

Title:	Reducing Risk of Surgical Site Infection in Caesarean Section		
Author(s)	Dr Mageed Abdelrahman (ST3 Obstetrics & Gynaecology) Dr Priscilla Devaseelan (Consultant Obstetrician) Dr Alyson Hunter (Consultant Obstetrician) Dr Colin Goldsmith (Consultant Microbiologist) Dr Dominic McAtamney (Consultant Anaesthetist)		
Ownership:	Mr Brian Barry, Director of Specialist's Hospitals Women's Health		
Approval by:	Specialist's Hospitals Women's Health Drugs and Therapeutics Standards and Guidelines Policy Committee Executive Team Meeting	Approval date:	25/8/13 25/11/14 10/12/14 15/12/14 17/12/14
Operational Date:	January 2015	Next Review:	January 2017
Version No.	V1	Supercedes	N/A
Key words	Caesarean section, Surgical site infection, antibiotic prophylaxis		
Links to other policies	http://intranet.belfasttrust.local/policies/Documents/Antimicrobial%20prophylaxis%20in%20specific%20adult%20surgical%20procedures.pdf http://intranet.belfasttrust.local/policies/Documents/Dress%20Code%20Policy.pdf http://intranet.belfasttrust.local/policies/Documents/Environmental%20Cleanliness%20Policy%20and%20Escalation%20Procedures.pdf http://intranet.belfasttrust.local/policies/Documents/Hand%20Hygiene%20policy.pdf http://intranet.belfasttrust.local/policies/Documents/Peripheral%20intravenous%20cannulae%20-%20Insertion%20and%20management%20of.pdf		

Date	Version	Author	Comments
3/7/13	0.1	As listed	Widely circulated amongst Excellence and Clinical Governance, Supervisors of Midwives and all key workers. End date for comments 25/8/2013.
1/10/13	0.2	As listed	Discussed at Labour Ward Forum
28/10/13	0.3	As listed	Comments addressed and sent to A. King Policy Co-ordinator.
28/10/13	0.4	As listed	Formatting changes required and forwarded to D&T.
16/11/2013	0.5	As listed	Further changes incorporated by author. New version sent to D&T.

1.0 INTRODUCTION / PURPOSE OF POLICY

1.1 Background

Caesarean section (CS) is the commonest surgical procedure performed in obstetrics. Postoperative maternal infections not only cause significant morbidity in the mother, but also place a considerable burden on already scarce hospital resources. With rising CS rates and women presenting with increasing co-morbidities, the health and economic burden of post-CS infections will continue to rise, as seen with recent trends in our maternity statistics.

With the changing evidence in literature and in line with current NICE recommendation, a change in current practice has become necessary.

There are three levels of surgical site infection (SSI) as defined by NICE:

- **Superficial incisional**, affecting the skin and subcutaneous tissue. These infections may be indicated by localised signs such as redness, pain, heat or swelling at the site of the incision or by the drainage of pus.
- **Deep incisional**, affecting the fascial and muscle layers. These infections may be indicated by the presence of pus or an abscess, fever with tenderness of the wound, or a separation of the edges of the incision exposing the deeper tissues.
- **Organ or space infection**, which involves any part of the anatomy other than the incision that is opened or manipulated during the surgical procedure, for example uterus or peritoneum. These infections may be indicated by the drainage of pus or the formation of an abscess detected by histopathological or radiological examination or during re-operation.

Patients with SSI have 2-11 increased risk of death than those without SSI. Since 2009, the Public Health Agency has introduced mandatory SSI surveillance for CS in Northern Ireland. ¹

1.2 Purpose

To provide guidance to all healthcare staff on risk factors for SSI at CS and ways recommended to minimise risk.

1.3 Objectives

The primary objective of this policy is to reduce the rate of SSI at CS.

2.0 SCOPE OF THE POLICY

This policy applies to all obstetricians, midwives, anaesthetists and neonatologists caring for pregnant women.

3.0 **ROLES/RESPONSIBILITIES**

The responsibility for adhering to the policy rests with all stakeholders.

4.0 **KEY POLICY PRINCIPLES**

Key Policy Statement

This policy involves changes in practice before, during and after CS to reduce the risk of surgical site infections.

4.1 **Policy Principles**

Preoperative phase:

Preoperative showering:

- Patient is advised to shower using soap on the day of elective surgery- although this may not be possible for women undergoing emergency CS.

Hair removal:

- Remove hair with electric clippers with a single-use head on the day of surgery or depilatory creams a few days before surgery. Razors increase the risk of SSI.

Patient theatre wear:

- Patients should be given appropriate theatre wear, considering her comfort and dignity. It should also provide easy access to the operative site and areas for placing devices, such as intravenous cannulas.

Staff theatre wear:

- All staff should wear specific non-sterile theatre wear in all areas where operations are undertaken.

Staff leaving the operating area:

- Staff wearing non-sterile theatre wear should keep their movements in and out of the operating area to a minimum.

Hand jewellery, artificial nails and nail polish:

- The operating team should remove hand jewellery before operations.
- Artificial nails and nail polish should be removed.

Correction of anaemia:

- Correction of anaemia prior to CS is important to reduce the risk of SSI. Pregnant women should be offered a haemoglobin assessment before CS to identify those who have anaemia. Patient should be group and held or cross matched according to haemoglobin levels. ² Please refer to the trust guidance on 'Management of iron deficiency anaemia'.

Vaginal cleansing before CS:

- There is evidence that cleansing the vagina with an antiseptic solution (like povidone iodine) immediately before the caesarean delivery reduced the risk of post-caesarean infection of the uterus. The benefit was greater if the woman's waters had already broken.³ This is a simple and inexpensive intervention and could be considered for women with prelabour rupture of membranes or prolonged rupture of membranes > 18 hours. It should be performed by the surgeon prior to gowning. Please note that if the woman has an iodine allergy, an alternate antiseptic like chlorhexidine should be used.

Antibiotic prophylaxis:

Single Dose Prophylaxis

The first and foremost proposal for antimicrobial prophylaxis across the Trust is to adopt the principles of guidance from the Scottish Intercollegiate Guidelines Network, which is to limit antimicrobial prophylaxis to a single dose in most instances. This is seen by the Medical Director, the Infection Control and Prevention Team, the Microbiologists and the Infectious Disease Physicians as a central measure to control the incidence of *C. Difficile*, MRSA, ESBL and other multi-resistant pathogens.

The relevant exceptions to single dose prophylaxis would be:

1. When duration of surgery is >3 hours (extra intra-operative dose of short half life antibiotic administered)
2. When blood loss exceeds 1.5 litres (extra dose administered after fluid replaced)
3. Emergency surgery for contaminated or dirty operations
4. Infections already pre-existing pre-operatively

Women having a CS should be offered single dose prophylactic antibiotics to reduce the risk of postoperative infections.^{4, 5} Ideally the antibiotic should be effective against endometritis, urinary tract infections and wound infections.

Timing of antibiotic prophylaxis:

- Ideally, prophylactic antimicrobial administration should be completed within the hour prior to incision unless the woman is already on antibiotics (e.g. for the prevention or treatment of chorioamnionitis – in which case, please then discuss the timing of these and the need for additional peri-operative antibiotics with the duty medical microbiologist). Women should be informed that this reduces the risk of maternal infections more than prophylactic antibiotics given after skin incision. Women should also be counselled about possible effects on baby in the rare event of anaphylaxis. For elective CSs, this could be administered in the anaesthetic room before the patient in wheeled into the surgical room.

- In case of emergency CS, the antibiotic may be administered in the operating room just before the start of the anaesthetic.
- A single dose of a second generation cephalosporin, Cefuroxime 1.5g IV, and Metronidazole 500 mg IV is the antibiotic regimen of choice, unless significant allergies are present.
- In elective cases the anaesthetic team will take responsibility for administering antibiotics. In emergencies, the obstetric team will take this responsibility. It is important that there is flexibility and teamwork with regards to this.

Penicillin Allergy

- If the patient has a history of significant allergy to penicillin or cephalosporins, the preferred alternative antibiotic regimen is a combination of single dose Metronidazole (500 mg IV), Teicoplanin (10 mg/kg IV) and Gentamicin (2 mg/kg IV– maximum 400mg – see appendix for calculation of adjusted dosing weight, using ideal body weight, if > 20% overweight). N.B. use the pregnancy booking weight / adjusted weight to calculate the above doses.

While a precautionary approach to penicillin or other drug allergy should be adopted, where a reliable history can be obtained, the following definition of significant penicillin allergy should be used:

- *A history of a hypersensitivity reaction such as anaphylaxis, laryngeal oedema, bronchospasm, angioedema, hypotension, local swelling, urticaria, or pruritic rash, which occurs immediately following penicillin administration – or other life threatening reactions (e.g Stevens Johnson syndrome) – contraindicates further exposure to penicillin and beta lactams apart from aztreonam*. Late manifestations are only a relative contraindication. (Please refer to Trust Guideline: ‘Guidelines for the antimicrobial prophylaxis of surgical site infections in specific types of surgery’).*

**N.B – as this agent has no anaerobic or Gram-positive cover, it is not usually used in CSs, unless part of a combination antibiotic regimen advised by medical microbiology / infectious diseases.*

- In obese patients (BMI>30), use of higher dose antibiotics should be considered. (See Appendix 1).

Intraoperative phase:

Hand decontamination:

- The operating team should wash their hands prior to the first CS (e.g. on the elective CS list) using aqueous antiseptic surgical solution, with a single-use brush or pick for the nails and ensure that the hands and nails are visibly clean.
- Before subsequent CSs, hands should be washed again using antiseptic surgical solution. If hands are soiled then they should be washed again with an antiseptic surgical solution.

Incise drapes:

- Iodophor-impregnated drapes are recommended unless the patient has an iodine allergy. In patients with iodine allergy, ordinary non-medicated drapes could be used.

Sterile gowns:

- The operating team should wear sterile gowns in the operating theatre during the operation.

Gloves:

- Consider wearing two pairs of sterile gloves when there is a high risk of glove perforation and the consequences of contamination may be serious.

Antiseptic skin preparation:

- Skin should be prepared at the surgical site immediately before incision using an antiseptic preparation: 2% chlorhexidine gluconate in 70% isopropyl alcohol solution is recommended. Gently apply with a back and forth motion, concentrating at the incision site for 30 seconds before working outwards towards the periphery. It is important that the solution is allowed to air dry fully before continuing with the procedure. If the patient has a sensitivity, povidone-iodine application is used.⁶

Maintaining patient homeostasis:

- Effective tissue healing occurs when tissue oxygenation, perfusion and body temperature are optimal. **Maintaining adequate oxygenation** and hydration during surgery, particularly for women who undergo general anaesthetic, helps in good tissue healing and reduces the risk of SSI.⁷ Consider use of forced air warmer and IV fluid warmer particularly if surgery is prolonged.⁷
- There is no role for insulin for non-diabetic patients to optimise blood glucose postoperatively as a means of reducing the risk of SSI. Diabetic patients however require good glucose control.

Surgical techniques:

- The use of separate surgical knives to incise the skin and the deeper tissues at CS is not recommended because it does not decrease wound infection.
- At CS, the placenta should be removed using controlled cord traction and not manual removal as this reduces the risk of endometritis.
- There is no evidence for the use of wound irrigation or intracavity lavage to reduce the risk of SSI, but it may be considered in cases of chorioamnionitis.
- Good attention to haemostasis is important to reduce the risk of post-operative haematoma and thereby SSI. Use of drains in peritoneal cavity and wound should be considered in those at high risk of developing post operative bleeding e.g. thrombocytopenia.

Antiseptic and antimicrobial agents before wound closure:

- Intraoperative skin disinfectant or topical cefotaxime in CS to reduce the risk of SSI is not recommended.
- Subcutaneous fat closure is not recommended unless more than 2 cm thick.
- Superficial wound drains should not be routinely used at CS because they do not decrease the incidence of wound infection or wound haematoma.⁸

Skin closure

- Obstetricians should be aware that the effects of different suture materials or methods of skin closure at CS are uncertain.

Wound dressings:

- The surgical wound should be covered with an appropriate dressing at the end of the operation with an aseptic technique. There is no robust evidence to support one type of dressing over other, but use of a thin semi-permeable film with or without an absorbent island is preferable. The use of gauze as a primary dressing should be avoided due to its association with pain and disruption of healing tissues at the time of dressing change.
- In women considered to be at extremely high risk of infection such as BMI >40 (class 3 obesity) with coexisting diabetes or other significant risk factor for infection, a Topical Negative Pressure dressing may be considered. (Please refer to Trust Guideline: 'Guidelines for the management of obesity in Pregnancy, during Labour and Postnatally').⁹

Postoperative phase:

Changing dressings:

- An aseptic non-touch technique should be used for changing or removing surgical wound dressings.

Postoperative cleansing:

- Patients should be encouraged to have a shower rather than a bath on first and second day post operative to soak off the dressing and clean the wound. Baths are more likely to spread bacterial infection. ¹⁰

Topical antimicrobial agents for wound healing by primary intention:

- Topical antimicrobial agents do not offer any significant benefit for wounds that are healing by primary intention and are not recommended to reduce the risk of SSI.

Wound healing by secondary intention:

- The Eusol and gauze, or moist cotton gauze or mercuric antiseptic solutions in the management of wounds that are healing by secondary intention is not evidence based and is not recommended.
- It is important to use an appropriate dressing to manage wounds that are healing by secondary intention.
- Refer to a tissue viability nurse for advice on appropriate dressings for the management of wounds that are healing by secondary intention.

Antibiotic treatment of SSI and treatment failure:

- When SSI is suspected (i.e. cellulitis), either de novo or because of treatment failure, the patient is started on appropriate antibiotic that covers the likely causative organisms. Consider local resistance patterns and the results of microbiological tests in choosing an antibiotic. It is important to involve the microbiologist early on if required regarding the choice of antibiotic.

Debridement:

- Do not use Eusol and gauze, or dextranomer or enzymatic treatments for debridement in the management of SSI.

Specialist wound care services:

- A structured approach to care (including preoperative assessments to identify individuals with potential wound healing problems) is required in order to improve the overall management of surgical wounds. To support this,

enhanced education of healthcare workers, patients and carers, and sharing of clinical expertise will be required.

Discharge from hospital:

- On discharge, women should be informed about signs of wound infection and when to seek advice from her community midwife. ¹¹
- All recently delivered women need to be informed of the risks and signs and symptoms of infection and how to prevent its transmission. Advice to all women should include verbal and written information about its prevention, signs and symptoms and the need to seek advice early if concerned, as well as the importance of good personal hygiene. This includes avoiding contamination of the perineum by washing hands before and after using the lavatory or changing sanitary towels. It is especially necessary when the woman or her family or close contacts have a sore throat or upper respiratory tract infection. ¹²

Diet:

- Protein is essential for wound healing, muscle and skin re-growth. It is essential that women are advised that meals or snacks include a good source of protein.

5.0 IMPLEMENTATION OF POLICY

5.1 Dissemination

Following ratification by the Standards and Guidelines Committee this guideline will be published on the Belfast Trust Intranet Site and staff will be informed. Staff regularly accesses the policy and guidelines section.

5.2 Resources

The change in practice will be disseminated to all staff involved in the care of pregnant women through education at local audit days.

6.0 MONITORING

There is on-going prospective data collection of SSI at CS which will be regularly audited and disseminated. Should the need arise, the guideline will be updated.

7.0 EVIDENCE BASE / REFERENCES

1. **Public Health Agency.** Caesarean Section Surveillance in Northern Ireland. Surgical Site Infection Protocol. Version 2.1 2009.

2. **Benson G.M.** Management of iron deficiency in pregnancy.

<http://intranet.belfasttrust.local/policies/Documents/Iron%20deficiency%20in%20pregnancy-Management%20of.pdf>

3. **Haas DM, Morgan S, Contreras K.** Vaginal cleansing before cesarean delivery to reduce post-cesarean infections. *Cochrane Database Syst Rev.* 2013;1:CD007892.

4. **Small F, Hofmeyr GJ.** Antibiotic prophylaxis for cesarean section. *Cochrane Database Syst Rev.* 2002;(3):CD000933.

5. **Small FM, Gyte GM.** Antibiotic prophylaxis versus no prophylaxis for preventing infection after cesarean section. *Cochrane Database Syst Rev.* 2010 Jan 20;(1):CD007482. doi: 10.1002/14651858.CD007482.pub2.

6. **Darouiche RO, Wall MJ, Itani KM, Otterson MF, Webb AL, Carrick MM, Miller HL, Awad SS, Crosby CT, Mosier MC, Alsharif A, Berger DH.** Chlorhexidine-alcohol versus povidone-iodine for surgical site antisepsis. *New England Journal of Medicine* 2010; 362: 18-26.

7. **National Institute for Health and Clinical Excellence.** CG65. Perioperative hypothermia (inadvertent) www.nice.org.uk/CG65.

8. **Gates S, Anderson ER.** Wound drainage for caesarean section. *Cochrane Database Syst Rev.* 2005 Jan 25;(1):CD004549.

9. **Zawislak A, Dohery L, Martin L.** Guidelines for the management of obesity in Pregnancy, during Labour and Postnatally.

<http://intranet.belfasttrust.local/policies/Documents/Obesity%20in%20Pregnancy%20-%20during%20labour%20and%20postnatally.pdf>

10. **National Institute for Health and Clinical Excellence.** CG74. Surgical Site Infection www.nice.org.uk/CG74.

11. **National Institute for Health and Clinical Excellence.** CG37. Postnatal care www.nice.org.uk/CG37.

12. **Centre for Maternal and Child Enquiries (CMACE).** Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer: 2006–08. The Eighth Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. *BJOG* 2011;118 (Suppl. 1):1–203.

Recommended reading:

National Institute for Health and Clinical Excellence. CG132. Caesarean Section www.nice.org.uk/CG132.

American College of Obstetricians and Gynaecologists (ACOG). Use of prophylactic antibiotics in labor and delivery (ACOG practice bulletin; no.120). Washington (DC): *American College of Obstetricians and Gynecologists (ACOG)*. June 2011. <http://www.guidelines.gov/content.aspx?id=34024>

Baaqeel H, Baaqeel R. Timing of administration of prophylactic antibiotics for caesarean section: a systematic review and meta-analysis. *BJOG* 2013; 120:661-669.

Owens SM, Brozanski BS, Meyn LA, Wiesenfeld HC. Antimicrobial prophylaxis for cesarean delivery before skin incision. *Obstet Gynecol* 2009; 114:573-9.

Lamont RF, Sobel J, Kusanovic JP, Vaisbuch E, Mazaki-Tovi S, Kim SK, Uldbjerg N, Romero R. Current Debate on the Use of Antibiotic Prophylaxis for Cesarean Section. *BJOG* 2011; 118(2): 193-201.

The Society of Obstetricians and Gynaecologists of Canada (SOGC). Antibiotic Prophylaxis in Obstetric Procedures (SOGC Clinical practical guideline no. 247). The Society of Obstetricians and Gynaecologists of Canada (SOGC); September 2010. http://sogc.org/wp-content/uploads/2013/01/gui247CPG1009E_000.pdf

Constantine M, Rahman M, Ghulmiyah L, Byers B, Longo M, Wen T, et al. Timing of perioperative antibiotics for cesarean delivery: a metaanalysis. *Am J Obstet Gynecol* 2008; 199:301-6.

8.0 CONSULTATION PROCESS

The principles of this policy were discussed with the microbiologists, anaesthetists and neonatologists.

9.0 APPENDICES / ATTACHMENTS

Appendix 1 – Antibiotics and dosage in specific circumstances
Appendix 2 - Ideal Body Weight Chart

10.0 EQUALITY STATEMENT

In line with duties under the equality legislation (Section 75 of the Northern Ireland Act 1998), Targeting Social Need Initiative, Disability discrimination and the Human Rights Act 1998, an initial screening exercise to ascertain if this policy should be subject to a full impact assessment has been carried out. The outcome of the Equality screening for this policy is:

Major impact

Minor impact

No impact.

SIGNATORIES

(Policy – Guidance should be signed off by the author of the policy and the identified responsible director).



Author

Date: _____ **January 2015** _____



Director

Date: _____ **January 2015** _____

Appendix 1

Antibiotics and Dosage in specific circumstances

<p>History of MRSA colonisation or infection</p>	<p>Use alternate regimen as above for penicillin allergy ie a combination of single doses of IV Metronidazole (500 mg), Teicoplanin (10 mg/kg –maximum 800mg) and Gentamicin (2 mg/kg –maximum 400mg –see appendix 2 for calculation of adjusted dosing weight, using ideal body weight, if >20% overweight) NB use the pregnancy booking weight / adjusted weight to calculate these doses.</p>
<p>Body Mass Index ≥ 30</p>	<p>Consider doubling the IV doses to 3g of Cefuroxime and 1 g of Metronidazole respectively.</p> <p>The doses of Teicoplanin (10mg/kg) and Gentamicin (2mg/kg) are already weight adjusted, though note that the dose of Teicoplanin should not exceed 800mg and that of Gentamicin should not exceed 400mg.</p> <p>For patients where the Actual Body Weight (ABW) is 20% or more greater than the Ideal Body weight (IBW) calculate the Gentamicin Dosing Weight (DW) according to the formula:(DW) = IBW + 0.4 x (ABW – IBW) -See IBW Chart following references. (Appendix 2)</p>
<p>Procedure prolonged > 3 hours</p> <p>(e.g. where a CS culminates in a caesarean hysterectomy)</p>	<p>An additional unit dose of intra-operative Cefuroxime should be administered 3-4 hours after the initial dose (i.e. either 1.5 or 3g according to weight as chosen pre-op).</p> <p>Gentamicin and Metronidazole should only be re-dosed intra-operatively because of a prolonged surgical procedure if ≥ 8 hours have elapsed since the initial doses of these antibiotics.</p> <p>Teicoplanin does not need to be re-dosed because of prolonged surgery.</p>
<p>Endocarditis</p> <p>(Please refer to the latest edition of the BNF Section 5.1. for the most up to date guidance on this subject as this advice may be updated)</p>	<p>Additional antibacterial prophylaxis is not recommended for the prevention of endocarditis in patients undergoing obstetric procedures, unless there is a pre-existing infection at the time of the operative procedure. Therefore in such cases, please review the results of microbiological tests, if necessary in the context of local resistance patterns and consider discussion with the on call microbiologist. Cefuroxime and metronidazole do not cover enterococcal infections, but in most cases the above alternative regimen for penicillin allergy will also cover for endocarditis in general and enterococcal endocarditis in particular, in the rare situations where this is necessary.</p>

Appendix 2

Ideal Body Weight Chart

NB when using the below weights to calculate Gentamicin doses please use the pregnancy booking weight.

For patients where the Actual Body Weight (ABW) is 20% or more greater than the Ideal Body weight (IBW) calculate the Gentamicin Dosing Weight (DW) according to the formula: $(DW) = IBW + 0.4 \times (ABW - IBW)$ -See IBW Chart below.

THE GENTAMICIN DOSE FOR CS PERI-OPERATIVE PROPHYLAXIS SHOULD NOT EXCEED 400MG.

HEIGHT	FEMALES (KG)
5'1"/ 152.5 cm	47.8
5'2"/ 155 cm	50.
5'3"/ 157.5 cm	52.4
5'4"/ 160 cm	54.7
5'5"/ 162.5 cm	57.0
5'6"/ 165 cm	59.3
5'7"/ 167.5 cm	61.6
5'8"/ 170 cm	63.9
5'9"/ 172.5 cm	66.2
5'10"/ 175 cm	68.5
5'11"/ 177.5 cm	70.8
6'0"/ 180 cm	73.1
6'1"/ 182.5 cm	75.4
6'2"/ 185 cm	77.7
6'3"/ 187.5 cm	80.0
6'4"/ 190 cm	82.3
6'5"/ 192.5 cm	84.6
6'6"/ 195 cm	86.9
6'7"/197.5 cm	89.2