multicenter prospective randomized trial	• Study location *USA* • Study setting *Department of Orthopaedic Surgery* • Study dates *Not reported* • Duration of follow-up *2 weeks and 6 weeks* • Sources of funding *Not reported*	• Barbed sutures *Two-layer closure using barbed suture with a running, knotless technique. Arthrotomy closure using running knotless #2 Quill SRS PDO and subdermal closure using running knotless 0 Quill SRS Monoderm. Both using running baseball stitch.*	• Knotted sutures *Standard interrupted, knotted suture technique. Arthrotomy closure using interrupted #1 Ethibond in figure of eight fashion. Subdermal closure using 2-0 Monocryl in interrupted buried fashion.*	• SSI *at 2 and 6 weeks*
Niggebrugge (1999)	Influence of abdominal-wound closure technique on complications after surgery: a randomised study.	• Study location *Netherlands* • Study setting *Community Hospital Leyenburg* • Study dates *January 1994 - January 1997* • Duration of follow-up *30 days* • Sources of funding *Not reported*	• Continuous double-loop closure	• Continuous suturing technique	• SSI • Mortality post surgery • Length of hospital stay • Wound dehiscence
Rubin (2014)	A multicenter randomized controlled trial comparing absorbable barbed sutures versus conventional absorbable sutures for dermal closure in open surgical procedures	• Study location *USA and Europe* • Study setting *9 institutions across the United States and Europe* • Study dates *August 2009 - January 2010* • Duration of follow-up *12 weeks* • Sources of funding *Covidien*	• Barbed sutures *Closure of deep dermal layer wiht interrupted 3-0 Monocryl sutures (optional) Intra-dermal layer closed with running subcuticular barbed sutures (either fast- or slow-*	• Interrupted suturing technique *Closure of deep dermal layer with interrupted 3-0 Monocryl sutures no further than 2 cm apart Closure of intradermal layer with running 3-0 Moncryl*	• SSI • Wound dehiscence

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
			absorbing)	*sutures*	

Table 4 Summary table of included studies: Materials and techniques for wound closure

Short Title	Title	Study details	Interventions	Comparator	Outcome measure(s)
Gislason (1995)	Burst abdomen and incisional hernia after major gastrointestinal operations--comparison of three closure techniques.	• Study location *Norway* • Study setting *University hospital* • Study dates *December 1990 - February 1992* • Duration of follow-up *1 year* • Sources of funding *Not reported*	• Continuous suturing technique *Continuous mass polyglactin 910 (Vicryl) sutures. In layers for transverse incisions. Mass closure for midline incisions*	• Interrupted suturing technique *Interrupted mass polyglactin 910 (Vicryl) sutures. In layers for transverse incisions. Mass closure for midline incisions*	• SSI *Inflammation of the wound with inflammation or discharge or both. Confirmed by standard signs (fever, raised white cell count, C-reactive protein concentration) and the presence of a pathogen on culture of wound fluid* • Wound dehiscence *Either ascitic fluid or abdominal viscera escaping from the wound*

See appendix E for full evidence tables.

Quality assessment of clinical studies included in the evidence review

All studies included in the review were RCTs. A number of studies demonstrated unclear blinding of participants and personnel, however as the outcome measures were objective, with a number of studies assessing SSI based on microbiology findings, studies were not downgraded in these domains. Studies were mainly downgraded for unclear random sequence generation, allocation concealment and blinding of outcome assessment.

Most studies included in the review classified infections using the Centres for Disease Control and Prevention (CDC) SSI criteria. Studies which did not explicitly describe the criteria used for the classification of infection were downgraded for serious indirectness.

See appendix G for full GRADE tables.

Economic evidence

A literature search was conducted to identify cost–utility analyses comparing skin closure methods in the prevention of a surgical site infection. Standard health economic filters were applied to a clinical search, returning a total of 3,138 citations. Following review of all titles and abstracts, 33 studies were identified as being potentially relevant to this decision problem, and were ordered for full review. After reviewing the full texts, no studies were included as economic evidence for this review question.

Excluded studies

Studies that were excluded upon full review are listed in Appendix L, including the primary reason for exclusion.

Resource impact

Below are some costs that committee felt are representative of sutures that are commonly used in the UK. The first half of each of the tables describe sutures that contain antimicrobial agents.

Monocryl plus antibacterial (Poliglecaprone 25) sutures and Monocryl absorbable monofilament (taken from NHS Supply Chain August 2018)

Description	Brand	Unit of issue	Units	Band 1 price	Price each
MCP218H Monocryl plus antibacterial (Poliglecaprone 25) suture violet 4-0 70cm SH-1 22mm 1/2 circle taperpoint plus	Monocryl Plus	Pack	36	127.91	£3.55
MCP220H Monocryl plus antibacterial (Poliglecaprone 25) suture violet 2-0 70cm SH-1 22mm 1/2 circle taperpoint plus	Monocryl Plus	Pack	36	121.82	£3.38
W3660 70cm monocryl absorbable monofilament violet 4/0 22mm 1/2 circle taper point plus needle	Monocryl	Pack	12	32.17	£2.68
W3662 70cm monocryl absorbable monofilament violet 2/0 22mm 1/2 circle taper point plus needle	Monocryl	Box	12	31.6	£2.63

Vycril and Vycril Plus sutures (taken from NHS Supply Chain August 2018)

Description	Brand	Unit of issue	Units	Band 1 price	Price each
VCP231H 70cm vicryl plus absorbable coated braided undyed 4/0 22mm 1/2 circle tapercut needle	Vicryl Plus	Box	36	165.97	£4.61
V231H 70cm vicryl absorbable coated braided undyed 4/0 22mm 1/2 circle tapercut needle	Vicryl	Box	36	182.69£	£5.07

Evidence statements

The format of the evidence statements is explained in the methods in appendix B. Evidence statements were also stratified by follow up period.

Triclosan-coated versus non triclosan-coated sutures

Overall outcomes at 30 days after surgery

Low to high quality evidence from up to 11 RCTs, including 7,571 people, showed that the use of triclosan-coated sutures for wound closure reduces the number of people who experience SSIs and the number of people who require post-operative antimicrobials in comparison to the use of standard sutures.

Very low to moderate quality evidence from up to 5 RCTs, including 4,856 people, could not differentiate mortality, length of stay or the number of people who experience superficial SSI, deep SSI or dehiscence between the use of triclosan-coated sutures or standard sutures for wound closure.

Outcomes by surgery type at 30 days after surgery

High quality evidence from 1 RCT, including 1,633 people, showed that the use of triclosan-coated sutures for wound closure in paediatric surgery reduces the number of children who experience SSIs or deep SSIs and reduces the number who require post-operative antimicrobials in comparison to the use of standard sutures.

Moderate quality evidence from 1 RCT, including 510 people, could not differentiate the number of children who experience superficial SSI or wound dehiscence following paediatric surgery between the use of triclosan-coated sutures or standard sutures for wound closure.

Very low quality evidence from 1 RCT, including 510 people, could not differentiate the number of people who experience SSI following cardiac (sternal) surgery between the use of triclosan-coated sutures or standard sutures for wound closure.

Very low to low quality evidence from up to 2 RCTs, including 604 people, could not differentiate mortality, length of stay or the number of people who experience SSI following lower limb arterial surgery between the use of triclosan-coated sutures or standard sutures for wound closure.

Very low to moderate quality evidence from up to 4 RCTs, including 3,488 people, could not differentiate mortality, length of stay or the number of people who experience SSI, superficial SSI, deep SSI or wound dehiscence following abdominal surgery between the use of triclosan-coated sutures or standard sutures for wound closure.

Very low to moderate quality evidence from up to 2 RCTs, including 710 people, could not differentiate length of stay or the number of people who experience SSI, superficial SSI, deep SSI or organ/space SSI following colorectal surgery between the use of triclosan-coated sutures or standard sutures for wound closure.

Overall outcomes 30 days – 1 year after surgery

Very low to low quality evidence from up to 2 RCTs, including 749 people, could not differentiate the number of people who experience SSI, superficial SSI, deep SSI, organ/space SSI or wound dehiscence when either triclosan-coated or standard sutures are used for wound closure.

Outcomes by surgery type 30 days – 1 year after surgery

Low quality evidence from 1 RCT, including 392 people, could not differentiate the number of people who experience SSI, superficial SSI, deep SSI, or wound

dehiscence following cardiac (sternal) surgery when either triclosan-coated or standard sutures are used for wound closure.

Moderate quality evidence from 1 RCT, including 374 people, could not differentiate the number of people who experience SSI or wound dehiscence following cardiac (lower limb arterial) surgery when either triclosan-coated or standard sutures are used for wound closure.

Staples versus sutures

Overall outcomes at 30 days after surgery

High quality evidence from up to 3 RCTs, including 1,908 people, showed that the use of staples for wound closure increases the number of people who experience wound dehiscence in comparison to the use of sutures.

Very low to moderate quality evidence from up to 6 RCTs, including 3,792 people, could not differentiate length of stay, the number of people who experience SSI, superficial SSI or deep SSI or the number of people readmitted to hospital or who require antimicrobial treatment between the use of staples or sutures for wound closure.

Outcomes by surgery type at 30 days after surgery

Moderate quality evidence from up to 2 RCTs, including 828 people, showed that the use of staples for wound closure in caesarean section increases the number of women who experience wound dehiscence in comparison to the use of sutures.

Very low to moderate quality evidence from up to 2 RCTs, including 828 people, could not differentiate length of stay, the number of women readmitted to hospital or requiring post-operative antimicrobials, or the number of women who experience SSI or dehiscence following caesarean section, between the use of staples or sutures for wound closure.

Very low quality evidence from 1 RCT, including 401 people, could not differentiate the number of people who experience superficial SSI following abdominal laparotomy, between the use of staples or sutures for wound closure.

Very low quality evidence from 1 RCT, including 1,264 people, could not differentiate the number of people who experience superficial SSI following colorectal surgery, between the use of staples or sutures for wound closure.

Very low quality evidence from 1 RCT, including 1,080 people, could not differentiate the number of people who experience superficial SSI or wound dehiscence following gastrointestinal (non-laparotomy) surgery, between the use of staples or sutures for wound closure.

Very low quality evidence from 1 RCT, including 219 people, could not differentiate the number of people who experience deep SSI following hip arthroplasty surgery, between the use of staples or sutures for wound closure.

Outcomes by surgery type 30 days – 1 year after surgery (same as overall outcomes)

High quality evidence from up to 2 RCTs, including 1,144 people, showed that the use of staples for wound closure in caesarean section increases the number of women who experience wound dehiscence in comparison to the use of sutures.

Low quality evidence from up to 2 RCTs, including 1,144 people, could not differentiate the number of women who experience SSI or the number of women readmitted to hospital following caesarean section between the use of staples or sutures for wound closure.

Absorbable versus non-absorbable sutures

Overall outcomes at 30 days after surgery

Very low to moderate quality evidence from up to 5 RCTs, including 2,497 people, could not differentiate length of stay, the number of people who experience SSI, superficial SSI, organ/space SSI or wound dehiscence between the use of absorbable or non-absorbable sutures for wound closure.

Outcomes by surgery type at 30 days after surgery

Very low quality evidence from 1 RCT, including 1,174 people, showed that the use of absorbable sutures for wound closure in gastrointestinal surgery increases the number of people who experience SSI in comparison to the use of non-absorbable sutures.

Moderate quality evidence from 1 RCT, including 301 people, showed that the use of non-absorbable sutures for wound closure in laparotomy increases the number of people who experience wound dehiscence in comparison to the use of absorbable sutures.

Very low quality evidence from up to 2 RCTs, including 822 people, could not differentiate the number of people who experience SSI following laparotomy between the use of absorbable or non-absorbable sutures for wound closure.

Very low quality evidence from up to 2 RCTs, including 557 people, could not differentiate length of stay or the number of people who experience superficial SSI or organ/space SSI following colorectal surgery between the use of absorbable or non-absorbable sutures for wound closure.

Very low quality evidence from up to 1 RCTs, including 1,467 people, could not differentiate length of stay following gastrointestinal and hepatobiliary surgery between the use of absorbable or non-absorbable sutures for wound closure.

Outcomes 30 days – 1 year after surgery by surgery type (same as overall outcomes)

Very low quality evidence from up to 4 RCTs, including 921 people, could not differentiate the number of people who experience SSI, superficial SSI or wound dehiscence following abdominal surgery between the use of absorbable or non-absorbable sutures for wound closure.

Fast-absorbable versus slow-absorbable sutures

Outcomes at 30 days after surgery by surgery type (same as overall outcomes)

Very low to low quality evidence from up to 1 RCT, including 550 people, could not differentiate the number of people who experience SSI, superficial SSI, deep SSI,

organ/space SSI or wound dehiscence following caesarean section between the use of fast-absorbable or slow-absorbable sutures for wound closure.

Outcomes 30 days – 1 year after surgery by surgery type (same as overall outcomes)

Very low to low quality evidence from up to 1 RCT, including 599 people, could not differentiate the number of people who experience SSI or wound dehiscence following gastrointestinal surgery between the use of fast-absorbable or slow-absorbable sutures for wound closure.

Barbed versus standard sutures

Outcomes at 30 days after surgery by surgery type (same as overall outcomes)

Very low quality evidence from up to 1 RCT, including 411 people, could not differentiate the number of people who experience SSI following knee arthroplasty between the use of barbed and standard sutures.

Overall outcomes 30 days – 1 year after surgery

Very low to low quality evidence from up to 2 RCTs, including 640 people, could not differentiate the number of people who experience SSI or dehiscence between the use of barbed and standard sutures.

Outcomes 30 days – 1 year after surgery by surgery type

Very low quality evidence from 1 RCT, including 411 people, could not differentiate the number of people who experience SSI following knee arthroplasty between the use of barbed or standard sutures for wound closure.

Low quality evidence from 1 RCT, including 229 people, could not differentiate the number of people who experience SSI or wound dehiscence following breast surgery between the use of barbed or standard sutures for wound closure.

Continuous versus interrupted sutures

Outcomes 30 days – 1 year after surgery by surgery type (same as overall outcomes)

Low to moderate quality evidence from up to 2 RCTs, including 1,224 people, could not differentiate the number of people who experience SSI or wound dehiscence following abdominal surgery between the use of continuous and interrupted sutures.

Recommendations

D1. Consider using sutures rather than staples to close the skin after caesarean section to reduce the risk of superficial wound dehiscence.

D2. Consider using triclosan-coated sutures, especially for paediatric surgery, to reduce the risk of surgical site infection.

Research recommendations

1. Does the use of barbed sutures for wound closure reduce the incidence of SSI?

2. Which patient groups, contamination groups and which layers gain the most benefit from the use of triclosan-coated or triclosan-impregnated sutures?
3. Which closure method or technique is the most effective for reducing SSI in patients undergoing emergency surgery?

Rationale and impact

Why the committee made the recommendations

Overall, the evidence suggested that staples increase the incidence of wound dehiscence when compared with sutures for wound closure across different types of surgery. However, when the studies were analysed according to the type of surgery, many of the studies showing this difference were found to be on wound closure after caesarean section. The committee agreed that there was not enough evidence to recommend sutures over staples in all surgery, and decided to focus the recommendation on caesarean section. The committee agreed that this was important in improving recovery for women having caesarean sections, and that it should be reflected in the recommendations. But the committee did note that limited evidence of varying quality was identified and evidence did not capture all populations, for example obese women. Due to this a strong recommendation could not be made. Therefore, the recommendation was made to consider sutures rather than staples. It was also noted that the NICE guideline on caesarean section was published before this evidence was available, and currently states that the effects of different methods of skin closure are not certain.

The committee discussed the evidence for triclosan-coated sutures and agreed that the evidence overall favoured triclosan-coated sutures over standard sutures for reducing surgical site infection. However, they noted that the studies covered many different types of surgery and were of variable quality, meaning that it was difficult to be confident of the benefit. Further analysis by the type of surgery, showed that only paediatric surgery showed a clear benefit of using triclosan-coated sutures. The committee therefore agreed that they should be considered as an option for wound closure in all types of surgery, and that their use in paediatric surgery should be emphasised in particular. The committee also developed a research recommendation to better clarify which patients should have triclosan-coated sutures and which surgical layers they should be used for.

Impact of the recommendations on practice

The recommendations are unlikely to have a major effect on current practice. Current practice in wound closure varies, so the new recommendations may help to reduce variation and standardise practice.

Using sutures rather than staples for wound closure in caesarean section may lead to a reduction in the number of women experiencing wound dehiscence following surgery, which may reduce the costs of treatment.

Use of triclosan-coated sutures may increase, which may have cost implications because they are more expensive than standard sutures. However, it is likely that the increased cost will be outweighed by savings from a reduction in the number of surgical site infections, which are costly to treat.

The committee's discussion of the evidence

Interpreting the evidence

The outcomes that matter most

The committee identified SSI including superficial SSI, deep SSI and organ space SSI as well as dehiscence as outcomes of interest. The committee were interested in outcomes at both one month and one year after surgery, although it was suggested that the outcomes at one month were the most important as any SSIs reported up to one year are likely to have been evident within the first 30 days.

The quality of the evidence

The studies ranged from very low- to high-quality evidence. Study location varied, with only 2 of the studies based in the UK. When data were pooled the majority of outcomes for triclosan-coated sutures were very low or low quality and heterogeneity between studies was high. However, when stratified by surgery type, one study [Renko 2016] was found to be high-quality. This study was used to support the recommendation in favour of triclosan-coated sutures in paediatric surgery. The committee were aware that with only one study on paediatric surgery meeting the inclusion criteria there was no evidence regarding the repeatability of these findings. However, given the high quality of the study, it was decided that this was sufficient to make a consider recommendation.

The committee also discussed the wide variety of follow-up periods reported in the literature. Outcomes for the meta-analysis were grouped by those reported up to 30 days post-surgery and those reported between 30 days and 1 year post-surgery. However, some studies reported follow-up assessments both before and after 30 days despite only reporting one overall figure for the number of people developing an SSI. The committee decided that it would be unlikely for someone to develop an SSI beyond 30 days if they did not already have one in the first 30 days and so this did not affect their decisions when deciding on the recommendations. Studies examining the use of triclosan-coated sutures were lower quality. The committee raised concerns about the low percentage of SSIs reported in one study [Ichida 2018] and suggested that the reported SSI rate of 6.9% is lower than would typically be expected in patients undergoing colorectal surgery. Another study [Galal 2011] examined SSI in a variety of procedures. The committee suggested that this form of analysis was problematic as the variation in SSI rates between different surgeries means that they cannot easily be compared. The low quality of evidence for patient groups other than paediatrics meant that the committee did not feel they could confidently make a recommendation in favour of using triclosan-coated sutures for other specific types of surgery. However they acknowledged that, although low quality, the pooled evidence in favour of triclosan-coated sutures indicates that there may be an effect.

Evidence for the use of staples or sutures for wound closure ranged from very low to moderate quality. The low quality and high levels of inconsistency in these studies made it difficult for the committee to make general recommendations on these outcomes. However, when stratified by surgery type, 3 studies [Basha 2010, Figueroa 2013, Mackeen 2014] provided evidence for the benefits of sutures over staples for wound closure after caesarean-section. Evidence for other types of surgery were low-quality and the committee did not consider them sufficient to confidently make any other recommendations regarding the use of staples or sutures.

Evidence for absorbable sutures ranged from very low to moderate quality and did not produce any conclusive findings. There was limited evidence for the other comparisons (fast- or slow-absorbable, barbed or standard sutures and continuous or interrupted sutures) and the quality of findings for the majority of the outcomes was very low to low quality. As a result, the committee did not feel there was sufficient information for them to confidently make a recommendation on other methods or techniques for wound closure.

Benefits and harms

The committee noted the wide range of procedures that were investigated in the literature. The committee discussed how the operative site can affect the rate of SSI with some surgeries, such as colorectal surgery, more prone to SSI than others, such as orthopaedic surgery. As a result, outcomes were stratified by type of surgery to highlight the effects in individual procedures. This approach identified paediatrics as a particular group which might benefit from triclosan-coated sutures and caesarean as a surgery in which the use of sutures appears to be a benefit.

A discussion point from the committee was the definition of SSI and dehiscence. The committee agreed that the benefits of sutures over staples in caesarean was an important finding which needed to be reflected in the recommendations. However, with no significant findings in relation to SSI there were concerns that the recommendation would not be addressing the aim of the guideline. After discussion, the committee agreed that the current CDC definition does not separate SSI from dehiscence and so a recommendation relating exclusively to dehiscence did meet the remit of the guideline. However, they agreed that greater clarification on the definition of SSI and dehiscence would be useful.

The committee noted that the treatment of SSIs can result in considerable costs to the NHS and so the reduction of these could help to reduce costs as well as improving patient outcomes following surgery. The costs of triclosan-coated sutures are higher than traditional sutures but it was agreed that this difference in cost is less than the cost of treating an SSI.

The committee were not aware of any reports of adverse reactions as a result of using triclosan-coated sutures. As a result, they agreed that the recommendation that healthcare professionals consider using them should not result in any additional risk of harm to patients.

One potential harm of an increased use of triclosan-coated sutures is a rise in antimicrobial resistance. These effects may need to be considered if future evidence shows further benefits of using triclosan-coated sutures over standard sutures in different types of surgery.

The use of sutures over staples for wound closure following caesarean section has the potential benefit of reducing the number of patients experiencing wound dehiscence and any costs associated with subsequent treatment. The committee were not aware of any obvious harms to patients if a change were made from the use of staples to sutures.

Cost effectiveness and resource use

Although this review question was not prioritised for original economic analyses, the committee agreed that unit costs presented for triclosan-coated sutures and non-triclosan-coated sutures suggested that the difference was around £0.80. The

committee were aware that, in the economic models developed for the nasal decontamination and skin preparation prior to surgical procedure review questions, the average cost of managing a single patient with an SSI was estimated at £3,122.86.

Therefore, the committee understood that, as long as the use of triclosan-coated sutures avoids even a single case of SSI, the marginal increase in costs for triclosan-coated sutures compared to non-coated sutures would still result in the strategy cost being less than that of non-coated sutures. Furthermore, a patient who has avoided an SSI would have more QALYs than a patient without an SSI, so triclosan-coated sutures would represent a dominant strategy.

Other factors the committee took into account

The committee noted the wide variation between the different materials used for wound closure and the different layers closed in the procedures reported in the literature. They noted that this made it difficult to determine the precise effects of the different materials used, such as the different types of triclosan-coated sutures. However as this reflects current practice, with the choice of suture often based on surgeon preference, the research was still considered relevant.

There were no particular concerns over any specific patient groups who may be affected by the recommendations made. However, it was highlighted that it was not clear how emergency patients would benefit from these recommendations as it is often difficult to recruit this group of patients for research. For this reason, the committee decided to make this a research recommendation.

Appendices

Appendix A – Review protocols

Review protocol for the effectiveness of closure materials and techniques in the prevention of surgical site infection

ID	Field	Content		
0.	PROSPERO registration number	[Complete this section with the PRSOSPERO registration number once allocated]		
1.	Review title	Type of method for wound closure		
2.	Review question	RQ4: Which closure methods are clinically effective in the prevention of a surgical site infection?		
3.	Objective	Identifying the closing materials and techniques that might influence the incidence of SSI.		
4.	Searches	The following databases will be searched: • Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • Cumulated Index to Nursing and Allied Health Literature (CINAHL) • Database of Abstracts of Reviews of Effectiveness (DARE) • Embase • MEDLINE/MEDLINE in Process • NHS EED		

		Searches will be restricted by: • No date limit applied • English language • Human studies Other searches: • Reference searching • Inclusion lists of systematic reviews Full search strategies for all databases will be published in the final review.		
5.	Condition or domain being studied	Surgical site infection is a type of health-care associated infection in which a wound infection occurs after an invasive procedure. Surgical site infections have been shown to compose up to 20% of all of healthcare-associated infections. At least 5% of patients undergoing a surgical procedure develop a surgical site infection.		
6.	Population	Inclusion: People of any age undergoing any surgery, including minimally invasive surgery (arthroscopic, thoracoscopic and laparoscopic surgery) Exclusion: Patients undergoing a surgical procedure that does not involve a visible incision, and therefore does not result in the presence of a conventional surgical wound**.**		
7.	Intervention/Exposure/Test	Closure of the skin and closure of internal layers using the following materials:		

		Suture materials: • Traditional sutures including coated polyglactin sutures • Absorbable antibacterial coated and impregnated sutures (including triclosan coated sutures) • Other absorbable sutures (including polydioxanone and polyglyconate monofilament) • Non- absorbable sutures, including polypropylene and polyamide monofilament Non-suture materials: • Staples • Tissue adhesives (including butylcyanoacrylate and octylcyanoarcylate) • Adhesive tapes <u>Closure of the skin and internal layers using the following techniques:</u> • Continuous suturing (including subcuticular suturing, running closure, running lock suturing and purse string suturing) • Interrupted suturing (including simple sutures, vertical mattress and horizontal mattress)		

8.	Comparator/Reference standard/Confounding factors	<u>For skin closure and closure of the internal layers:</u>
		• Absorbable antibacterial coated and impregnated sutures compared traditional sutures
		• Other absorbable sutures versus traditional sutures
		• Staples compared with sutures
		• Tissues adhesives compared with adhesive tapes
		• Comparison of suture techniques
		  ○ Running closure compared with running lock suturing
		  ○ Simple sutures compared with vertical mattress
		  ○ Continuous technique compared with interrupted technique.		

9.	Types of study to be included	• RCTs with a sample size of ≥ 200 subjects • Systematic reviews of RCTs with a sample size of ≥ 200 subjects If less than five RCTs identified, quasi randomised trials will be used. This is to ensure that the review includes a sufficient number of studies.		
10.	Other exclusion criteria	• Studies examining the use of drains during closure • Conference abstracts and non-published studies will be excluded from the review. • Non-English language publications		
11.	Context	The NICE guideline on Surgical site infection: prevention and treatment was published in October 2008. This guideline includes recommendations on information for patients and carers, the preoperative phase, the intraoperative phase and the post-operative phase.		

		The guideline underwent regular surveillance at 3, 6 and 8 years following publication. During the 8 year surveillance process new evidence on the choice of preoperative skin antiseptics was identified. This warranted an update of this review question.		
12.	Primary outcomes (critical outcomes)	• Surgical site infections (superficial, deep and organ/space SSI) including MRSA and MSSA SSI defined using appropriate criteria such as CDC SSI criteria. (Including SSIs up to 30 days and 1 year).		
13.	Secondary outcomes (important outcomes)	• Wound dehiscence (superficial/ partial dehiscence and complete wound dehiscence) • Mortality post-surgery • Length of hospital stay • Postoperative antibiotic use • Hospital readmission		
14.	Data extraction (selection and coding)	See Appendix B		
15.	Risk of bias (quality) assessment	See Appendix B		
16.	Strategy for data synthesis	See Appendix B		
17.	Analysis of sub-groups	• Type of surgery (including cardiac and orthopaedic surgery) • Wound classification (clean, clean-contaminated, contaminated, dirty) • Elective surgery • Emergency surgery		
		☒ Intervention		

18.	Type and method of review	☐ Diagnostic ☐ Prognostic ☐ Qualitative ☐ Epidemiologic ☐ Service Delivery ☐ Other (please specify)				
19.	Language	English				
20.	Country	England				
21.	Anticipated or actual start date	July 2018				
22.	Anticipated completion date	April 2019				
23.	Stage of review at time of this submission	**Review stage**	**Started**	**Completed**		
		Preliminary searches	☑ ☑	☐ ☐		

		Piloting of the study selection process	☐ ☐	☐ ☐		
		Formal screening of search results against eligibility criteria	☐ ☐	☐ ☐		
		Data extraction	☐ ☐	☐ ☐		
		Risk of bias (quality) assessment	☐ ☐	☐ ☐		
		Data analysis	☐ ☐	☐ ☐		
24.	Named contact	**5a. Named contact** Guideline Updates Team **5b Named contact e-mail** SSI@nice.org.uk **5c Named contact address**				

		NICE Guideline Updates Team Centre for Guidelines NICE 10 Spring Gardens London, SW1A 2BU **5d Named contact phone number** +44 (0) 300 323 0410 **5e Organisational affiliation of the review** National Institute for Health and Care Excellence (NICE) and NICE Guideline Updates Team		
25.	Review team members	From the Centre for Guidelines: • Caroline Mulvihill, Guideline Lead • Shreya Shukla, Technical Analyst • Jamie Elvidge, Health Economist • Sarah Glover, Information Specialist		
26.	Funding sources/sponsor	This systematic review is being completed by the Centre for Guidelines which receives funding from NICE.		
27.	Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of		

		interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.		
28.	Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with Developing NICE guidelines: the manual. Members of the guideline committee are: Chair: Damien Longson Members: • Melanie Burden, Infection Control Nurse • Pamela Carroll, Theatre Practitioner • Annie Hitchman, Patient/ carer • Peter Jenks, Microbiologist • David Leaper, Surgeon • Thomas Pinkney, Surgeon • Melissa Rochon, Infection Control Nurse • Giovanni Satta, Microbiologist • David Saunders, Anaesthetist • Nigel Westwood, Patient/ carer		
29.	Other registration details			
30.	Reference/URL for published protocol			
31.	Dissemination plans	The reviewers and guideline committee work with NICE's communications team to disseminate and promote awareness of the guideline at the time of publication and afterwards.		

		Members from the NICE communications team discuss with the reviewers and the committee opportunities for promoting the guideline. Committee members may be asked to take part in such activities. With help from the guideline committee and the developer, they identify how to reach relevant audiences for the guideline, including people using services, carers, the public, practitioners and providers. NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: • notifying registered stakeholders of publication • publicising the guideline through NICE's newsletter and alerts • issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE. NICE may also use other means of raising awareness of the guideline – for example, newsletters, websites, training programmes, conferences, implementation workshops, NICE field team support and other speaking engagements. Some of these may be suggested by guideline committee members (particularly members affiliated to organisations for people using services and carer organisations). Each guideline is different and activities for raising awareness will vary depending on the type and content of the guideline.		
32.	Keywords	Intervention, surgical site infections, invasive surgery, superficial SSI, deep SSI, deep organ space SSI, suture, coated polyglactin sutures, absorbable antibacterial coated, impregnated sutures, staples, tissue adhesives, adhesive tape, continuous suturing, interrupted suturing, primary skin closure, delayed skin closure.		

33.	Details of existing review of same topic by same authors	This is an update of the previous review on closure methods and materials in CG74 Surgical Site Infection 2008). https://www.nice.org.uk/guidance/cg74/documents/surgical-site-infection-consultation-full-guideline2		
34.	Current review status	☒ Ongoing ☐ Completed but not published ☐ Completed and published ☐ Completed, published and being updated ☐ Discontinued		
35..	Additional information			
36.	Details of final publication	www.nice.org.uk		

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Appendix B- Methods

Priority screening

The reviews undertaken for this guideline all made use of the priority screening functionality with the EPPI-reviewer systematic reviewing software. This uses a machine learning algorithm (specifically, an SGD classifier) to take information on features (1, 2 and 3 word blocks) in the titles and abstract of papers marked as being 'includes' or 'excludes' during the title and abstract screening process, and re-orders the remaining records from most likely to least likely to be an include, based on that algorithm. This re-ordering of the remaining records occurs every time 25 additional records have been screened.

As an additional check to ensure this approach did not miss relevant studies, the included studies lists of included systematic reviews were searched to identify any papers not identified through the primary search.

Quality assessment

Individual systematic reviews were quality assessed using the ROBIS tool, with each classified into one of the following three groups:

- High quality – It is unlikely that additional relevant and important data would be identified from primary studies compared to that reported in the review, and unlikely that any relevant and important studies have been missed by the review.
- Moderate quality – It is possible that additional relevant and important data would be identified from primary studies compared to that reported in the review, but unlikely that any relevant and important studies have been missed by the review.
- Low quality – It is possible that relevant and important studies have been missed by the review.

Each individual systematic review was also classified into one of three groups for its applicability as a source of data, based on how closely the review matches the specified review protocol in the guideline. Studies were rated as follows:

- Fully applicable – The identified review fully covers the review protocol in the guideline.
- Partially applicable – The identified review fully covers a discrete subsection of the review protocol in the guideline.
- Not applicable – The identified review, despite including studies relevant to the review question, does not fully cover any discrete subsection of the review protocol in the guideline.

Using systematic reviews as a source of data

If systematic reviews were identified as being sufficiently applicable and high quality, and were identified sufficiently early in the review process (for example, from the surveillance review or early in the database search), they were used as the primary source of data, rather than extracting information from primary studies. The extent to which this was done depended on the quality and applicability of the review, as defined in Table . When systematic reviews were used as a source of primary data, any unpublished or additional data included in the review which is not in the primary studies was also included. Data from these systematic reviews was then quality assessed and presented in GRADE tables as described below, in the same way as if data had been extracted from primary studies. In

questions where data was extracted from both systematic reviews and primary studies, these were cross-referenced to ensure none of the data had been double counted through this process.

Table 5: Criteria for using systematic reviews as a source of data

Quality	Applicability	Use of systematic review
High	Fully applicable	Data from the published systematic review were used instead of undertaking a new literature search or data analysis. Searches were only done to cover the period of time since the search date of the review.
High	Partially applicable	Data from the published systematic review were used instead of undertaking a new literature search and data analysis for the relevant subsection of the protocol. For this section, searches were only done to cover the period of time since the search date of the review. For other sections not covered by the systematic review, searches were undertaken as normal.
Moderate	Fully applicable	Details of included studies were used instead of undertaking a new literature search. Full-text papers of included studies were still retrieved for the purposes of data analysis. Searches were only done to cover the period of time since the search date of the review.
Moderate	Partially applicable	Details of included studies were used instead of undertaking a new literature search for the relevant subsection of the protocol. For this section, searches were only done to cover the period of time since the search date of the review. For other sections not covered by the systematic review, searches were undertaken as normal.

Evidence of effectiveness of interventions

Quality assessment

Individual RCTs were quality assessed using the Cochrane Risk of Bias Tool. Other study were quality assessed using the ROBINS-I tool. Each individual study was classified into one of the following three groups:

- Low risk of bias – The true effect size for the study is likely to be close to the estimated effect size.
- Moderate risk of bias – There is a possibility the true effect size for the study is substantially different to the estimated effect size.
- High risk of bias – It is likely the true effect size for the study is substantially different to the estimated effect size.

Each individual study was also classified into one of three groups for directness, based on if there were concerns about the population, intervention, comparator and/or outcomes in the study and how directly these variables could address the specified review question. Studies were rated as follows:

- Direct – No important deviations from the protocol in population, intervention, comparator and/or outcomes.
- Partially indirect – Important deviations from the protocol in one of the population, intervention, comparator and/or outcomes.

- Indirect – Important deviations from the protocol in at least two of the following areas: population, intervention, comparator and/or outcomes.

Methods for combining intervention evidence

Meta-analyses of interventional data were conducted with reference to the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al. 2011).

Where different studies presented continuous data measuring the same outcome but using different numerical scales (e.g. a 0-10 and a 0-100 visual analogue scale), these outcomes were all converted to the same scale before meta-analysis was conducted on the mean differences. Where outcomes measured the same underlying construct but used different instruments/metrics, data were analysed using standardised mean differences (Hedges' g).

A pooled relative risk was calculated for dichotomous outcomes (using the Mantel–Haenszel method). Both relative and absolute risks were presented, with absolute risks calculated by applying the relative risk to the pooled risk in the comparator arm of the meta-analysis.

Fixed- and random-effects models (der Simonian and Laird) where appropriate, with the presented analysis dependent on the degree of heterogeneity in the assembled evidence. Fixed-effects models were the preferred choice to report, but in situations where the assumption of a shared mean for fixed-effects model were clearly not met, even after appropriate pre-specified subgroup analyses were conducted, random-effects results are presented. Fixed-effects models were deemed to be inappropriate if one or both of the following conditions was met:

- Significant between study heterogeneity in methodology, population, intervention or comparator was identified by the reviewer in advance of data analysis. This decision was made and recorded before any data analysis was undertaken.
- The presence of significant statistical heterogeneity in the meta-analysis, defined as $I^2 \geq 50\%$.

In any meta-analyses where some (but not all) of the data came from studies at high risk of bias, a sensitivity analysis was conducted, excluding those studies from the analysis. Results from both the full and restricted meta-analyses are reported. Similarly, in any meta-analyses where some (but not all) of the data came from indirect studies, a sensitivity analysis was conducted, excluding those studies from the analysis.

Meta-analyses were performed in Cochrane Review Manager v5.3.

Minimal clinically important differences (MIDs)

The Core Outcome Measures in Effectiveness Trials (COMET) database was searched to identify published minimal clinically important difference thresholds relevant to this guideline. Identified MIDs were assessed to ensure they had been developed and validated in a methodologically rigorous way, and were applicable to the populations, interventions and outcomes specified in this guideline. In addition, the Guideline Committee were asked to prospectively specify any outcomes where they felt a consensus MID could be defined from their experience. In particular, any questions looking to evaluate non-inferiority (that one treatment is not meaningfully worse than another) required an MID to be defined to act as a non-inferiority margin.

No MIDs were identified. Therefore, a default MID interval for dichotomous outcomes of 0.8 to 1.25 was used. Continuous outcomes were judged based on whether the difference between the study arms was significant ($p<0.05$).

When decisions were made in situations where MIDs were not available, the 'Evidence to Recommendations' section of that review should make explicit the committee's view of the expected clinical importance and relevance of the findings. In particular, this includes consideration of whether the whole effect of a treatment (which may be felt across multiple independent outcome domains) would be likely to be clinically meaningful, rather than simply whether each individual sub outcome might be meaningful in isolation.

GRADE for pairwise meta-analyses of interventional evidence

GRADE was used to assess the quality of evidence for the selected outcomes as specified in 'Developing NICE guidelines: the manual (2014)'. Data from all study designs was initially rated as high quality and the quality of the evidence for each outcome was downgraded or not from this initial point, based on the criteria given in Table 6.

Table 6: Rationale for downgrading quality of evidence for intervention studies

GRADE criteria	Reasons for downgrading quality
Risk of bias	Not serious: If less than 33.3% of the weight in a meta-analysis came from studies at moderate or high risk of bias, the overall outcome was not downgraded. Serious: If greater than 33.3% of the weight in a meta-analysis came from studies at moderate or high risk of bias, the outcome was downgraded one level. Very serious: If greater than 33.3% of the weight in a meta-analysis came from studies at high risk of bias, the outcome was downgraded two levels. Outcomes meeting the criteria for downgrading above were not downgraded if there was evidence the effect size was not meaningfully different between studies at high and low risk of bias.
Indirectness	Not serious: If less than 33.3% of the weight in a meta-analysis came from partially indirect or indirect studies, the overall outcome was not downgraded. Serious: If greater than 33.3% of the weight in a meta-analysis came from partially indirect or indirect studies, the outcome was downgraded one level. Very serious: If greater than 33.3% of the weight in a meta-analysis came from indirect studies, the outcome was downgraded two levels. Outcomes meeting the criteria for downgrading above were not downgraded if there was evidence the effect size was not meaningfully different between direct and indirect studies.
Inconsistency	Concerns about inconsistency of effects across studies, occurring when there is unexplained variability in the treatment effect demonstrated across studies (heterogeneity), after appropriate pre-specified subgroup analyses have been conducted. This was assessed using the I^2 statistic. N/A: Inconsistency was marked as not applicable if data on the outcome was only available from one study. Not serious: If the I^2 was less than 33.3%, the outcome was not downgraded. Serious: If the I^2 was between 33.3% and 66.7%, the outcome was downgraded one level. Very serious: If the I^2 was greater than 66.7%, the outcome was downgraded two levels.

GRADE criteria	Reasons for downgrading quality
	Outcomes meeting the criteria for downgrading above were not downgraded if there was evidence the effect size was not meaningfully different between studies with the smallest and largest effect sizes.
Imprecision	If an MID other than the line of no effect was defined for the outcome, the outcome was downgraded once if the 95% confidence interval for the effect size crossed one line of the MID, and twice if it crosses both lines of the MID. If the line of no effect was defined as an MID for the outcome, it was downgraded once if the 95% confidence interval for the effect size crossed the line of no effect (i.e. the outcome was not statistically significant), and twice if the sample size of the study was sufficiently small that it is not plausible any realistic effect size could have been detected. Outcomes meeting the criteria for downgrading above were not downgraded if the confidence interval was sufficiently narrow that the upper and lower bounds would correspond to clinically equivalent scenarios.

The quality of evidence for each outcome was upgraded if any of the following three conditions were met:

- Data from non-randomised studies showing an effect size sufficiently large that it cannot be explained by confounding alone.
- Data showing a dose-response gradient.
- Data where all plausible residual confounding is likely to increase our confidence in the effect estimate.

Publication bias

Publication bias was assessed in two ways. First, if evidence of conducted but unpublished studies was identified during the review (e.g. conference abstracts, trial protocols or trial records without accompanying published data), available information on these unpublished studies was reported as part of the review. Secondly, where 10 or more studies were included as part of a single meta-analysis, a funnel plot was produced to graphically assess the potential for publication bias.

Evidence statements

Evidence statements for pairwise intervention data are classified in to one of four categories:

- Situations where the data are only consistent, at a 95% confidence level, with an effect in one direction (i.e. one that is 'statistically significant'), and the magnitude of that effect is most likely to meet or exceed the MID (i.e. the point estimate is not in the zone of equivalence). In such cases, we state that the evidence showed that there is an effect.
- Situations where the data are only consistent, at a 95% confidence level, with an effect in one direction (i.e. one that is 'statistically significant'), but the magnitude of that effect is most likely to be less than the MID (i.e. the point estimate is in the zone of equivalence). In such cases, we state that the evidence could not demonstrate a meaningful difference.
- Situations where the data are consistent, at a 95% confidence level, with an effect in either direction (i.e. one that is not 'statistically significant') but the confidence limits are smaller than the MIDs in both directions. In such cases, we state that the evidence demonstrates that there is no difference.
- In all other cases, we state that the evidence could not differentiate between the comparators.

For outcomes without a defined MID or where the MID is set as the line of no effect, evidence statements are divided into 2 groups as follows:

- We state that the evidence showed that there is an effect if the 95% CI does not cross the line of no effect.
- The evidence could not differentiate between comparators if the 95% CI crosses the line of no effect.

Health economics

Literature reviews seeking to identify published cost–utility analyses of relevance to the issues under consideration were conducted for all questions. In each case, the search undertaken for the clinical review was modified, retaining population and intervention descriptors, but removing any study-design filter and adding a filter designed to identify relevant health economic analyses. In assessing studies for inclusion, population, intervention and comparator, criteria were always identical to those used in the parallel clinical search; only cost–utility analyses were included. Economic evidence profiles, including critical appraisal according to the Guidelines manual, were completed for included studies.

Economic studies identified through a systematic search of the literature are appraised using a methodology checklist designed for economic evaluations (NICE guidelines manual; 2014). This checklist is not intended to judge the quality of a study per se, but to determine whether an existing economic evaluation is useful to inform the decision-making of the committee for a specific topic within the guideline.

There are 2 parts of the appraisal process. The first step is to assess applicability (that is, the relevance of the study to the specific guideline topic and the NICE reference case); evaluations are categorised according to the criteria in Table 1.

Table 1 Applicability criteria

Level	Explanation
Directly applicable	The study meets all applicability criteria, or fails to meet one or more applicability criteria but this is unlikely to change the conclusions about cost effectiveness
Partially applicable	The study fails to meet one or more applicability criteria, and this could change the conclusions about cost effectiveness
Not applicable	The study fails to meet one or more applicability criteria, and this is likely to change the conclusions about cost effectiveness. These studies are excluded from further consideration

In the second step, only those studies deemed directly or partially applicable are further assessed for limitations (that is, methodological quality); see categorisation criteria in Table 2.

Table 2 Methodological criteria

Level	Explanation
Minor limitations	Meets all quality criteria, or fails to meet one or more quality criteria but this is unlikely to change the conclusions about cost effectiveness

Level	Explanation
Potentially serious limitations	Fails to meet one or more quality criteria and this could change the conclusions about cost effectiveness
Very serious limitations	Fails to meet one or more quality criteria and this is highly likely to change the conclusions about cost effectiveness. Such studies should usually be excluded from further consideration

Studies were prioritised for inclusion based on their relative applicability to the development of this guideline and the study limitations. For example, if a high quality, directly applicable UK analysis was available, then other less relevant studies may not have been included. Where selective exclusions were made on this basis, this is noted in the relevant section.

Where relevant, a summary of the main findings from the systematic search, review and appraisal of economic evidence is presented in an economic evidence profile alongside the clinical evidence.

Appendix C – Literature search strategies

Databases	Date searched	Version/files
Cochrane Central Register of Controlled Trials (CENTRAL)	29/06/2018	Issue 6 of 12, June 2018
Cochrane Database of Systematic Reviews (CDSR)	29/06/2018	Issue 6 of 12, June 2018
Database of Abstracts of Reviews of Effect (DARE)	29/06/2018	Issue 2 of 4, April 2015
HTA	29/06/2018	Issue 4 of 4, October 2016
Embase (Ovid)	29/06/2018	1974 to 2018 June 28
MEDLINE (Ovid)	29/06/2018	1946 to Present with Daily Update
MEDLINE In-Process (Ovid)	29/06/2018	June 28, 2018
MEDLINE Epub Ahead of Print[a]	29/06/2018	June 28, 2018
CINAHL Plus with full text (EBSCO)	29/06/2018	-
MHRA – Drug Safety Alerts	29/06/2018	-

The MEDLINE search strategy is presented below. This was translated for use in all of the other databases listed. The aim of the search was to identify evidence for the clinical question being asked. Randomised Controlled Trial and Systematic Review filters were used to identify the study designs specified in the Review Protocol.

1 Surgical Wound Infection/
2 Wound Infection/
3 SURGICAL WOUND DEHISCENCE/
4 Infection Control/
5 (infection adj4 control).tw.
6 Postoperative Complications/
7 ((wound? or incision* or suture*) adj4 (infect* or sepsis or septic* or dehiscen* or site* or contamin* or disrupt* or rupture* or separat*)).tw.
8 (SSI or SSIs or SSTI or SSTIs).tw.
9 Bacterial Infections/pc [Prevention & Control]
10 ((post operative* or postoperative* or post surgical* or postsurgical*) adj4 (infect* or sepsis or septic*)).tw.
11 or/1-10

12 Sutures/
13 (suture? or stitch*).tw.
14 Surgical Tape/
15 exp Tissue Adhesives/
16 ((tape? or adhesive?) adj4 (skin or tissue or surg*)).tw.
17 Surgical stapling/
18 staple?.tw.
19 (surg* adj4 stapling).tw.
20 suture techniques/
21 (glue* adj4 (skin or tissue or surg*)).tw.
22 (skin adj4 sealant*).tw.
23 ((wound? or incision* or skin or surg*) adj4 closure).tw.
24 (biologic* adj4 glue*).tw.
25 (fibrin* adj4 (glue* or sealant*)).tw.
26 (clip? adj4 (skin or tissue or surg*)).tw.
27 or/12-26
28 11 and 27
29 animals/ not humans/
30 28 not 29
31 limit 30 to english language
32 Randomized Controlled Trial.pt.
33 Controlled Clinical Trial.pt.
34 Clinical Trial.pt.
35 exp Clinical Trials as Topic/
36 Placebos/
37 Random Allocation/
38 Double-Blind Method/
39 Single-Blind Method/
40 Cross-Over Studies/
41 ((random$ or control$ or clinical$) adj3 (trial$ or stud$)).tw.
42 (random$ adj3 allocat$).tw.
43 placebo$.tw.
44 ((singl$ or doubl$ or trebl$ or tripl$) adj (blind$ or mask$)).tw.
45 (crossover$ or (cross adj over$)).tw.
46 or/32-45
47 Meta-Analysis.pt.
48 Network Meta-Analysis/
49 Meta-Analysis as Topic/
50 Review.pt.
51 exp Review Literature as Topic/
52 (metaanaly$ or metanaly$ or (meta adj3 analy$)).tw.
53 (review$ or overview$).ti.
54 (systematic$ adj5 (review$ or overview$)).tw.
55 ((quantitative$ or qualitative$) adj5 (review$ or overview$)).tw.
56 ((studies or trial$) adj2 (review$ or overview$)).tw.
57 (integrat$ adj3 (research or review$ or literature)).tw.
58 (pool$ adj2 (analy$ or data)).tw.
59 (handsearch$ or (hand adj3 search$)).tw.
60 (manual$ adj3 search$).tw.

61 or/47-60
62 46 or 61
63 31 and 62
64 limit 63 to ed=20070901-20180629

Economic evaluations and quality of life data

Search filters to retrieve economic evaluations and quality of life papers were appended to the strategy listed above to identify relevant evidence. The MEDLINE economic evaluations and quality of life search filters are presented below. They were translated for use in MEDLINE in Process, Embase, The Cochrane Library, CINAHL and Econlit databases.

Sources searched to identify economic evaluations:

Databases	Date searched
Embase (Ovid)	29/06/2018
MEDLINE (Ovid)	29/06/2018
MEDLINE In-Process (Ovid)	29/06/2018
EconLit (Ovid)	29/06/2018
NHS Economic Evaluation Database (NHS EED) (legacy database)	29/06/2018
Health Technology Assessment (HTA Database)	29/06/2018
CINAHL Plus with Fulltext (EBSCO)	29/06/2018

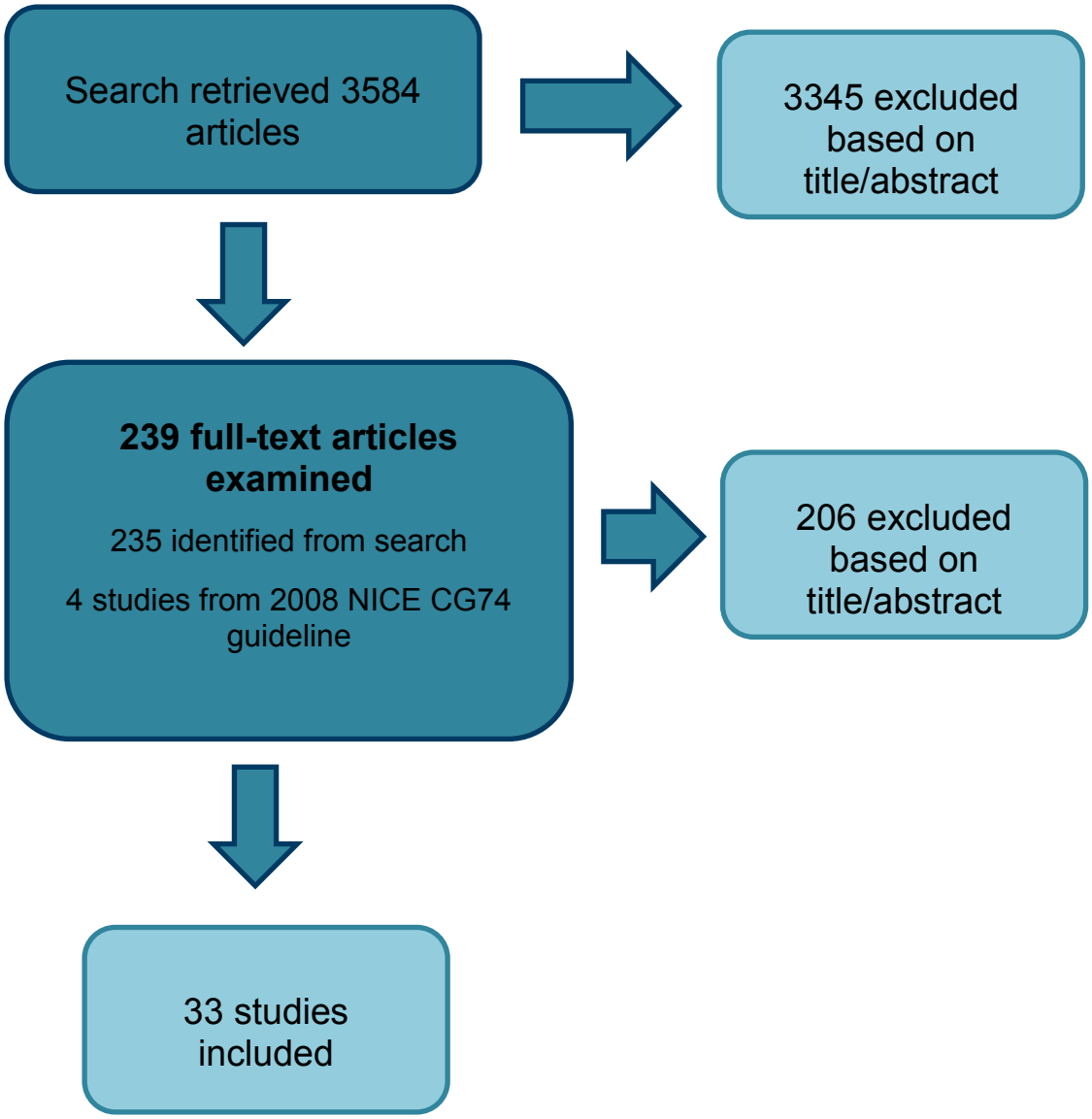
Economic evaluations
1. Economics/
2. exp "Costs and Cost Analysis"/
3. Economics, Dental/
4. exp Economics, Hospital/
5. exp Economics, Medical/
6. Economics, Nursing/
7. Economics, Pharmaceutical/
8. Budgets/

9. exp Models, Economic/
10. Markov Chains/
11. Monte Carlo Method/
12. Decision Trees/
13. econom$.tw.
14. cba.tw.
15. cea.tw.
16. cua.tw.
17. markov$.tw.
18. (monte adj carlo).tw.
19. (decision adj3 (tree$ or analys$)).tw.
20. (cost or costs or costing$ or costly or costed).tw.
21. (price$ or pricing$).tw.
22. budget$.tw.
23. expenditure$.tw.
24. (value adj3 (money or monetary)).tw.
25. (pharmacoeconomic$ or (pharmaco adj economic$)).tw.
26. or/1-25

Quality of Life
1. "Quality of Life"/
2. quality of life.tw.
3. "Value of Life"/
4. Quality-Adjusted Life Years/
5. quality adjusted life.tw.
6. (qaly$ or qald$ or qale$ or qtime$).tw.
7. disability adjusted life.tw.
8. daly$.tw.
9. Health Status Indicators/
10. (sf36 or sf 36 or short form 36 or shortform 36 or sf thirtysix or sf thirty six or shortform thirtysix or shortform thirty six or short form thirtysix or short form thirty six).tw.
11. (sf6 or sf 6 or short form 6 or shortform 6 or sf six or sfsix or shortform six or short form six).tw.
12. (sf12 or sf 12 or short form 12 or shortform 12 or sf twelve or sftwelve or shortform twelve or short form twelve).tw.
13. (sf16 or sf 16 or short form 16 or shortform 16 or sf sixteen or sfsixteen or shortform sixteen or short form sixteen).tw.
14. (sf20 or sf 20 or short form 20 or shortform 20 or sf twenty or sftwenty or shortform twenty or short form twenty).tw.
15. (euroqol or euro qol or eq5d or eq 5d).tw.
16. (qol or hql or hqol or hrqol).tw.
17. (hye or hyes).tw.
18. health$ year$ equivalent$.tw.
19. utilit$.tw.
20. (hui or hui1 or hui2 or hui3).tw.
21. disutili$.tw.
22. rosser.tw.
23. quality of wellbeing.tw.
24. quality of well-being.tw.
25. qwb.tw.
26. willingness to pay.tw.
27. standard gamble$.tw.

28. time trade off.tw.
29. time tradeoff.tw.
30. tto.tw.
31. or/1-30

Appendix D – Clinical evidence study selection



Appendix E – Clinical evidence tables

E1. Baracs 2011

	Baracs (2011)
Title	Surgical site infections after abdominal closure in colorectal surgery using triclosan-coated absorbable suture (PDS Plus) vs. uncoated sutures (PDS II): a randomized multicenter study
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Hungary* • Study setting *Multicentre study* • Study dates *December 2009 - November 2010* • Duration of follow-up *30 days* • Sources of funding *Not reported* **Inclusion criteria** • Patients undergoing colon or rectal surgery **Exclusion criteria** • None reported **Sample size** • Sample size

	Baracs (2011)
	385 **Sample characteristics** • Split between study groups *Triclosan suture group: 188 Standard suture group: 197* • %female *Triclosan suture group: 41% Standard suture group: 44%* • Mean Age *Triclosan suture group: 62.6 Standard suture group: 63.5* • Body Mass Index (SD) *Triclosan suture group: 24.7 Standard suture group: 25.5*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Running looped triclosan-coated PDS Plus (polydioxanone) suture*
Comparator	**Comparator - Materials** • Non-absorbable sutures *Running looped PDS (polydioxanone) suture*
Outcome measure(s)	**Outcome measure(s)** • SSI • Superficial SSI • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Unclear risk of bias *Insufficient information provided.*

	Baracs (2011)
	Blinding of participants and personnel • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *Unclear blinding of outcome assessment* **Directness** • Directly applicable

E2. Basha 2010

	Basha (2010)
Title	Randomized controlled trial of wound complication rates of subcuticular suture vs staples for skin closure at caesarean delivery

	Basha (2010)
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *USA* • Study setting *Community hospital* • Study dates *March 2008 - May 2009* • Duration of follow-up *2-4 weeks* • Sources of funding *Not reported* **Inclusion criteria** • Over 18 years of age • Patients undergoing caesarean delivery **Exclusion criteria** • <24 weeks gestation **Sample size** • Sample size *430* **Sample characteristics** • Split between study groups *Staples group: 206 Sutures group: 224* • Mean age (SD)

	Basha (2010)
	Staples group: 28.9 (6.1) Sutures group: 29.0 (5.7) • Body Mass Index (SD) *Staples group: 29.0 (7.3) Sutures group: 28.6 (7.6)* • Diabetes (%) *Staples group: 15% Sutures group: 16%*
Interventions	**Interventions - Materials** • Non-suture material: Staples *Stainless steel staples*
Comparator	**Comparator - Materials** • Other absorbable sutures *Subcuticular 4-0 Monocryl sutures*
Outcome measure(s)	**Outcome measure(s)** • Length of hospital stay • Hospital readmission • Postoperative antibiotic use • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Unclear risk of bias *No allocation concealment.* **Blinding of participants and personnel** • Low risk of bias *Blinding of participants and personnel not possible. However, as outcomes were objective measures, study was not downgraded in this domain.*

	Basha (2010)
	Blinding of outcome assessment • *Low risk of bias* *Blinding of outcome assessment not possible.* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E3. Bloemen 2011

	Bloemen (2011)
Title	Randomized clinical trial comparing polypropylene or polydioxanone for midline abdominal wall closure
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Netherlands*

	Bloemen (2011)
	• Study setting *Single centre study* • Study dates *October 2001 - January 2005* • Duration of follow-up *30 days* • Sources of funding *Not reported* **Inclusion criteria** • Over 18 years of age • Patients undergoing emergency or elective midline laparotomy **Exclusion criteria** • Pregnant or breastfeeding **Sample size** • Sample size *523* **Sample characteristics** • Split between study groups *Absorbable polydioxanone suture group: 267 Nonabsorbable polyproylene suture group: 256* • Mean age (SD) *Absorbable polydioxanone suture group: 63.8 (13.8) Nonabsorbable polyproylene suture group: 63.1 (13.8)* • Body Mass Index (SD) *Absorbable polydioxanone suture group: 25.8 (4.4) Nonabsorbable polyproylene suture group: 25.6 (4.6)* • Diabetes (%) *Absorbable polydioxanone suture group: 6.4% Nonabsorbable polyproylene suture group: 9.8%*

	Bloemen (2011)
	• COPD (%) *Absorbable polydioxanone suture group: 10.1% Nonabsorbable polyproylene suture group: 3.9%*
Interventions	**Interventions - Materials** • Other absorbable sutures *Slowly absorbable monofilament polydioxanone sutures*
Comparator	**Comparator - Materials** • Non-absorbable sutures *Nonabsorbable polypropylene (Prolene) sutures*
Outcome measure(s)	**Outcome measure(s)** • SSI *CDC criteria*
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting**

	Bloemen (2011)
	• Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *Unclear blinding of outcome assessment* **Directness** • Directly applicable

E4. Buresch 2017

	Buresch (2017)
Title	Comparison of Subcuticular Suture Type for Skin Closure After Cesarean Delivery: A Randomized Controlled Trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *USA* • Study setting *Single centre study* • Study dates *May 2015 - August 2016* • Duration of follow-up *30 days*

	Buresch (2017)
	• Sources of funding *Not reported* **Inclusion criteria** • Over 18 years of age • Patients undergoing caesarean delivery **Exclusion criteria** • Preoperative infection **Sample size** • Sample size *550* **Sample characteristics** • Split between study groups *Slow absorbing sutures: 263 Fast absorbing sutures: 257* • Loss to follow-up *Slow absorbing sutures: 6 Fast absorbing sutures: 7* • Mean age (SD) *Slow absorbing sutures: 31.4 (5.4) Fast absorbing sutures: 31.2 (5.4)* • Body Mass Index (SD) *Slow absorbing sutures: 34.3 (6.7) Fast absorbing sutures: 34.1 (7.1)* • Diabetes (%) *Slow absorbing sutures: 17.5% Fast absorbing sutures: 19.5%*
Interventions	**Interventions - Materials** • Other absorbable sutures *Subcuticular using slow absorbing sutures (Poliglecaprone 25)*

	Buresch (2017)
Comparator	**Comparator - Materials** • Other absorbable sutures *Subcuticular closure using fast absorbing sutures (Polyglactin 910)*
Outcome measure(s)	**Outcome measure(s)** • SSI *CDC criteria* • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Unclear risk of bias *No blinding of participants and personnel. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Unclear risk of bias* *No blinding of outcome assessment* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias**

	Buresch (2017)
	• Moderate *No blinding of outcome assessment* **Directness** • Directly applicable

E5. Buttaro 2015

	Buttaro (2015)
Title	Skin staples versus intradermal wound closure following primary hip arthroplasty: A prospective, randomised trial including 231 cases
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Argentina* • Study setting *Single centre study* • Study dates *September 2011 - May 2012* • Duration of follow-up *45 days* • Sources of funding *None reported* **Inclusion criteria** • Patients undergoing primary total hip arthroplasty

	Buttaro (2015)
	Exclusion criteria • Arthroscopy • Femoral neck fracture **Sample size** • Sample size *219* **Sample characteristics** • Split between study groups *Staples group: 105 Intradermal sutures group: 115*
Interventions	**Interventions - Materials** • Non-suture material: Staples *Skin staples (Leukosan SkinStapler PTW-35). Vicryl 0 used for deep fascia and deep subcutaneous fat tissue. Subcuticular used to close superficial soft tissues*
Comparator	**Comparator - Materials** • Non-absorbable sutures *Polypropelene suture (Prolene, Ethicon) intradermal sutures Vicryl 0 used for deep fascia and deep subcutaneous fat tissue.*
Outcome measure(s)	**Outcome measure(s)** • Deep SSI • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Unclear risk of bias *Insufficient information provided.*

	Buttaro (2015)
	Blinding of participants and personnel • Low risk of bias *Not possible to blind participants and personnel.* ***Blinding of outcome assessment*** • *Low risk of bias* *Not possible to blind outcome assessment.* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low *No blinding of outcome assessment* **Directness** • Partially directly applicable *Argentinian population. Did not use CDC criteria*

E6. Cameron 1987

	Cameron (1987)
Title	A randomised comparison of polydioxanone (PDS) and polypropylene (Prolene) for abdominal wound closure.
Study details	**Study type** • Randomised controlled trial

	Cameron (1987)
	Study details • Study location *UK study* • Study setting *Kings College Hospital* • Study dates *10 month period. Dates not reported* • Duration of follow-up *Early follow up: Up to 1 month Late follow up: Minimum 12 months (mean 14.7 months)* • Sources of funding *Not reported* **Inclusion criteria** • Laparotomy by vertical abdominal incision **Exclusion criteria** • Previous midline incision **Sample size** • Sample size *301* **Sample characteristics** • Split between study groups *Polydioxanone (absorbable) suture group: 143 Polypropylene (non-absorbable) suture group: 141* • Loss to follow-up *17* • Mean age (SD) *Polydioxanone (absorbable) suture group: 61.6 (15.2) Polypropylene (non-absorbable) suture group: 60.2 (17.0)*

	Cameron (1987)
Interventions	**Interventions - Materials** • Other absorbable sutures *Polydioxanone 1*
Comparator	**Comparator - Materials** • Non-absorbable sutures *Polypropylene 1*
Outcome measure(s)	**Outcome measure(s)** • SSI • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided* **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Unclear risk of bias *Surgeon was not blinded to the intervention. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias**

	Cameron (1987)
	• Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E7. Diener 2014

	Diener (2014)
Title	Effectiveness of triclosan-coated PDS Plus versus uncoated PDS II sutures for prevention of surgical site infection after abdominal wall closure: the randomised controlled PROUD trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Germany* • Study setting *Multicentre study* • Study dates *April 2010 - October 2012* • Duration of follow-up *30 days* • Sources of funding *Johnson & Johnson Medical Limited* **Inclusion criteria** • Over 18 years of age

	Diener (2014)
	• Patients undergoing elective laparotomy *Midline laparotomy* **Exclusion criteria** • Participation in another similar trial **Sample size** • Sample size *1224* **Sample characteristics** • Split between study groups *Triclosan-coated sutures group: 607 Standard sutures group: 617* • Loss to follow-up *Triclosan-coated sutures group: 26 Standard sutures group: 29* • %female *Triclosan-coated sutures group: 38.5% Standard sutures group: 38.5%* • Mean age (SD) *Triclosan-coated sutures group: 64.7 (11.8) Standard sutures group: 65.0 (12.1)* • Body Mass Index (SD) *Triclosan-coated sutures group: 26.1 (4.3) Standard sutures group: 26.1 (4.6)* • Diabetes (%) *Triclosan-coated sutures group: 13.8% Standard sutures group: 16.1%* • COPD (%) *Triclosan-coated sutures group: 6.5% Standard sutures group: 8.5%*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Abdominal wall closure using triclosan-coated polydioxanone sutures (PDS Plus)*

	Diener (2014)
Comparator	**Comparator - Materials** • Other absorbable sutures *Abdominal wall closure using standard polydioxanone sutures (PDS II)*
Outcome measure(s)	**Outcome measure(s)** • Superficial SSI *CDC criteria* • Deep SSI *CDC criteria* • Mortality post-surgery • Length of hospital stay • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias

	Diener (2014)
	Overall risk of bias • Low **Directness** • Directly applicable

E8. Figueroa 2013

	Figueroa (2013)
Title	Surgical staples compared with subcuticular suture for skin closure after cesarean delivery: a randomized controlled trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *USA* • Study setting *University Hospital, Birmingham, Alabama* • Study dates *August 2009 - November 2010* • Duration of follow-up *3-4 days 4-6 weeks* • Sources of funding *NIH Women's Reproductive Health Research* **Inclusion criteria** • Patients undergoing caesarean delivery **Exclusion criteria**

	Figueroa (2013)
	• Immune compromising disease • Chronic steroid use **Sample size** • Sample size *398* **Sample characteristics** • Split between study groups *Staples group: 198 Suture group: 200* • Loss to follow-up *Staples group: 19 Suture group: 29* • Mean age (SD) *Staples group: 26.7 (6.1) Suture group: 26.9 (5.9)* • Body Mass Index (SD) *Staples group: 36.8 (8.1) Suture group: 35.9 (8.5)* • Diabetes (%) *Staples group: 11% Suture group: 11%*
Interventions	**Interventions - Materials** • Non-suture material: Staples
Comparator	**Comparator - Materials** • Other absorbable sutures *4-0 Monocryl*
Outcome measure(s)	**Outcome measure(s)** • SSI *Purulent drainage, cellulitis, abscess or wound requiring drainage, debridement and antibiotics associated with a clinical diagnosis of infection*

	Figueroa (2013)
	• Wound dehiscence *Subcutaneous or fascial dehiscence*
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias *Not possible to blind of participants and personnel. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Low risk of bias* *Not possible to blind outcome assessment.* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E9.Galal 2011

	Galal (2011)
Title	Impact of using triclosan-antibacterial sutures on incidence of surgical site infection
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Egypt* • Study setting *Cairo University Hospital* • Study dates *Not reported* • Duration of follow-up *Most surgery: 30 days (weekly) Prosthetic surgery: 1 year (monthly)* • Sources of funding *Not reported* **Inclusion criteria** • None reported **Exclusion criteria** • Preoperative infection **Sample size** • Sample size *450* **Sample characteristics** • Split between study groups *Triclosan sutures group: 230 Standard sutures group: 220*

	Galal (2011)
	• %female *Triclosan sutures group: 36% Standard sutures group: 42%* • Diabetes (%) *Triclosan sutures group: 14% Standard sutures group: 19%*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Triclosan-coated polyglactin 910 antibacterial suture (Vicryl Plus)*
Comparator	**Comparator - Materials** • Other absorbable sutures *Polyglactin 910 suture (Vicryl)*
Outcome measure(s)	**Outcome measure(s)** • SSI • Length of hospital stay
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias

	Galal (2011)
	Other sources of bias • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E10.Gilliland 2014

	Gililland (2014)
Title	Barbed versus standard sutures for closure in total knee arthroplasty: A multicenter prospective randomized trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *USA* • Study setting *Department of Orthopaedic Surgery* • Study dates *Not reported* • Duration of follow-up *2 weeks and 6 weeks* • Sources of funding *Not reported* **Inclusion criteria** • Patients undergoing primary total knee arthroplasty

	Gililland (2014)
	• Over 18 years of age **Exclusion criteria** • Prior surgical incision or scar close to proposed incision *<2 cm from proposed incision* **Sample size** • Sample size *411* **Sample characteristics** • Split between study groups *Intervention group: 191 Comparator group: 203* • Loss to follow-up *Not reported* • %female *52%* • Mean age (SD) *Intervention group: 64 (10) Comparator group: 63 (10)* • Body Mass Index (SD) *Intervention group: 33 (8) Comparator group: 33 (8)*
Interventions	**Intervention- Technique** • Barbed sutures *Two-layer closure using barbed suture with a running, knotless technique. Arthrotomy closure using running knotless #2 Quill SRS PDO and subdermal closure using running knotless 0 Quill SRS Monoderm. Both using running baseball stitch.*
Comparator	**Comparator - technique** • Knotted sutures

	Gililland (2014)
	Standard interrupted, knotted suture technique. Arthrotomy closure using interrupted #1 Ethibond in figure of eight fashion. Subdermal closure using 2-0 Monocryl in interrupted buried fashion.
Outcome measure(s)	**Outcome measure(s)** • SSI *at 2 and 6 weeks*
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided.* **Allocation concealment** • High risk of bias *No evidence of allocation concealment* **Blinding of participants and personnel** • Unclear risk of bias *Patients blinded to intervention but not investigators. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias**

	Gililland (2014)
	• Moderate *Unclear random sequence generation and blinding of outcome assessment* **Directness** • Partially directly applicable *Infection classified using Wound Infection Grade not CDC criteria*

E11.Gislason 1995

	Gislason (1995)
Title	
Study details	Burst abdomen and incisional hernia after major gastrointestinal operations--comparison of three closure techniques.
Interventions	**Study type** • Randomised controlled trial **Study details** • Study location *Norway* • Study setting *University hospital* • Study dates *December 1990 - February 1992* • Duration of follow-up *1 year* • Sources of funding *Not reported* **Inclusion criteria**

	Gislason (1995)
	• Over 18 years of age • Patients undergoing major gastrointestinal operations **Exclusion criteria** • Laparotomy in previous 3 months **Sample size** • Sample size *599* **Sample characteristics** • Split between study groups *Continuous polyglactin double suture group: 203 Continuous polyglactin suture group: 199 Interrupted polyglactin suture group: 197* • %female *Continuous polyglactin double suture group: 50% Continuous polyglactin suture group: 53% Interrupted polyglactin suture group: 48%* • Mean age (SD) *Continuous polyglactin double suture group: 62 (17) Continuous polyglactin suture group: 60 (19) Interrupted polyglactin suture group: 60 (19)*
Comparator	**Intervention- Technique** • Continuous suturing technique *Continuous mass polyglactin 910 (Vicryl) sutures. In layers for transverse incisions. Mass closure for midline incisions*
Outcome measure(s)	**Comparator - technique** • Interrupted suturing technique *Interrupted mass polyglactin 910 (Vicryl) sutures. In layers for transverse incisions. Mass closure for midline incisions*

	Gislason (1995)
Risk of bias Directness	**Outcome measure(s)** • SSI *Inflammation of the wound with inflammation or discharge or both. Confirmed by standard signs (fever, raised white cell count, C-reactive protein concentration) and the presence of a pathogen on culture of wound fluid* • Wound dehiscence *Either ascitic fluid or abdominal viscera escaping from the wound*
	Random sequence generation • Unclear risk of bias *Insufficient information provided* **Allocation concealment** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* **Blinding of participants and personnel** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias**

	Gislason (1995)
	• Low risk of bias **Overall risk of bias** • Moderate *Insufficient information provided about random sequence generation and blinding of outcome assessment* **Directness** • Directly applicable

E12.Ichida 2018

	Ichida (2018)
Title	Effect of triclosan-coated sutures on the incidence of surgical site infection after abdominal wall closure in gastroenterological surgery: a double-blind, randomized controlled trial in a single center
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Japan* • Study setting *De- partment of Surgery, Saitama Medical Center, Jichi Medical University, Japan* • Study dates *March 2014 - March 2017* • Duration of follow-up *30 days* • Sources of funding *Not reported* **Inclusion criteria**

	Ichida (2018)
	• Patients undergoing gastroenterological surgery **Exclusion criteria** • Pregnant or breastfeeding • Preoperative infection **Sample size** • Sample size *1023* **Sample characteristics** • Split between study groups *Triclosan suture group: 508 Standard suture group: 505* • Loss to follow-up *Triclosan suture group: 0 Standard suture group: 0* • %female *Triclosan suture group: 40.2% Standard suture group: 36.2%* • Mean age (SD) *Triclosan suture group: 67.0 (11.5) Standard suture group: 67.5 (11.6)* • Diabetes (%) *Triclosan suture group: 21.3% Standard suture group: 25.0%*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Abdominal fascia and peritoneum closure: Interrupted polyglactin 910 antibacterial sutures coated with triclosan (Vicryl Plus) Skin closure: Interrupted subcutaneous sutures using poly- dioxanone antibacterial sutures coated with triclosan (PDS Plus)*
Comparator	**Comparator - Materials** • Other absorbable sutures

	Ichida (2018)
	Abdominal fascia and peritoneum closure: Interrupted uncoated polyglactin 910 antibacterial sutures (Vicryl Skin closure: Interrupted subcutaneous sutures using poly- dioxanone sutures (PDS II)
Outcome measure(s)	**Outcome measure(s)** • Superficial SSI *CDC criteria* • Deep SSI *CDC criteria*
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness**

	Ichida (2018)
	• Partially directly applicable *Japanese population*

E13.Imamura 2016

	Imamura (2016)
Title	Randomized Comparison of Subcuticular Sutures Versus Staples for Skin Closure After Open Abdominal Surgery: a Multicenter Open-Label Randomized Controlled Trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Japan* • Study setting *Three Tokyo Metropolitan institutions in Japan* • Study dates *September 2010 - August 2015* • Duration of follow-up *30 days* • Sources of funding *Tokyo Metropolitan Government* **Inclusion criteria** • Patients undergoing open abdominal surgery **Exclusion criteria** • Diabetes *Uncontrolled diabetes*

	Imamura (2016)
	• Preoperative infection **Sample size** • Sample size *401* **Sample characteristics** • Split between study groups *Suture group: 199 Staple group: 202* • Loss to follow-up *Suture group: 7 Staple group: 6* • %female *Suture group: 37% Staple group: 36%* • Median Age (IQR) *Suture group: 72 (64-78) Staple group: 73 (65-79)* • Median Body Mass Index (range) *Median (IQR) Suture group: 21.35 (19.2 - 24.0) Staple group: 21.25 (19.5 - 23.8)* • Diabetes (%) *Suture group: 12% Staple group: 11%*
Interventions	**Interventions - Materials** • Other absorbable sutures *Interrupted subcuticular sutures with 4–0 monofilament*
Comparator	**Comparator - Materials** • Non-suture material: Staples *Metallic skin staples at 10-15 mm intervals*
Outcome measure(s)	**Outcome measure(s)** • Superficial SSI

	Imamura (2016)
	Purulent discharge; microorganisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision; and at least one of the following symptoms of infection: pain or tenderness, localized swelling, redness or heat, and a superficial incision deliberately opened by the surgeon provided the incision was not culture negative • Length of hospital stay
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Unclear risk of bias **Blinding of participants and personnel** • Low risk of bias *No blinding of participants and personnel. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness**

	Imamura (2016)
	• Partially directly applicable *Japanese population*

E14.Isik 2012

	Isik (2012)
Title	Efficiency of antibacterial suture material in cardiac surgery: a double-blind randomized prospective study
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Turkey* • Study setting *Private hospital, Istanbul* • Study dates *April 2008 - September 2009* • Duration of follow-up *30 days (every 10 days)* • Sources of funding *Not reported* **Inclusion criteria** • Patients undergoing cardiac surgery **Exclusion criteria** • None reported **Sample size** • Sample size

	Isik (2012)
	510 **Sample characteristics** • Split between study groups *Triclosan-suture group: 170 Standard suture group: 340* • Loss to follow-up *Not reported* • %female *Triclosan-suture group: 32.8% Standard suture group: 50.0%* • Mean age (SD) *Triclosan-suture group: 60.15 (10.77) Standard suture group: 61.21 (10.25)* • Diabetes (%) *Triclosan-suture group: 34% Standard suture group: 35%*
Interventions	**Interventions - Materials** • Absorbable antimicorbial coated/ impregnated sutures *Polyglactin 910 triclosan-coated suture*
Comparator	**Comparator - Materials** • Other absorbable sutures *Polyglactin 910 traditional suture*
Outcome measure(s)	**Outcome measure(s)** • SSI *CDC criteria*
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided* **Allocation concealment**

	Isik (2012)
	• Low risk of bias **Blinding of participants and personnel** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Unclear risk of bias *Insufficient information provided* **Selective reporting** • Unclear risk of bias *Insufficient information provided* **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *Unclear random sequence generation and pre-specified outcomes* **Directness** • Directly applicable

E15.Justinger 2013

	Justinger (2013)
Title	Surgical-site infection after abdominal wall closure with triclosan-impregnated polydioxanone sutures: results of a randomized clinical pathway facilitated trial (NCT00998907)
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Germany* • Study setting *Single centre* • Study dates *September 2009 - September 2011* • Duration of follow-up *2 weeks* • Sources of funding *Johnson&Johnson, Summerville, NJ* **Inclusion criteria** • Laparotomy by vertical abdominal incision **Exclusion criteria** • None reported **Sample size** • Sample size *856* **Sample characteristics** • Split between study groups

	Justinger (2013)
	Triclosan suture group: 485 Standard suture group: 371 • %female *Triclosan suture group: 37.9% Standard suture group: 39.6%* • Mean age (SD) *Triclosan suture group: 63 (13) Standard suture group: 63 (13)* • Diabetes (%) *Triclosan suture group: 10.1% Standard suture group: 9.4%*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Fascia closed with atriclosan impregnated 2-0 polydioxanone loop (PDS Plus, 150 cm)*
Comparator	**Comparator - Materials** • Other absorbable sutures *Fascia closed with 2-0 polydioxanone loop (PDS II, 150 cm)*
Outcome measure(s)	**Outcome measure(s)** • SSI *CDC criteria*
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data**

	Justinger (2013)
	• Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E16.Kobayashi 2015

	Kobayashi (2015)
Title	Randomized clinical trial of skin closure by subcuticular suture or skin stapling after elective colorectal cancer surgery
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Japan* • Study setting *Multicentre study* • Study dates *August 2012 - April 2012* • Duration of follow-up *30 days*

	Kobayashi (2015)
	• Sources of funding *Ministry of Health, Labour and Welfare of Japan* **Inclusion criteria** • Elective colorectal resection **Exclusion criteria** • None reported **Sample size** • Sample size *1264* **Sample characteristics** • Split between study groups *Staples group: 629 Subcuticular sutures group: 635* • %female *Staples group: 45% Subcuticular sutures group: 46%* • Median age (range) *Staples group: 67 (25-91) Subcuticular sutures group: 65 (30-91)* • Median Body Mass Index (range) *Staples group: 22.6 (14.3 - 38.2) Subcuticular sutures group: 22.3 (14.6 - 34.3)* • Diabetes (%) *Staples group: 7.7% Subcuticular sutures group: 10.3%*
Interventions	**Interventions - Materials** • Non-suture material: Staples *Skin staples with the dermis attached at intervals of 10-15 mm*

	Kobayashi (2015)
Comparator	**Comparator - Materials** • Other absorbable sutures *Dermal layers attached using 4/0 or 5/0 absorbable monofilament sutures*
Outcome measure(s)	**Outcome measure(s)** • Superficial SSI • Length of hospital stay • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided* **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias *Not possible to blind participants and personnel.* ***Blinding of outcome assessment*** • *Low risk of bias* *Blinding of outcome assessment not possible* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias**

	Kobayashi (2015)
	• Moderate *Insufficient information for random sequence generation* **Directness** • Partially directly applicable *Japanese population*

E17.Leaper 1985

	Leaper (1985)
Title	Abdominal wound closure: a controlled trial of polyamide (nylon) and polydioxanone suture (PDS).
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *UK* • Study setting *Two centres* • Study dates *10 months. Dates not reported* • Duration of follow-up *6 months* • Sources of funding *Not reported* **Inclusion criteria** • Patients undergoing elective laparotomy **Exclusion criteria**

	Leaper (1985)
	• None reported **Sample size** • Sample size *233* **Sample characteristics** • Split between study groups *Polyamide non-absorbable suture group: 97 Polydioxanone absorbable suture group:107* • Loss to follow-up *29* • %female *Polyamide non-absorbable suture group: 64% Polydioxanone absorbable suture group: 60%* • Mean age (SD) *Mean (standard error of mean) Polyamide non-absorbable suture group: 57.4 (1.8) Polydioxanone absorbable suture group: 57.9 (1.7)*
Interventions	**Interventions - Materials** • Other absorbable sutures *Polydioxanone absorbable suture (PDS)*
Comparator	**Comparator - Materials** • Non-absorbable sutures *No 1 (BPC) polyamide (Nylon) sutures*
Outcome measure(s)	**Outcome measure(s)** • SSI • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias

	Leaper (1985)
	Allocation concealment • Unclear risk of bias *Insufficient information provided.* **Blinding of participants and personnel** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *Insufficient information for blinding of outcome assessment* **Directness** • Directly applicable

E18.Mackeen 2014

	Mackeen (2014)
Title	Suture compared with staple skin closure after cesarean delivery: a randomized controlled trial

	Mackeen (2014)
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *USA* • Study setting *Multicentre study* • Study dates *2010 - 2012* • Duration of follow-up *6 weeks* • Sources of funding *Not reported* **Inclusion criteria** • Patients undergoing caesarean delivery *Caesarean delivery through low-transvers skin incision* **Exclusion criteria** • Diabetes *Poorly controlled diabetes* • Immune compromising disease • Chronic steroid use **Sample size** • Sample size *746* **Sample characteristics**

	Mackeen (2014)
	• Split between study groups *Staples group: 376 Sutures group: 370* • Loss to follow-up *Staples group: 0 Sutures group: 0* • Median Age (IQR) *Staples group: 31.0 (26.4 - 35.6) Sutures group: 31.0 (26.9 - 35.4)* • Body Mass Index (SD) *Staples group: 32.5 (28.3 - 38.3) Sutures group: 32.3 (28.2 - 37.7)*
Interventions	**Interventions - Materials** • Non-suture material: Staples *Closure of skin with stainless steel staples*
Comparator	**Comparator - Materials** • Other absorbable sutures *Skin closure with subcuticular continuous 4-0 sutures*
Outcome measure(s)	**Outcome measure(s)** • SSI • Length of hospital stay • Hospital readmission • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** •Low risk of bias

	Mackeen (2014)
	Blinding of intervention not possible. ***Blinding of outcome assessment*** • *Low risk of bias* *Blinding of intervention not possible* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E19.Maehara 2017

	Maehara (2017)
Title	Impact of intra-abdominal absorbable sutures on surgical site infection in gastrointestinal and hepato-biliary-pancreatic surgery: results of a multicenter, randomized, prospective, phase II clinical trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Japan* • Study setting

	Maehara (2017)
	Multicentre study • Study dates *February 2009 - June 2010* • Duration of follow-up *30 days* • Sources of funding *Japan Surgical Society Clinical Investigation Project Award Health Labour Science Research Grant* **Inclusion criteria** • Age 20-80 **Exclusion criteria** • Total laparoscopic gastrectomy • Combined hepatectomy **Sample size** • Sample size *1174* **Sample characteristics** • Split between study groups *Absorbable sutures - gastrectomy: 134 Silk sutures - gastrectomy: 132 Absorbable sutures - colorectal surgery: 131 Silk sutures - colorectal surgery: 133 Absorbable sutures - hepatectomy: 163 Silk sutures - hepatectomy: 164 Absorbable sutures - PD: 145 Silk sutures - PD: 145* • Body Mass Index (SD) *Absorbable sutures - gastrectomy: 22.6 (3.5) Silk sutures - gastrectomy: 22.5 (3.1) Absorbable sutures - colorectal surgery: 22.6 (3.3) Silk sutures - colorectal surgery: 23.0 (3.8) Absorbable sutures - hepatectomy: 22.7 (3.9) Silk sutures - hepatectomy: 22.9 (3.4) Absorbable sutures - PD: 22.3 (3.4) Silk sutures - PD: 21.8 (3.2)*

	Maehara (2017)
Interventions	**Interventions - Materials** • Other absorbable sutures *Polyglactin 910 or polydioxanone sutures*
Comparator	**Comparator - Materials** • Non-absorbable sutures *Silk sutures*
Outcome measure(s)	**Outcome measure(s)** • SSI *CDC criteria* • Superficial SSI *CDC criteria* • Deep SSI *CDC criteria* • Organ/space SSI *CDC criteria* • Length of hospital stay
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • High risk of bias *No blinding of participants and personnel.* ***Blinding of outcome assessment*** • *High risk of bias* *No*

	Maehara (2017)
	blinding of outcome assessment **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *No blinding of participants or outcome assessment* **Directness** • Partially directly applicable *Japanese population*

E20.Mattavelli 2015

	Mattavelli (2015)
Title	Multi-Center Randomized Controlled Trial on the Effect of Triclosan-Coated Sutures on Surgical Site Infection after Colorectal Surgery
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Italy* • Study setting

	Mattavelli (2015)
	Four university hospitals • Study dates *January 2010 - March 2013* • Duration of follow-up *30 days* • Sources of funding *None reported* **Inclusion criteria** • Over 18 years of age • Elective colorectal resection **Exclusion criteria** • Pregnant or breastfeeding • Preoperative infection • Emergency operations **Sample size** • Sample size *300* **Sample characteristics** • Split between study groups *Triclosan suture group: 150 Standard suture group: 150* • Loss to follow-up *Triclosan suture group: 0 Standard suture group: 0* • %female *Triclosan suture group: 42.2 Standard suture group: 47.6* • Median Age (IQR)

	Mattavelli (2015)
	Triclosan suture group: 69 (60-75) Standard suture group: 69 (60-76) • Median Body Mass Index (range) *Triclosan suture group: 24.3 (2.6 - 27.2) Standard suture group: 24.8 (22.3 - 27.1)* • Diabetes (%) *Triclosan suture group: 15.0% Standard suture group: 12.8%*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Peritoneum: triclosan-coated polyglactin 910 (0 Vicryl Plus) Skin: triclosan-coated polydiaxanone (PDS Plus)*
Comparator	**Comparator - Materials** • Other absorbable sutures *Peritoneum: Polyglactin 910 (Vicryl) Skin: polydiaxanone (PDS II)*
Outcome measure(s)	**Outcome measure(s)** • Superficial SSI *Infection occurring within 30 days and involving only skin or subcutaneous tissue. Purulent drainage, pain or tenderness, localised swelling, redness or heat* • Deep SSI *Occurring within 30 days and involving deep soft tissues (fascial and muscle layers). Purulent drainage from the incision but not from organ/space, spontaneous dehiscence or deliberate incision by surgeon when fever is present, localised pain or tenderness* • Length of hospital stay
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel**

	Mattavelli (2015)
	• Low risk of bias ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E21.Nakamura 2013

	Nakamura (2013)
Title	Triclosan-coated sutures reduce the incidence of wound infections and the costs after colorectal surgery: a randomized controlled trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Japan* • Study setting *Single centre study*

	Nakamura (2013)
	• Duration of follow-up *30 days* • Sources of funding *Not reported* **Inclusion criteria** • Elective colorectal resection **Exclusion criteria** • None reported **Sample size** • Sample size *410* **Sample characteristics** • Split between study groups *Triclosan sutures group: 206 Standard sutures group: 204* • Loss to follow-up *Triclosan sutures group: 0 Standard sutures group: 0* • %female *Triclosan sutures group: 37% Standard sutures group: 45%* • Mean age (SD) *Triclosan sutures group: 69.4 (11.3) Standard sutures group: 70.2 (11.1)* • Body Mass Index (SD) *Triclosan sutures group: 23.2 (3.6) Standard sutures group: 23.4 (3.8)* • Diabetes (%) *Triclosan sutures group: 20% Standard sutures group: 15%*

	Nakamura (2013)
	• COPD (%) *Triclosan sutures group: 5% Standard sutures group: 7%*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Wound closed with Triclosan-coated polyglactin 910 sutures (Vicryl Plus). Skin closure with staples*
Comparator	**Comparator - Materials** • Other absorbable sutures *Would closure with Polyglactin 910 sutures (Vicryl). Skin closure with staples*
Outcome measure(s)	**Outcome measure(s)** • SSI *CDC criteria up to 30 days* • Organ/space SSI • Length of hospital stay
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided* **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Unclear risk of bias *Surgeon was not blinded to the intervention. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data**

	Nakamura (2013)
	• Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *Insufficient information on random sequence generation and no blinding of surgeon* **Directness** • Partially directly applicable *Japanese population*

E22.Orr 2003

	Orr (2003)
Title	Continuous abdominal fascial closure: a randomized controlled trial of poly(L-lactide/glycolide).
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *USA* • Study setting *Multi-centre study* • Study dates *June 1999 - June 2000* • Duration of follow-up

	Orr (2003)
	6 months • Sources of funding *Ethicon, Inc.* **Inclusion criteria** • Over 18 years of age • Evidence of compromised wound healing **Sample size** • Sample size *203* **Sample characteristics** • Split between study groups *Absorbable suture group: 104 Nonabsorbable suture group: 97* • Mean age (SD) *Absorbable suture group: 55.1 (15.4) Nonabsorbable suture group: 55.3 (14.3)* • Diabetes (%) *Absorbable suture group: 14% Nonabsorbable suture group: 14%*
Interventions	**Interventions - Materials** • Other absorbable sutures *No 1 poly (L-lactide/glycolide) using running mass technique*
Comparator	**Comparator - Materials** • Non-absorbable sutures *No 1 permanent monofilament suture (Prolene) using running mass technique*
Outcome measure(s)	**Outcome measure(s)** • SSI

	Orr (2003)
	Definition not provided • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided* **Allocation concealment** • Unclear risk of bias *Insufficient information provided.* **Blinding of participants and personnel** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** *• Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Unclear risk of bias *Insufficient information provided* **Selective reporting** • Unclear risk of bias *Pre-specified outcomes not reported* **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate

	Orr (2003)
	Unclear random sequence generation and blinding of outcome assessment **Directness** • Partially directly applicable *Type of absorbable suture used was discontinued in 2002. No definition for SSI.*

E23.Pandey 2013

	Pandey (2013)
Title	A Prospective Randomized Study Comparing Non-absorbable Polypropylene (Prolene) and Delayed Absorbable Polyglactin 910 (Vicryl) Suture Material in Mass Closure of Vertical Laparotomy Wounds
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *India* • Study setting *Rajindra Hospital, Patiala, Punjab, India* • Study dates *September 2009 - August 2011* • Duration of follow-up *90 days* • Sources of funding *Not reported* **Inclusion criteria** • Over 18 years of age • Patients undergoing emergency or elective midline laparotomy

	Pandey (2013)
	Exclusion criteria • Previous midline incision • Pregnant or breastfeeding **Sample size** • Sample size *211* **Sample characteristics** • Split between study groups *Absorbable suture group: 105 Non-absorbable suture group: 106* • Loss to follow-up *Absorbable suture group: 5 Non-absorbable suture group: 6* • Mean Age *Absorbable suture group: 56 Non-absorbable suture group: 54* • Body Mass Index (SD) *Absorbable suture group: 27.6 Non-absorbable suture group: 28.4*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Mass closure using polyglactin 910 (Vicryl) sutures*
Comparator	**Comparator - Materials** • Non-absorbable sutures *Mass closure using polypropylene (prolene) sutures*
Outcome measure(s)	**Outcome measure(s)** • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias

	Pandey (2013)
	Allocation concealment • Unclear risk of bias *Insufficient information provided.* **Blinding of participants and personnel** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting** • High risk of bias *No information provided for prespecified outcomes of wound redness or infection* **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *Insufficient information provided for blinding of outcome assessment.* **Directness** • Partially directly applicable *Indian population*

E24.Renko 2016

	Renko (2016)
Title	Triclosan-containing sutures versus ordinary sutures for reducing surgical site infections in children: a double-blind, randomised controlled trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Finland* • Study setting *Oulu University Hospital* • Study dates *September 2010 - December 2014* • Duration of follow-up *30 days* • Sources of funding *The Alma and K A Snellman Foundation* **Inclusion criteria** • Under 18 years of age **Exclusion criteria** • Surgery on cleft lip or palate **Sample size** • Sample size *1633* **Sample characteristics** • Split between study groups

	Renko (2016)
	Triclosan suture group: 778 Standard suture group: 779 • %female *Triclosan suture group: 38% Standard suture group: 36%* • Mean age (SD) *Triclosan suture group: 7.2 (5.4) Standard suture group: 7.1 (5.5)*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Triclosan sutures*
Comparator	**Comparator - Materials** • Other absorbable sutures *Standard absorbable sutures*
Outcome measure(s)	**Outcome measure(s)** • SSI • Superficial SSI *CDC criteria* • Deep SSI *CDC criteria* • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias ***Blinding of outcome assessment***

	Renko (2016)
	• *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E25.Rubin 2014

	Rubin (2014)
Title	A multicenter randomized controlled trial comparing absorbable barbed sutures versus conventional absorbable sutures for dermal closure in open surgical procedures
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *USA and Europe* • Study setting *9 institutions across the United States and Europe* • Study dates *August 2009 - January 2010*

	Rubin (2014)
	• Duration of follow-up *12 weeks* • Sources of funding *Covidien* **Inclusion criteria** • Over 18 years of age • Patients scheduled for abdominoplasty, mastoplexy or reduction mammoplasty **Exclusion criteria** • Pregnant or breastfeeding • BMI>40 *BMI >40* • Diabetes • Active cutaneous or systemic infection at time of surgery **Sample size** • Sample size *229* **Sample characteristics** • Split between study groups *Slow-absorbing barbed suture: 115 Rapid-absorbing barbed suture: 114* • Loss to follow-up *Slow-absorbing barbed suture: 10 Rapid-absorbing barbed suture: 2* • %female *Slow-absorbing barbed suture: 106 (92.2%) Rapid-absorbing barbed suture: 107 (93.9%)* • Mean age (SD) *Slow-absorbing barbed suture: 42.7 (11.6) Rapid-absorbing barbed suture: 42.5 (12.6)*

	Rubin (2014)
	• Body Mass Index (SD) *Slow-absorbing barbed suture: 29.6 (5.0) Rapid-absorbing barbed suture: 27.9 (4.9)* • Diabetes (%) *Slow-absorbing barbed suture: 1 (0.9%) Rapid-absorbing barbed suture: 8 (7.0%)*
Interventions	**Intervention- Technique** • Barbed sutures *Closure of deep dermal layer wiht interrupted 3-0 Monocryl sutures (optional) Intra-dermal layer closed with running subcuticular barbed sutures (either fast- or slow-absorbing)*
Comparator	**Comparator - technique** • Interrupted suturing technique *Closure of deep dermal layer with interrupted 3-0 Monocryl sutures no further than 2 cm apart Closure of intradermal layer with running 3-0 Moncryl sutures*
Outcome measure(s)	**Outcome measure(s)** • SSI • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Unclear risk of bias *Insufficient information provided.* **Blinding of participants and personnel** • Unclear risk of bias *Surgeon not blinded. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment***

	Rubin (2014)
	• *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E26.Seiler 2009

	Seiler (2009)
Title	Interrupted or continuous slowly absorbable sutures for closure of primary elective midline abdominal incisions: a multicenter randomized trial (INSECT: ISRCTN24023541)
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Germany* • Study setting *Multi-centre trial* • Study dates *July 2004 - September 2006*

	Seiler (2009)
	• Duration of follow-up *1 year* • Sources of funding *BBD-Aesculap, GmbH Johnson & Johnson Covidien Healthcare Deutschland GmbH* **Inclusion criteria** • Over 18 years of age • Patients undergoing elective laparotomy *With expected incision length of at least 15 cm* **Exclusion criteria** • Emergency operations • Undergoing chemotherapy **Sample size** • Sample size *625* **Sample characteristics** • Split between study groups *Interrupted (Vicryl) group: 210 Continuous (PDS) group: 205 Continuous (Monoplus) group: 210* • Loss to follow-up *Interrupted (Vicryl) group: 44 Continuous (PDS) group: 10 Continuous (Monoplus) group: 39* • %female *Interrupted (Vicryl) group: 37% Continuous (PDS) group: 40% Continuous (Monoplus) group: 37%* • Mean age (SD) *Interrupted (Vicryl) group: 64.5 (13.4) Continuous (PDS) group: 63.8 (12.8) Continuous (Monoplus) group: 64.7 (11.7)* • Body Mass Index (SD)

	Seiler (2009)
	Interrupted (Vicryl) group: 26.1 (3.8) Continuous (PDS) group: 25.6 (3.7) Continuous (Monoplus) group: 26.0 (3.7)
Interventions	**Intervention- Technique** • Continuous suturing technique *Fascial closure using slowly absorbable monofilament materials. 2 groups: 1 - with longitudinal elasticity (Monoplus USP 1) 2 - no longitudinal elasticity (PDS II USP 1) No subcutaneous suture or drainage inserted. Skin closed with staples*
Comparator	**Comparator - technique** • Interrupted suturing technique *Fascial closure using absorbable braided material (Vicryl USP 2) No subcutaneous suture or drainage inserted. Skin closed with staples*
Outcome measure(s)	**Outcome measure(s)** • SSI *Redness, wound dehiscence with secretion of putrid fluid or requiring antibiotic treatment or surgical intervention* • Wound dehiscence *Fascial dehiscence after completed superficial wound healing with or without a prolapse of abdominal organs*
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data**

	Seiler (2009)
	• Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Partially directly applicable *Study examines interrupted v continuous technique but also uses different materials for each study arm.*

E27.Seim 2012

	Seim (2012)
Title	Triclosan-coated sutures do not reduce leg wound infections after coronary artery bypass grafting
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Norway* • Study setting *Oslo University Hospital* • Study dates *September 2009 - September 2011* • Duration of follow-up *4 weeks*

	Seim (2012)
	• Sources of funding *Not reported* **Inclusion criteria** • Patients undergoing cardiac surgery *Elective coronary artery bypass grafting* **Exclusion criteria** • None reported **Sample size** • Sample size *328* **Sample characteristics** • Split between study groups *Triclosan suture group: 160 Standard suture group: 163* • Loss to follow-up *Triclosan suture group: 4 Standard suture group: 1* • %female *Triclosan suture group: 10.6% Standard suture group: 11.7%* • Mean age (SD) *Mean (Standard error of mean) Triclosan suture group: 63.5 (0.7) Standard suture group: 63.1 (0.8)* • Body Mass Index (SD) *Mean (standard error of mean) Triclosan suture group: 27.7 (0.3) Standard suture group: 27.5 (0.3)* • Diabetes (%) *Triclosan suture group: 19.4% Standard suture group: 24.5%*

	Seim (2012)
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Triclosan-cated Vicryl Plus suture*
Comparator	**Comparator - Materials** • Other absorbable sutures *Conventional Vicryl suture*
Outcome measure(s)	**Outcome measure(s)** • SSI *Limited definition provided*
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided* **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • *Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting**

	Seim (2012)
	• Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *Insufficient information for random sequence generation and blinding of outcome assessment* **Directness** • Directly applicable

E28.Steingrimsson 2015

	Steingrimsson (2015)
Title	Triclosan-coated sutures and sternal wound infections: a prospective randomized clinical trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Sweden* • Study setting *University Hospital* • Study dates *March 2009 - February 2012* • Duration of follow-up *60 days* • Sources of funding *Vastra Gothaland Healthcare Region Ethicon, Inc.*

	Steingrimsson (2015)
	Inclusion criteria • Patients undergoing cardiac surgery *Elective coronary artery bypass surgery* **Exclusion criteria** • Preoperative infection • Previous cardiac surgery **Sample size** • Sample size *392* **Sample characteristics** • Split between study groups *Triclosan suture group: 193 Standard suture group: 200* • Loss to follow-up *Triclosan suture group: 17 Standard suture group: 12* • %female *Triclosan suture group: 23% Standard suture group: 16%* • Mean age (SD) *Triclosan suture group: 67.6 (8.1) Standard suture group: 66.7 (8.2)* • Body Mass Index (SD) *Triclosan suture group: 27.7 (4.1) Standard suture group: 27.5 (3.7)*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Fascia & subcutaneous tissue closed with 2-0 Vicryl Plus Intracutaneously closed with 4-0 Monocryl Plus*

	Steingrimsson (2015)
Comparator	**Comparator - Materials** • Other absorbable sutures *Fascia & subcutaneous tissue closed with 2-0 Vicryl Intracutaneously closed with 4-0 Monocryl*
Outcome measure(s)	**Outcome measure(s)** • SSI *CDC criteria within 60 days* • Superficial SSI *CDC criteria within 60 days* • Deep SSI *CDC criteria within 60 days* • Postoperative antibiotic use
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias

	Steingrimsson (2015)
	Overall risk of bias • Low **Directness** • Directly applicable

E29.Talpur 2011

	Talpur (2011)
Title	Closure of elective abdominal incisions with monofilament, non-absorbable suture material versus polyfilament absorbable suture material
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Pakistan* • Study setting *Multi-centre* • Study dates *January 2005 - October 2009* • Duration of follow-up *6 months* • Sources of funding *Not reported* **Inclusion criteria** • Patients undergoing open abdominal surgery • Over 13 years of age

	Talpur (2011)
	Exclusion criteria • Heart disease **Sample size** • Sample size *274* **Sample characteristics** • Split between study groups *Absorbable polyactide suture group: 136 Non-absorbable polypropylene group: 138* • Loss to follow-up *Not reported* • %female *57.3% (not reported by group)* • Mean age (SD) *42.43 (14.09) (not reported by group)*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Abdominal wall closed with polyfilament absorbable co-polymer of polyglycolide with Polyactide (Vicryle) No 1*
Comparator	**Comparator - Materials** • Non-absorbable sutures *Abdominal wall closed with monofilament non-absorbable polypropylene (Prolene) suture No 1*
Outcome measure(s)	**Outcome measure(s)** • Superficial SSI *Limited definition provided* • Wound dehiscence

	Talpur (2011)
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided.* **Allocation concealment** • Unclear risk of bias *Insufficient information provided.* **Blinding of participants and personnel** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** *• Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Unclear risk of bias *Insufficient information provided for pre-specified outcomes* **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *Unclear random sequence generation, blinding of outcome assessment and pre-specified outcomes* **Directness**

	Talpur (2011)
	• Partially directly applicable *Pakistani population. Not clear if SSI was defined by CDC criteria*

E30.Tanaka 2014

	Tanaka (2014)
Title	Randomized controlled trial comparing subcuticular absorbable suture with conventional interrupted suture for wound closure at elective operation of colon cancer
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Japan* • Study setting *Tokai University Hospital* • Study dates *November 2007 - November 2011* • Duration of follow-up *30 days* • Sources of funding *Not reported* **Inclusion criteria** • Patients undergoing elective colectomy through midline incision **Exclusion criteria** • Laparotomy in previous 3 months • Preoperative infection

	Tanaka (2014)
	• Undergoing chemotherapy **Sample size** • Sample size *293* **Sample characteristics** • Split between study groups *Absorbable suture group: 147 Standard suture group: 146* • Loss to follow-up *Absorbable suture group: 19 Standard suture group: 17* • Mean age (SD) *Absorbable suture group: 66.9 (11.5) Standard suture group: 66.7 (11.0)* • Body Mass Index (SD) *Absorbable suture group: 22.3 (3.3) Standard suture group: 22.2 (3.2)* • Diabetes (%) *Absorbable suture group: 9.6% Standard suture group: 8.8%*
Interventions	**Interventions - Materials** • Other absorbable sutures *Interrupted subcuticular absorbable 4-0 polydioaxonne suture*
Comparator	**Comparator - Materials** • Non-absorbable sutures *Interrupted transdermal 3-0 nylon suture*
Outcome measure(s)	**Outcome measure(s)** • Superficial SSI *CDC definition*

	Tanaka (2014)
	• Organ/space SSI *CDC definition*
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided* **Allocation concealment** • Unclear risk of bias *Insufficient information provided.* **Blinding of participants and personnel** • Unclear risk of bias *Insufficient information provided. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** *• Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness**

	Tanaka (2014)
	• Partially directly applicable *Japanese population*

E31.Thimour-Bergstrom 2013

	Thimour-Bergstrom (2013)
Title	Triclosan-coated sutures reduce surgical site infection after open vein harvesting in coronary artery bypass grafting patients: a randomized controlled trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Sweden* • Study setting *Sahlgrenska University Hospital* • Study dates *March 2009 - February 2012* • Duration of follow-up *30 days, 60 days* • Sources of funding *Västra Götaland Healthcare Region Ethicon, Inc.* **Inclusion criteria** • Patients undergoing cardiac surgery *Coronary artery bypass graft* **Exclusion criteria** • Preoperative infection

	Thimour-Bergstrom (2013)
	• Emergency operations **Sample size** • Sample size *374* **Sample characteristics** • Split between study groups *Triclosan suture group: 193 Standard suture group: 199* • Loss to follow-up *Triclosan suture group: 3 Standard suture group: 2* • %female *Triclosan suture group: 16.3% Standard suture group: 21.1%* • Mean age (SD) *Triclosan suture group: 66.9 (8.1) Standard suture group: 67.6 (8.3)* • Body Mass Index (SD) *Triclosan suture group: 27.6 (4.1) Standard suture group: 27.6 (4.1)* • Diabetes (%) *Triclosan suture group: 26.3% Standard suture group: 25.0%*
Interventions	**Interventions - Materials** • Absorbable antimicorbial coated/ impregnated sutures *Subcutaneous layer closed with 3.0 monofilament polyglactin suture coated with triclosan (Vicryl Plus®) Intracutaneous layer closed with 4.0 triclosan-coated monofilament polyglecaprone suture (Monocryl Plus®)*
Comparator	**Comparator - Materials** • Other absorbable sutures *Subcutaneous layer closed with 3.0 monofilament polyglactin suture (Vicryl) Intracutaneous layer closed with 4.0 monofilament polyglecaprone suture (Monocryl)*

	Thimour-Bergstrom (2013)
Outcome measure(s)	**Outcome measure(s)** • Superficial SSI *CDC criteria* • Deep SSI *CDC criteria affecting fascia or muscle layers* • Wound dehiscence *Non-infectious leg-wound dehiscence*
Risk of bias Directness	**Random sequence generation** • Low risk of bias **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias ***Blinding of outcome assessment*** • *Low risk of bias* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Directly applicable

E32.Tsujinaka 2013

	Tsujinaka (2013)
Title	Subcuticular sutures versus staples for skin closure after open gastrointestinal surgery: a phase 3, multicentre, open-label, randomised controlled trial
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Japan* • Study setting *24 centres* • Study dates *June 2009 - February 2012* • Duration of follow-up *30 days* • Sources of funding *Johnson & Johnson* **Inclusion criteria** • Patients undergoing gastroenterological surgery • Patients undergoing abdominoperineal resection for rectal cancer **Exclusion criteria** • Previous midline incision • Diabetes *Uncontrolled diabetes* • Preoperative infection • Emergency operations

	Tsujinaka (2013)
	• Laparoscopic operations **Sample size** • Sample size *1080* **Sample characteristics** • Split between study groups *Sutures group: 562 Staples group: 518* • Loss to follow-up *Sutures group: 28 Staples group: 29* • %female *Sutures group: 31.0% Staples group: 29.5%* • Median Age (IQR) *Sutures group: 68 (61-75) Staples group: 68 (61-74)*
Interventions	**Interventions - Materials** • Non-suture material: Staples *Metallic skin staples 10-15 mm apart*
Comparator	**Comparator - Materials** • Other absorbable sutures *Interrupted subcuticular sutures with 3-0 or 4-0 mono filament absorbable suture (polydioxanone)*
Outcome measure(s)	**Outcome measure(s)** • Superficial SSI *Within 30 days. CDC criteria.* • Wound dehiscence
Risk of bias Directness	**Random sequence generation** • Low risk of bias

	Tsujinaka (2013)
	Allocation concealment • Low risk of bias **Blinding of participants and personnel** • Low risk of bias *Not possible to blind participants and personnel. However, as outcomes were objective measures, study was not downgraded in this domain.* ***Blinding of outcome assessment*** • Low risk of bias *Not possible to blind of outcome assessment* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Low **Directness** • Partially directly applicable *Japanese population*

E33.Turtianen 2012

	Turtiainen (2012)
Title	Effect of triclosan-coated sutures on the incidence of surgical wound infection after lower limb revascularization surgery: a randomized controlled trial

	Turtiainen (2012)
Study details	**Study type** • Randomised controlled trial **Study details** • Study location *Finland* • Study setting *Multicentre* • Study dates *Not reported* • Duration of follow-up *Minimum 30 days* • Sources of funding *Not reported* **Inclusion criteria** • Over 18 years of age • Patients undergoing nonemergency lower-limb arterial surgery **Exclusion criteria** • None reported **Sample size** • Sample size *276* **Sample characteristics** • Split between study groups *Triclosan suture group: 139 Standard suture group: 137* • Loss to follow-up

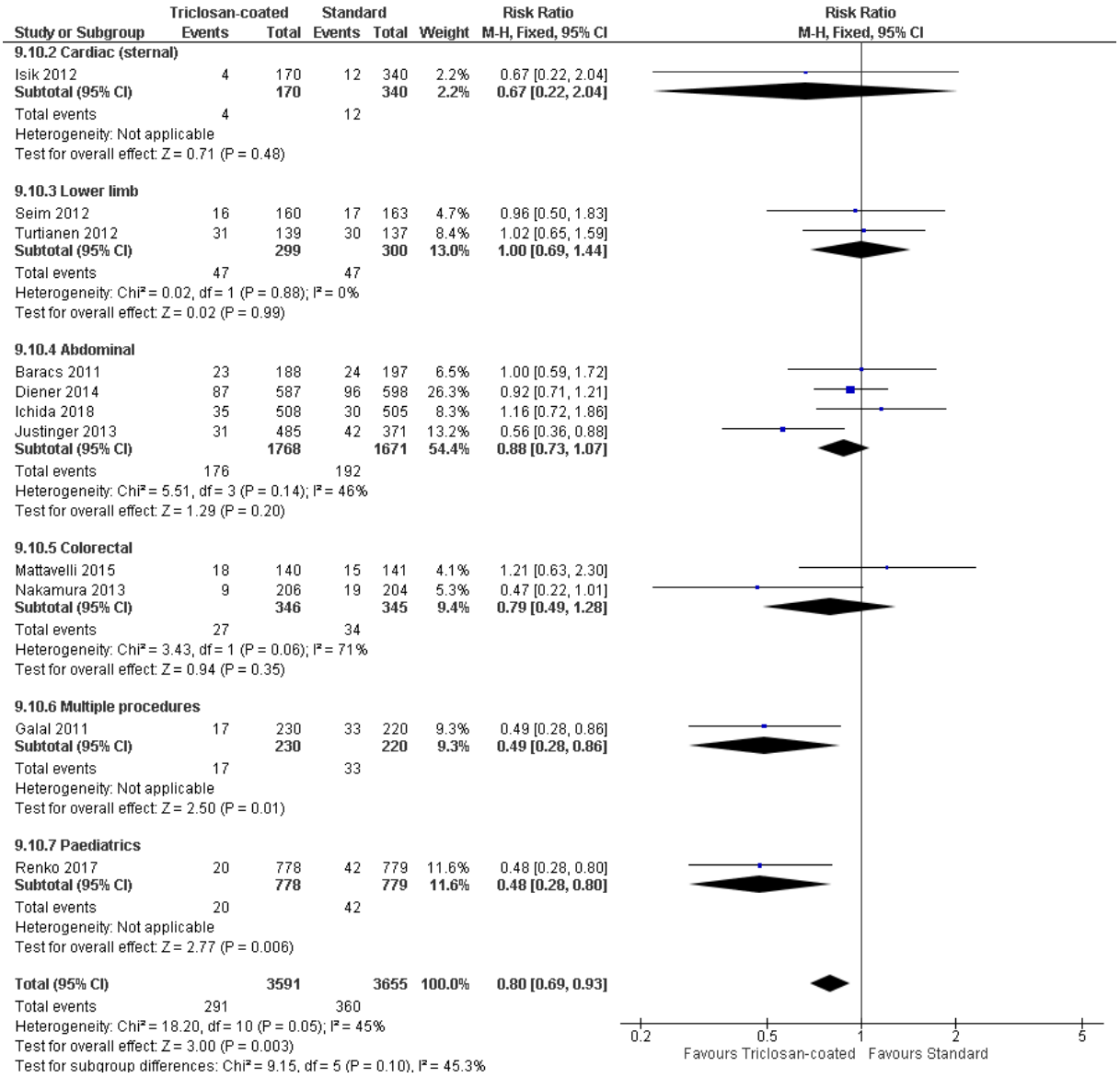
	Turtiainen (2012)
	Triclosan suture group: 0 Standard suture group: 0 • %female *Triclosan suture group: 37% Standard suture group: 37%* • Mean age (SD) *Triclosan suture group: 72 (11) Standard suture group: 72 (11)* • Body Mass Index (SD) *Triclosan suture group: 26 (5) Standard suture group: 26 (4)* • Diabetes (%) *Triclosan suture group: 31% Standard suture group: 32%* • COPD (%) *Triclosan suture group: 12% Standard suture group: 17%*
Interventions	**Interventions - Materials** • Absorbable antibacterial coated/ impregnated sutures *Subcutaneous sutures: 2-0 Vicryl Plus Continuous intracutaneous sutures: 3-0 Monocryl Plus*
Comparator	**Comparator - Materials** • Other absorbable sutures *Subcutaneous sutures: 2-0 Vicryl Continuous intracutaneous sutures: 3-0 Monocryl*
Outcome measure(s)	**Outcome measure(s)** • SSI *CDC criteria* • Superficial SSI *CDC criteria* • Deep SSI *CDC criteria*

	Turtiainen (2012)
Risk of bias Directness	**Random sequence generation** • Unclear risk of bias *Insufficient information provided* **Allocation concealment** • Low risk of bias **Blinding of participants and personnel** • Low risk of bias ***Blinding of outcome assessment*** • *Unclear risk of bias* *Insufficient information provided* **Incomplete outcome data** • Low risk of bias **Selective reporting** • Low risk of bias **Other sources of bias** • Low risk of bias **Overall risk of bias** • Moderate *Unclear random sequence generation and blinding of outcome assessment* **Directness** • Directly applicable

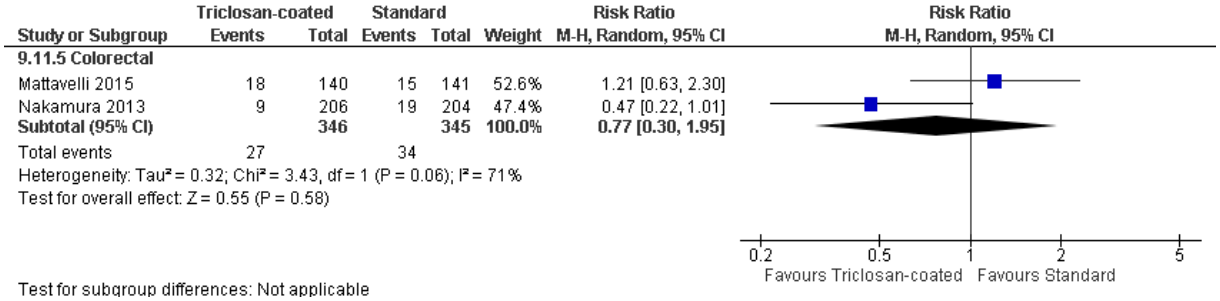
Appendix F – Forest plots

F.1 Triclosan versus non-triclosan coated sutures

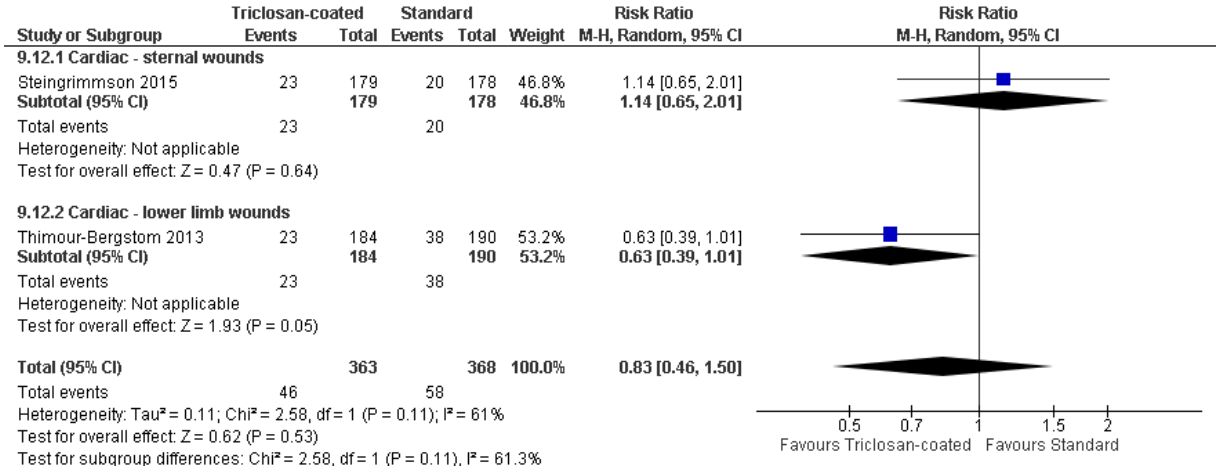
SSI (up to 30 days) – Fixed effects (by surgery type and overall)



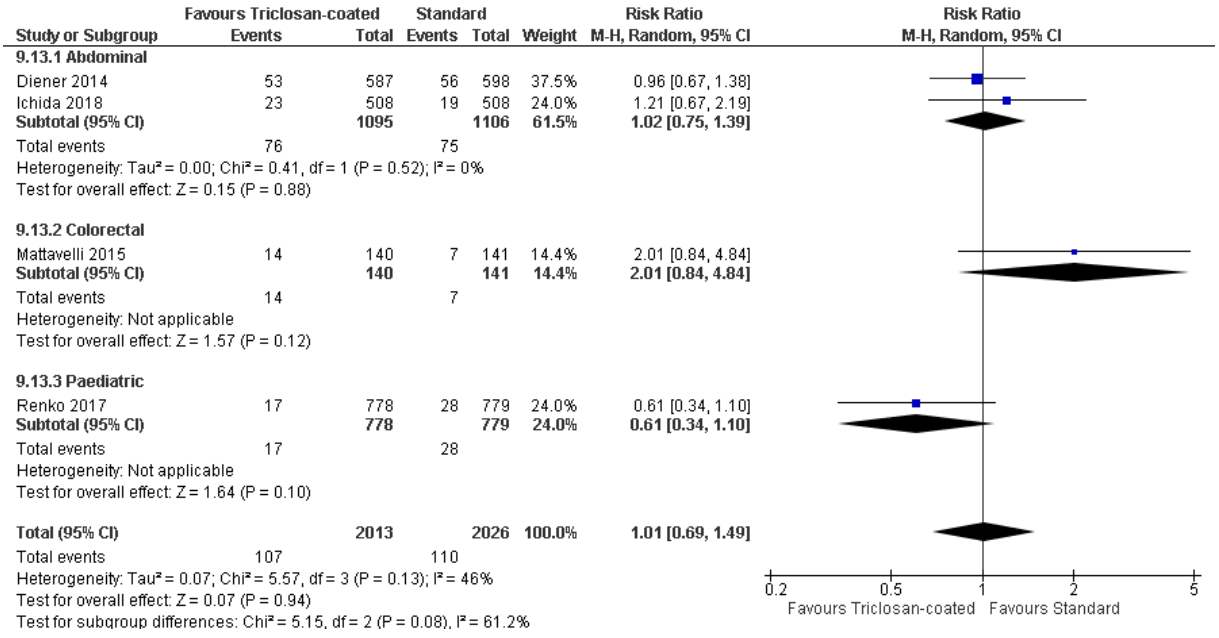
SSI (up to 30 days) – Random effects



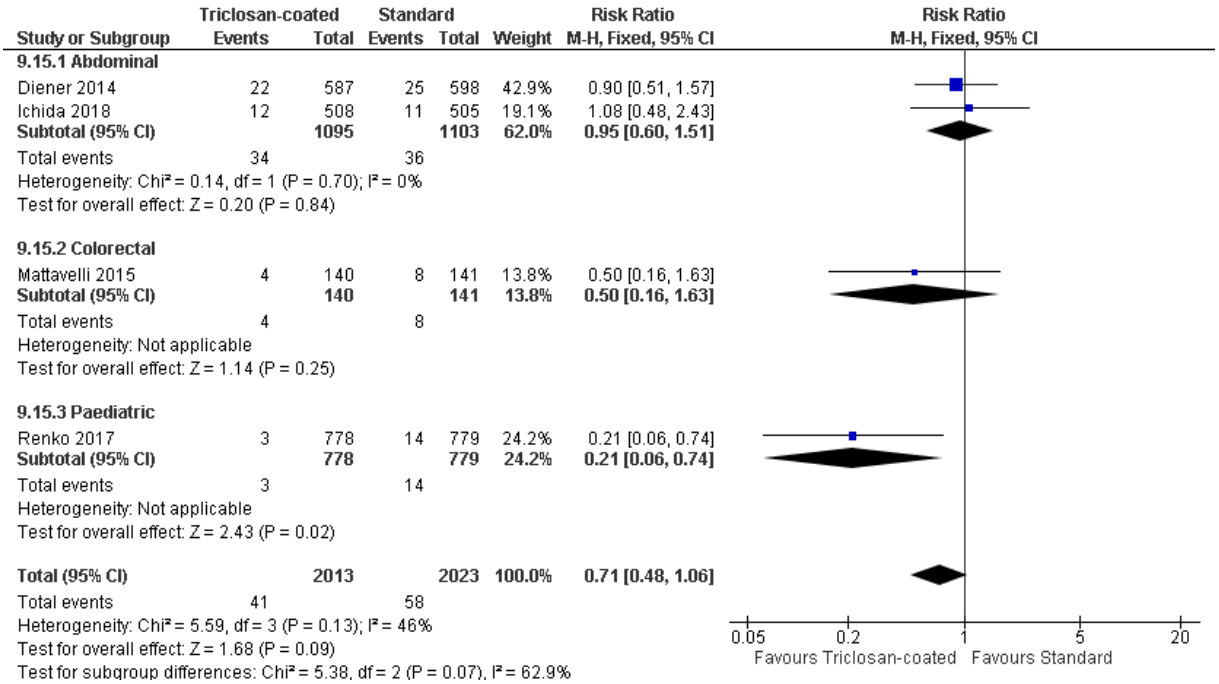
SSI (30 days – 1 year)



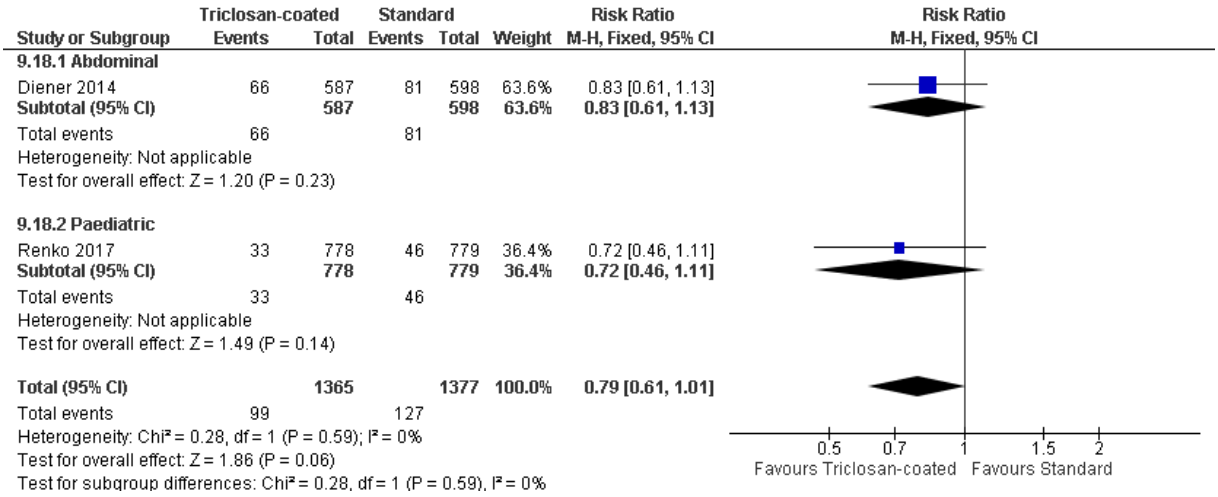
SSI (superficial) (up to 30 days)



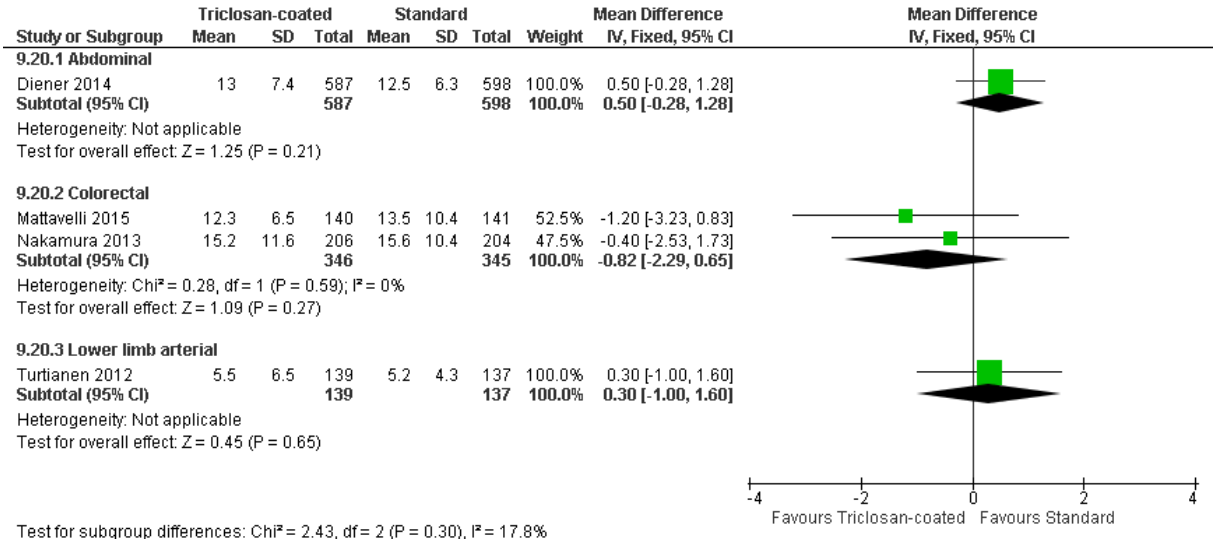
SSI (deep) (up to 30 days)



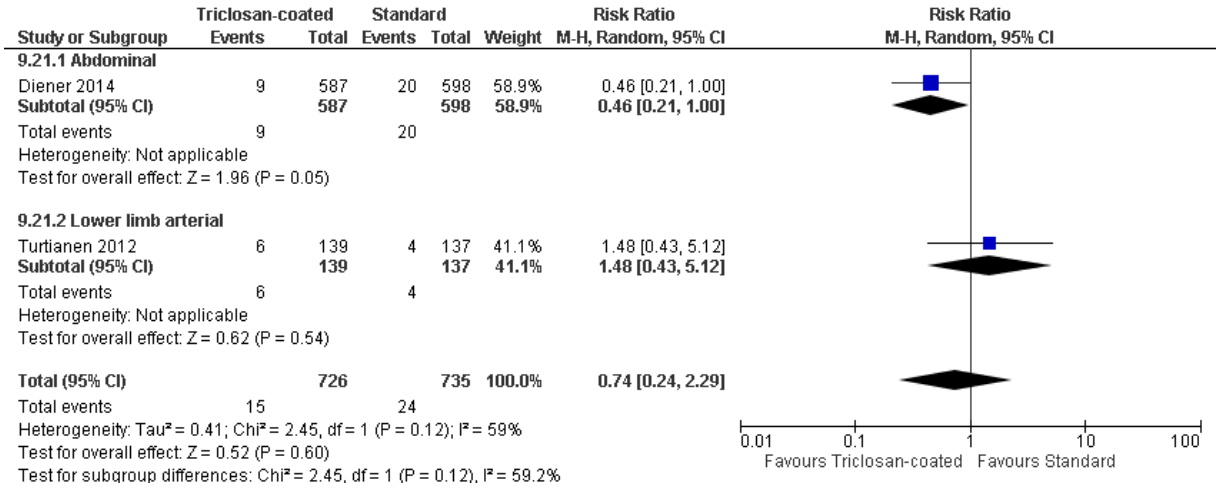
Dehiscence (up to 30 days)



Length of stay

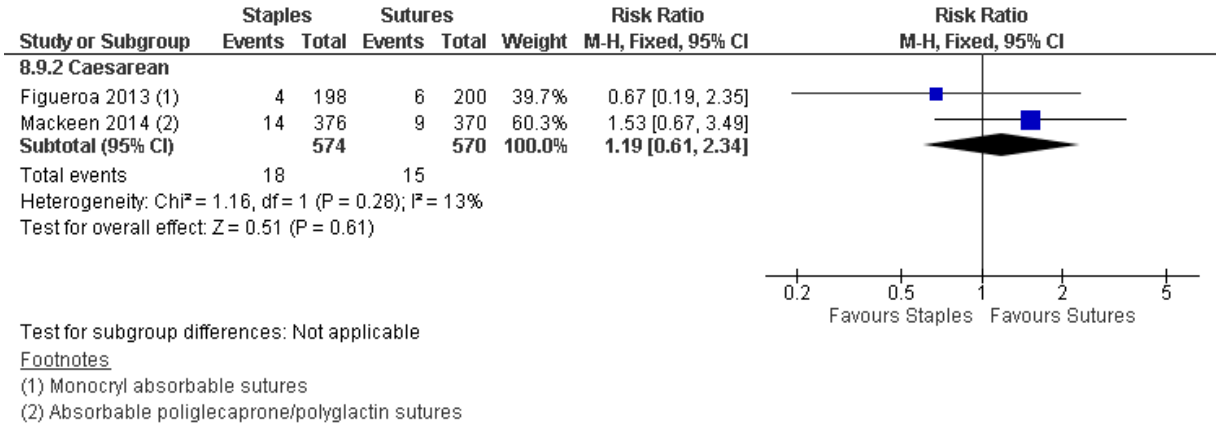


Mortality

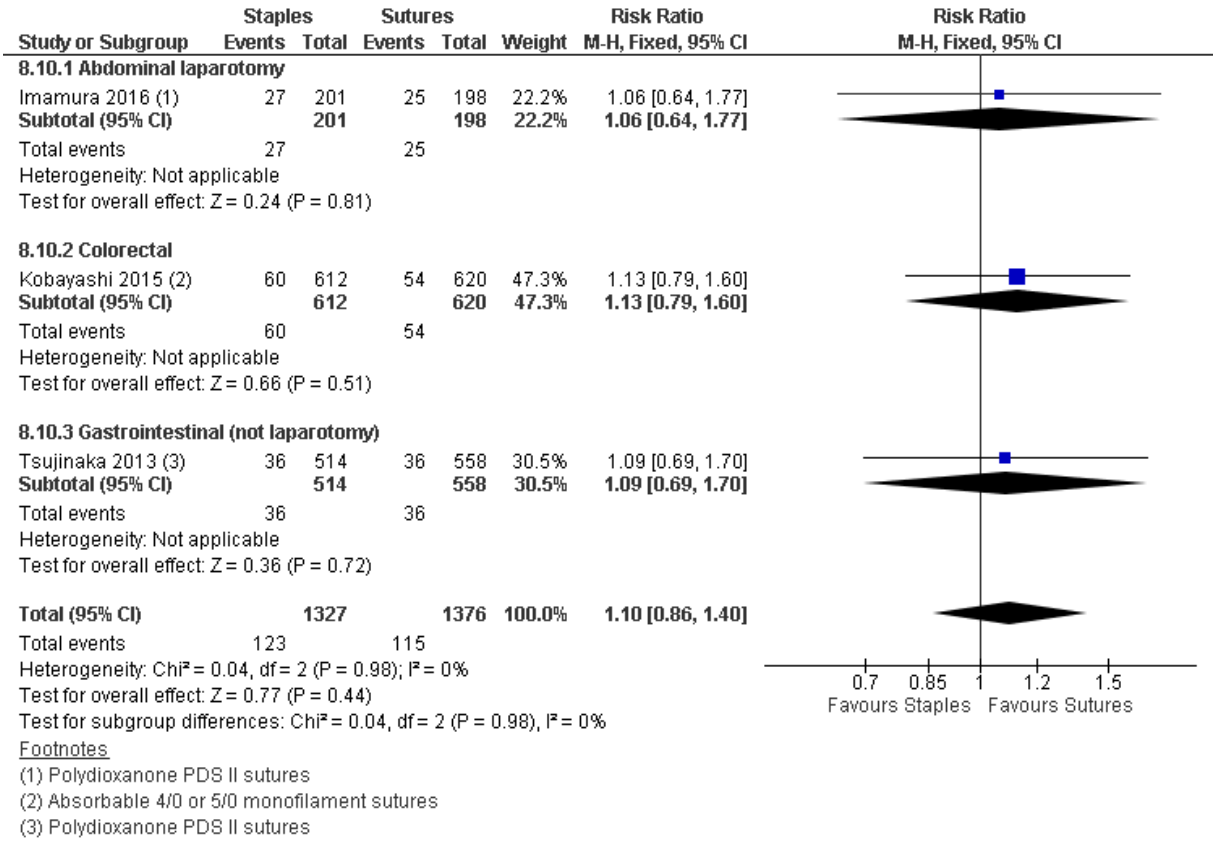


F.2 Staples versus sutures

SSI (30 days – 1 year)



SSI superficial (up to 30 days)



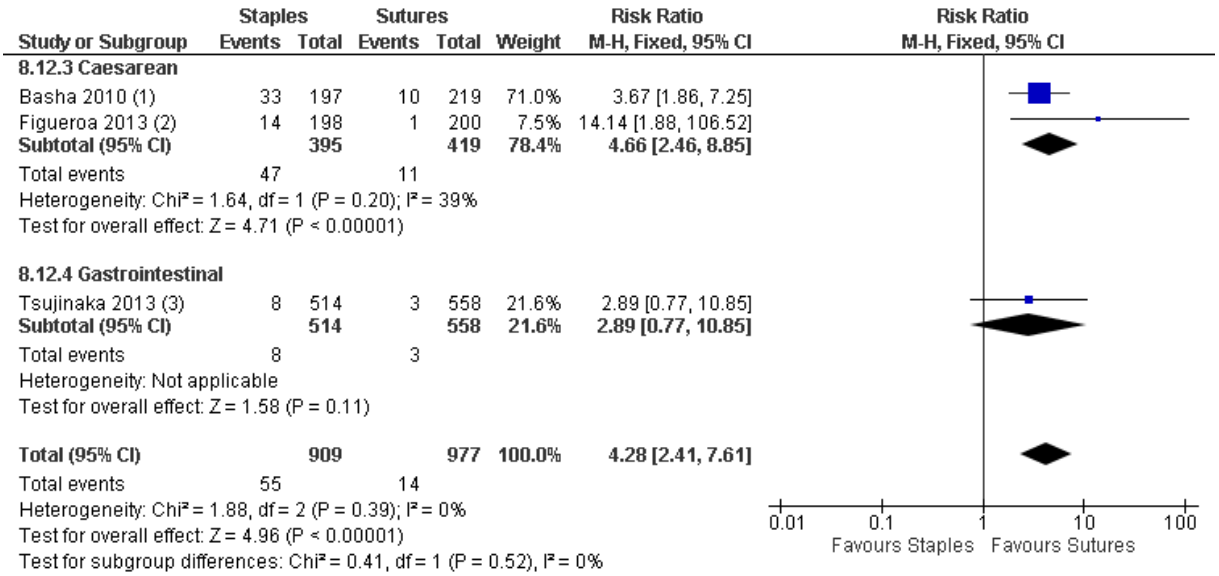
Footnotes

(1) Polydioxanone PDS II sutures

(2) Absorbable 4/0 or 5/0 monofilament sutures

(3) Polydioxanone PDS II sutures

Dehiscence (up to 30 days)



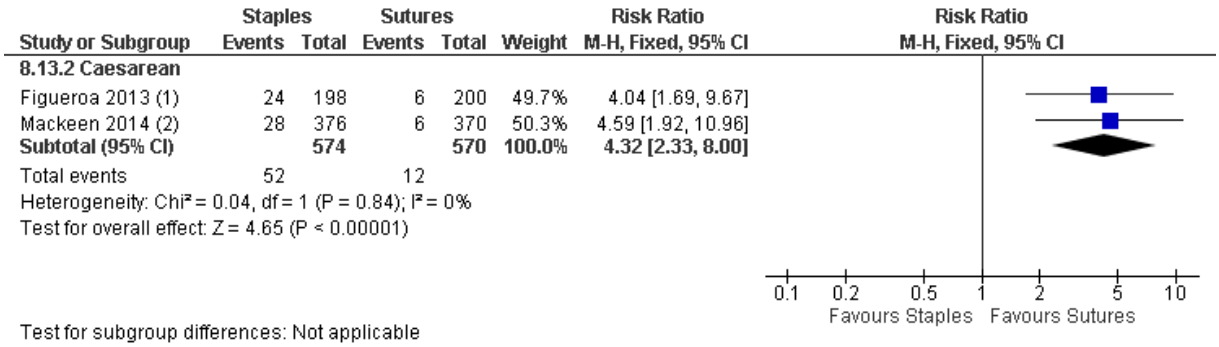
Footnotes

(1) Monocryl absorbable sutures

(2) Monocryl absorbable sutures

(3) Polydioxanone PDS II suture

Dehiscence (30 days – 1 year)



Test for subgroup differences: Not applicable

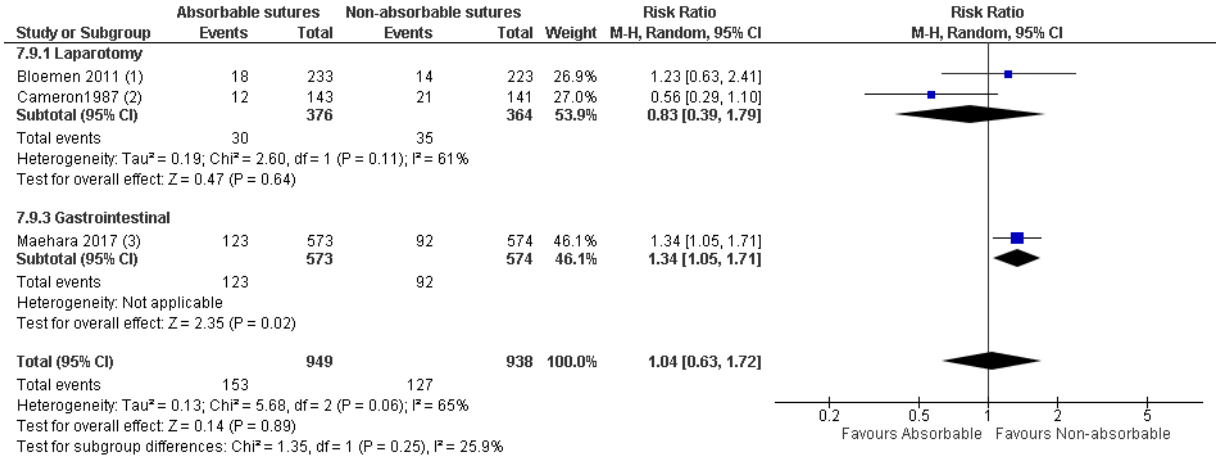
Footnotes

(1) Monocryl absorbable sutures

(2) Absorbable poliglecaprone/polyglactin sutures

F.3 Absorbable versus non-absorbable sutures

SSI (less than 30 days)



Footnotes

(1) Polydioxanone PDS v Prolene sutures

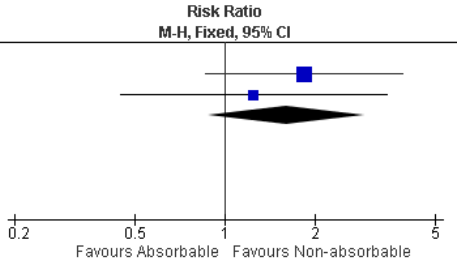
(2) Polydioxanone PDS v Prolene sutures

(3) Polyglactin/polydioxanone v Prolene sutures

SSI (30 days – 1 year)

Study or Subgroup	Absorbable sutures Events	Total	Non-absorbable sutures Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
7.10.2 Abdominal						
Leaper 1985 (1)	18	106	9	97	60.2%	1.83 [0.86, 3.88]
Orr 2003 (2)	8	104	6	97	39.8%	1.24 [0.45, 3.45]
Subtotal (95% CI)		**210**		**194**	**100.0%**	**1.60 [0.87, 2.92]**
Total events	26		15			

Heterogeneity: Chi² = 0.36, df = 1 (P = 0.55); I² = 0%
Test for overall effect: Z = 1.52 (P = 0.13)



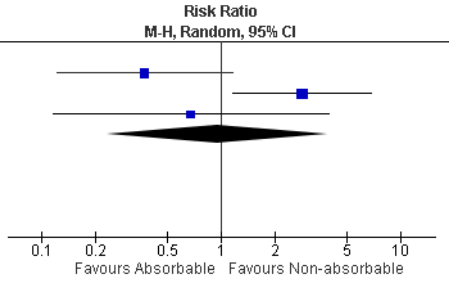
Test for subgroup differences: Not applicable

Footnotes
(1) Polydioxanone PDS v Polyamide nylon sutures
(2) Poly (L-lactide/glycolide) v Prolene sutures

Dehiscence (30 days - 1 year)

Study or Subgroup	Absorbable sutures Events	Total	Non-absorbable sutures Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
7.15.2 Abdominal						
Orr 2003 (1)	4	104	10	97	35.2%	0.37 [0.12, 1.15]
Pandey 2013 (2)	17	100	6	100	38.4%	2.83 [1.17, 6.89]
Talpur 2011 (3)	2	136	3	138	26.4%	0.68 [0.11, 3.99]
Subtotal (95% CI)		**340**		**335**	**100.0%**	**0.95 [0.23, 3.90]**
Total events	23		19			

Heterogeneity: Tau² = 1.15; Chi² = 8.13, df = 2 (P = 0.02); I² = 75%
Test for overall effect: Z = 0.07 (P = 0.94)



Test for subgroup differences: Not applicable

Footnotes
(1) Poly (L-lactide/glycolide) v Prolene sutures
(2) Polyglactin 910 (Vicryl) v Prolene sutures
(3) Vicryl No 1 (polyglycolide & polyactide) v Prolene sutures

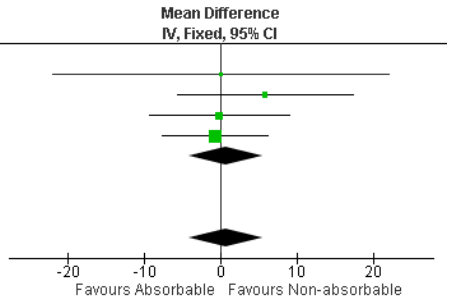
Length of Stay

Study or Subgroup	Absorbable sutures Mean	SD	Total	Non-absorbable sutures Mean	SD	Total	Weight	Mean Difference IV, Fixed, 95% CI
7.17.1 Gastrointestinal								
Maehara 2017 (1)	41	44.2	23	41	44.2	47	4.9%	0.00 [-22.04, 22.04]
Maehara 2017 (2)	31.2	19	19	25.4	15.8	16	17.8%	5.80 [-5.73, 17.33]
Maehara 2017 (3)	24.6	11.7	19	24.8	13.3	12	28.0%	-0.20 [-9.38, 8.98]
Maehara 2017 (4)	24.4	10.2	19	25.1	11.2	18	49.4%	-0.70 [-7.61, 6.21]
Subtotal (95% CI)			**80**			**93**	**100.0%**	**0.63 [-4.23, 5.49]**

Heterogeneity: Chi² = 0.95, df = 3 (P = 0.81); I² = 0%
Test for overall effect: Z = 0.25 (P = 0.80)

Total (95% CI)			**80**			**93**	**100.0%**	**0.63 [-4.23, 5.49]**

Heterogeneity: Chi² = 0.95, df = 3 (P = 0.81); I² = 0%
Test for overall effect: Z = 0.25 (P = 0.80)
Test for subgroup differences: Not applicable

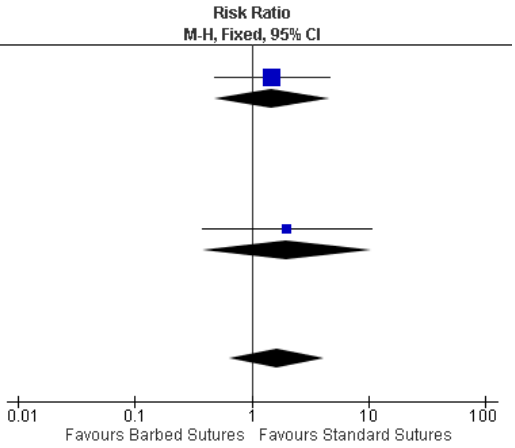


Footnotes
(1) PD
(2) Hepatectomy
(3) Gastrectomy
(4) Colorectal surgery

F.4 Barbed versus standard sutures

SSI (30 days – 1 year)

Study or Subgroup	Barbed sutures Events	Total	Standard sutures Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
11.2.1 Knee arthroplasty						
Gilliland 2014 (1)	7	191	5	203	70.8%	1.49 [0.48, 4.61]
Subtotal (95% CI)		**191**		**203**	**70.8%**	**1.49 [0.48, 4.61]**
Total events	7		5			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.69 (P = 0.49)						
11.2.2 Breast surgery						
Rubin 2014 (2)	4	115	2	115	29.2%	2.00 [0.37, 10.71]
Subtotal (95% CI)		**115**		**115**	**29.2%**	**2.00 [0.37, 10.71]**
Total events	4		2			
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.81 (P = 0.42)						
Total (95% CI)		**306**		**318**	**100.0%**	**1.64 [0.64, 4.17]**
Total events	11		7			
Heterogeneity: Chi² = 0.08, df = 1 (P = 0.77); I² = 0%						
Test for overall effect: Z = 1.03 (P = 0.30)						
Test for subgroup differences: Chi² = 0.08, df = 1 (P = 0.77), I² = 0%						

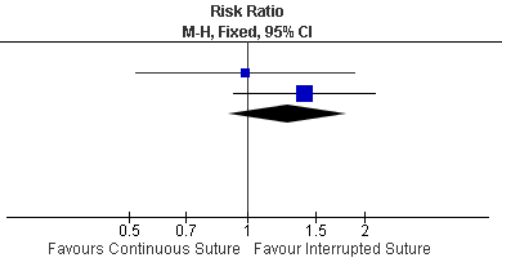


Footnotes
(1) Absorbable barbed suture v non-absorbable standard suture
(2) Slow absorbing barbed sutures v slow absorbing standard sutures

F.6 Continuous versus interrupted sutures

SSI (30 days – 1 year)

Study or Subgroup	Continuous sutures Events	Total	Interrupted sutures Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
12.2.2 Abdominal						
Gislason 1995 (1)	17	194	17	192	33.1%	0.99 [0.52, 1.88]
Seiler 2009 (2)	72	415	26	210	66.9%	1.40 [0.92, 2.13]
Subtotal (95% CI)		**609**		**402**	**100.0%**	**1.27 [0.89, 1.79]**
Total events	89		43			
Heterogeneity: Chi² = 0.79, df = 1 (P = 0.37); I² = 0%						
Test for overall effect: Z = 1.32 (P = 0.19)						



Test for subgroup differences: Not applicable

Footnotes
(1) Continuous fast-absorbable Polyglactin 910 (Vicryl) v interrupted fast-absorbable Polyglactin 910 (Vicryl) sutures
(2) Continuous slow-absorbable v interrupted fast-absorbable sutures

Appendix G – GRADE tables

G.1 Triclosan-coated versus non triclosan-coated sutures

Outcomes up to 30 days after surgery - overall

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI (RR<1 favours triclosan coated sutures)										
11 Baracs 2011 Diener 2014 Galal 2011 Ichida 2018 Isik 2012 Justinger 2013 Mattavelli 2015 Nakamura 2013 Renko 2017 Seim 2012 Turtianen 2012	RCTs	7571	RR 0.80 (0.69, 0.93)	10 per 100	8 per 100 (7, 9)	Not serious	Not serious	Serious[1]	Serious[2]	Low
SSI (superficial) (RR<1 favours triclosan coated sutures)										
4 Diener 2014 Ichida 2018 Mattavelli 2015 Renko 2017	RCTs	4170	RR 1.01 (0.69, 1.49)	4 per 100	4 per 100 (2, 8)	Not serious	Not serious	Serious[1]	Very serious[3]	Very low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI (deep) (RR<1 favours triclosan coated sutures)										
4 Diener 2014 Ichida 2018 Mattavelli 2015 Renko 2017	RCTs	4170	RR 0.67 (0.37, 1.23)	2 per 100	1 per 100 (0, 3)	Not serious	Not serious	Not serious	Serious[2]	Moderate
SSI (organ/space) (RR<1 favours triclosan coated sutures)										
1 Nakamura 2013	RCT	410	RR 1.24 (0.34, 4.54)	2 per 100	2 per 100 (1, 9)	Serious[5]	Serious[6]	N/A[7]	Very serious[3]	Very low
Dehiscence (RR<1 favours triclosan coated sutures)										
2 Diener 2014 Renko 2017	RCTs	2857	RR 0.79 (0.61, 1.01)	6 per 100	4 per 100 (3, 7)	Not serious	Not serious	Not serious	Serious[2]	Moderate
Length of Stay (MD<0 favours triclosan coated sutures)										
4 Diener 2014 Mattavelli 2015 Nakamura 2013 Turtianen 2012	RCTs	2210	MD 0.23 (-0.38, 0.84)	-	-	Not serious	Not serious	Not serious	Serious[4]	Moderate
Mortality (RR<1 favours triclosan coated sutures)										
2 Diener 2014 Turtianen 2012	RCTs	1500	RR 0.74 (0.24, 2.29)	3 per 100	4 per 100 (1, 15)	Serious[5]	Not serious	N/A[7]	Serious	Low
Post-operative antimicrobial use (RR<1 favours triclosan coated sutures)										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Renko 2017	RCT	1633	RR 0.31 (0.18, 0.55)	7 per 100	2 per 100 (1, 4)	Not serious	Not serious	N/A[7]	Not serious	High

1. I^2 between 33.3%-66.7%. Downgraded 1 level.
2. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level.
3. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels.
4. Non-significant result. Downgraded 1 level.
5. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level.
6. >33.3% of studies partially directly applicable. Downgraded 1 level.
7. Inconsistency not applicable

Outcomes up to 30 days after surgery - by surgery type

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Cardiac (sternal) (RR<1 favours triclosan coated sutures)										
1 Isik 2012	RCT	510	RR 0.67 (0.22, 2.04)	4 per 100	2 per 100 (1, 7)	Serious[1]	Not serious	N/A[4]	Very serious[5]	Very low
SSI: Lower limb (RR<1 favours triclosan coated sutures)										
2 Seim 2012 Turtianen 2012	RCTs	604	RR 1.00 (0.69, 1.44)	16 per 100	16 per 100 (11, 23)	Not serious	Not serious	Not serious	Very serious[5]	Low
SSI: Abdominal (RR<1 favours triclosan coated sutures)										
4 Baracs 2011 Diener 2014	RCTs	3488	RR 0.88 (0.73, 1.07)	11 per 100	10 per 100 (8, 12)	Not serious	Not serious	Serious[3]	Serious[6]	Low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Ichida 2018 Justinger 2013										
SSI: Multiple procedures (RR<1 favours triclosan coated sutures)										
1 Galal 2011	RCT	450	RR 0.49 (0.28, 0.86)	15 per 100	7 per 100 (4, 13)	Not serious	Not serious	N/A[4]	Serious[6]	Moderate
SSI: Paediatrics (RR<1 favours triclosan coated sutures)										
1 Renko 2017	RCT	1633	RR 0.48 (0.28, 0.80)	5 per 100	3 per 100 (2,4)	Not serious	Not serious	N/A[4]	Not serious	High
SSI: Colorectal (RR<1 favours triclosan coated sutures)										
2 Mattavelli 2015 Nakamura 2013	RCTs	710	RR 0.77 (0.30, 1.95)	10 per 100	8 per 100 (3, 19)	Serious[1]	Serious[2]	Serious[3]	Very serious[5]	Very low
SSI (superficial): Abdominal (RR<1 favours triclosan coated sutures)										
2 Diener 2014 Ichida 2018	RCTs	2247	RR 1.02 (0.75, 1.39)	7 per 100	7 per 100 (5, 9)	Not serious	Serious[2]	Not serious	Very serious[5]	Very low
SSI (superficial): Colorectal (RR<1 favours triclosan coated sutures)										
1 Mattavelli 2015	RCT	300	RR 2.01 (0.84, 4.84)	5 per 100	10 per 100 (4, 24)	Not serious	Not serious	N/A[4]	Serious[6]	Moderate
SSI (superficial): Paediatric (RR<1 favours triclosan coated sutures)										
1 Renko 2017	RCT	1633	RR 0.61 (0.34, 1.10)	4 per 100	2 per 100 (1, 4)	Not serious	Not serious	N/A[4]	Serious[6]	Moderate

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI (deep): Abdominal (RR<1 favours triclosan coated sutures)										
2 Diener 2014 Ichida 2018	RCTs	2247	RR 0.95 (0.60, 1.51)	3 per 100	3 per 100 (2, 5)	Not serious	Serious[2]	Not serious	Very serious[5]	Very low
SSI (deep): Colorectal (RR<1 favours triclosan coated sutures)										
1 Mattavelli 2015	RCT	300	RR 0.50 (0.16, 1.63)	6 per 100	3 per 100 (1, 9)	Not serious	Not serious	N/A[4]	Very serious[5]	Low
SSI (deep): Paediatric (RR<1 favours triclosan coated sutures)										
1 Renko 2017	RCT	1633	RR 0.21 (0.06, 0.74)	2 per 100	0 per 100 (0, 1)	Not serious	Not serious	N/A[4]	Not serious	High
SSI (organ/space): Colorectal (RR<1 favours triclosan coated sutures)										
1 Nakamura 2013	RCT	410	RR 1.24 (0.34, 4.54)	2 per 100	2 per 100 (1, 9)	Serious[1]	Serious[2]	N/A[4]	Very serious[5]	Very low
Dehiscence: Abdominal (RR<1 favours triclosan coated sutures)										
1 Diener 2014	RCT	1224	RR 0.83 (0.61, 1.13)	14 per 100	11 per 100 (8, 15)	Not serious	Not serious	N/A[4]	Serious[6]	Moderate
Dehiscence: Paediatric (RR<1 favours triclosan coated sutures)										
1 Renko 2017	RCT	1633	RR 0.72 (0.46, 1.11)	6 per 100	4 per 100 (3, 7)	Not serious	Not serious	N/A[4]	Serious[6]	Moderate
Length of Stay: Abdominal (MD<0 favours triclosan coated sutures)										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
1 Diener 2014	RCT	1224	MD 0.50 (-0.28, 1.28)	-	-	Not serious	Not serious	N/A[4]	Serious[7]	Low
Length of Stay: Colorectal (MD<0 favours triclosan coated sutures)										
2 Mattavelli 2015 Nakamura 2013	RCT	710	MD -0.82 (-2.29, 0.65)	-	-	Serious[1]	Serious[2]	Serious[3]	Serious[7]	Very low
Length of Stay: Lower limb arterial (MD<0 favours triclosan coated sutures)										
1 Turtianen 2012	RCT	276	MD 0.30 (-1.00, 1.60)	-	-	Serious[1]	Not serious	N/A[4]	Serious[7]	Low
Mortality: Abdominal (RR<1 favours triclosan coated sutures)										
1 Diener 2014	RCT	1224	RR 0.46 (0.21, 1.00)	3 per 100	2 per 100 (1, 3)	Not serious	Not serious	N/A[4]	Serious[6]	Moderate
Mortality: Lower limb arterial (RR<1 favours triclosan coated sutures)										
1 Turtianen 2012	RCT	276	RR 1.48 (0.43, 5.12)	3 per 100	4 per 100 (1, 15)	Serious[1]	Not serious	N/A[4]	Very serious[5]	Very low
Post-operative antimicrobial use: Paediatric (RR<1 favours triclosan coated sutures)										
1 Renko 2017	RCT	1633	RR 0.31 (0.18, 0.55)	7 per 100	2 per 100 (1, 4)	Not serious	Not serious	N/A[4]	Not serious	High
1. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level. 2. >33.3% of studies partially directly applicable. Downgraded 1 level. 3. I^2 between 33.3%-66.7%. Downgraded 1 level. 4. Inconsistency not applicable										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
5. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels. 6. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level. 7. Non-significant result. Downgraded 1 level.										

Outcomes 30 days – 1 year after surgery - overall

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI (RR<1 favours triclosan coated sutures)										
2 Steingrimmson 2015 Thimour-Bergstrom 2013	RCTs	749	RR 0.83 (0.46, 1.50)	16 per 100	13 per 100 (7, 24)	Not serious	Not serious	Serious[1]	Very serious[2]	Very low
SSI (superficial) (RR<1 favours triclosan coated sutures)										
1 Steingrimmson 2015	RCT	357	RR 1.24 (0.67, 2.32)	9 per 100	11 per 100 (6, 21)	Not serious	Not serious	N/A[3]	Very serious[2]	Low
SSI (deep) (RR<1 favours triclosan coated sutures)										
1 Steingrimmson 2015	RCT	357	RR 0.75 (0.17, 3.28)	2 per 100	2 per 100 (0, 7)	Not serious	Not serious	N/A[3]	Very serious[2]	Low
Deshiscence (RR<1 favours triclosan coated sutures)										
1	RCT	392	RR 0.80 (0.37, 1.73)	9 per 100	7 per 100 (3, 15)	Not serious	Not serious	N/A[3]	Very serious[2]	Low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Thimour-Bergstrom 2013										
1. I^2 between 33.3%-66.7%. Downgraded 1 level. 2. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels. 3. Inconsistency not applicable										

Outcomes 30 days – 1 year after surgery – by surgery type

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Cardiac (sternal) (RR<1 favours triclosan coated sutures)										
1 Steingrimmson 2015	RCT	392	1.14 (0.65, 2.01)	11 per 100	13 per 100 (7, 23)	Not serious	Not serious	N/A[1]	Very serious[2]	Low
SSI: Cardiac (lower limb) (RR<1 favours triclosan coated sutures)										
1 Thimour-Bergstrom 2013	RCT	374	0.63 (0.39, 1.01)	20 per 100	13 per 100 (8, 20)	Not serious	Not serious	N/A[1]	Serious[3]	Moderate
SSI (superficial): Cardiac (sternal) (RR<1 favours triclosan coated sutures)										
1 Steingrimmson 2015	RCT	357	RR 1.24 (0.67, 2.32)	9 per 100	11 per 100 (6, 21)	Not serious	Not serious	N/A[1]	Very serious[2]	Low
SSI (deep): Cardiac (sternal) (RR<1 favours triclosan coated sutures)										
1 Steingrimmson	RCT	357	RR 0.75 (0.17, 3.28)	2 per 100	2 per 100 (0, 7)	Not serious	Not serious	N/A[1]	Very serious[2]	Low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Dehiscence: Cardiac (lower limb) (RR<1 favours triclosan coated sutures)										
1 Thimour-Bergstrom 2013	RCT	392	RR 0.80 (0.37, 1.73)	9 per 100	7 per 100 (3, 15)	Not serious	Not serious	N/A[1]	Very serious[2]	Low
1. Inconsistency not applicable 2. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels. 3. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level.										

G.2 Staples versus sutures

Outcomes up to 30 days after surgery - overall

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI (RR<1 favours staples)										
1 Figueroa 2013	RCT	398	RR 0.34 (0.01, 8.22)	1 per 100	0 per 100 (0, 4)	Not serious	Not serious	N/A[4]	Very serious[1]	Low
SSI (superficial) (RR<1 favours staples)										
3 Imamura 2016 Kobayashi 2015 Tsujinaka 2013	RCTs	2745	RR 1.10 (0.86, 1.40)	8 per 100	9 per 100 (7, 12)	Serious[2]	Serious[3]	Not serious	Serious[6]	Very low
SSI (deep) (RR<1 favours staples)										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
1 Buttaro 2015	RCT	219	RR 0.35 (0.01, 8.60)	1 per 100	0 per 100 (0, 7)	Not serious	Serious [3]	N/A[4]	Very serious[1]	Very low
Dehiscence (RR<1 favours staples)										
3 Basha 2010 Figueroa 2013 Tsujinaka 2013	RCTs	1908	RR 4.28 (2.41, 7.61)	1 per 100	6 per 100 (3, 11)	Not serious	Not serious	Not serious	Not serious	High
Length of Stay (MD<0 favours staples)										
1 Basha 2010	RCT	430	MD 0.10 (-0.01, 0.21)	-	-	Not serious	Not serious	N/A[4]	Serious[5]	Moderate
Hospital Readmission (RR<1 favours staples)										
1 Basha 2010	RCT	430	RR 0.56 (0.14, 2.19)	3 per 100	2 per 100 (0, 6)	Not serious	Not serious	N/A[4]	Very serious[1]	Low
Post-operative antimicrobial use (RR<1 favours staples)										
1 Basha 2010	RCT	430	RR 1.39 (0.56, 3.45)	4 per 100	5 per 100 (2, 13)	Not serious	Not serious	N/A[4]	Very serious[1]	Low

1. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels.
2. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level.
3. >33.3% of studies partially directly applicable. Downgraded 1 level.
4. Inconsistency not applicable
5. Non-significant result. Downgraded 1 level.
6. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level.

Outcomes up to 30 days after surgery – by surgery type

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Caesarean (RR<1 favours staples)										
1 Figueroa 2013	RCT	398	RR 0.34 (0.01, 8.22)	1 per 100	0 per 100 (0, 4)	Not serious	Not serious	N/A[3]	Very serious[6]	Low
SSI (superficial): Abdominal laparotomy (RR<1 favours staples)										
1 Imamura 2016	RCT	401	RR 1.06 (0.64, 1.77)	13 per 100	13 per 100 (8, 22)	Not serious	Serious[2]	N/A[3]	Very serious[6]	Very low
SSI (superficial): Colorectal (RR<1 favours staples)										
1 Kobayashi 2015	RCT	1264	RR 1.13 (0.79, 1.60)	9 per 100	10 per 100 (7, 14)	Serious[1]	Serious[2]	N/A[3]	Very serious[6]	Very low
SSI (superficial): Gastrointestinal (not laparotomy) (RR<1 favours staples)										
1 Tsjuinaka 2013	RCT	1080	1.09 (0.69, 1.70)	6 per 100	7 per 100 (4, 11)	Not serious	Serious[2]	N/A[3]	Very serious[6]	Very low
SSI (deep): Hip arthroplasty (RR<1 favours staples)										
1 Buttaro 2015	RCT	219	RR 0.35 (0.01, 8.60)	1 per 100	0 per 100 (0, 7)	Not serious	Serious[2]	N/A[3]	Very serious[6]	Very low
Dehiscence: Caesarean (RR<1 favours staples)										
2 Basha 2010 Figueroa 2013	RCTs	828	RR 4.66 (2.46, 8.85)	3 per 100	12 per 100 (6, 23)	Not serious	Not serious	Serious[4]	Not serious	Moderate
Dehiscence: Gastrointestinal (RR<1 favours staples)										

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
1 Tsujinaka 2013	RCT	1080	2.89 (0.77, 10.85)	1 per 100	2 per 100 (0, 6)	Not serious	Serious[2]	N/A[3]	Very serious[6]	Very low
Length of Stay: Caesarean (MD<0 favours staples)										
1 Basha 2010	RCT	430	MD 0.10 (-0.01, 0.21)	-	-	Not serious	Not serious	N/A[5]	Serious[7]	Moderate
Hospital Readmission: Caesarean (RR<1 favours staples)										
1 Basha 2010	RCT	430	RR 0.56 (0.14, 2.19)	3 per 100	2 per 100 (0, 6)	Not serious	Not serious	N/A[3]	Very serious[6]	Low
Post-operative antimicrobial use: Caesarean (RR<1 favours staples)										
1 Basha 2010	RCT	430	RR 1.39 (0.56, 3.45)	4 per 100	5 per 100 (2, 13)	Not serious	Not serious	N/A[3]	Very serious[6]	Low

1. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level.
1. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels.
2. >33.3% of studies partially directly applicable. Downgraded 1 level.
3. Inconsistency not applicable
4. I^2 between 33.3%-66.7%. Downgraded 1 level.
5. Non-significant result. Downgraded 1 level.
6. 2. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels.
7. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level.

Outcomes 30 days – 1 year after surgery - overall (same as by surgery type)

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Caesarean (RR<1 favours staples)										
2 Figueroa 2013 Mackeen 2014	RCTs	1144	RR 1.19 (0.61, 2.34)	3 per 100	3 per 100 (2, 6)	Not serious	Not serious	Serious[1]	Very serious[2]	Low
Dehiscence: Caesarean (RR<1 favours staples)										
2 Figueroa 2013 Mackeen 2014	RCTs	1144	RR 4.32 (2.33, 8.00)	2 per 100	9 per 100 (5, 17)	Not serious	Not serious	Not serious	Not serious	High
Hospital Readmission: Caesarean (RR<1 favours staples)										
1 Mackeen 2014	RCT	746	RR 1.48 (0.25, 8.78)	1 per 100	1 per 100 (0, 5)	Not serious	Not serious	N/A[3]	Very serious[2]	Low

1. I^2 between 33.3%-66.7%. Downgraded 1 level.
2. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels.
3. Inconsistency not applicable

G.3 Absorbable versus non-absorbable sutures

Outcomes up to 30 days after surgery - overall

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI (RR<1 favours absorbable sutures)										
3 Bloemen 2011 Cameron 1987 Maehara 2017	RCTs	1998	RR 1.04 (0.63, 1.72)	14 per 100	14 per 100 (9, 23)	Serious[6]	Serious[4]	Serious[1]	Very serious[2]	Very low
SSI (superficial) (RR<1 favours absorbable sutures)										
1 Tanaka 2014	RCT	293	RR 1.00 (0.52, 1.92)	11 per 100	11 per 100 (6, 21)	Serious[6]	Serious[4]	N/A[5]	Very serious[2]	Very low
SSI (organ/space) (RR<1 favours absorbable sutures)										
1 Tanaka 2014	RCT	293	RR 0.76 (0.39, 1.52)	12 per 100	9 per 100 (5, 18)	Serious[6]	Serious[4]	N/A[5]	Very serious[2]	Very low
Dehiscence (RR<1 favours absorbable sutures)										
1 Cameron 1987	RCT	301	RR 0.11 (0.01, 0.85)	6 per 100	1 per 100 (0, 5)	Not serious	Not serious	N/A[5]	Serious[3]	Moderate
Length of Stay (MD<0 favours absorbable sutures)										
1 Maehara 2017	RCT	1174	MD 0.63 (-4.23, 5.49)	-	-	Serious[6]	Serious[4]	N/A[5]	Serious[3]	Very low

1. I^2 between 33.3%-66.7%. Downgraded 1 level.
2. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels.
3. Non-significant result. Downgraded 1 level.
4. >33.3% of studies partially directly applicable. Downgraded 1 level.
5. Inconsistency not applicable
6. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level.

Outcomes up to 30 days after surgery – by surgery type

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Laparotomy (RR<1 favours absorbable sutures)										
2 Bloemen 2011 Cameron 1987	RCTs	822	0.83 (0.39, 1.79)	10 per 100	8 per 100 (4, 17)	Serious[1]	Not serious	Serious[3]	Very serious[5]	Very low
SSI: Gastrointestinal (RR<1 favours absorbable sutures)										
Maehara 2017	RCT	1174	1.34 (1.05, 1.71)	16 per 100	21 per 100 (17, 27)	Serious[1]	Serious[2]	N/A[4]	Serious[6]	Very low
SSI (superficial): Colectomy (RR<1 favours absorbable sutures)										
1 Tanaka 2014	RCT	293	RR 1.00 (0.52, 1.92)	11 per 100	11 per 100 (6, 21)	Serious[1]	Serious[2]	N/A[4]	Very serious[5]	Very low
SSI (organ/space): Colectomy (RR<1 favours absorbable sutures)										
1 Tanaka 2014	RCT	293	RR 0.76 (0.39, 1.52)	12 per 100	9 per 100 (5, 18)	Serious[1]	Serious[2]	N/A[4]	Very serious[5]	Very low
Dehiscence: Laparotomy (RR<1 favours absorbable sutures)										
1 Cameron 1987	RCT	301	RR 0.11 (0.01, 0.85)	6 per 100	1 per 100 (0, 5)	Not serious	Not serious	N/A[4]	Serious[6]	Moderate

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Length of Stay: Gastrointestinal (MD<0 favours absorbable sutures)										
1 Maehara 2017	RCT	1174	MD 0.63 (-4.23, 5.49)	-	-	Serious[1]	Serious[2]	N/A[4]	Serious[7]	Very low
1. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level. 2. >33.3% of studies partially directly applicable. Downgraded 1 level. 3. I^2 between 33.3%-66.7%. Downgraded 1 level. 4. Inconsistency not applicable 5. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels. 6. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level. 7. Non-significant result. Downgraded 1 level.										

Outcomes 30 days – 1 year after surgery – overall (same as by surgery type)

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Abdominal (RR<1 favours absorbable sutures)										
2 Leaper 1985 Orr 2003	RCTs	436	RR 1.60 (0.87, 2.92)	8 per 100	12 per 100 (7, 23)	Serious[3]	Serious[4]	Not serious	Serious[1]	Very low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI (superficial): Abdominal (RR<1 favours absorbable sutures)										
Talpur 2011	RCT	274	RR 1.14 (0.45, 2.87)	6 per 100	7 per 100 (3, 17)	Serious[3]	Serious[4]	N/A[6]	Very serious[2]	Very low
Dehiscence: Abdominal (RR<1 favours absorbable sutures)										
3 Orr 2003 Pandey 2013 Talpur 2011	RCTs	688	RR 0.95 (0.23, 3.90)	6 per 100	5 per 100 (1, 22)	Serious[3]	Serious[4]	Very serious[5]	Very serious[2]	Very low
12. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level. 2. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels. 3. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level. 4. >33.3% of studies partially directly applicable. Downgraded 1 level. 5. I^2 >66.7%. Downgraded 2 levels. 6. Inconsistency not applicable										

G.4 Slow-absorbable versus fast-absorbable sutures

Outcomes up to 30 days after surgery - overall (same as by surgery type)

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Caesarean (RR<1 favours slow-absorbable sutures)										
1	RCT	550	RR 0.63 (0.34, 1.14)	10 per 100	6 per 100 (3, 11)	Serious[4]	Not serious	N/A[3]	Serious[1]	Low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
Buresch 2017										
SSI (superficial):Caesarean										
1 Buresch 2017	RCT	550	RR 0.76 (0.29, 2.01)	4 per 100	3 per 100 (1, 7)	Serious[4]	Not serious	N/A[3]	Very serious[2]	Very low
SSI (deep) (RR<1 favours slow-absorbable sutures): Caesarean										
1 Buresch 2017	RCT	550	RR 0.59 (0.22, 1.59)	4 per 100	2 per 100 (1, 6)	Serious[4]	Not serious	N/A[3]	Very serious[2]	Very low
SSI (organ/space) (RR<1 favours slow-absorbable sutures): Caesarean										
1 Buresch 2017	RCT	550	RR 0.49 (0.12, 1.93)	2 per 100	1 per 100 (0, 5)	Serious[4]	Not serious	N/A[3]	Very serious[2]	Very low
Dehiscence (RR<1 favours slow-absorbable sutures): Caesarean										
1 Buresch 2017	RCT	550	RR 0.53 (0.21, 1.30)	5 per 100	3 per 100 (1, 7)	Serious[4]	Not serious	N/A[3]	Very serious[2]	Very low
1. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level. 2. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels. 3. Inconsistency not applicable 4. 3. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level.										

Outcomes 30 days – 1 year after surgery – overall (same as by surgery type)

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control *	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Gastrointestinal (RR<1 favours slow-absorbable sutures)										
1 Gislason 1995	RCT	599	RR 1.64 (0.93, 2.87)	10 per 100	17 per 100 (10, 30)	Not Serious	Serious[4]	Not serious	Serious[1]	Low
Dehiscence: Gastrointestinal (RR<1 favours slow-absorbable sutures)										
1 Gislason 1995	RCT	599	RR 2.63 (0.71, 9.75)	2 per 100	4 per 100 (1, 15)	Serious[3]	Not serious	N/A[5]	Very serious[2]	Very low

1. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level.
2. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels.
3. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level.
4. >33.3% of studies partially directly applicable. Downgraded 1 level.
5. Inconsistency not applicable

G.5 Barbed versus standard sutures

Outcomes up to 30 days after surgery – overall (same as by surgery type)

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Knee arthroplasty (RR<1 favours barbed sutures)										
1 Gilliland 2014	RCT	411	RR 0.61 (0.18, 2.04)	3 per 100	2 per 100 (1, 7)	Serious[2]	Serious[3]	N/A[4]	Very serious[2]	Very low

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
1. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels. 2. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level. 3. >33.3% of studies partially directly applicable. Downgraded 1 level. 4. Inconsistency not applicable										

Outcomes 30 days – 1 year after surgery - overall

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI (RR<1 favours barbed sutures)										
2 Gilliland 2014 Rubin 2014	RCTs	640	RR 1.64 (0.64, 4.17)	2 per 100	4 per 100 (1, 9)	Serious[2]	Serious[3]	Not serious	Very serious[1]	Very low
Dehiscence (RR<1 favours barbed sutures)										
1 Rubin 2014	RCT	229	RR 2.00 (0.18, 21.75)	1 per 100	2 per 100 (0, 19)	Not serious	Not serious	N/A[4]	Very serious[1]	Low
1. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels. 2. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level. 3. >33.3% of studies partially directly applicable. Downgraded 1 level. 4. Inconsistency not applicable										

Outcomes 30 days – 1 year after surgery – by surgery type

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Knee arthroplasty (RR<1 favours barbed sutures)										
1 Gilliland 2014	RCT	411	1.49 (0.48, 4.61)	2 per 100	4 per 100 (1, 11)	Serious[1]	Serious[2]	N/A[3]	Very serious[4]	Very low
SSI: Breast surgery (RR<1 favours barbed sutures)										
1 Rubin 2014	RCT	229	2.00 (0.37, 10.71)	2 per 100	3 per 100 (1, 19)	Not serious	Not serious	N/A[3]	Very serious[4]	Low
Dehiscence: Breast surgery (RR<1 favours barbed sutures)										
1 Rubin 2014	RCT	229	RR 2.00 (0.18, 21.75)	1 per 100	2 per 100 (0, 19)	Not serious	Not serious	N/A[3]	Very serious[4]	Low

1. 2. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level.
2. >33.3% of studies partially directly applicable. Downgraded 1 level.
3. Inconsistency not applicable
4. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels.

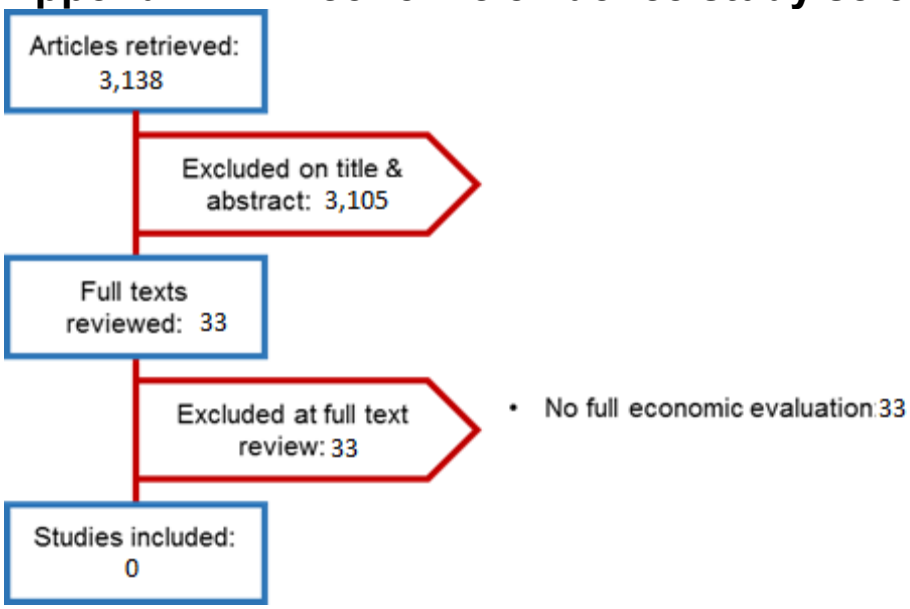
G.5 Continuous versus interrupted sutures

Outcomes 30 days – 1 year after surgery – overall (same as by surgery type)

No. of studies	Study design	Sample size	Effect size (95% CI)	Absolute risk: control *	Absolute risk: intervention (95% CI)	Risk of bias	Indirectness	Inconsistency	Imprecision	Quality
SSI: Abdominal (RR<1 favours continuous sutures)										
2 Gislason 1995 Seiler 2009	RCT	1224	RR 1.27 (0.89, 1.79)	11 per 100	13 per 100 (10, 19)	Not serious	Serious[6]	Not serious	Serious[1]	Low
Dehiscence: Abdominal (RR<1 favours continuous sutures)										
1 Gislason 1995	RCT	599	RR 1.48 (0.25, 8.79)	1 per 100	2 per 100 (0, 9)	Serious[2]	Not serious	N/A[3]	Very serious[4]	Very low

1. 95% confidence interval crosses one end of a defined MID interval (0.8, 1.25). Downgraded 1 level.
2. >33.3% of studies at moderate or high risk of bias. Downgraded 1 level.
3. Inconsistency not applicable
4. 95% confidence interval crosses both ends of a defined MID interval (0.8, 1.25). Downgraded 2 levels.

Appendix H – Economic evidence study selection



Appendix I – Excluded studies

Clinical studies

Short Title	Title	
Acar (2017)	Is Horizontal Mattress Suturing More Effective Than Simple Interrupted Suturing on Postoperative Complications and Primary Wound Healing After Impacted Mandibular Third Molar Surgery?	• Study does not contain any relevant interventions
Agarwal (2011)	Reinforced tension line suture closure after midline laparotomy in emergency surgery	• Study does not contain any of the outcomes of interest
Agrawal (2009)	Role of suture material and technique of closure in wound outcome following laparotomy for peritonitis	• Randomised controlled trial - technique • Randomised controlled trial - Material • <200 subjects
Agrawal (2014)	Interrupted Abdominal Closure Prevents Burst: Randomized Controlled Trial Comparing Interrupted-X and Conventional Continuous Closures in Surgical and Gynecological Patients	• Randomised controlled trial - technique • <200 subjects
Amin (2008)	Randomized Trial Tissue Adhesive/Staples in Thyroidectomy	• Conference abstract
Anderson (2004)	Techniques and materials for closure of the abdominal wall in caesarean section.	• Systematic review did not match review protocol
Andrade (2016)	Appendectomy Skin Closure Technique, Randomized Controlled Trial: Changing Paradigms (ASC)	
Annamalai (2015)	Comparing efficacy of octyl-cyanoacrylate adhesive glue versus polyglactin 910 sized 3/0 suture for closure of caesarean section skin incision	• Conference abstract
Ansari (2016)	Comparison of use of polypropylene with polydioxanon E for closure of midline abdominal incisions	• Study does not contain any of the outcomes of interest
Anuar (2013)	Comparative study between coaptive film versus suture for wound closure after long bone fracture fixation	• Randomised controlled trial - Material • <200 subjects

Short Title	Title	
Apisarnthanarak (2015)	Triclosan-coated sutures reduce the risk of surgical site infections: a systematic review and meta-analysis	• Systematic review - Material
Arslan (2014)	Effect of triclosan coated sutures on surgical site infection rate in pilonidal sinus disease: single-blinded randomized trial	• Conference abstract
Assadian (2009)	The effect of triclosan-coated sutures in wound healing and triclosan degradation in the environment	• Conference abstract
Ates (2012)	Comparison of intracorporeal knot-tying suture (polyglactin) and titanium endoclips in laparoscopic appendiceal stump closure: a prospective randomized study	• Does not contain a population of interest
Bashar (2014)	A comparison of fibrin sealant versus standard closure in the reduction of postoperative morbidity after groin dissection: a systematic review and meta-analysis	• Conference abstract
Beam (2008)	Tissue adhesives for simple traumatic lacerations	• Conference abstract
Beresford (1993)	A prospective comparison of abdominal hysterectomy using absorbable staples.	• Randomised controlled trial - Material • <200 subjects
Berretta (2010)	Randomised prospective study of abdominal wall closure in patients with gynaecological cancer	• Randomised controlled trial - Material • <200 subjects
Bhatia (2002)	Comparative study of "staples versus sutures" in skin closure following Dupuytren's surgery.	• Study does not contain any of the outcomes of interest
Bhattacharyya (2008)	Intraoperative handling and wound healing of arthroscopic portal wounds: a clinical study comparing nylon suture with wound closure strips	• Not a relevant study design
Biancari (2010)	Staples versus sutures for closing leg wounds after vein graft harvesting for coronary artery bypass surgery	• Systematic review - Material
Boesch (2009)	Effects of wound closure on wound healing in gynecologic surgery: a systematic literature review	• More recent systematic review included that covers the same topic
Bosanquet (2015)	Systematic Review and Meta-Regression of Factors Affecting Midline Incisional Hernia Rates: Analysis of 14,618 Patients	• Systematic review did not contain new relevant papers

Short Title	Title	
Buchweitz (2005)	A prospective randomized trial of closing laparoscopic trocar wounds by transcutaneous versus subcuticular suture or adhesive papertape.	• Randomised controlled trial - Material • <200 subjects
Buchweitz (2014)	Tissue adhesive versus suture for the closure of laparoscopic wounds. A prospective randomized trial	• Conference abstract
Buresch (2017)	Comparison of Subcuticular Suture Type for Skin Closure After Cesarean Delivery: A Randomized Controlled Trial	• Randomised controlled trial - Material • <200 subjects
Camacho-Mauries (2012)	Randomized, clinical trial that demonstrates the elimination of wound infection following pursestring versus conventional closure of ostomy wounds	• Conference abstract
Camacho-Mauries (2013)	Randomized clinical trial of intestinal ostomy takedown comparing pursestring wound closure vs conventional closure to eliminate the risk of wound infection	• Randomised controlled trial - technique • <200 subjects
Carlson (1995)	Polyglyconate (Maxon) versus nylon suture in midline abdominal incision closure: a prospective randomized trial.	• Study does not contain any of the outcomes of interest
Cetin (2018)	Evaluation of intradermal absorbable and mattress sutures to close pilonidal sinus wounds with Limberg flap: a prospective randomized comparative study	• Randomised controlled trial - technique • <200 subjects
Chan (2017)	Does Barbed Suture Lower Cost and Improve Outcome in Total Knee Arthroplasty? A Randomized Controlled Trial	• Randomised controlled trial - technique • <200 subjects
Chang (2012)	Triclosan-impregnated sutures to decrease surgical site infections: systematic review and meta-analysis of randomized trials	• Systematic review - Material
Chibbaro (2009)	Use of skin glue versus traditional wound closure methods in brain surgery: A prospective, randomized, controlled study	• Randomised controlled trial - Material • <200 subjects
Chughtai (2000)	Clips versus suture technique: is there a difference?	• Systematic review - Material • <200 subjects
Chunder (2012)	A randomised controlled trial on suture materials for skin closure at caesarean section: Do wound infection rates differ?	• Study does not contain any relevant

Short Title	Title	
		interventions
Chung (1991)	Effect of Wound Closure Technique on Wound Infection in the Morbidly Obese: results of a randomized trial	• Randomised controlled trial - Material • <200 subjects
Clay (2011)	Staples vs subcuticular sutures for skin closure at cesarean delivery: a metaanalysis of randomized controlled trials	• Systematic review - Material
Colak (2013)	A comparison of nonabsorbable polymeric clips and endoloop ligatures for the closure of the appendicular stump in laparoscopic appendectomy: a prospective, randomized study	• Does not contain a population of interest
Coulthard (2010)	Tissue adhesives for closure of surgical incisions	• Systematic review - Material
Croce (2007)	Cesarean section, techniques and skin suture materials	• Study not reported in English
Daoud (2014)	Meta-analysis of prevention of surgical site infections following incision closure with triclosan-coated sutures: robustness to new evidence	• Systematic review - Material
Daykan (2017)	Skin closure at cesarean delivery, glue vs subcuticular sutures: a randomized controlled trial	• Randomised controlled trial - Material • <200 subjects
Daykan (2017)	Comparison of skin closure at cesarean delivery, glue (Dermabond) versus intra-cuticular (Monocril) sutures: a randomized controlled trial	• Conference abstract
de Jonge (2017)	Meta-analysis and trial sequential analysis of triclosan-coated sutures for the prevention of surgical-site infection	• Systematic review - Material
Deliaert (2009)	The effect of triclosan-coated sutures in wound healing. A double blind randomised prospective pilot study	Randomised controlled trial - Material • <200 subjects
Dignon (2013)	Which is the better method of wound closure in patients undergoing hip or knee replacement surgery: sutures or skin clips?	• More recent systematic review included that covers the same topic
Doorly (2015)	Microbial sealants do not decrease surgical site infection for clean-contaminated colorectal procedures	• Study does not contain any relevant interventions
Dowson (2006)	A prospective, randomized controlled trial comparing n-butyl cyanoacrylate	• Randomised controlled trial -

Short Title	Title	
	tissue adhesive (LiquiBand) with sutures for skin closure after laparoscopic general surgical procedures.	Material • <200 subjects
Dresang (2011)	Topics in maternity care. What is the best skin closure for a cesarean section?	• Review article but not a systematic review
Dumville (2014)	Tissue adhesives for closure of surgical incisions	• Systematic review - Material
E F Magann (2002)	Subcutaneous stitch closure versus subcutaneous drain to prevent wound disruption after cesarean delivery: A randomized clinical trial	• Study does not contain any relevant interventions
Edmiston (2013)	Is there an evidence-based argument for embracing an antimicrobial (triclosan)-coated suture technology to reduce the risk for surgical-site infections?: A meta-analysis	• Systematic review - Material
Eggers (2011)	A Comparison of Wound Closure Techniques for Total Knee Arthroplasty	• Randomised controlled trial - Material • <200 subjects
Eldrup (1981)	Randomised trial comparing Proximate stapler with conventional skin closure.	• Study does not contain any of the outcomes of interest
Elsolh (2017)	The Effect of Antibiotic-Coated Sutures on the Incidence of Surgical Site Infections in Abdominal Closures: a Meta-Analysis	• Systematic review - Material
Eymann (2010)	Glue instead of stitches: a minor change of the operative technique with a serious impact on the shunt infection rate	• Randomised controlled trial - Material • <200 subjects
Falk-Brynhildsen (2014)	Bacterial growth and wound infection following saphenous vein harvesting in cardiac surgery: a randomized controlled trial of the impact of microbial skin sealant	• Study not relevant to RQ
Fisher (2010)	A randomized, prospective study of total hip wound closure with resorbable subcuticular staples	• Study does not contain any of the outcomes of interest
Fitzwater (2016)	Wound morbidity with staples compared with suture for cesarean skin closure by diabetic status	• Randomised controlled trial - Material • <200 subjects

Short Title	Title	
Ford (2005)	Intraoperative handling and wound healing: controlled clinical trial comparing coated VICRYL plus antibacterial suture (coated polyglactin 910 suture with triclosan) with coated VICRYL suture (coated polyglactin 910 suture).	• Study does not contain any of the outcomes of interest
Freitas (2015)	Randomized clinical trial comparing 2-octylcyanoacrylate versus intradermic suture with nylon: similar cosmetic results with different safety profile	• Conference abstract
Fujita (2009)	Suture materials and techniques for midline abdominal closure	• Not a peer reviewed publication
Fujita (2014)	Antibiotic sutures against surgical site infections	• Conference abstract
Gaikwad (2009)	An ideal suture for midline abdominal closure?	• Randomised controlled trial - Material • <200 subjects
Gazivoda (2015)	A clinical study on the influence of suturing material on oral wound healing	• Randomised controlled trial - Material • <200 subjects
Gkegkes (2012)	Adhesive strips for the closure of surgical incisional sites: a systematic review and meta-analysis	• Systematic review - Material
Gong (2013)	Stapled vs hand suture closure of loop ileostomy: a meta-analysis	• Systematic review - Material
Guo (2016)	Efficacy of triclosan-coated sutures for reducing risk of surgical site infection in adults: a meta-analysis of randomized clinical trials	• Systematic review - Material
Gupta (2008)	Comparison of interrupted versus continuous closure in abdominal wound repair: a meta-analysis of 23 trials	• Systematic review - Technique
Gurusamy (2014)	Continuous versus interrupted skin sutures for non-obstetric surgery	• Systematic review - Technique
Gys (1989)	A prospective comparative clinical study between monofilament absorbable and non-absorbable sutures for abdominal wall closure.	• Randomised controlled trial - Material • <200 subjects
Han (2016)	Gunsight versus pursestring procedure for closing the wound following ostomy closure: a prospective randomized controlled trial	• Conference abstract

Short Title	Title	
Harvey (1986)	A prospective trial of skin staples and sutures in skin closure.	• Randomised controlled trial - Material • <200 subjects
Hasdemir (2015)	Comparison of subcuticular suture materials in cesarean skin closure	• Not a relevant study design
Hemming (2013)	A systematic review of systematic reviews and panoramic meta-analysis: staples versus sutures for surgical procedures	• Systematic review - Material
Henriksen (2017)	Triclosan-coated sutures and surgical site infection in abdominal surgery: the TRISTAN review, meta-analysis and trial sequential analysis	• Systematic review - Material
Hochberg (2009)	Suture choice and other methods of skin closure	• Review article but not a systematic review
Hsieh (2015)	Pursestring Closure versus Conventional Primary Closure Following Stoma Reversal to Reduce Surgical Site Infection Rate: A Meta-analysis of Randomized Controlled Trials	• Systematic review - Technique
Huppelschoten (2013)	Different ways of subcutaneous tissue and skin closure at cesarean section: A randomized clinical trial on the long-term cosmetic outcome	• Study does not contain any of the outcomes of interest
Huszár (2012)	Comparison of wound infection rates after colon and rectal surgeries using triclosan-coated or bare sutures -- a multi-center, randomized clinical study	• Study not reported in English
Iavazzo (2011)	Sutures versus staples for the management of surgical wounds: a meta-analysis of randomized controlled trials	• Systematic review - Material
Jan (2013)	LiquiBand Surgical S topical adhesive versus sutures for the closure of laparoscopic wounds. A randomized controlled trial	• Randomised controlled trial - Material • <200 subjects
Javadi (2018)	Comparison of subcuticular and interrupted suturing methods for skin closure after appendectomy: A randomized controlled trial	• Randomised controlled trial - Material • <200 subjects
Jeppsson (2012)	Triclosan-coated sutures reduce surgical site infections after open vein harvesting in coronary artery bypass graft patients: a prospective randomized controlled trial	• Conference abstract

Short Title	Title	
Johnson (1997)	Cutaneous closure after cardiac operations: a controlled, randomized, prospective comparison of intradermal versus staple closures.	• Data not reported in an extractable format
Kakeji (2009)	Phase II multi-center randomized clinical trial on the use of synthetic absorbable sutures to prevent wound infection in surgery	• Study not reported in English
Kim (2017)	A Meta-Analysis and Systematic Review Evaluating Skin Closure After Total Knee Arthroplasty-What Is the Best Method?	• Systematic review did not match review protocol
Konstantelias (2017)	Triclosan-coated sutures for the prevention of surgical-site infections: a meta-analysis	• Systematic review - Material
Kotaluoto (2012)	Wound healing after open appendectomies in adult patients: a prospective, randomised trial comparing two methods of wound closure	• Data not reported in an extractable format
Krishnamoorthy (2016)	A randomized study comparing traditional monofilament knotted sutures with barbed knotless sutures for donor leg wound closure in coronary artery bypass surgery	• Randomised controlled trial - technique • <200 subjects
Krishnan (2016)	Comparing sutures versus staples for skin closure after orthopaedic surgery: systematic review and meta-analysis	• Systematic review - Material
Krukowski (1987)	Polydioxanone or polypropylene for closure of midline abdominal incisions: a prospective comparative clinical trial.	• Not a relevant study design
Kuroki (2017)	Wound Complication Rates After Staples or Suture for Midline Vertical Skin Closure in Obese Women: A Randomized Controlled Trial	• Randomised controlled trial - Material • <200 subjects
Lazar (2011)	Adhesive strips versus subcuticular suture for mediansternotomy wound closure	• Randomised controlled trial - Material • <200 subjects
Leaper (1985)	Subcuticular skin closure after inguinal surgery. A controlled trial of polypropylene or polydioxanone.	• Randomised controlled trial - Material • <200 subjects
Leaper (2017)	The role of antimicrobial sutures in preventing surgical site infection	• Review article but not a systematic review
Lee (2014)	Pursestring closure of the stoma site leads to fewer wound infections: results	• Randomised controlled trial - technique

Short Title	Title	
	from a multicenter randomized controlled trial	• <200 subjects
Leung (2008)	Comparison of stapled versus handsewn loop ileostomy closure: a meta-analysis	• Systematic review - Material
Li (2014)	Full fascia closure with interrupted absorbable suture and layered closure with interrupted silk suture in abdominal incision: comparison of curative effects and biocompatibility	• Study not reported in English
Lin (2016)	The Efficacy and Safety of Knotless Barbed Sutures in the Surgical Field: A Systematic Review and Meta-analysis of Randomized Controlled Trials	• Systematic review - Material
Lipp (2010)	Cyanoacrylate microbial sealants for skin preparation prior to surgery	• Study not reported in English
Loffler (2012)	HAnd Suture Versus STApling for Closure of Loop Ileostomy (HASTA Trial): results of a multicenter randomized trial (DRKS00000040)	• Study does not contain any relevant interventions
Loffler (2015)	Hand suture versus stapler for closure of loop ileostomy--a systematic review and meta-analysis of randomized controlled trials	• Does not contain a population of interest
Lopez (2015)	A randomized controlled clinical trial comparing the outcomes of circumferential subcuticular wound approximation (CSWA) with conventional wound closure after stoma reversal	• Randomised controlled trial - technique • <200 subjects
Maartense (2002)	Randomized study of the effectiveness of closing laparoscopic trocar wounds with octylcyanoacrylate, adhesive papertape or poliglecaprone.	• Randomised controlled trial - Material • <200 subjects
Mackeen (2012)	Techniques and materials for skin closure in caesarean section	• Systematic review - Technique • Systematic review - Material
Mackeen (2015)	Suture versus staples for skin closure after cesarean: a metaanalysis	• Systematic review - Material
Maged (2018)	Subcuticular interrupted versus continuous skin suturing in elective cesarean section in obese women: a randomized controlled trial	• Randomised controlled trial - technique • <200 subjects
Maino (2018)	Influence of suturing technique on wound healing and patient morbidity after connective tissue harvesting. A randomized clinical trial	• Randomised controlled trial - technique • <200 subjects

Short Title	Title	
Markides (2015)	Meta-analysis of handsewn versus stapled reversal of loop ileostomy	• Does not contain a population of interest
Marquez (2010)	Wound infection following stoma takedown: primary skin closure versus subcuticular purse-string suture	• Not a relevant study design
McCartan (2013)	Purse-string approximation is superior to primary skin closure following stoma reversal: a systematic review and meta-analysis	• Systematic review - Technique
Meena (2015)	Barbed versus standard sutures in total knee arthroplasty: a meta-analysis	• Systematic review - Technique
Millbourn (2009)	Effect of stitch length on wound complications after closure of midline incisions: a randomized controlled trial	• Not a relevant study design
Millbourn (2011)	Risk factors for wound complications in midline abdominal incisions related to the size of stitches	• Not a relevant study design
Mingmalairak (2009)	Efficacy of antimicrobial coating suture coated polyglactin 910 with triclosan (Vicryl plus) compared with polyglactin 910 (Vicryl) in reduced surgical site infection of appendicitis, double blind randomized control trial, preliminary safety report	• Randomised controlled trial - Material • <200 subjects
Mudd (2014)	A prospective randomized comparison of two skin closure techniques in acetabular fracture surgery	• Randomised controlled trial - Material • <200 subjects
Mullen (1999)	Reduction of leg wound infections following coronary artery bypass surgery.	• Randomised controlled trial - Material • <200 subjects
Murphy (1995)	Skin closure and the incidence of groin wound infection: a prospective study.	• Randomised controlled trial - Material • <200 subjects
Murphy (2004)	Comparison of clips versus sutures in orthopaedic wound closure	• Randomised controlled trial - Material • <200 subjects
Nadeem (2015)	Comparison of extracorporeal knot-tying suture and endoclips in laparoscopic appendiceal stump closure in uncomplicated acute appendicitis	• Conference abstract

Short Title	Title	
Nadeem (2016)	Comparison of extra-corporeal knot-tying suture and metallic endo-clips in laparoscopic appendiceal stump closure in uncomplicated acute appendicitis	• Does not contain a population of interest
Nasir (2001)	Continuous double loop closure for midline laparotomy wounds.	• Conference abstract
Navali (2014)	Comparison of three skin closure methods in knee mid-anterior incisions	• Study does not contain any of the outcomes of interest
Neutzling (2012)	Stapled versus handsewn methods for colorectal anastomosis surgery	• Does not contain a population of interest
Niggebrugge (1999)	Influence of abdominal-wound closure technique on complications after surgery: a randomised study.	• Study does not contain any relevant interventions
Nuthalapaty (2011)	Staples compared with subcuticular suture for skin closure after cesarean delivery: a systematic review and meta-analysis	• Conference abstract
Odijk (2017)	The MOVE-trial: Monocryl vs. Vicryl RapideTM for skin repair in mediolateral episiotomies: a randomized controlled trial	• Randomised controlled trial - Material • <200 subjects
Ohira (2015)	Synthetic polyglycomer short-term absorbable sutures vs. polydioxanone long-term absorbable sutures for preventing incisional hernia and wound dehiscence after abdominal wall closure: a comparative randomized study of patients treated for gastric or colon cancer	• Randomised controlled trial - Material • <200 subjects
Ong (2002)	Comparing wound closure using tissue glue versus subcuticular suture for pediatric surgical incisions: a prospective, randomised trial.	• Study does not contain any of the outcomes of interest
Ong (2010)	Prospective randomised study to evaluate the use of DERMABOND ProPen (2-octylcyanoacrylate) in the closure of abdominal wounds versus closure with skin staples in patients undergoing elective colectomy	• Randomised controlled trial - Material • <200 subjects
Orci (2014)	Systematic review and meta-analysis of fibrin sealants for patients undergoing pancreatic resection	• Does not contain a population of interest
Orr (1990)	Continuous or interrupted fascial closure: a prospective evaluation of No. 1 Maxon suture in 402 gynecologic procedures.	• Study does not contain any relevant

Short Title	Title	
		interventions
Osther (1995)	Randomized comparison of polyglycolic acid and polyglyconate sutures for abdominal fascial closure after laparotomy in patients with suspected impaired wound healing.	• Data not reported in an extractable format
Oswal (2017)	Surgical Staples: A Superior Alternative to Sutures for Skin Closure After Neck Dissection-A Single-Blinded Prospective Randomized Clinical Study	• Study does not contain any of the outcomes of interest
Patel (2017)	Closure methods for laparotomy incisions for preventing incisional hernias and other wound complications	• Systematic review
Pauniaho (2010)	Non-absorbable interrupted versus absorbable continuous skin closure in pediatric appendectomies	• Randomised controlled trial - technique • Randomised controlled trial - Material • <200 subjects
Pinkney (2010)	Sutures v staples. What about the NICE guidelines?	
Pogorelić (2017)	A Comparison of Endoloop Ligatures and Nonabsorbable Polymeric Clips for the Closure of the Appendicular Stump During Laparoscopic Appendectomy in Children	• Study does not contain any relevant interventions
Pronio (2011)	Closure of cutaneous incision after thyroid surgery: A comparison between metal clips and cutaneous octyl-2-cyanoacrylate adhesive. A prospective randomized clinical trial	• Randomised controlled trial - Material • <200 subjects
R J Cardos (2006)	Subcutaneous management of vertical incisions with 3 or more centimetres of subcutaneous fat	• Study does not contain any relevant interventions
Rakic (2014)	Analysis of endoloops and endostaples for closing the appendiceal stump during laparoscopic appendectomy	• Does not contain a population of interest
Ranaboldo (1992)	Closure of laparotomy wounds: skin staples versus sutures.	• Study does not contain any of the outcomes of interest
Ray (2013)	Comparison of Two Different Suture Materials for Transvaginal Sacrospinous Fixation of the Vault: A Prospective Randomized Trial	• Study does not contain any relevant interventions
Rezaie (2014)	Randomized comparison of nylon versus absorbing polyglactin 910 for fascial closure in caesarean section	• Data not reported in an extractable

Short Title	Title	
		format
Rogers (2012)	Effect of triclosan-coated sutures on incidence of surgical wound infection after lower limb revascularization surgery: a randomized controlled trial. By Turtiainen et al. DOI:10.1007/s00268-012-1655-4	• Conference abstract
Romero (2011)	Prospective, randomized, controlled trial comparing a tissue adhesive (DermabondTM) with adhesive strips (Steri-StripsTM) for the closure of laparoscopic trocar wounds in children	• Randomised controlled trial - Material • <200 subjects
Rondelli (2018)	Purse-string closure versus conventional primary closure of wound following stoma reversal: Meta-analysis of randomized controlled trials	• Systematic review - Technique
Rozzelle (2008)	Antimicrobial suture wound closure for cerebrospinal fluid shunt surgery: a prospective, double-blinded, randomized controlled trial	• Study does not contain any relevant interventions
Rubio-Perez (2014)	Sis-e fellowship project 'subcuticular continuous suture versus skin staples to reduce surgical site infections in colorectal surgery patients': current status of the investigation	• Conference abstract
Rui (2018)	A prospective randomised comparison of 2 skin closure techniques in primary total hip arthroplasty surgery	• Randomised controlled trial - Material • <200 subjects
Ruiz-Tovar (2015)	Association between Triclosan-Coated Sutures for Abdominal Wall Closure and Incisional Surgical Site Infection after Open Surgery in Patients Presenting with Fecal Peritonitis: A Randomized Clinical Trial	• Randomised controlled trial - Material • <200 subjects
Sadick (1994)	The modified buried vertical mattress suture. A new technique of buried absorbable wound closure associated with excellent cosmesis for wounds under tension.	• Randomised controlled trial - technique • <200 subjects
Sah (2015)	Is There an Advantage to Knotless Barbed Suture in TKA Wound Closure? A Randomized Trial in Simultaneous Bilateral TKAs	• Randomised controlled trial - technique • <200 subjects
Sajid (2009)	Meta-analysis of skin adhesives versus sutures in closure of laparoscopic port-site wounds	• Systematic review - Material

Short Title	Title	
Sajid (2011)	A systematic review on the effectiveness of slowly-absorbable versus non-absorbable sutures for abdominal fascial closure following laparotomy	• Systematic review - Material
Sajid (2013)	Fibrin glue instillation under skin flaps to prevent seroma-related morbidity following breast and axillary surgery	• Systematic review did not match review protocol
Sajid (2013)	Use of antibacterial sutures for skin closure in controlling surgical site infections: a systematic review of published randomized, controlled trials	• Systematic review - Material
Sajid (2013)	Systematic review and meta-analysis of published, randomized, controlled trials comparing suture anastomosis to stapled anastomosis for ileostomy closure	• Systematic review - Material
Sajid (2014)	Systematic review of absorbable vs non-absorbable sutures used for the closure of surgical incisions	• Systematic review - Material
Sala-Perez (2016)	Antibacterial suture vs silk for the surgical removal of impacted lower third molars. A randomized clinical study	• Not relevant to review question
Sandini (2016)	Systematic review and meta-analysis of sutures coated with triclosan for the prevention of surgical site infection after elective colorectal surgery according to the PRISMA statement	• Systematic review - Material
Shantz (2012)	Sutures versus staples for wound closure in orthopaedic surgery: a randomized controlled trial	• Randomised controlled trial - Material
Sharma (2014)	A randomized controlled trial comparing cosmetic outcome after skin closure with 'staples' or 'subcuticular sutures' in emergency cesarean section	• Study does not contain any of the outcomes of interest
Shoar (2012)	Assessment of prophylactic retention suture in reducing dehiscince in midline laparotomy in high risk patients: a randomized clinical trial	• Conference abstract
Shrestha (2013)	A randomized trial comparing skin closure in cesarean section: interrupted suture with nylon vs subcuticular suture with No '1' polyfilament	• Randomised controlled trial - Material • <200 subjects
Siddique (2015)	Polydioxanone vs prolene closure for midline abdominal incisions: To compare postoperative wound dehiscence	• Randomised controlled trial - Material • <200 subjects
Singh (2010)	Antibacterial suture reduces surgical site infections in coronary artery bypass grafting	• Conference abstract

Short Title	Title	
Sinha (2001)	A single blind, prospective, randomized trial comparing n-butyl 2-cyanoacrylate tissue adhesive (Indermil) and sutures for skin closure in hand surgery.	• Randomised controlled trial - Material • <200 subjects
Slade (2013)	Sutures versus staples for wound closure in orthopaedic surgery: a pilot randomized controlled trial	• Randomised controlled trial - Material • <200 subjects
Smith (2010)	Sutures versus staples for skin closure in orthopaedic surgery: meta-analysis	• Systematic review - Material
Smith (2014)	Barbed versus traditional sutures: Closure time, cost, and wound related outcomes in total joint arthroplasty	• Randomised controlled trial - technique • <200 subjects
Soni (2013)	Comparing cyanoacrylate tissue adhesive and conventional subcuticular skin sutures for maxillofacial incisions--a prospective randomized trial considering closure time, wound morbidity, and cosmetic outcome	• Randomised controlled trial - Material • <200 subjects
Sprowson (2014)	The effect of triclosan coated sutures on rate of surgical site infection after hip and knee replacement: a protocol for a double-blind randomised controlled trial	• Randomised controlled trial - Material
Sprowson (2018)	The effect of triclosan-coated sutures on the rate of surgical site infection after hip and knee arthroplasty: a double-blind randomized controlled trial of 2546 patients	• Not a relevant study design
Stenvik (2006)	Effect of subcutaneous suture line and surgical technique on wound infection after saphenectomy in coronary artery bypass grafting: a prospective randomised study	• Study does not contain any relevant interventions
Sureshkumar (2018)	Comparing Surgical Site Infection and Scar Cosmesis Between Conventional Linear Skin Closure Versus Purse-string Skin Closure in Stoma Reversal - A Randomized Controlled Trial	• Randomised controlled trial - technique • <200 subjects
Tejani (2012)	A comparison of cosmetic outcomes of lacerations of the trunk and extremity repaired using absorbable versus nonabsorbable sutures	• Conference abstract
Tejani (2014)	A comparison of cosmetic outcomes of lacerations on the extremities and trunk using absorbable versus nonabsorbable sutures	• Randomised controlled trial - Material • <200 subjects

Short Title	Title	
Toriumi (1998)	Use of octyl-2-cyanoacrylate for skin closure in facial plastic surgery.	• Data not reported in an extractable format
Towfigh (2008)	Significant reduction in incidence of wound contamination by skin flora through use of microbial sealant	• Study does not contain any relevant interventions
Tuuli (2011)	Staples compared with subcuticular suture for skin closure after cesarean delivery: a systematic review and meta-analysis	• Systematic review - Material
Uchino (2018)	The Efficacy of Antimicrobial-Coated Sutures for Preventing Incisional Surgical Site Infections in Digestive Surgery: a Systematic Review and Meta-analysis	• Systematic review - Material
van den Ende (2004)	Adhesive bonds or percutaneous absorbable suture for closure of surgical wounds in children. Results of a prospective randomized trial.	• Randomised controlled trial - Material • <200 subjects
Vats (2014)	Comparison of Efficacy of Three Suture Materials, i.e., Poliglecaprone 25, Polyglactin 910, Polyamide, as Subcuticular Skin Stitches in Post-Cesarean Women: A Randomized Clinical Trial	• Randomised controlled trial - Material • <200 subjects
Velmahos (2002)	Severe Trauma is Not an Excuse for Prolonged Antibiotic Prophylaxis	• Study does not contain any relevant interventions
Vo (2014)	Randomised controlled trial: Study shows insufficient decrease in wound complications with sutured versus stapled skin closure in gastrointestinal operations	• Conference abstract
Wade (2018)	Absorbable versus non-absorbable sutures for skin closure after carpal tunnel decompression surgery	• Systematic review - Material
Wang (2013)	Systematic review and meta-analysis of triclosan-coated sutures for the prevention of surgical-site infection	• Systematic review - Material
Wang (2016)	Subcuticular sutures versus staples for skin closure after cesarean delivery: a meta-analysis	• Systematic review - Material
Weldrick (2014)	A comparison of fibrin sealant versus standard closure in the reduction of postoperative morbidity after groin dissection: A systematic review and meta-analysis	• Systematic review - Material

Short Title	Title	
Williams (2011)	Randomized trial of antimicrobial-coated sutures to prevent surgical site infection after breast cancer surgery	• Randomised controlled trial - Material • <200 subjects
Wolterbeek (2002)	Skin closure after infrainguinal bypass surgery: a prospective randomised study.	• Randomised controlled trial - Material • <200 subjects
Wu (2017)	Antimicrobial-coated sutures to decrease surgical site infections: a systematic review and meta-analysis	• Systematic review - Material
Wu (2018)	Correction to: Antimicrobial-coated sutures to decrease surgical site infections: a systematic review and meta-analysis	• Systematic review - Material
Wyles (2016)	The Chitranjan Ranawat Award: Running Subcuticular Closure Enables the Most Robust Perfusion After TKA: A Randomized Clinical Trial	• Randomised controlled trial - Material • <200 subjects
Xu (2016)	Absorbable Versus Nonabsorbable Sutures for Skin Closure: A Meta-analysis of Randomized Controlled Trials	• Systematic review - Material
Yamaguchi (2014)	A randomized phase III trial of skin closure by subcuticular suture versus skin stapler to prevent incisional surgical site infection after elective colorectal cancer surgery: results of the subcuticular suture against infection (SSI) study	• Conference abstract
Yang (2013)	Closure of skin incision after thyroidectomy through a supraclavicular approach: a comparison between tissue adhesive and staples	• Randomised controlled trial - Material • <200 subjects
Yoon (2015)	Clinical trial on the incidence of wound infection and patient satisfaction after stoma closure: comparison of two skin closure techniques	• Not a relevant study design
Yuenyongviwat (2016)	A randomised controlled trial comparing skin closure in total knee arthroplasty in the same knee: nylon sutures versus skin staples	• Randomised controlled trial - Material • <200 subjects
Zabd-Ur-Rehman (2013)	Comparison of wound dehiscence in interrupted with continuous closure of laparotomy	• Randomised controlled trial - technique • <200 subjects

Short Title	Title	
Zaid (2010)	A randomized trial of secondary closure of superficial wound dehiscence by surgical tape or suture	• Randomised controlled trial - Material • <200 subjects
Zaki (2018)	Comparison of staples vs subcuticular suture in class III obese women undergoing cesarean: a randomized controlled trial	• Study does not contain any relevant interventions
Zhang (2011)	Cosmetic outcome and surgical site infection rates of antibacterial absorbable (Polyglactin 910) suture compared to Chinese silk suture in breast cancer surgery: a randomized pilot research	• Randomised controlled trial - Material • <200 subjects
Zhang (2016)	Barbed versus traditional sutures for wound closure in knee arthroplasty: a systematic review and meta-analysis	• Systematic review - Technique
Zhuang (2009)	Comparison of two absorbable sutures in abdominal wall incision	• Study not reported in English

Economic studies

Paper	Primary reason for exclusion
Abbott (2017) In Pursuit of the Most Cost-Effective Pediatric Laparoscopic Appendectomy: The Effect of Disposable Instrument Choice on Operative Time and Surgeon-Controllable Cost	Not a cost utility study
Alkhoury (2011) Cost and clinical outcomes of laparoscopic ventral hernia repair using intraperitoneal nonheavyweight polypropylene mesh	Not a cost utility study
Al-Temimi (2017) Endostapler versus Hem-O-Lok clip to secure the appendiceal stump and mesoappendix during laparoscopic appendectomy	Not a cost utility study
Arkadopoulos (2016) Cost-Effective Surgical Management of Liver Disease Amidst a Financial Crisis	Not a cost utility study
Arroyo (2015) Open-label clinical trial comparing the clinical and economic effectiveness of using a polyurethane film surgical dressing with gauze surgical dressings in the care of post-operative surgical wounds	Not a cost utility study
Barth (2008) Watertight dural closure: is it necessary? A prospective randomized trial in patients with supratentorial craniotomies	Not a cost utility study
Begum (2012) The use of vacuum-assisted wound closure therapy in thoracic operations	Not a cost utility study
Bejko (2012) Nitinol flexigrip sternal closure system and chest wound infections: insight from a comparative analysis of complications and costs	Not a cost utility study
Black (2014) Surgical site infections in gynecology	Not a cost utility study

Paper	Primary reason for exclusion
Borzio (2016) Barbed sutures in total hip and knee arthroplasty: what is the evidence? A meta-analysis	Not a cost utility study
Chopra (2016) The Economic Impact of Closed-Incision Negative-Pressure Therapy in High-Risk Abdominal Incisions: A Cost-Utility Analysis	Not a cost utility study
Deerenberg (2015) Small bites versus large bites for closure of abdominal midline incisions (STITCH): a double-blind, multicentre, randomised controlled trial	Not a cost utility study
Galal (2011) Impact of using triclosan-antibacterial sutures on incidence of surgical site infection	Not a cost utility study
Hagen (2012) Reducing cost of surgery by avoiding complications: the model of robotic Roux-en-Y gastric bypass	Not a cost utility study
Köşüş (2010) Rifamycin SV Application to Subcutanous Tissue for Prevention of Post-Cesarean Surgical Site Infection	Not a cost utility study
Lee (2014) An Economic Model: Value of Antimicrobial-Coated Sutures to Society, Hospitals, and Third-Party Payers in Preventing Abdominal Surgical Site Infections	Not a cost utility study
Mansour (2013) The use of barbed sutures during scoliosis fusion wound closure: A quality improvement analysis	Not a cost utility study
Millbourn (2013) Cost analysis of the use of small stitches when closing midline abdominal incisions	Not a cost utility study
Monsen (2015) A randomised study of NPWT closure versus alginate dressings in peri-vascular groin infections: quality of life, pain and cost	Not a cost utility study
Nakamura (2013) Triclosan-coated sutures reduce the incidence of wound infections and the costs after colorectal surgery: a randomized controlled trial	Not a cost utility study
Nickl (2018) First Experiences with Incisional Negative Pressure Wound Therapy in a High-Risk Poststernotomy Patient Population treated with Pectoralis Major Muscle Flap for Deep Sternal Wound Infection	Not a cost utility study
Olesen (2017) The cost of infection in severe open tibial fractures treated with a free flap	Not a cost utility study
Ooi (2016) Transcatheter Versus Surgical Closure of Atrial Septal Defects in Children: A Value Comparison	Not a cost utility study
Ortega-Zilic (2010) EpiDex Swiss field trial 2004-2008	Not a cost utility study
Singh (2014) An economic model: value of antimicrobial-coated sutures to society, hospitals, and third-party payers in preventing abdominal surgical site infections	Not a cost utility study
Siribumrungwong (2018) Comparison of Superficial Surgical Site Infection Between Delayed Primary Versus Primary Wound Closure in Complicated Appendicitis: A Randomized Controlled Trial	Not a cost utility study
Smith (2014) Barbed versus traditional sutures: Closure time, cost, and wound related outcomes in total joint arthroplasty	Not a cost utility study

Paper	Primary reason for exclusion
Stanirowski (2016) Randomized Controlled Trial Evaluating Dialkylcarbamoyl Chloride Impregnated Dressings for the Prevention of Surgical Site Infections in Adult Women Undergoing Cesarean Section	Not a cost utility study
Warner (2010) Comparison of vacuum-assisted closure to the antibiotic bead pouch for the treatment of blast injury of the extremity	Not a cost utility study
Watson (2016) Comparison of stapled haemorrhoidopexy with traditional excisional surgery for haemorrhoidal disease (eTHoS): a pragmatic, multicentre, randomised controlled trial	Not a cost utility study
Webster (2014) Negative pressure wound therapy for skin grafts and surgical wounds healing by primary intention	Not a cost utility study
Ye (2014) Use of ValtracTM-secured intracolonic bypass in laparoscopic rectal cancer resection	Not a cost utility study
Zhang (2016) Barbed versus traditional sutures for wound closure in knee arthroplasty: a systematic review and meta-analysis	Not a cost utility study

Appendix J – Research recommendations

1. Does the use of barbed sutures for wound closure reduce the incidence of SSI?

Only two studies were identified which examined the effectiveness of barbed sutures for wound closure in reducing the incidence of SSIs. The evidence was found to be inconclusive and of low quality. Three further studies were identified which examined the effectiveness of barbed sutures compared to standard sutures, however these studies contained less than 200 participants and were excluded. Further research is needed using a robust study design to explore the clinical and cost effectiveness of barbed sutures in reducing the incidence of SSI, especially as the committee noted an increased use of this suture in clinical practice. Research in this area can help improve patient outcomes.

PICO	**Population:** People of any age undergoing any surgery, including minimally invasive surgery (arthroscopic, thoracoscopic and laparoscopic surgery) **Interventions:** • Barbed suture **Comparator:** • Other absorbable sutures (including polydioxanone and polyglyconate monofilament) • Other sutures (traditional, absorbable, non-absorbable) **Outcomes:** • Surgical site infection (including SSIs up to 30 days and 1 year) defined using appropriate criteria such as CDC SSI criteria. • Wound dehiscence (superficial/ partial dehiscence and complete wound dehiscence) • Mortality post-surgery • Length of hospital stay • Postoperative antibiotic use • Hospital readmission
Current evidence base	2 RCTs of very low/ low quality
Study design	Randomised controlled trial

2. **Which patient groups, contamination groups and which layers gain the most benefit from the use of triclosan-coated or triclosan-impregnated sutures?**

Low to high quality evidence from up to 11 RCTs, showed that the use of triclosan-coated sutures for wound closure reduces the number of people who experience SSIs and the number of people who require post-operative antimicrobials in comparison to the use of standard sutures. However very low to moderate quality evidence from up to 5 RCTs, could not differentiate mortality, length of stay or the number of people who experience superficial SSI, deep SSI or dehiscence between the use of triclosan-coated sutures or standard sutures for wound closure. Triclosan-coated or impregnated sutures are also more expensive than standard sutures. Further research is therefore needed using a robust study design to explore the clinical and cost effectiveness of triclosan-coated sutures in reducing the incidence of SSI. Research in this area is essential to inform future updates of key recommendations in this guidance which in turn can help improve patient outcomes.

PICO	**Population:** People of any age undergoing any surgery, including minimally invasive surgery (arthroscopic, thoracoscopic and laparoscopic surgery) **Interventions:** • Triclosan coated sutures **Comparator:** • Other absorbable sutures (including polydioxanone and polyglyconate monofilament) • Different layer of closure **Outcomes:** • Surgical site infection (including SSIs up to 30 days and 1 year) defined using appropriate criteria such as CDC SSI criteria. • Wound dehiscence (superficial/ partial dehiscence and complete wound dehiscence) • Mortality post-surgery • Length of hospital stay • Postoperative antibiotic use • Hospital readmission • Adverse events such as: antimicrobial resistance
Current evidence base	13 RCTs of varying quality
Study design	Randomised controlled trial

3. Which closure method or technique is the most effective for reducing SSI in patients undergoing emergency surgery?

Of the 33 RCTs investigated, only 2 studies included patients undergoing emergency surgery. The committee noted a general lack of evidence of surgical closure methods within emergency surgery as it is often difficult to recruit this group of patients for research. Further research is therefore needed using a robust study design to explore the clinical and cost effectiveness of different closure methods in reducing the incidence of SSI in patients undergoing emergency surgery. Further research in this area can help improve services and therefore improve patient outcomes.

PICO	**Population:** People of any age undergoing emergency surgery **Interventions:** Closure of the skin and closure of internal layers using the following materials: Suture materials: • Traditional sutures including coated polyglactin sutures • Absorbable antibacterial coated and impregnated sutures (including triclosan coated sutures) • Other absorbable sutures (including polydioxanone and polyglyconate monofilament) • Non- absorbable sutures, including polypropylene and polyamide monofilament Non-suture materials: • Staples • Tissue adhesives (including butylcyanoacrylate and octylcyanoarcylate) • Adhesive tapes Closure of the skin and internal layers using the following techniques: • Continuous suturing (including subcuticular suturing, running closure, running lock suturing and purse string suturing) • Interrupted suturing (including simple sutures, vertical mattress and horizontal mattress) **Comparator:** For skin closure and closure of the internal layers: • Absorbable antibacterial coated and impregnated sutures compared to traditional sutures • Other absorbable sutures versus traditional sutures • Staples compared with sutures • Tissues adhesives compared with adhesive tapes Comparison of suture techniques: • Running closure compared with running lock suturing • Simple sutures compared with vertical mattress • Continuous technique compared with interrupted technique.

	Outcomes: • Surgical site infection (including SSIs up to 30 days and 1 year) defined using appropriate criteria such as CDC SSI criteria. • Wound dehiscence (superficial/ partial dehiscence and complete wound dehiscence) • Mortality post-surgery • Length of hospital stay • Postoperative antibiotic use • Hospital readmission • Adverse events such as: antimicrobial resistance
Current evidence base	2 RCTs
Study design	Randomised controlled trial

Appendix K – References

Included Studies

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