Systematic review of surgical gowns in the control of contamination/surgical site infection*

REVISÃO SISTEMÁTICA SOBRE AVENTAIS CIRÚRGICOS NO CONTROLE DA CONTAMINAÇÃO/INFECÇÃO DO SÍTIO CIRÚRGICO

REVISIÓN SISTEMÁTICA SOBRE DELANTALES QUIRÚRGICOS EN EL CONTROL DE LA CONTAMINACIÓN/INFECCIÓN DEL LOCAL QUIRÚRGICO

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ABSTRACT

Surgical scrubs are made with both fabric and non-fabric material. The study aimed to observe whether there is scientific evidence, according to the systematic review, that supports the practice of wearing scrubs in surgeries, according to the material they are made of. Basic intervention studies were considered, which investigated contamination and/or infection of the surgical site with the use of either reusable or single-use surgical scrubs, using people submitted to surgeries as the study population, either in real or simulated situations, at any period, without any language limitations. The strategy of searching electronic databases was used to find studies. With this, difficulties in isolating the object of intervention from countless other factors that can interfere in the outcomes were identified in studies of this type. Two studies (E1 and E2) showed strong evidence for the recommendation. In conclusion, there is no difference in contamination and infection of the surgical site between fabric and non-fabric scrubs.

KEY WORDS

Surgical wound infection.
Protective clothing.
Infection control.

RESUMO

O avental cirúrgico é confeccionado com materiais de tecido e não-tecido. O estudo teve como objetivo verificar se há evidências científicas, pela revisão sistemática, que fundamentem a prática do uso de aventais em cirurgias, conforme seu material de confecção. Consideraram-se estudos básicos de intervenção, que investigaram a contaminação e ou a infecção do sítio cirúrgico com uso de aventais cirúrgicos reutilizáveis e ou de uso-único, utilizando como população pessoas submetidas a cirurgias, em situações reais ou simuladas, em qualquer período, sem limitação de idioma. Para localizar os estudos, utilizou-se estratégia de busca nas bases de dados eletrônicas. Constata-se, com isso, dificuldade de isolar o objeto de intervenção de outros inúmeros fatores que podem interferir nos desfechos, em estudos desta natureza. Dois estudos (E1, E2) obtiveram forte evidência de recomendação, concluindo pela não diferença de contaminação e infecção do sítio cirúrgico entre aventais e campos de tecido e não-tecido.

DESCRITORES

Infecção da ferida operatória.
Roupa de proteção.
Controle de infecções.

RESUMEN

El delantal quirúrgico confeccionado con materiales de tejido y no-tejido. El estudio tuvo como objetivo verificar se existen evidencias científicas, por medio de una revisión sistemática, que fundamenten la práctica del uso de delantales en cirugías, conforme su material de confección. Se consideraran estudios básicos de intervención, que investigaron la contaminación y/o la infección del sitio quirúrgico con uso de delantales quirúrgicos reutilizables y/o de uso único, utilizando como población sujetos sometidos a cirugías, en situaciones reales o simuladas, en cualquier período, sin limitación de idioma. Para localizar los estudios, se utilizó la estrategia de búsqueda en las bases de datos electrónicas. Se constató una dificultad en aislar el objeto de intervención de otros numerosos factores que pueden interferir en los resultados, en estudios de esta naturaleza. Dos estudios (E1, E2) obtuvieron una fuerte evidencia de recomendación, concluyendo por no diferenciar la contaminación e infección del sitio quirúrgico entre delantales e indumentaria quirúrgica de tejido y no-tejido.

DESCRIPTORES

Infección de herida operatoria.
Ropa de protección.
Control de infecciones.

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INTRODUCTION

Despite technological advances in the surgical center area and greater knowledge on hospital infection risk factors, for the last decades, surgical site infection (SSI) rates remain high. Many SSI prevention measures are recommended. Most acknowledged are the Guidelines for the Prevention of Surgical Site Infection of the Centers for Disease Control and Prevention of the United States (CDC), published in 1999. Intrinsic and extrinsic factors are considered. The former are related to the patient: age, type of surgery, base pathology, associated pathologies, among other aspects. The latter refer to assistance procedures: surgery technique, pre-surgery preparation, environment, surgical attire and antibiotic prophylaxis, among others[1].

Among the extrinsic factors, surgical attire stands out, composed of cap, mask, sterilized glove, safety glasses, shoe cover, private uniform, sterilized drapes and gowns. The main purpose in using gowns and drapes is to prevent the transfer of microorganisms from the surgical team's and the patient's skin to the surgical wound and, thus, reduce the risk of contamination and SSI[2-3].

Regarding the occurrence of SSI, there is no agreement in literature about the use of reusable or single-use surgical gowns. Thus, a systematic review was performed to seek scientific evidence on surgical wound contamination or occurrence of SSI with the use of spun-laced non-woven or fabric surgical gowns, during surgeries.

The main purpose in using gowns and drapes is to prevent the transfer of microorganisms from the surgical team's and the patient's skin to the surgical wound

OBJECTIVE

Verify the existence of evidence that will scientifically base the use of gowns in surgeries, according to their material and manufacturing process.

METHOD

Study Format

This systematic review of scientific literature was developed according to the recommendations proposed by the Cochrane Collaboration, a non-for-profit international organization responsible for preparing, maintaining and guaranteeing access to systematic reviews in the health area[4].

Study Question

The study question is the first step in a systematic review and works as a compass towards the appropriate direction, in this case, the answer[4]. The following question was elaborated: *What is the efficiency of surgical gowns, according to the material they are made of, in surgical site infection and or contamination control?*

Inclusion and exclusion criteria

Based on the study question, only basic intervention studies that investigated the contamination and or surgical site infection with the use of reusable and or disposable surgical gowns were considered in this systematic review, using people submitted to real or simulated surgeries as the population. Therefore, primary laboratory studies (microbial barrier analysis), secondary studies, publications related to letters to the reader, duplicates and replicates, editorials, comments and opinions, literature analyses without systematic review with or without meta analysis were excluded. Also, any period was considered, without language limitations.

Sample

Sources for the literature search

Initially, the searches were oriented by the electronic databases considered by international evidence-based practice centers (PubMed/MEDLINE, EMBASE, COCHRANE, CINAHL, LILACS), references of the included studies and manual search in the *Sociedade Brasileira de Enfermeiros de Centro Cirúrgico e Centro de Material (SOBECC)* Magazine.

Search strategies in electronic databases

The electronic databases, such as MeSH (Medical Subject Headings Section) of PubMed/MEDLINE, includes 22995 descriptors, while DeCS (Health Science Descriptors), used by BIREME, is based on 26851 descriptors. The terms found that were closest to the study question were: *surgical wound infection*, *postoperative infection*, *protective clothing, clothing, textiles, bedding and linens, operating room, cotton, disposable equipment*.

For non-indexed descriptors, the terms in the scientific article itself were used, as they were found: *single-use clothing* and *reusable clothing*, *woven clothing*, *non-woven clothing*, *staff clothing*, *surgical wound contamination*, *surgical site infection*, *surgical gowns*, *operative gowns*, *disposable gowns*, *garments, operating room personnel, drapes*. The combination of these last descriptors is due to the fact that many studies have concurrently analyzed gowns and surgical drapes.

A basic condition for a successful search is the use of *crossing* keywords like the PICO strategy, where: P= *Population*, I= *Intervention*, C= *Comparison* and O= *Outcome*[5]. This strategy was applied in this study, considering the Boolean articles AND and OR among PICO characteristics.

Study Selection

The studies were searched by the first reviewer of this research. All of those obtained from the used descriptors

were evaluated by their titles and abstracts. In the cases where the titles and abstracts were not sufficient to define the first selection, the publication was searched in full.

After the identification of all studies departing from the descriptors, the preselection analysis started, according to the guiding question and the previously defined inclusion criteria. This phase was performed separately by two reviewers - the author of this investigation and her advisor, who independently extracted the data.

Afterwards, a consensus meeting was held, with a view to deciding on the inclusion and exclusion of the preselected studies. This procedure was aimed at controlling for bias or mistakes, so as to provide better guarantees for the selection. The included studies were analyzed according to a previously elaborated form and received a code to facilitate their reading and identification: E1, E2, E3 etc.

Data analysis

An instrument for data extraction was elaborated. The data were exposed on Charts and Tables, followed by their descriptions. Tables were presented with absolute and relative figures.

RESULTS AND DISCUSSION

This evidence was based on the search and analysis, through a systematic review, of already performed basic research, totaling 12 publications, found in electronic databases, mainly in PubMed/MEDLINE. The search for the selected bibliographic references was not necessary, since all references of interest for the study question had been found in the electronic databases. No study was found through manual search.

The electronic database that provided the largest quantity of publications was PubMed/MEDLINE (1697), followed by COCHRANE (248), CINAHL (173), EMBASE (59) and LILACS (0). Studies were repeated in the different databases. Thus, 20 studies were preselected, which served the inclusion criteria. After the full reading of these 20 articles by the first reviewer, 08 were excluded, composing a sample of 12 studies.

The data presented in Chart 1 (Annex) show a panoramic synthesis of all included studies, as well as the assessment of their quality through two scales: Jadad Scale[6] and the level of evidence of the Oxford Center of Evidence-based Medicine, adapted[7]. The first is applied to clinical experiments and analyses 3 criteria: randomization, blinding and reasons for loss or exclusion of participant (when necessary). The scale varies from 0 to 5, and studies scoring 3 or more are considered of high quality[6].

In the other scale, the classification of studies is based on evidence levels of studies from the Oxford Center of Evidence-based Medicine, associated to the variable risk control for SSI[7].

Although the specific component of this reviewer's analysis is the surgical gown, only one study (E5) has solely used it as an intervention object. The others have mainly correlated with surgical drapes (E1, E2, E3, E6, E7, E9, E10, and E11).

Another question is related to the type of manufacturing material of gowns and other surgical attire components investigated. There was no coincidence among the analyzed studies, in other words, there was no use of the same material, neither for fabric groups nor non-woven fabrics. Moreover, the type of material was not always described in detail. Sometimes, the commercial name was omitted on some non-woven fabrics and sometimes the composition of the fabrics was not detailed. Regarding the fabric, the threads varied or, sometimes, they were not even described. Lastly, none of the analyzed studies considered reuse frequency, that is, the number of times fabric gowns were reprocessed.

It is acknowledged that there is attrition and progressive loss of the barrier capacity of fabric materials according to the number of reprocessing procedures. In one study[8], the effect of washing on barrier properties of five reusable fabric surgical gowns was analyzed at baseline, twenty-five and fifty washes. As a result, it was stated that, the more washes, the more fabric attrition, reducing its ability to repel liquids and prevent microbial passage, except for one type of fabric that did not increase its bacterial permeability after washes[8].

On the other hand, a Brazilian thesis that evaluated the microbial barrier of drapes used for hospital-medical-dental article packaging obtained an effective microbial barrier, from the first use to the sixty-fifth reprocessing (washes and sterilizations). The fabric on these drapes was doubled and composed of 100% cotton, serge T1, in compliance with standards by the Brazilian Association of Technical Standards (ABNT), for packaging of goods. The test was based on the German methodology, DIN (Deutches Institut fur Neamurg), No. 58.953-part 6, used for packaging microbial barrier testing. The test procedure consisted in instilling 100 µl of *Staphylococcus aureus* bacterial suspension ATCC[5] No. 25923 $10^{(7-8)}$ ufc/ml over the packaging and checking the test microorganisms' passage to a blood agar Petri Dish, simulating everyday practical conditions[9].

It is evident that more porous materials, mainly fabrics, constitute less efficient barriers, mainly under humid conditions. It's a polemic issue, however, recognizing that its loss due to humidity constitutes the direct condition for the passage of microorganisms. A water molecule is much smaller than most known bacteria. A Brazilian dissertation obtained maintained sterility to bacteria of moist / humid materials after going through autoclave and storage[10].

Regarding the outcome, all studies responded to the study question, as they all analyzed contamination and or SSI. Analysis of contamination only is advantageous since it shows no need to control for many variables that repre-

sent SSI risk factors in surgeries, besides the presence of microorganisms. Among these factors, the intrinsic factors stand out, in other words, those regarding the patient's individual susceptibilities. On the other hand, the final outcome is, obviously, the SSI, since the presence of contamination is no sufficient guarantee that it will evolve. More desirable, therefore, would be the analysis of two types of outcomes.

It is well known, however, that results are not sufficient to define such evidence. The quality of the developed studies should be acknowledged according to the proposal of this systematic review. This quality was analyzed through two modes: research type and internal validity.

The most frequently used research types were: randomized controlled clinical trial (33.3%), corresponding to studies E1, E2, E5, E8. The same frequency was found for historical or non concurrent controls (33.3%) in studies E3, E6, E7, and E11. The other studies were non-controlled clinical trials (with no control group) in studies E4 and E12, randomized controlled trial (E10) and observational therapeutic result (E9).

After systematic reviews of clinical trials with meta-analysis, randomized controlled clinical trials are considered the best research type by the main evidence-based practice centers and guidelines on clinical recommendations. Therefore, regarding the classification, studies E1, E2, E5 and E8 are considered of better quality than the others.

Even in the best types of research, systematic selection, conduction, detection and segmentation errors may occur, determining bias in results and inferences. These biases interfere with the internal validity in the studies. According to the Cochrane Collaboration Handbook, they refer to: a) significant differences in the comparison groups (selection biases), in which randomization is used to prevent this type of error; b) equal care or the same exposure to all other factors, and also interventions of interest (conduction biases), in which masking is used to avoid this type of error; c) losses and exclusion of people included in the study (segmentation biases), which should be explained; d) verifying mode of outcomes (detection or diagnosis biases). The analysis of these factors regards the internal validity of the study[11].

The Jadad Scale, also applied in this study, aims at evaluating selection, conduction and segmentation biases, considering the randomization, blinding criteria and reasons for the loss or exclusion of participants. Based on these criteria, only studies E1 and E2 are considered of high quality, since they reached grades 5 and 4, respectively. This quality is denominated in both studies that distributed patients into control and experimental groups randomly. Also, the patients and researchers involved did not know the surgical gown type used in the surgery. Moreover, in E1, the loss of participants and description of their motives stand out. The other studies scored less than 3[6].

According to the other resource used to evaluate in this study, which associated the risk variable control for SSI with evidence adapted levels from the Oxford Center of Evidence-based Medicine[7], most of them were classified in evidence B category, in other words, moderate, varying from B2- (E3, E4, E6, E7, E10, E11, E12) to B3- (E9). Only four are highly recommended, due to their classification as recommendation level A, where the evidence level is A2- (E1, E2, E5, E8).

Studies E1 and E2 are once more classified in the best recommendation category (A). Studies E5 and E8 are also included in the best evidence level (A2-).

Considering the results of the best four studies, E1, E2, E5 and E8, which analyzed surgical wound contamination, they did not present significant difference between the use of fabric and non-woven material. And studies E1 and E2, which analyzed SSI, did not present any significant difference in occurrence either between the use of the confectioned material of fabric and non-woven.

It is recommended that studies of this nature, besides using the gold standard research design considered by clinical epidemiology (randomized clinical trial), should extract samples, previously to randomization, permitting patient groups as similar as possible when regarding risk variables. Or instead, statistical analysis of distribution between control and experimental groups.

The extrinsic and intrinsic variables analyzed by the included studies are in Table 1 and 2.

Table 1 states that the extrinsic factors most controlled by the studies were surgery type (12), antibiotic prophylaxis (9), surgery endurance and surgical team (7). Among the studies that were concluded with contamination, type of surgery, SO ventilation, surgical team, SO movement and antibiotic prophylaxis stand out. Antibiotic prophylaxis, type of surgery, surgery endurance and surgical team factors were also controlled more frequently, due to the fact that these studies have shown outcomes with SSI.

Table 1 - Extrinsic risk factor frequency controlled by the included studies for systematic review, according to outcomes - São Paulo - 2007

Type of outcome Extrinsic variables	Contamination (N=5)		SSI (N=5)		Contamination and SSI (N=2)	
	N	%	N	%	N	%
Pre-surgical Preparation	2	40.0	1	20.0	1	50.0
Pre-surgical Time	-	-	1	20.0	1	50.0
Antibiotic prophylaxis	3	60.0	5	100.0	1	50.0
Surgical team	4	80.0	3	60.0	-	-
Surgery endurance	1	20.0	4	80.0	2	100.0
Type of surgery	5	100.0	5	100.0	2	100.0
Surgery technique	2	40.0	-	-	-	-
SO ventilation	5	100.0	-	-	-	-
No. of people in SO	1	20.0	2	40.0	1	50.0
SO movement	3	60.0	-	-	-	-
Same SO	2	40.0	2	40.0	-	-
Wound irrigation	1	20.0	1	20.0	-	-
Ventilation hours	-	-	1	20.0	-	-
Glove holes	1	20.0	-	-	-	-

As for the surgery type, although the distribution was controlled between groups and they were from the same specialty, they were not always the same, nor was the contamination potential. Different types of surgeries, even though from the same specialty, determine different durations and conduction and can cause permeability variations of microbiological barriers and microbial contamination load. Yet, surgeries of the same type and similar duration, but performed in locations with resident microbiota, become, as we all know, the main source of wound contamination and SSI[2], making the isolated value of the intervention object difficult to establish.

Table 2 - Intrinsic risk factor frequency distribution controlled in the included studies for systematic review, according to outcomes - São Paulo - 2007

Type of outcome Extrinsic variables	Contamination (N=5)		SSI (N=5)		SSI+ Contamination (N=2)	
	N	%	N	%	N	%
Pre-existing diseases	-	-	1	20.0	1	50.0
Age	1	20.0	4	80.0	1	50.0
Sex	1	20.0	3	60.0	2	100.0
Smoker	-	-	1	20.0	-	-
Nutritional status	-	-	-	-	1	50.0
BMI*	-	-	1	20.0	-	-
ASA**	-	-	-	-	1	50.0

*BMI: Body Mass Index
** ASA: Patient's evaluation for SSI risk

As shown in Table 2, few studies controlled for the intrinsic variables, related to the individual susceptibilities to develop SSI. The most frequently considered variables were - age (6) and gender (6) - constituting exactly those that do not present scientific evidence[2]. Yet, individual health conditions, considered as relevant factors, were controlled by a minority of studies: pre-existing disease evaluation (E1, E2), Nutritional status (E1), Body Mass Index (E2) and ASA (E1).

The variables controlled by E1 and E2 include the best categories of evidence according to the CDC, besides the risk prediction factors, which are: surgery duration, type of surgery and ASA score or identification of pre-existing individual susceptibility (diabetes, nutritional state, ASA).

CONCLUSION

Considering the sample of this systematic review (12 studies), two studies (E1, E2) stood out with strong recommendation evidence. Both, however, refer to surgical gowns and drapes, concurrently, concluding about the

non-difference in contamination and/ or surgical site infection between fabrics and non-woven. Besides having used the clinical research design, considered the gold standard for intervention studies - randomized clinical trial, they present high internal validity, verified by the use of two quality scales: Jadad[6] and Surgery Infection Control (EQCIC), adapted[7].

The non similarity of intervention format and variable control between the analyzed studies did not permit meta-analysis.

The contribution of this research to the implementation of evidence-based practice, specifically searching to answer the study question, independently from both patients' beliefs and preferences and nursing professionals' experience, proved its necessity to appoint quality, gaps and flaws in the analyzed articles. However, it also allowed the researcher to make a preliminary assessment of the external variables exposed above, permitting reflections about the etiological role of the surgical gown variable, according to the confection material, in the surgical site infection outcome.

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ANNEX

Chart 1 - Panoramic Synthesis of the studies included in the systematic review, as for their range, investigation method, result and quality evaluation by Scales of Surgical Infection Control (QSSIC) and JADAD Clinical Experiments - São Paulo - 2007

E	Range	Method	Result
1	Microbial contamination of surgical wound and SSI in elective clean surgeries and or holding low contamination potential, with the use of cotton fabric (180 tread/polyester^2) and polyester x non-woven polyester mixture drapes and gowns. Both cases were thickened in the front and on the forearms (270 tread/polyester^2)	Controlled randomized clinical trial.	No significant difference in positive culture and SSI rates. QSSIC: A2- JADAD: 04
2	SSI in coronary artery surgeries with the use of fabric x non-woven (both material type were not discriminated) drapes and gowns	Controlled randomized clinical trial.	No significant SSI difference. QSSIC: A2- JADAD: 05
3	SSI in clean, contaminated clean and contaminated surgeries, performed in two hospitals, using cotton fabric muslin (280 tread/polyester2 - Hospital A and 140 tread/polyester2 - Hospital B) x non-woven spun-bonded olefin drapes and surgical gowns	Historical or non-concurrent control.	The SSI rate with the use of disposable gown was 2.27%, against 6.41% with the reusable gown; therefore a significant difference. The SSI rate in clean surgeries was 1.98% when using disposable gowns versus 4.42% with the use of reprocessed gowns. In clean contaminated surgeries, the surgical infection rate was of 1.98% with the use of disposable versus 10.89% with the use of reprocessed materials. QSSIC: B2- JADAD: non-classifiable
4	Air and surgical wound microbial contamination in idiopathic scoliosis correction surgery, divided into 5 phases: 1) conventional ventilation + cotton private uniform + cotton drapes and gowns + disposable masks and caps. 2) Conventional ventilation + cotton private uniform + viscose drapes and gowns with internal polyamide layer thickened in the front and on the sleeves, disposable masks and caps. 2) Conventional ventilation, polypropylene private uniform; viscose drapes and gowns with internal polyamide layer thickened in the front and on the sleeves, disposable masks and caps. 4) ultra-clean ventilation, cotton private uniform and cotton drapes, helmet system gowns, helmet masks and caps with exhaustion system. 5) Ultra-clean ventilation, cotton private uniform, disposable viscose drapes and gowns with internal polyamide layer thickened on the sleeves and front, helmet exhaustion system caps + masks.	Non-controlled clinical trial.	No contamination variation in periods 1 and 2 in which the ventilation and the private uniform were conventional, where only the surgical drapes and gowns were made of cotton in period 1 and disposable in period 2. Less contamination was registered in periods 3, 4 and 5, when compared to periods 1 and 2. Conflict of interests. QSSIC: B2- JADAD: non-classifiable
5	Air and surgical wound microbial contamination in primary knee substitution surgery with the use of Body Exhaust Suit system gown, De Puy® gown and UCA ventilation x spun-laced Rotecno (Dunfermline®) system gown and the same ventilation system.	Controlled randomized clinical trial.	With no significant microbial contamination difference in the surgical wound. QSSIC: A2- JADAD: 02
6	SSI in clean and contaminated clean surgeries with the use of cotton fabric (280 tread/polyester 2) surgical gowns and drapes x spun-laced non-woven materials, over alternate periods.	Historical or non-concurrent control.	SSI significantly lower with the use of non-woven materials in clean and contaminated clean surgeries with the use of spun-laced disposable versus cotton materials. QSSIC: B2- JADAD: non-classifiable
7	Surgical wound contamination by albumin micro spheres in orthopedic surgeries with the use of fabric X non-woven Barrier® drapes and gowns	Historical or non-concurrent control.	Micro spheres recovery in all wounds with the use of fabric material and its proportional increase to surgery duration and non-recovery with the use of non-woven materials. QSSIC: B2- JADAD: non-classifiable

E	Range	Method	Result
8	Wound and SO air microbial contamination in open and elective coronary artery surgery with the use of conventional cotton x non-woven private uniforms, drapes and gowns (polypropylene private uniforms and Mönlyke® gowns thickened with plastic film on the front and sleeves and impermeable laminated plastic drapes with edge stickers).	Controlled randomized clinical trial.	No significant difference in bacterial growth in the surgical wound.
			QSSIC: A2- JADAD: 01
9	SSI in general animal (cats and dogs) surgeries between muslin 140 tread/polyester 2 cotton drapes and gowns x spun-laced polypropylene non-woven.	Observational therapeutic results.	No significant difference in SSI between cotton barrier versus disposable materials.
			QSSIC: B3- JADAD: non-classifiable
10	Surgical wound microbial contamination and SSI in clean, contaminated clean, contaminated and dirty surgeries with the use of FABRIC 450® non-woven fabric x cotton fabric drapes and gowns.	Non-randomized controlled clinical trial.	No significant difference of SSI in brief (less than 100 minutes) and medium surgeries (100 to 200 minutes). In Long lasting interventions (more than 200 minutes), there was no occurrence of SSI with the use of TNT FABRIC 450® versus 33.3% of SSI with the use of cotton. Microbial contamination was present in 16% of the interventions with the use of disposable versus 24% with the use of cotton.
			QSSIC: B2- JADAD: non-classifiable
11	SSI in clean, contaminated clean, contaminated and dirty surgeries with the use of disposable versus textile drapes and gowns.	Historical or non-concurrent control.	No significant difference of SSI due to the low number of surgeries (according to the authors).
			QSSIC: B2- JADAD: non-classifiable
12	Surgical wound, air and the patient's skin microbial contamination in hip substitution surgeries with the use of Barrier 450® non-woven versus cotton private uniforms and gowns.	Non-controlled clinical trial.	No significant difference of surgical wound microbial contamination with the use of non-woven Barrier 450® versus cotton private uniforms and gowns.
			QSSIC: B2- JADAD: non-classifiable

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