

Antibiotics prophylaxis in connection with caesarean section – guidelines at Norwegian maternity departments

Summary

Background. The frequency of caesarean sections is increasing. Infection in operation wounds and/or underlying spaces and organs is a common complication. In *Veileder i fødselshjelp* [Clinical Guidelines in Obstetrics], 2008, antibiotic prophylaxis is recommended in the form of single dose ampicillin or first generation cephalosporins in connection with acute caesarean sections and under special conditions such as prolonged operations. We wanted to find out whether Norwegian maternity departments follow these recommendations.

Material and method. All head senior consultants at maternity departments that carried out more than one caesarean section in 2008 were invited to take part in a survey of the department's written guidelines for use of antibiotic prophylaxis in connection with caesarean section. The extent to which the guidelines were followed was evaluated using data from the Norwegian Surveillance System for Hospital-Associated Infections (NOIS).

Results. 38 of the 42 maternity departments in the survey had written guidelines for antibiotic prophylaxis. Four of these departments gave prophylaxis for all caesarean sections, one only when indicated, and 33 gave prophylaxis in connection with acute caesareans. The guidelines varied with respect to choice of medicinal product and time of administration. At those maternity departments where the written guidelines recommended use of antibiotic prophylaxis with all caesareans, this recommendation was complied with. When the guidelines recommended prophylaxis only in connection with acute operations, there was agreement between practice and the guidelines for between 71 % and 97 % of the patients in the department.

Interpretation. The majority of Norwegian maternity departments have written guidelines for the use of antibiotic prophylaxis in connection with caesarean section. The contents of the guidelines varied substantially, but were largely in agreement with current Norwegian recommendations.

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The frequency of caesarean sections in Norway increased from 2 % in 1967 to 17 % in 2009. More than 9 000 caesarean sections are now performed each year (1, 2). One possible complication with caesarean sections is infection in operation wounds and/or underlying spaces and organs (3). *Veileder i fødselshjelp* [Guidelines in clinical obstetrics] from 2008 recommends the use of antibiotic prophylaxis in the form of a single dose of ampicillin or first generation cephalosporin to prevent infection in cases of acute caesarean section or special conditions, such as a prolonged operation or excessive haemorrhaging. Clindamycin is an alternative in cases of penicillin allergy (4). There is nothing in the guidelines about when the antibiotics should be administered, or the dose.

Hospitals are required through the Regulations on the Norwegian Surveillance System for Hospital-Associated Infections (NOIS) to monitor for infections after certain surgical operations, including caesarean sections. NOIS data showed that 25 % of patients who had an acute Caesarean in the surveillance periods in 2005–2007 had not had antibiotic prophylaxis (5). A survey from 1995 showed that 46 % of Danish maternity departments had written guidelines on antibiotic prophylaxis, but the recommendations varied considerably (6). There is no overview over how Norwegian maternity departments comply

with the recommendations in *Guidelines in clinical obstetrics*.

The main purpose of this study was to survey the existence and contents of written guidelines for antibiotic prophylaxis in cases of caesarean sections at Norwegian maternity departments, and whether the guidelines are complied with in practice.

Material and method

All heads of maternity departments where more than ten caesarean sections were carried out in 2008 (n = 42) were invited to participate. After two e-mail reminders, those who had not responded to the electronic questionnaires were called up and asked the same questions over the phone. All those who replied that they had written guidelines for antibiotic prophylaxis were asked for supplementary information – whether prophylaxis was administered in connection with all caesareans or only acute operations, and whether it was administered on indication in cases of elective caesarean section. We also asked for the product name and dose of the recommended antibiotic, number of doses and time of administering the medicine. Similar information was also requested in connection with penicillin allergy.

The extent to which the departmental guidelines were followed was evaluated with the aid of NOIS data from 2009. The NOIS surveillance periods extend over a three-month period – from 1 September to 30 November. Data on antibiotic prophylaxis and type of operation (acute or elective) are entered in NOIS.

The time of antibiotic prophylaxis was defined either as antibiotics administered

Main points

- Special guidelines for use of antibiotic prophylaxis in connection with caesarean sections observed to varying degree at Norwegian hospitals
- No correspondence between current Norwegian guidelines and international systematic review articles on the use of antibiotics prophylaxis in connection with caesarean sections
- Most Norwegian maternity departments observe the Norwegian guidelines, while four hospitals have their own guidelines in line with the Cochrane recommendations

Table 1 Content of local guidelines on the use of and time of administering antibiotic prophylaxis in connection with caesarean sections, by type of hospital

	University hospitals (n = 7)	Central hospitals (n = 9)	Local hospitals (n = 22)
All caesarean sections	0	2	2
Acute caesarean sections	7	6	20
Only on clinical indication	0	1	0
Time			
At the start of the intervention	2	3	7
After umbilical cord severance	5	6	15

Table 2 Content of local guidelines for antibiotic prophylaxis regime in connection with caesarean sections, by type of hospital

	Intravenous dose (mg)	University hospitals (n = 7)	Central hospitals (n = 9)	Local hospitals (n = 22)
Cefalotin	1 000	1		1
Cefalotin	2 000	5	4	10
Cefuroxime	1 500	1	1	10
Dicloxacillin	2 000		1	
Ampicillin	2 000		3	
Clindamycin	600			1
Metronidazole ¹	1 500			2

¹ Used at two hospitals in combination with cefalotin and cefuroxime, respectively

with the first skin incision/within two hours of operation start or after severance of the umbilical cord. We compared NOIS data on the use of antibiotic prophylaxis after elective/acute operations with the responses from the questionnaire survey concerning the contents of the written guidelines. In this evaluation we excluded patients for whom we lacked information about antibiotic prophylaxis or type of operation and maternity departments that did not have written guidelines on use of antibiotics.

The analyses were performed after a classification at group level of hospitals, where level 1 is maternity departments in university hospitals, i.e. University Hospital of North

Norway, St. Olav's Hospital, Haukeland University Hospital, Stavanger University Hospital, Oslo University Hospital (Rikshospitalet and Ullevål Hospital) and Akershus University Hospital. Level 2 is maternity departments in central hospitals, i.e. Nordland Hospital Bodø, Ålesund Hospital, Førde Central Hospital, Vestfold Hospital Tønsberg, Telemark Hospital Skien, Vestre Viken (Buskerud Hospital), Sørlandet Hospital and Østfold Hospital. Level 3 is maternity departments in local hospitals, i.e. all others.

The analyses were carried out with the aid of Microsoft Office Excel 2003, with the exception of the dropout analyses, which were carried out in SPSS, Version 17.0.

Results

We received responses from all the 42 maternity departments at which more than ten caesarean sections had been carried out in 2008. Of these, 26 responded to the written questionnaire, and 16 were interviewed over the phone.

Four maternity departments, all at local hospitals, had no written guidelines for the use of antibiotics prophylaxis. Of the 38 departments that had written guidelines, four used antibiotic prophylaxis for all caesarean sections, 33 for all acute operations and one only on indication. At 18 of the 33 maternity departments where prophylaxis was administered in connection with acute operations, it was also given in connection with elective operations, but only on clinical indication, such as a prolonged operation, high body mass index or extensive haemorrhaging.

Table 1 shows the indication and time of administering antibiotic prophylaxis by hospital level (local, central or university hospital). At 12 maternity departments, prophylaxis was administered before or at the start of the operation, whereas with 26 prophylaxis was administered after umbilical cord severance.

First-generation cephalosporins are recommended by 21 maternity departments, while three used ampicillin. The recommended dose of first-generation cephalosporin varied from 1 g to 2 g (Table 2). Data on recommendations in the event of penicillin allergy are based on responses from 29 maternity departments. Clindamycin and erythromycin were used most frequently, at 19 and seven maternity departments, respectively. Two maternity departments recommended metronidazole and cefuroxime, one recommended administering these two in combination. There were considerable differences in the dose – from 300 mg to 1 200 mg for clindamycin and from 0.25 g to 2 g for erythromycin.

During the surveillance period in 2009, NOIS received data on 2 183 caesarean sections. Four of the maternity departments that stated that they had guidelines for antibiotic

Table 3 Number and percentage of patients who were given antibiotic prophylaxis at maternity departments at Norwegian hospitals in the period 1 September–30 November 2009, based on data from the Norwegian Surveillance System for Hospital-Associated Infections (NOIS)

Guidelines	Maternity departments with guidelines for use of antibiotic prophylaxis in connection with all caesarean sections				Maternity departments with guidelines for use of antibiotic prophylaxis in connection with acute caesarean sections and clinical indication			
	Elective caesarean sections		Acute caesarean sections		Elective caesarean sections		Acute caesarean sections	
Type of hospital	Patients (number)	Percentage who received antibiotic prophylaxis (%)	Patients (number)	Percentage who received antibiotic prophylaxis (%)	Patients (number)	Percentage who received antibiotic prophylaxis (%)	Patients (number)	Percentage who received antibiotic prophylaxis (%)
University hospitals	0		0		173	5.2	430	97.0
Central hospitals	55	98.2	139	97.1	131	16.0	201	71.1
Local hospitals	35	100	59	98.3	118	16.9	194	82.5
Total	90	98.9	198	97.5	422	11.8	825	87.3

prophylaxis did not deliver data to NOIS in 2009, so that 1 614 patients were included in the analysis. In maternity departments with procedures concerning antibiotic prophylaxis for all acute caesarean sections and possibly on indication for elective operations, the use of antibiotic prophylaxis varied from 71 % to 97 % for acute operations and from 5 % to 17 % for elective operations (Table 3). At the four maternity departments that practised prophylaxis for all caesarean sections, 1.1 % and 2.5 % of women with elective and acute sections, respectively, did not get antibiotic prophylaxis. At the four maternity departments without guidelines, 77 % and 65 % of women received antibiotic prophylaxis for acute and elective caesareans, respectively.

Discussion

This survey shows that the great majority of Norwegian maternity departments have written guidelines for antibiotic prophylaxis in connection with caesarean sections, and these are largely in line with *Guidelines in clinical obstetrics*. As shown for Denmark, we found that the practice of antibiotic prophylaxis in connection with caesarean sections varies, with regard to indication, time of administration, type of antibiotic and dose (6).

At four Norwegian maternity departments it is routine practice to administer prophylaxis in all caesarean sections – in line with the most recent Cochrane recommendations (7). In a metaanalysis based on seven randomised surveys, it is pointed out that when the incidence of post-operative surgical site infections is higher than 5 %, antibiotic prophylaxis ought also to be administered in elective operations (8). NOIS data from 2005–2007 show that the total incidence of post-operative surgical site infections, including endometritis, for all caesarean sections was 8.3 %, and that it was 7.9 % for elective caesareans (5).

Most maternity departments recommend a single dose of first- or second-generation cephalosporins. A minority recommend ampicillin. A Cochrane analysis of 51 randomised studies showed that ampicillin and first-generation cephalosporins have the same infection-preventing effect, that the use of second-generation cephalosporins is not more effective and that a single dose is sufficient (9). Two maternity departments in this survey routinely administered metronidazole in combination with cephalosporins. This combination has been shown to result in fewer infections, shorter time in hospital and lower medicine costs than use of first-generation cephalosporins alone (10). In a recent study based on 10 000 caesarian sections, the combination of cephalosporins at the start and azitromycin after umbilical cord severance resulted in significantly fewer cases of endometritis (11). None of the Norwegian maternity departments reported that they used this combination.

More than two third of maternity departments routinely administered antibiotics after umbilical cord clamping. In a metaanalysis from 2008 based on five studies, two of them randomised, it was concluded that antibiotic prophylaxis administered before the start of the operation reduced the incidence of post-operative infections more than antibiotics administered after umbilical cord severance. The neonatal outcome was not affected, but the follow-up time was often limited to the first six weeks of life (12).

The Norwegian recommendations in *Guidelines in clinical obstetrics* correspond to the Danish ones in terms of both indication and recommendation of a single dose intravenously (13). In contrast to the Norwegian recommendations, the Danish ones prefer second-generation rather than first-generation cephalosporins. The Swedish Association of Obstetrics and Gynaecology has published a report in which antibiotic prophylaxis is recommended for all acute caesarean sections and on indication for elective caesareans (14). In Finland there are no national recommendations for antibiotic prophylaxis in connection with caesarian sections.

NOIS data from 2009 showed that 13 % of the women who had acute caesarians did not get antibiotic prophylaxis, and that the percentage of women who did varied from one maternity department to the next and from one hospital level to the next. Only 2 % of women did not get prophylaxis at maternity departments that had written procedures about administering antibiotic prophylaxis for all caesarian sections. This indicates that compliance is better when the procedure requires that antibiotic prophylaxis be given for all caesarian sections, not just the acute ones.

This is the first systematic survey of guidelines for antibiotic prophylaxis in connection with caesarean sections at Norwegian maternity departments. We used NOIS data to determine whether the guidelines are complied with in practice. The study is strengthened by the fact that the guidelines were assessed against practice in independent data sets.

A possible weakness of the survey is that the NOIS data have not been quality assured against patient records data or other registry data, for example the Medical Birth Registry or the Norwegian Patients Register. A major register integration study is currently in progress with data from all three of these registers.

We did not systematically read the written guidelines of the Norwegian maternity departments. Nor did we quality assure the data on antibiotic prophylaxis. The use of antibiotic prophylaxis in connection with caesarean sections is not included in entries in the Medical Birth Register.

In the analyses of whether the guidelines were followed, 569 (of 2 183) women, mainly at two maternity departments, were excluded because the use of antibiotic prophylaxis was not reported to NOIS. How-

ever, there were no essential differences in age between the women who were included and those who were excluded, but the number of elective caesarean sections and the ASA Score (American Society of Anesthesiology Score) was somewhat higher among those who were excluded.

One of the purposes of NOIS is to describe the incidence of infection by patient characteristics and type of treatment. The information is used as the basis for advice on infection prevention measures, among other things. This survey is an example of how the NOIS register can also be used to evaluate clinical practice. The register does not contain information about risk factors like haemorrhaging, type of antibiotic, time of administration and dose. These are data that should be considered for inclusion in any revised version of NOIS or the Medical Birth Registry.

The recommendations in *Guidelines on maternity assistance* do not correspond to either the Cochrane Reviews of 2010 (7) or a newly published review article in *BJOG* (15), in which antibiotic prophylaxis is recommended for all caesarean sections. Nor do the Norwegian guidelines say anything about the time of administering antibiotic prophylaxis, or the dose. There have been discussions for many years (16–18) as to what should be standard procedure for antibiotic prophylaxis in connection with caesarean sections. Our survey shows that there is still a need for a technical clarification of the contents of the Norwegian recommendations.

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