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Position paper on prevention of surgical site infections in obstetric and gynecological surgery

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ABSTRACT

Surgical site infections represent about a quarter of all infections that develop in the hospital setting.
Far from being solved, this problem is expected even increasing in the next years, mainly for the increase in prevalence of obesity and diabetes and the increasing spread of antibiotic resistance. Obstetrics and Gynecology represent, for frequency of interventions, incidence and impact, one of the major fields of interest.
Caesarean section is one of the most frequent surgical procedures in women and is the one most likely to get complicate with surgical site infection. According to some estimates, up to 12% of cesarean sections will be complicated by surgical site infection with repercussions on women and newborn health, and high costs for the community.
With regard to Gynecology in particular, Gynecological Oncology often requires extensive interventions with a high risk of infections.
The Italian Society of Gynecology and Obstetrics (SIGO) has collected a group of colleagues, from all over Italy and from different professional areas, to "update" and "adapt" the most important international guidelines and recommendations on the prevention of surgical site infections in the Italian clinical practice of obstetric and gynecological procedures, in compliance with current legislation.
The aim of the document is to inform healthcare personnel to strictly adopt standardized procedures and to use for antisepsis pharmaceutical specialties with specific indications.

SOMMARIO

Le infezioni del sito chirurgico rappresentano circa un quarto di tutti le infezioni che si sviluppano nell'ambiente ospedaliero. Lungi dall'essere risolto, questo problema è sembrerebbe in crescita nei prossimi anni, soprattutto per l'aumento della prevalenza di obesità e diabete e la crescente diffusione della resistenza agli antibiotici.
Ostetricia e ginecologia rappresentano, per frequenza degli interventi, incidenza e impatto, uno dei principali campi di interesse. Il parto cesareo è una delle più frequenti procedure chirurgiche nelle donne ed è quello che ha più probabilità di ottenere infezioni chirurgiche del sito. Secondo alcune stime, fino al 12% dei parti cesarei sarà complicato da un'infezione del sito chirurgico con ripercussioni sulle donne, sulla salute dei neonati e costi elevati per la comunità. Per quanto riguarda la ginecologia in particolare, l'oncologia ginecologica richiede spesso interventi estesi con un alto rischio di infezioni.
La Società Italiana di Ginecologia e Ostetricia (SIGO) ha raccolto un gruppo di colleghi, provenienti da tutta Italia da diverse aree professionali, per "aggiornare" e "adattare" le più importanti linee guida e raccomandazioni internazionali sulla prevenzione delle infezioni da siti chirurgici nella pratica clinica italiana delle procedure ostetriche e ginecologiche, nel rispetto della legislazione vigente.
Lo scopo del documento è quello di informare il personale sanitario a adottare rigorosamente procedure standardizzate e ad utilizzare per le specialità farmaceutiche antisepsi con specifiche indicazioni.

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INTRODUCTION

Technological innovations always move the frontiers forward in obstetric and gynecological surgery, offering today to women and to products of conception, opportunities once unthinkable.
However, this must not let us forget some "historical", fundamental, topics of our discipline that never cease to be crucial, for which we cannot let our guard down and a constant updating on preventive and therapeutic methods and possibilities is necessary.
The field of surgical infections owes the birth to an obstetric colleague, the Hungarian Ignac Semmelweis, in the mid-1800s, he had the intuition of the infection transmission to one subject to another and the additional illumination that often is the health professional who transmits the infection.
Even today in the Obstetrics and Gynecology departments, despite significant progress in prevention and control, surgical site infections (SSI) represent a problem with an important impact on individual, economic and social terms. Obstetrics and Gynecology represent, for frequency of interventions, incidence and impact of infections, one of the major fields of interest. Caesarean section is one of the most frequent surgical procedures in women and is the one most likely to get complicate with surgical site infection. According to some estimates, up to 12% of cesarean sections will be complicated by surgical site infection (from cutaneous infection up to endometritis or abscess) with repercussions on women and newborn health, and high costs for the community.
With regard to Gynecology in particular, Gynecological Oncology often requires extensive interventions with a high risk of infections.
In the prevention of surgical site infections, healthcare personnel must strictly adopt standardized procedures and pharmaceutical specialties with specific indications must be used for antisepsis.
In consideration of all these aspects, the Italian Society of Gynecology and Obstetrics (SIGO) has brought together a group of colleagues, from all over Italy and different professional areas, to "update" and "adapt" the most important international guidelines and recommendations on the prevention of surgical site infections in the Italian clinical practice of obstetric and gynecological procedures, in compliance with current legislation and finally disseminate them to all SIGO members.

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SSI DEFINITION AND EPIDEMIOLOGY

According to the definition of the ECDC (European Center for Disease Prevention and Control), postoperative infection that occurs within 30 days of a surgical procedure, or within one year in case of implantation of permanent device, is defined as a SSI (1).
The World Health Organization has defined the reduction of the risk of SSI as one of the 10 priority objectives for safe surgery (2).
Surgical site infections represent about a quarter of all infections that develop in the hospital setting (so-called nosocomial infections) (3).
On the basis of this definition of SSI, it can be seen that the measurements based only on hospital surveillance considerably underestimate the frequency.

SSI can be classified (4) into:

- incisional (about 2/3);
  - superficial when affects skin and subcutaneous tissue;
  - deep when reaches the fascia or muscle plane;
- organ and space infections (about 1/3) when affect any other anatomical site involved in the surgery.

There are numerous factors influencing the probability of incidence of SSIs. Surgical intervention can be classified by the probability and degree of contamination of the wound at the end of surgery. One of the most used classifications is the following (5):

Class I / clean	Surgical interventions on non-infected wound, without affecting the respiratory, gastrointestinal, genitourinary tract. Interventions closed at first instance and, when necessary, drained with closed drains. Surgical procedures consecutive to non-penetrating trauma must be included in this category if they meet the previous criteria.
Class II/ clean contaminated	Surgical interventions affecting the respiratory, gastrointestinal or genitourinary tract, in controlled conditions and without significant contamination of the wound. In particular, surgical interventions on the biliary tract, appendix, vagina and oropharynx are included in this category, provided that there is no evidence of infection and no interruption of aseptic techniques
Class III / contaminated	Surgical interventions consecutive to a recent, open trauma. Interventions in which asepsis is not guaranteed (e.g. open heart massage) or there is significant spreading of the gastrointestinal contents or surgical interventions involving an acute, non-purulent inflammatory process.
Class IV / dirty-infected	Interventions on long-standing traumas with tissue retention and interventions involving acute purulent infectious processes or in the presence of viscera perforation. In these procedures, the microorganisms causing the postoperative infection are present in the operating field before the procedure.

In addition, the risk is also dependent by the conditions of patients who are classified into 5 groups according to life expectancy defined by the American Society of Anesthesiology (6):

ASA 1	Healthy patients undergoing surgery for a localized pathology.
ASA 2	Mild or moderate systemic disease (well-controlled high blood pressure, history of asthma, anemia, smoking, well-controlled diabetes mellitus, mild obesity, age <1 year or> 70 years, pregnancy).
ASA 3	Serious systemic disease (angina, myocardial infarction, uncontrolled hypertension, symptomatic respiratory disease, severe obesity).
ASA 4	Severe life-threatening systemic disease (unstable angina, heart failure, liver or kidney failure).
ASA 5	Dying patient with low survival expectations.

The National Nosocomial Infections Surveillance (NNIS) index allows to divide patients into four categories (0, 1, 2, 3) according to their risk of developing a SSI. This index allows to calculate the infection rates taking into account certain risks related to patients and interventions, in comparing different hospitals.
The index is based on three parameters to which the value 0 or 1 are assigned.

	0	1
Contamination class	<III	≥ III
Score ASA	<3	≥ 3
Duration of the intervention	The duration is below the 75th percentile of the surgical intervention	The duration is above the 75th percentile of the surgical intervention

The 75th percentile of the duration of the intervention is therefore a stable value (7). The type of intervention has a significant influence (8). Looking at European surveillance studies, a study conducted by ECDC in 16 countries based on post-discharge surveillance showed the highest overall SSI rate in Europe 30 days after colorectal surgery (9.5 episodes per 100 operations), followed by cardiac surgery (3.5% in cesarean operations) (1).
Two national SSI surveillance studies have been carried out in our country. The first study (9) was conducted in 48 Italian surgeries, studying cases up to 30 days after surgery. The overall incidence rate of SSI was 5.2% with a maximum of 18.9% for colorectal surgery. At a multivariate analysis, factors independently associated with SSI risk were: emergency intervention (OR 1.73 with 95% CI 1.22- 2.44; p = 0.02), NNIS score higher than 0 (OR 3.34 with 95% CI 1.41-7.93; p = 0.006), preoperative hospital stay longer than 1 day (OR 1.45 with 95% CI 1.06-1.98; p = 0.02) and use of drainage (OR 2.17 with 95% CI 1.39-3.43; p <0.001).
Data from the national SSI surveillance program during the period 2009 to 2011 show (10) an incidence of 2.6%, which in one third of the cases was represented by a deep or involving organ/

space infection. At a multivariate analysis the duration of the intervention above the 75th percentile (OR 1.52 with 95% CI 1.32-1.74; p <0.001), an ASA score higher than or equal to 3 (OR 1.42 with 95% CI 1.22-1.65; p <0.001), a preoperative hospital stay longer than or equal to 2 days (OR 1.22 with 95% CI 1.05-1.41; p <0.05), and an emergency intervention (OR 1.29 with 95% CI 1.11-1.51; p <0.05) were associated with a higher risk of SSI, while a laparoscopic procedure was associated with a significant lower risk of SSI (OR: 049 with 95% CI 0.40-0.61: p <0.001). It should be noted that around 50% of SSIs was identified ten days after surgery, when 90% of the patients had already been discharged. From an epidemiological projection point of view, the aging of population, the increase in prevalence of obesity and diabetes and the increasing spread of antibiotic resistance is likely to increase SSI rate in the coming years.

With regard to the epidemiology of interventions in the obstetric-gynecological area, a subject of particular interest is the caesarean section (CS), considering the high number of CS, the particular immunological condition of pregnant women and the possibility this intervention could have urgent characteristics. The Multicountry Survey on Maternal and Newborn Health made by the World Health Organization in 29 countries showed a total percentage of caesarean sections equal to 28.6% and an antibiotic prophylactic coverage of 87.3% (11).

The risk of post-partum infection after cesarean delivery is approximately 5 times higher than after vaginal delivery (12). SSI frequency after cesarean sections varies in literature from 5 to 12% (13)(14)(15) and can vary from skin infection up to endometritis or abscess around the hysterorafia (16).

In ECDC surveillance, the average incidence of SSI 30 days after cesarean delivery was 2.9%; there are large differences between countries in the incidence of SSI, the highest cumulative incidences are reported in countries with intensive post-discharge surveillance system (Norway, United Kingdom). 87% of the total is represented by superficial SSI, 10% by deep SSI and 3% by SSI involving organ/space. 16% of SSI referred to diagnoses made in hospital, while 84% were post-discharge. Characteristics of women who developed SSI after cesarean were the following:

Age (median)	31 years
Surgery duration (median)	40 minutes
Duration of post-intervention stay (median)	5.6 days
Emergency surgery	53%
Antibiotic prophylaxis	89.1%

According to ECDC data in Italy the recorded incidence is 1.8% (1).

One of the factors most frequently associated with infectious complications after cesarean delivery is prolonged labor (more than 6-8 hours) after rupture of the membranes. In fact with the rupture of the membranes disappears the protective barrier of the uterus against bacterial infections (17). Additional risk factors are systemic diseases, poor personal hygiene, obesity and anemia (17) (18).

After cesarean delivery, the most frequent surgery in the obstetric-gynecological area is hysterectomy mainly due to fibroids, prolapses, hyperplasias, endometriosis and cancer.

The extent of the surgery and the surgical approach can be different.

The rate of SSI after abdominal hysterectomy varies in a range between 1% and 4% with a higher risk when compared to the vaginal approach (19). Laparoscopic hysterectomy showed a significantly lower average rate of infections compared to the laparotomic technique (1.15% vs 3.44%) (20).

In oncological surgery, women can have an immunosuppression state due to therapies or to the psychological status; furthermore, previous radiant therapies may represent a local risk factor for SSI (21).

SSI BURDEN

The onset of nosocomial infections has an important effect on patients and their families due to the increase of mortality and morbidity rate and it has also direct and indirect costs.

Direct costs concern:

- hospital and post-discharge care (hospitalization, intensive care unit, instrumental examinations, drugs, new surgery, rehabilitation therapy, outpatient medical checks, home care):
- NON-healthcare assistance provided by

family members outside of working hours for assistance, treatment and medical visits.

Indirect costs concern:

- possible loss of productivity of the patient and the caregiver;
- the so-called intangible costs i.e. mental, physical and social suffering and negative implications on quality of life.

In Europe, are estimated at 4.1 million cases of hospital infections, with an estimated annual economic load of around 7 billion euros, only for direct costs (8).
In Italy, it has been hypothesized that hospital infections generate approximately 1 billion euros of additional healthcare costs, mainly due to the increased hospital stay (up to € 28,000 for a patient in Intensive Care) (22).
SSI represents the most frequent hospital infections, but its economic impact is extremely variable in consideration of the type of intervention, and of the different site that may be affected, the type and severity of infection, but also of the differences in the methods of management and prevention of infections in different countries. A patient with SSI usually extends his hospital stay by 7-10 days, with an increased risk of staying in an intensive care unit (+ 60%), of new hospitalizations (up to 5 times) or even exitus (up to doubles) (23,24,25,26). Infections occurring after discharge carry the risk of new hospitalizations (27,28). Unfortunately, SSI is more and more frequently caused by antibiotic-resistant microorganisms that make harder the recovery, with the risk of more severe sequelae, even more extended hospitalization and increased costs (29). Long-term consequences of SSI can be persistent pain, unaesthetic scars, joint limitation, impact on quality of life (30,31,3).
Focusing on European data, in the United Kingdom 14,300 SSI were analyzed over about two years, for which an average hospital stay of 10 days was calculated (95% confidence interval: 7-13 days), which is approximately twice compared to patients without SSI (32).
In Germany the estimated additional cost due to SSI varies between 7,500 and 16,000 euros (33).
An aspect often underestimated, especially in the past, is the impact on patient's quality of life. In SSI patients the values of Health-Related Quality of Life (HRQoL) remain low for months or even years compared to subjects without infection(34) (35).
A final aspect of great relevance concerns the cost relating to legal disputes that patients increasingly start against the hospital.

Surgical site infection in obstetric patients carries implications not only for patients and for the society, but also for the newborn, because a complicated puerperium can interfere in the mother-newborn relationship, making hard the breastfeeding and the creation of a real bond between them (36).

MAIN GUIDELINES AND RECOMMENDATIONS FOR PREVENTION OF SSI SPECIFICALLY IN THE OBSTETRIC-GYNECOLOGICAL FIELD

Fortunately, a good percentage of SSI, up to 65%, can be prevented (37).
The prevention concerns health professionals and health procedures, the environment and materials in which the procedures take place, but also patients who must be considered as the gateway for the pathogens responsible for many SSI (38,39,40).
Table I schematically shows the main risk factors for SSI.

Table I. *Risk Factor (10,41).*

RELATED TO PATIENTS	RELATED TO THE TYPE OF SURGERY	RELATED TO OPERATOR
Age	Site Contaminated	Suitability of operating procedures
Comorbidities	Urgency Laparotomy/laparoscopy	
ASA score ≥ 3		
Preoperative hospital stay at least 2 days		

Active SSI surveillance is inherently associated with lower incidence rates, on the contrary intermittent interruptions of an active surveillance have shown a new increase in SSI rates (42). An interesting surveillance program carried out in Italy (10) has shown that a plan for detection and

reporting of hospital infections, in hospitals participating for more than 2 years, was able to lead to a reduction of 29 % of SSI rates.
In Italy there is a particular focus on quality and safety in health services through programming policies and service management and the practice of the Integrated Clinical Government (43,44).
Adverse events related to care processes are unexpected events resulting in unintentional and undesirable damage to patients, they can be divided between preventable and non-preventable; an adverse event attributable to a medical error is a preventable adverse event. SSI is a care-related infection and therefore can be assimilated to a preventable adverse event.
According to the Integrated Clinical Government, risk management concerns not only to clinical activities, but also technological-environmental, organizational aspects without forgetting the care appropriateness and sustainability.

The Gelli-Bianco law decree n. 24 March 8,2017, promotes the adoption of guidelines and good practices based on evidences (45). From a practical point of view, all health professionals are involved in patients taking care and sanitary facilities are called to actively engage monitoring strategies, prevention and risk management and to promote the implementation of specific protocols to improve guidelines.
In approaching the recommendations, it should be considered that evidence-based surgery, behavior and/or practice, if adequately carried out, will improve the quality and outcomes of procedures with a better effect than would be obtained if implemented separately (46).
The application of recommendations concerns all healthcare personnel and facility as a whole: surgeons, nurses, instrumentalists, operating room technicians, anesthesiologists and any other healthcare professional involved in the pre, intra and post-operative management of the patient, not excluded - in certain aspects - other crucial personnel such as infectious disease specialists, pharmacists, sterilization staff, up to decisional and organizational hospital staff (health department, quality and risk management staff, surgical, anesthesia and resuscitation department directors, nursing and pharmacy and organization and management of operating room managers) in order to convey the importance and the cost-effectiveness standardization for patient safety.
In this document, among all evidence-based materials and recommendations included in the international guidelines for SSI prevention, are taken in consideration those fundamental in terms of strength of scientific evidence and describing perioperative procedures concerning operator habits and facility organization:

- global guidelines on SSI prevention, made by the World Health Organization (WHO). First published on November 3rd, 2016. Structured into 29 recommendations, the quality of evidence currently available ("very low", "low", "moderate", "high") is provided for each recommendation, but also the strength of the recommendation itself. http://www.who.int/gpsc/ssi-guidelines/en/
- Centers for Disease Control and Prevention (CDC), published on May 3rd, 2017 on the surgical section of JAMA. https://www.cdc.gov/infectioncontrol/guidelines/ssi/index.html
- Italian Consensus Document "Recommendations for perioperative prevention of surgical site infections" in which, referring to the most important international Guidelines published by WHO and CDC, are analytically examined the evidence-based recommendations that authors identify as crucial for SSI perioperative prevention based on the consistency of scientific evidences supporting them, the new data, the cost-effectiveness tests and the strength of recommendations.

PATIENT PREPARATION AND ANTIBIOTIC PROPHYLAXIS

Nutritional Support

Considering oral or enteral administration of nutritional supplements in order to prevent the onset of SSI in malnourished patients undergoing major surgery (WHO 2016, conditioned/very low).
According to a meta-analysis conducted by the

LG WHO 2016 working group, in major oncological surgery, malnourished patients (body mass index <18.5 and/or body weight 15-20% lower than the normal for age and height) fed with multiple nutritional preparations, showed a preventive effect towards SSI compared to a standard nutritional support.

Preoperative shower

Patients should shower or bathe, including hair washing, the previous day or the day of surgery, using normal soap or an antiseptic soap.
(WHO 2016, conditioned/moderate; CDC 2017, IB). It is not known what is the optimal time to have a preoperative shower or bath, the total number of soap or antiseptic applications and the effectiveness of cloths soaked in chlorhexidine in order to prevent SSI.
(CDC 2017, no recommendation/unresolved topic).
The preoperative bath or shower all over the body is considered a good clinical practice to reduce the bacterial load, especially at the incision site, remembering that the first source of infection is represented by microorganisms present on the skin.
From a practical point of view, the patient can have the preoperative shower at home or in the hospital bathroom if she is hospitalized, although if she is bedridden the ward staff must wash the patient.
The practice of the preoperative shower can be adequately explained and its importance must be underlined before surgery and reported in the instruction sheet given to the patient before hospitalization. At the time of admission, the execution and adequacy of the practice must be verified. Particular attention for laparoscopic surgery must be paid to navel hygiene.

Trichotomy

Routine preoperative hair removal should be avoided; trichotomy must be performed only when necessary, i.e. in case hair, at or around the surgical site, interferes with the surgery. (WHO 2016, strong / moderate; CDC 2017 reaffirms CDC recommendation 1999).

- When necessary, it must be carried out, exclusively with an electric clipper, the day of surgery (WHO 2016, strong/moderate; CDC 2017 reaffirms CDC recommendation 1999).
- It is believed that the safest time to have trichotomy is immediately before surgery (WHO 2016; CDC 2017 reaffirms CDC recommendation 1999).
- It is not possible to recommend or not the use of depilatory creams as the indications are controversial (WHO 2016).
- The razor trichotomy with traditional blades is absolutely not recommended both in the preoperative phase and in the surgery room (WHO 2016, strong/moderate).

This recommendation undermines the traditional surgical preoperative preparation based on "fasting, enema and trichotomy".

Having a completely hairless surgical field was considered protective against SSI, but today, on the contrary, trichotomy is considered a risk factor for SSI as it can cause skin microtraumas and abrasions that favor bacterial colonization of the surgical site in particular if carried out with a traditional razor.

In cases where the surgical field is in an area where hairs must be removed because they interfere with the surgical activity, the traditional razor must not be used, an electric clipper which cuts the hair at the base, 2-3 mm from the skin is indicated. The electric clipper must have disposable or reusable razor blades, which can be properly disinfected for every new patient, taking attention in the staff training regarding supply, use and maintenance of the clippers.
The time aspect should not be underestimated because, when absolutely necessary, the trichotomy must be performed maximum two hours before surgery; therefore from a practical point of view, at the time of the call or even in the surgery preparation room (41).

Women must be informed not to shave independently before admission and this information must be reported in the information booklet.
As for hair removal by wax, there is no evidence,but certainly due to the risk of micro-

injuries it must be done at least 10 days before surgery.

PERIOPERATIVE ANTIBIOTIC PROPHYLAXIS (PAP)

- PAP should be administered only when indicated according to the type of surgery (WHO 2016, strong/low; CDC 2017, IB);
- It must be made within 120 minutes from the incision, taking into account the half-life of the antibiotic (WHO 2016, strong/moderate), that is, in a timing that allows to reach an effective concentration in the serum and tissues at the time of incision (WHO 2016; CDC 2017, IB);
- In cesarean section it is preferable to administer PAP before the skin incision (CDC 2017, IA);
- It is recommended not to continue PAP after suturing the surgical incision (WHO 2016, strong/moderate), even in presence of drainage (WHO 2016, conditioned/low; CDC 2017, IA).

When considering the opportunity of a Perioperative Antibiotic Prophylaxis (PAP) to prevent SSI, it should be considered the assessment of the risk of side effects, the increase of antibiotic resistance and infections by C. Difficilis (47). The effectiveness of PAP is always closely linked to the kinetics of the antibiotic used: the shorter the half-life of the antibiotic used, the closer must be the administration at the time of incision of the skin. The antibiotic characteristics must ensure sufficient blood and tissue concentration for the entire duration of the surgery, because insufficient concentrations at the time of suturing have even proven to favor the development of SSI. It is reasonable to administer an additional intraoperative dose of antibiotic in case of surgeries lasting longer than twice the half-life of the antibiotic or in case of significant blood loss during surgery (> 1500 ml in the adult). It is underlined the absence of indications to continue the administration of antibiotic in absence of signs of infection after the end of surgery.
The obstetric population represents a particular challenge for antibiotic prophylaxis, because the transplacental passage of antibiotic to the fetus must be considered. In the past, the administration of antibiotic prophylaxis was delayed until after cord clamping to avoid the passage of antibiotics to the fetus. The fears related to the administration of antibiotic to the newborn concerned the possible masking of a neonatal infection, the interference with the diagnostic-therapeutic path of a possible sepsis, and the selection of antibiotic resistant bacterial strains that can affect the newborn (46). Based on these theoretical risks, the Centers for Disease Control and Prevention's Guideline for Prevention of Surgical Site Infection, in 1999 established, with a high level of evidence, that for high-risk cesareans, antimicrobial agents should be administered immediately after cord clamping rather than preoperatively (4). A meta-analysis comparing the administration of antibiotic prophylaxis before skin incision versus antibiotic prophylaxis after cord clamping concluded that antibiotic prophylaxis before incision, in caesarean sections, not only decreased the incidence of postpartum endomyometritis and the overall incidence of infectious episodes, but also did not adversely affect any neonatal parameters (47). Several studies have been carried out to evaluate the impact of the timing of antibiotic prophylaxis on postoperative infectious complications and there was evidence of a decrease in infectious complications with antibiotic administration before skin incision compared to post-clamping administration (48,36).
In 2010 a Cochrane review concluded that the antibiotic prophylaxis compared to the absence of prophylaxis was associated with a reduction in feverish episodes, wound infections, endometritis and other mother's serious infectious complications, but data were insufficient to compare the timing of antibiotic administration (49).
The American College of Obstetricians and Gynecologists (ACOG), in accordance with the recommendations of the National Surgical Infection Prevention Project (50) recommended antibiotic prophylaxis for all caesarean sections and concluded that the administration should be performed within 60 minutes from start (51).
A Cochrane systematic review, that analyzed 10 trials and a total of 5041 women, finally showed that PAP is more effective if administered before incision, rather than after clamping the umbilical cord, in reducing maternal infectious complications. In particular, women who received

antibiotics pre-operatively were 46% less likely to develop endomyometritis and 41% less likely to develop surgical wounds than women who received the antibiotic after umbilical cord clamping (52).
Bactericidal levels against group B streptococcus were obtained in maternal, fetal and amniotic fluid samples even 5 minutes before ampicillin administration (54). Data are in harmony with the results of the Cochrane review aimed at defining which antibiotics were most effective in reducing the incidence of infectious complications in cesarized women (55). The most commonly used antibiotic in elective cesarean delivery is cefazoline: pharmacokinetic studies show that the MIC (minimum inhibitory concentrations) for group B streptococcus are reached in maternal, fetal and amniotic fluid samples within 30 minutes after administration (53). In non-elective cesarean delivery, the choice is directed towards a second generation cephalosporin, an ureidopenicillin or an aminopenicillin and betalactamase inhibitor association (47). In gynecological surgery, the PAP administration resulted in a reduction of the infection rate and hospital costs(56). Antibiotic prophylaxis has always proven to be significantly effective in SSI prevention, both in abdominal (57) and vaginal hysterectomies (58). As far as laparoscopic gynecological procedures are concerned, there are some evidence that antibiotic prophylaxis seems unnecessary (59), but current recommendations do not distinguish between laparoscopic or laparotomic approach regarding the need of PAP (60).

ORAL ANTIBIOTIC PROPHYLAXIS

The administration of preoperative oral antibiotics in combination with mechanical bowel preparation (MBP) is suggested to reduce the risk of SSI in adult patients, candidates for colorectal elective surgery (WHO 2016, conditioned/moderate):

- MBP alone (without oral antibiotic administration) should not be used for reducing SSI in adult patients, candidate for colorectal surgery (WHO 2016, strong/moderate).

Oral administration of antibiotics in combination with preoperative administration of glycolpolyethylene or sodium phosphate solutions to induce bowel emptying (MBP) showed to reduce significantly the rate of SSI compared to MBP alone, therefore, in case of mechanical preparation, oral antibiotic prophylaxis should also be administered, both in addition to intravenous antibiotic prophylaxis, when appropriate.
Obstetric-gynecological surgery must be considered mostly "normal" abdominal surgery, fast track, without the need for abdominal preparation and oral antibiotic prophylaxis, but in Gynecological Oncology interventions involving the rectum, prophylaxis must be applied.

ANTISEPSIS

Skin preparation of the surgical team

Before entering the surgery room, wash your hands with non-medicated soap to remove organic material and reduce the bacterial load of the skin (for the correct hand hygiene in health sector, refer to the specific gl on the subject):

- before putting on sterile gloves, perform the surgical preparation of the hands and forearms of health personnel by washing with antiseptic soap or by applying hydro-alcoholic gel.

(WHO 2016, strong/moderate).

One of the cornerstones in SSI prevention is the surgical preparation of hands to keep the contamination of the surgical field at low levels, reducing the entry of microorganisms coming from the surgeon's skin into the surgical incision, especially in case of breakage of sterile gloves during surgery.
After removing all kind of jewelries and, if present, the nail polish (48), antiseptic soaps should be used, according to the manufacturer's instructions, generally for 2-5 minutes.
If a hydro-alcoholic gel is used, a product with a long-lasting action (for example chlorhexidine based) according to the manufacturer's instructions should be preferred, remembering that the effectiveness of the alcohol-based gel can be reduced when the product is applied on a not perfectly dry skin.

Sterile wipes and towels must be available for drying.

PATIENT SKIN ANTISEPSI

Before starting the surgical site antisepsis, cleanse the skin thoroughly around the incision area to remove coarse contamination (CDC 2017):

- patient's skin antisepsis must be performed with an alcoholic antiseptic solution based on chlorhexidine gluconate. In people allergic to chlorhexidine, the antisepsis with alcoholic iodopovidone represents a second choice, if applied correctly and, possibly, in a 10% alcoholic solution.
- The use of colored products is recommended as an opportunity to verify the correct application of the product.
- The use of the disposable applicator, compared to the traditional method using gauze and multipurpose containers, improves the safety (risk of fire and contamination), standardization (correct dose of antiseptic) and practicality (time of application) of the procedure.
- There is currently no evidence in favor of repeating the antisepsis before the closure of the surgical incision.

(CDC 2017, no recommendation/unresolved topic).

Up to 106 bacteria per cm^2 are estimated to be present on human skin, 80% of the bacteria are found in the first five layers of the epidermis, while the remaining 20% are closely related to the skin annexes (sebaceous glands, sweat glands and hair formations) (36).

Any action that alters the integrity of the skin (from a puncture of a vascular access to a surgical incision), decreases the barrier function towards infections and allows the microorganisms present to reach the circulatory stream or the tissues.

In the SSI case, patient's endogenous skin microflora is the main source of infection (39) most of which are aerobic gram positive cocci (49), including reported strains of methicillin-resistant Staphylococcus aureus (MRSA) (50).

When dealing with surgical antisepsis, it is necessary to talk about the type of antiseptic and the method of application.

From a semantic point of view, it is useful to remember that disinfectant means a chemical agent with antimicrobial activity intended for the use on inanimate objects or surfaces (instrumental or environmental), whereas the antiseptic is an organic or inorganic substance used on living tissues to prevent or stop the action and growth of pathogenic microorganisms.

The ideal antiseptic should have the following properties: broad spectrum of action, rapidity of action, long duration, maintenance of effectiveness in presence of blood and organic material, good tolerability.

Chlorhexidine and povidone iodine are comparable as antimicrobial spectrum, but chlorhexidine in alcohol has a faster action, a more stable and prolonged activity and a better residual effect despite exposure to body fluids, because unlike povidone iodine is not inactivated by contact with organic substances (51). At low concentrations chlorhexidine is effective on Gram-positive bacteria, but an increase in concentration broadens the spectrum of action to include Gram-negative bacteria and fungi. Chlorhexidine is positively charged and reacts with the negative charges of the microbial cell surface, destroying the integrity of the cell membrane, penetrating inside and causing the loss of components up to cell death. Chlorhexidine has high affinity with epidermis proteins, thanks to which the molecule is adsorbed at the stratum corneum level, where it remains active for hours.

The antiseptic action of iodopovidone is determined by the iodine which progressively frees itself from the complex, binds to lipids and oxidizes the components of the cytoplasm and membranes: for this reason, its speed of action is intermediate and, while using it, it is essential to guarantee an adequate contact time (in any case longer than 2'). The residual effect is scarce, and a negative aspect is that povidone iodine is rapidly neutralized by organic material. The products are on average well tolerated; iodine allergy is much more frequent than chlorhexidine allergy, but in those allergic to chlorhexidine, antisepsis with alcoholic iodopovidone is a valid second choice alternative, if applied correctly and, possibly, in 10% alcohol solution.

For surgeons and surgery room staff, an added value is the presence or absence of coloring which gives security of the operating field

antisepsis (52). In general, alcohol-based antiseptic solutions are more effective than watery ones in reducing the risk of SSI, alcoholic chlorhexidine is significantly better than povidone iodine in aqueous solution in preventing superficial and deep incisional infections (53). Furthermore, iodopovidone in aqueous solution requires longer contact time, while alcoholic solutions have the advantage of drying quickly when applied to the skin, reducing the preparation time of the surgical site (22).

By comparing preparations in alcoholic solution for surgical antisepsis of patient's skin, chlorhexidine in alcohol is more effective than povidone iodine in alcohol.

A systematic review of 19 international studies showed a 30% reduction in the incidence of SSI in patients undergoing preoperative antisepsis with alcoholic chlorhexidine, compared to alcoholic iodopovidone (22), plus a meta-analysis that evaluated 13 RCT on patients undergoing clean and clean/contaminated surgery confirmed a significant superiority of the preoperative antisepsis with chlorhexidine in alcohol compared to povidone iodine in alcohol in SSI prevention (RR, 0.70, 95% CI, 0.60-0.83) (54). Chlorhexidine is more expensive than povidone iodine, but an economic analysis of studies comparing alcoholic chlorhexidine in a sterile applicator compared to alcoholic iodopovidone for surgical site antisepsis, has shown that it is up to 36% more cost -effective of alcoholic iodopovidone (55).

For mucosal antisepsis, the choice must fall on a product in an aqueous solution; in fact, alcohol and alcoholic solutions are irritating and drying for mucous membranes with the result of causing pain to the patient and paradoxically promoting the growth of microorganisms creating local damage.

Mucosal antiseptics therefore need to be evaluated not only for their antimicrobial activity, but also for any cytotoxic, irritative, sensitizing action that can be caused in different ways on different mucous membranes in different surgical areas (ophthalmology, otorino, gynecological, urological etc.).

Recent NICE guidelines state that if the surgical site is close to a mucosa, chlorhexidine in aqueous solution should be used (48).

With regard to the antiseptic product used, the regulatory aspects vary in the different countries even if the European Chemicals Agency (ECHA) prepared a guide for the application of the European Biocides Regulation (BPR-EU Regulation 528/2012). The document specifies very clearly that products for injured skin antisepsis (e.g. surgical wound antisepsis) or intact skin antisepsis prior to invasive medical treatment (e.g. preoperative skin antisepsis before surgery or before the application of a vascular access) must always be medicinal products, and therefore fall under the regulation of Directive 2001/83/ EC (56).

Several European countries, such as Germany, the United Kingdom, Belgium and the Netherlands have already included in their national legislation the antiseptics used on skin before surgery in the field of medicinal products. According to current legislation in Italy the situation is more ambiguous: they must be registered as "medicinal products", and as such they must respond to the Legislative Decree no. 219/2006 and subsequent amendments and additions in transposition to the European Directive of antiseptics intended for use on damaged skin and mucous membranes. Instead, they can be registered at the Health Ministry as "presidi medico-chirurgici" the antiseptics used on intact skin (e.g. for staff hand washing and surgical site preparation) and disinfectants for environmental use. Finally, disinfectants for medical devices and/or equipment are registered as "medical devices".

It is not a mere classification issue, the differences and possible consequences are considerable. Drugs require clinical efficacy and safety studies for marketing and ministerial authorization (AIC), but above all, during production, the drug is subjected to Good Manufacturing Practices, there is a system production quality management, internal and external controls, a pharmacovigilance system and sterility verification. On the contrary, no specific requirements are required for biocides manufacturing process and not even sterility certificates or microbiological controls. Also in the storage and distribution chain of drugs, guarantees and checks are required from suppliers and traceability is ensured, i.e. the possibility of identifying and following a product through all stages of production, transformation and distribution up to the time of its use (and the consequent traceability, that is the possibility of following the history of

a product backwards), whereas this is not possible for biocides. The risk of bacteria or spores contamination in non-sterile antiseptic solutions, especially during the production process (intrinsic contamination), is not hypothetical, but is widely documented in literature (57,58,59) with cases of epidemics and pseudo-epidemics (60) and lots of antiseptic solutions (classified as biocides) withdrawn from the market because of contamination (61). As summarized by the Royal College of Surgeons in conjunction with the Medicines Agency, the best way to minimize damages is to use the product duly authorized for its specific intended use, in accordance with the manufacturer's instructions for use (62).

With regard to the method of application of the chosen antiseptic, the Spanish Guidelines expressly recommend a disposable applicator and a method of "back and forth" application for 30 seconds (36) which allows to reach a greater number of skin layers, going deeper into the epidermal layer and allowing a more effective reduction of bacterial load (63). It should be remembered that about 20% of bacteria live in the deepest layers of the skin, between necrotic skin cells, sweat glands and hair follicles, making adequate decontamination of the skin difficult (64).

In a study comparing chlorhexidine in alcohol with applicator and iodopovidone in alcohol with gauze, with standard method, the compliance of health professionals with the protocol for the correct application of the antiseptic was significantly higher for chlorhexidine with applicator, the essential steps of the application method were completely carried out 90% of the times with chlorhexidine and 33.3% with iodopovidone (p = 0.0001) (65). Furthermore, since alcohol is flammable and stagnation of alcoholic solutions on patient's drapes and skin surfaces (in particular supraclavicular cavities, armpits, navel, groin...) can potentially cause a fire risk, particularly when using electrocauteries and surgical lasers (66), it is necessary to wait for the evaporation of any excess antiseptic for at least 3 minutes, or use disposable applicators to avoid shedding (41).

In summary, the disposable applicator, compared to the traditional method using gauze and multipurpose containers, improves patient's antisepsis safety, reduces risk of fire and solution contamination; in addition, standardization and practicality of the procedure is increased, allowing to dispense the correct dose of antiseptic and reducing the risk of operator-related errors, the risk of cross-contamination and the time of application (67).

The antisepsis practice of the operating field in the obstetric-gynecological area presents particular problems related to surgery on mucous areas such as vagina or possible risks for newborn (hypothyroidism).

The frequency of cesarean sections required particular attention to the issue of preoperative skin preparation, pivotal for improving the quality of care and reducing the infection rate of the surgical site in patients undergoing cesarean section (68) (69).

In 2012 the Cochrane Library carried out a review, then updated in 2014 (70) in which 6 studies were analyzed, involving 1522 women and in which iodine, povidone iodine, alcohol, chlorhexidine and parachloromethoxylenol were used for skin preparation. As main conclusion, the authors claim that chlorhexidine gluconate shows lower bacterial growth rates after cesarean section than iodine. However, in the same conclusion the authors pointed out that in the articles there were no exhaustive data to evaluate the different antiseptics preparations in aqueous or alcoholic solution and that further studies are necessary.

In a randomized controlled trial of SSI after cesarean delivery, preoperative cutaneous antisepsis with 2% chlorhexidine and with 70% isopropyl alcohol in sterile applicator was associated with a significantly lower risk of SSI, compared to that with 8.3% povidone iodine and with 70% isopropyl alcohol (23 patients (4.0%) vs .42 (7.3%) RR 0.55, CI 95% 0.34 - 0.90). The superficial infection rate was 3.0% in the chlorhexidine - alcohol group and 4.9% in the iodine - alcohol group (P = 0.10); the rate of deep infection was 1.0% and 2.4% respectively (P = 0.07).

The reduction risk was not influenced by the fact that the caesarean section was scheduled or not, the presence or absence of obesity, the type of suture, the presence or absence of chronic diseases or the presence of diabetes. 52% of the cultures were polymicrobial and Staphylococcus aureus was the most commonly isolated microorganism (37%) (16). Given the higher efficacy, speed and ease of application on obstetric patients, 2% chlorhexidine in alcoholic solution in disposable applicator is of particular importance

in emergency caesarean sections where, as known, the incidence of SSI is higher and the time for fetus extraction is, in most cases, crucial.

Another extremely frequent practice in obstetrics is amniocentesis; the infection following amniocentesis is extremely rare, it is estimated 1 case per 1000 procedures for inoculation in the amniotic cavity liquid of bacterial flora present on the skin (71). For a long time, disinfection of the skin before amniocentesis was made with iodopovidone-based solutions (72), where chlorhexidine was superior as skin antiseptic in the positioning of venous catheters and before blood culture samples (73). In a study of 50 pregnant women, the skin was cleaned with chlorhexidine in alcoholic solution on one side and povidone iodine on the other. The post-cleaning colony average count was 17.3 for povidone iodine and 0.12 for chlorhexidine, the median for povidone iodine was 2 (range from 0 to 142), whereas for chlorhexidine in alcoholic solution it was 0 (range from 0 to 3) with a statistically significant results in favor of chlorhexidine. In the chlorhexidine group colonies developed only in 3 out of 50 plates, whereas in the iodopividone group colonies developed in 30 plates out of 50 (72).

In a retrospective study, two homogeneous groups of patients undergoing elective laparoscopic gynecological surgery were compared in which the skin antisepsis was made with iodopividone or with chlorhexidine in alcoholic solution. The infection rate was 14.6% in the iodopividone vs. group. 4.5% in the chlorhexidine in alcoholic solution group ($p = 0.011$) with a risk of developing SSI 3.2 times higher (95% CI 1.13-9.30) in the iodopividone group compared to chlorhexidine in alcoholic solution. Obviously, hospitalization in patients with SSI was significantly longer (11.8 ± 7.7 vs. 6.3 ± 3.2, days, $p = 0.002$) (74).
Conventional skin antisepsis usually leaves more product than necessary on the skin, which accumulates in the sloping areas, and can wet the sheets which will then remain in contact with the patient's hips or back with the risk of causing chemical burns. The application of the exact dose obtained with 2% chlorhexidine in 70% isopropyl alcohol in sterile applicator will avoid this risk, particularly important in oncologic surgery, which have rather long surgery time such as in cervical, endometrial and ovarian cancer surgery (36).
Pelvic floor surgery treats an area where skin and mucous surfaces coexist.
Vaginal delivery is physiological and the birth canal is not currently cleaned; in the past the risk of inducing neonatal hypothyroidism was demonstrated with the use of iodine-based preparations (75), and therefore aqueous chlorhexidine was preferred.
In a randomized comparison study between 4% chlorhexidine gluconate and 10% iodopovidone in patients undergoing vaginal hysterectomy, the cultures taken at 30 minutes in the iodinepovidone group were 6 times more likely to be contaminated than those taken in the chlorhexidine group, a trend similar is confirmed for crops obtained at 90 minutes even if the difference does not reach statistical significance (76).
Chlorhexidine as a vaginal preparation has shown to be safe in 3 large randomized studies (77,78,79), but a case of desquamatory reaction after vaginal scrub with chlorhexidine has also been reported (80).
Iodopovidone (10% iodine) in aqueous solution is currently used whenever vagina asepsis is needed, such as before the manipulator insertion in laparoscopic surgery.

INTRAOPERATIVE MANAGEMENT

Tissue Oxygenation

Patients undergoing general anesthesia with endotracheal intubation and mechanical ventilation must receive oxygen supplementation during surgery and, if possible, in the immediate postoperative time (for 2-6 hours) in order to reduce the risk of SSI.
(WHO 2016, strong/moderate; CDC 2017, IA).
According to WHO Guidelines, the value of the inspired oxygen fraction (FiO_2) should be 80% (WHO 2016, strong / moderate).
A meta-analysis conducted by the WHO Guidelines expert group has shown that the perioperative oxygen inspired fraction (FiO_2) 80% is superior to the standard (30-35%) in reducing the risk of SSI in patients undergoing surgical procedures under general anesthesia with endotracheal intubation and through a high flow mask in the immediate postoperative time.
Oxygen supplementation beyond the standard

of 30% is intended to improve tissue oxygenation in the surgical area and to enhance the patient's defense by increasing the oxidative capacity of the neutrophils.
The effect of hyperoxygenation is maximized by the maintenance of perioperative normothermia and normovolemia.

Normothermia

It is recommended to keep patient's normothermia throughout the perioperative time. (WHO 2016, conditioned/moderate; CDC 2017, IA):

- the use of heating devices in the surgery room and during the surgical procedure to avoid patient's hypothermia is suggested in order to reduce SSI risk and other important complications (myocardial events, blood loss requiring transfusions) (WHO 2016, conditioned/moderate).

No recommendation can be made on what is the best system to obtain and maintain normothermia, on minimum temperature level to be reached, on best time to start heating and optimal duration (CDC 2017, no unresolved recommendation/topic).

Maintenance of normothermia has a significant benefit on reducing the risk of SSI; a decrease in body temperature can occur commonly during surgery due to a reduced function of neutrophilic granulocytes and secondary hypoxia to vasoconstriction, both associated with an increased risk of SSI (41).
From a practical point of view, the patient at high risk of hypothermia should be identified (ASA from II to IV, temperature <36 ° C before urgent surgery, combined general and loco-regional anesthesia, major or intermediate surgery, risk of cardiovascular complications) (41).

Particular attention must be paid in long-term surgeries.

Normoglycemia

Adequate perioperative glycemic control is recommended in all surgical patients, diabetic and non-diabetic, in order to reduce the risk of SSI.

(WHO 2016, conditioned / low; CDC 2017, IA):

- the benefit of a glicemic target < 200 mg/dl is certain (CDC 2017, IA).
- Low quality evidence supports additional benefits associated with intensive glycemic control (<110-150 mg/dl) (WHO 2016, conditioned/low).
- In case of glicemic target <110 mg/dl, pay attention to the risk of hypoglycaemia (WHO 2016).

Studies towards an intensive glycemic control both in intra- and in postoperative phases showed advantages in SSI onset.
Surgical stress causes an increase in blood glucose levels during and after surgery and several observational studies have shown that such hyperglycaemia is associated with an increased risk of SSI in both diabetic and non-diabetic patients, in different types of surgery (81).

Normovolemia

Monitor patient's blood volume throughout the intraoperative time and ensure adequate restoration of body fluids (WHO 2016, conditioned/low; CDC 2017, IA):

- the intraoperative use of Goal Direct Fluid Therapy (GDFT) protocol is recommended in order to reduce the SSI risk (WHO 2016, conditioned/low).

The intraoperative GoalDirectFluidTherapy protocol has a significant benefit in reducing the rate of SSI compared to standard fluid management and the effect is confirmed in the postoperative time. The GDFT protocol allows to standardize patient's hemodynamic monitoring by evaluating the volume based on volumetric parameters such as the Stroke Volume (SV) or the Stroke Volume Variation (SVV), rather than pressometric, in order to restore an adequate state of hydration and maximize the release of oxygen to the tissues (82).
The control of blood losses must be particularly careful in obstetrics, if there is fluid loss more than 500 ml, fibrinogen is administered.

OBSTETRIC-GYNECOLOGICAL APPLICATIONS

150 years after Ignazio Semmelweis's fundamental observations on puerperal sepsis and its reduction due to the antisepsis of the surgeons' hands, SSI is now at the center of a renewed interest because surgical procedures are increasingly complex, and candidate patients have a much higher risk of contracting infections than in the past (more advanced average age, polymorbidity, even debilitated subjects, polypharmacies).

In the obstetric-gynecological field, surgeries of greatest interest for SSI are those in obstetrics, in oncological surgery and urogynecology; fortunately, minimally invasive techniques have reduced, but not eliminated, the infectious risk. The problem is however of great importance because in Italy 45% of germs are multi resistant.

The proposed actions are recommended with the aim of reducing the impact of surgical site infections in terms of morbidity and mortality. To implement them, plans and investment in human capital are required by the health organization because the action effectiveness does not depend on their formal correctness, but on the ability to make them concrete in the daily context.

The implementation of evidence-based bundles (definable as the implementation of three or more processes capable of preventing SSI) for the prevention of infections in cesarized patients has shown, in a broad meta-analysis, to be able to lower the infection rate from 6.2% to 2.0% (pooled RR 0.33, 95% CI 0.25–0.43) (83).

The change in previously assumed, often consolidated, behaviors requires determination and a clear responsibility of each health professional. Conscious adherence comes from a correct information and training (to explain the reasons of some choices, the assess of surgery feasibility and how to memorize them) and it is followed by a process of validation test of the correct execution and surveillance activity results in order to increase awareness among health professionals about the importance of preventing SSI and their role in ensuring patient safety. The training program must also include periodic educational reinforcement updates and audit programs (84).

In the training process, checklists must be introduced that, summarizing the most important evidence and translating it into concrete behaviors, become an important tool for disseminating updated knowledges in clinical practice, for standardizing work processes and systematic controls related to key processes (85) as well as having important and useful legal value.

In addition to training and people motivation, maximum connection and structured communication among healthcare team components taking care of patients in the pre-, intra- and postoperative phase is mandatory. Implementation of actions to fight SSI in the obstetric-gynecological field not only affects surgical acts, but the system as a whole and also involves healthcare professionals external to the surgical room: for example, the microbiological report is part of a treatment path in case of SSI and represents the opportunity for a professional relationship between the microbiologist and the other healthcare professionals, the presence of a clinical pharmacologist allows an in-depth knowledge of pharmacokinetics and pharmacodynamics molecules interacting with surgical patients. Furthermore, the active involvement of managers whose conviction and endorsement are used to motivate staff and redefine processes by ensuring appropriate infrastructures and technological equipment is also essential, with the awareness that the additional cost of prevention can in many cases be more than compensated by savings deriving from the SSI reduction and its costs associated. An example is given by the widespread use of disposable sterile supplies, such as drapes, gloves and staff clothing, but also trichotome heads and disposable applicators for skin antisepsis (67). Technological innovation always offers new contributions in reducing SSI risks, such as suture threads with antibacterial agents (triclosan) (48).

A fundamental aspect in prevention consists in guaranteeing specific communication strategies with patients involved in the preparatory phase, remembering how high the motivation of obstetric patients is, while in gynecology is on average lower. SSI studies show the importance of post-discharge surveillance in assessing the size of the problem, which can be implemented by introducing the practice of calling patients at home

to check their progress. Particular attention requires communication to women belonging to the so-called "Hard to reach populations" who will be able to use cultural mediators, multilingual supplies, etc.

With the opportunity of SSI prevention, SIGO draws the attention to the surgery room environment, not only regarding the patient temperature, but also to the surgeon's comfort.

It would be necessary to request the attention of all the surgical room staff in keeping the doors closed, avoiding crowding and noise to reduce the possibility of surgeons' error. In this regard, the robotic room is particular because often the room staff tends to be distracted.

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