

# What is the suggested time interval to change surgical gloves?

## An integrative review

Adriana Cristina de Oliveira<sup>1</sup>, Camila Sarmiento Gama<sup>2</sup>, Patrícia Reis França<sup>3</sup>

<sup>1</sup> Nurse, Ph.D. in Nursing. Associate Professor at Universidade Federal de Minas Gerais. Belo Horizonte, MG, Brazil. E-mail: [adrianacoliveira@gmail.com](mailto:adrianacoliveira@gmail.com).

<sup>2</sup> Nurse, Master in Nursing. Student at the Nursing Graduate Program, Doctoral level, at Universidade Federal de Minas Gerais. Belo Horizonte, MG, Brazil. E-mail: [camilasarmiento@gmail.com](mailto:camilasarmiento@gmail.com).

<sup>3</sup> Nurse. Nurse at the Hospital Lifecenter. Belo Horizonte, MG, Brazil. E-mail: [patricia.rfranca@hotmail.com](mailto:patricia.rfranca@hotmail.com).

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### ABSTRACT

To change gloves during a procedure constitutes an important measure to maintain its integrity and to prevent infection in the surgical site, however, there is little consensus regarding the time for these changes. Our objective was to identify, analyze and synthesize findings available in the literature about the suggest time interval to change surgical gloves during procedures to keep its integrity. We conducted an integrative review of studies published between 2003 and 2016. We selected 19 studies addressing the relationship of surgical glove integrity and its use time. The studies showed a direct connection between surgery time and the increase of gloves perforation. Based on our analysis, we suggest changing gloves in less than 120 minutes for surgeries in the digestive system, gynecological and thoracic. The creation of protocols for different surgical specialties should be considered.

**Descriptors:** Gloves, Surgical; Exposure to Biological Agents; Surgical Procedures, Operative.

### INTRODUCTION

The surgical site infection (SSI) is one of the most frequent complications for patients submitted to surgeries, corresponding to about 160,000 – 300,000 events each year in the United States<sup>(1)</sup>. They are in the third position within infections related to Healthcare Associated Infections (HAI) in Brazil, representing 14% to 16% of infections in hospitalized patients<sup>(2)</sup>. Besides, they are the most costing and preventable infections within 60% of cases<sup>(1)</sup>.

The surgical team should adopt good practices to prevent the development of SSI, as the use of sterile gloves during surgical procedures.

Sterile surgical gloves are used to complement surgical hand antisepsis and to propitiate a physical barrier for microorganisms present in the hands of health professionals, equipment and in patients<sup>(3-4)</sup>.

However, its use is subject to flaws, and (micro) perforations/tears are frequent and compromise the ability to protect patients<sup>(5)</sup>. The exposure to sharp materials, bone fragments, and chemical products favor the rupture of its integrity<sup>(6)</sup> that in many situations are not even noted by professionals<sup>(7)</sup>.

There is an association between the integrity of gloves with the material type and quality, to the intensity and duration of its use, to the conduction of tests before and after its use, and to the method for detection of leakage as well as the ability of the surgeon using it<sup>(4)</sup>.

It is estimated that an average of 18% (CI 5-82%) of (micro) perforations/tears in gloves during procedures<sup>(3,5)</sup> that allow the transference of microorganisms<sup>(7)</sup>, and this event can double the SSI risk<sup>(8)</sup>.

In this context, the perforation of surgical gloves contributes as an important source of microorganisms transference to the surgical wound<sup>(7,9)</sup>. Thus, to minimize harms caused by the presence of microorganisms in the surgical wound coming from the hands of professionals from the surgical team, there is a recommendation to change gloves at regular intervals or at any time when there is a detection of perforation<sup>(10)</sup>. Those recommendations are double gloving in surgical procedures using prostheses<sup>(4,10)</sup> and in long procedures, in situations with high risk of perforations<sup>(11)</sup> or when the exposure to body fluids is high<sup>(4)</sup>.

Regardless of the strong association between the surgical gloves wearing time and the occurrence of perforations seen in many studies that could influence the occurrence of SSI<sup>(7,12-15)</sup>, the emphasis on glove change during the operation is not always brought up, or when it is, there is little consensus about the preconized time interval considering the different existing procedures.

Considering the exposed, this study aims to answer the following question: *what is the suggested time interval to change surgical gloves seeking maintenance of its integrity?* The explanation for this issue aims to inform health professionals of surgical teams to implement a safer practice and; it could contribute to the creation of protocols with time intervals for changing sterile gloves during the surgical procedure. Thus, keeping the integrity of gloves and consequently, reducing the potential of transferring microorganisms from the professional's skin to the surgical wound.

Therefore, our objective was to identify, analyze and synthesize findings from the literature about the suggested interval time to change surgical gloves during surgeries, with the intention to keep their integrity during the whole procedure.

## METHODS

We conducted an integrative review intended to contribute to the scientific knowledge and professional practices<sup>(16)</sup>, following the steps: identification of the study question and its objective, literature search, creation of a database, analysis of the identified studies, data interpretation and discussion of results.

To conduct this study, we consider the need to identify a suggested time to change surgical gloves

during surgical procedures, aiming to reduce rates of glove perforations and, consequently, the transmission of microorganisms that can potentially cause infections in patients.

We searched journals published in English, Spanish and Portuguese using the Portal of the Brazilian Coordination for the Improvement of Higher Education Personnel (CAPES), where we searched the databases ScienceDirect, Scopus, and Web of Science.

We searched studies published between 2003 and 2016 using the DECS/MESH descriptors "*luvas cirúrgicas (surgical, gloves/guantes quirúrgicos)*", "*exposição a agentes biológicos (exposure to biological agents/exposición a agente biológico)*", "*procedimentos cirúrgicos operatórios (surgical procedures, operative/procedimentos quirúrgicos operativos)*" and the term "*perfuração de luva (glove perforation/perforación de guantes)*", which does not have a DECS/MESH term, but it was used to increase the sensibility of the search for articles related to the theme.

The inclusion criterion was the inclusion of original articles about the relationship between the integrity of the surgical glove and its using time. And we excluded studies that addressed only the perforation rate without relating it to the using time, studies that followed a pre-determined protocol for glove changing and those not fully available.

After the reading of titles and abstracts, 94 articles were pre-selected: we identified 45 studies on Scopus, 12 on Science Direct and 37 in the Web of Science. We excluded 46 studies due to duplications and unavailability in full-text, leaving 48 studies. From those, after the reading of abstracts, we selected 26 that we read in full-text.

We wrote annotations of these publications with the following information: title, author, year of publication, surgical specialty, type of surgery, role developed in the surgical team, number of assessed gloves, gloves' material, type of gloving and, perforation percentual per time of use. We excluded seven (26.9%) studies because they did not report precise perforation data per time of use or, they determined a protocol for glove exchange in pre-determined time intervals, diffculting the analysis of gloves' behavior in prolonged periods. Nineteen articles composed the final analysis.

After analyzing this synthesis, surgical specialties described in more than one article we pooled as they were from the same field, and we determined the time interval suggested for changing gloves per specialty based on the pooling of similar intervals among these articles and, in the mean calculation of perforation per interval. We considered the specialties that had only one published article as a reference for suggesting the changing time, and the interval assessed as the higher perforation percentage and the recommendation done before this period we considered as "critical".

## RESULTS

The 19 selected articles were from different procedure and specialties, with different methods. The studies had a percentage of perforation/tears registered according to their respective surgical time and period of glove use. For the analysis, we considered the surgical time and the period of glove use as

equivalent, once wearing gloves is happens immediately before the beginning of the procedure and its removal is done right after the closure of the incision, that is, the end of the surgery (Chart 1).

**Chart 1:** Characteristics of surgical gloves perforations per surgical time in diverse procedures.

Authors/country of origin/year/ type of study	Type of Surgery	Specialty	Nº of Assessed Gloves	Perforation Test	Type of Gloving	Perforation Percentage per Time of Glove use
Harnoß et al. <sup>(7)</sup> Germany 2010 Prospective	Perforations and resections of the gastrointestinal tract, abdominal washes and exploratory laparotomies	Digestive system	250 gloves  128 external gloves 122 internal gloves	Water test	Single  Double	< 90min: 4/86 – 4.7% 91 to 150min: 20/84 – 23.8% > 151min: 21/80 – 26.3%
Partecke et al. <sup>(12)</sup> Germany 2009 Prospective	General surgery: laparoscopic procedures (surgeries of the biliary ducts, appendectomies, hernia repair), small, medium and large abdominal surgeries, vascular and cardiothoracic procedures	Digestive and Cardiovascular systems	898 pairs of gloves	Water test	Not mentioned	≤ 90 minutes: 46 (15.4%) 91 – 150 minutes: 54 (18.1%) >150 minutes: 71 (23.7%)
Oliveira & Gama <sup>(15)</sup> Brazil 2014 Cross-sectional	Undefined procedures: surgeries of the digestive tract, cardiovascular and pediatrics	Digestive and Cardiovascular systems Pediatrics	1090  148 double 942 single	Water test	Single  Double	≤29 minutes: 13 (9.9%) 30 – 119 minutes: 55 (42%) ≥120 minutes: 63 (48.1%)
Manjunath et al. <sup>(17)</sup> England 2008 Prospective	Laparotomy	Gynecology and Obstetrics	462 gloves  154 single 18 double 290 double with index	Air test and immersion in water to detect bubbles	Single Double  Double with index	≤ 180min: 25 (1.6%) 180 – 300min: 17 (1.9%) ≥ 300min: 19 (4.8%)
Yinusa et al. <sup>(18)</sup> China 2003 Prospective	Pediatrics, spine, and hands	Pediatric Orthopedics	792 gloves	Water test	Single  Double	30 – 60min: 8 (30.8%) 61 – 120min: 12 (36.4%) 121 – 180min: 9 (47.4%) > 180min: 16 (72.7%)

Authors/country of origin/year/ type of study	Type of Surgery	Specialty	Nº of Assessed Gloves	Perforation Test	Type of Gloving	Perforation Percentage per Time of Glove use
Malhotra et al. <sup>(19)</sup> India 2004 Prospective	Caesarean sections, hysterectomies and exploratory laparotomies	Gynecology and Obstetrics	1120 gloves  592 internal 528 external	Water test	Single  Double	< 40min: 40 (7.6%) > 40min: 112 (18.6%)
Al-Habdan & Sadat-Ali <sup>(20)</sup> Saudi Arabia 2003 Prospective	Pelvic and femoral osteotomies,	Pediatric orthopedics	427 pairs	Water test	Not mentioned	> 120 minutes: 57 (79%)
Oliveira & Gama <sup>(21)</sup> Brazil 2015 Cross-sectional	Undefined procedures: surgeries of the digestive tract, cardiovascular and pediatrics	Digestive tract Cardiovascular Pediatrics	214	Water test	Single  Double	≤29 minutes: 7 (30.4%) 30 – 119 minutes: 6 (26.1%) ≥120 minutes: 10 (43.5%)
Al-Habdan, Corea & Sadat-Ali <sup>(22)</sup> Saudi Arabia 2006 Prospective	Pediatric orthopedic surgeries	Pediatric orthopedics	526 doubles 316 singles	Water test	Single  Double	< 60 minutes: double gloving did not have perforation; single gloving had 3 perforated gloves 60-120 minutes: double gloving had 11 perforated gloves; single gloving had 21 perforated gloves > 120 minutes: double gloving had 32 perforated gloves; single gloving had 4 perforated gloves
Murta, Silva & Júnior <sup>(23)</sup> Brazil 2003 Prospective	Gynecologic and obstetric surgeries	Gynecology and Obstetrics	792 double 240 single	Water test	Single  Double	< 120 minutes: Double gloving 3 (30%) perforated gloves; single 2 (20%) perforated gloves > 120 minutes: Double gloving 24 (58.5%) perforated gloves; single 14 (56%) perforated gloves

Authors/country of origin/year/ type of study	Type of Surgery	Specialty	Nº of Assessed Gloves	Perforation Test	Type of Gloving	Perforation Percentage per Time of Glove use
Laine et al. <sup>(24)</sup> Finland 2004 Prospective Randomized	Gastrointestinal surgeries: appendectomies, Colostomies, cancer surgeries, cholecystectomies	Digestive tract	814 gloves	Water test	Single Double	< 120 minutes: 26 (8.2%) > 120 minutes: 41 (10.9%)
Dhar <sup>(25)</sup> Oman 2011 Prospective	Orthopedic surgeries	Orthopedics	404 gloves 369 double 35 single	Water test	Single Double	30-60 minutes: 16 (26.2%) 60-90 minutes: 11 (18%) 90-120 minutes: 16 (26.2%) >120 minutes: 18 (29.6%)
Shek & Chau <sup>(26)</sup> China 2013 Case-control	Ophthalmic surgeries	Ophthalmology	100 gloves	Water test	Single	< 60 minutes: 4 (4%) > 60 minutes: 0 (0%)
Kuroyanagi et al. <sup>(27)</sup> Japan 2012 Prospective	Oral and maxillofacial surgeries	Oral and maxillofacial	1436 gloves	Water test	Single Double	95.3 minutes ± 55.7 minutes: 82 (54.7%)
Castro-Peraza et al. <sup>(28)</sup> Canary Islands 2010 Randomized controlled trial	Diverse procedures: large, small and video laparoscopic procedures	Not mentioned	1537 gloves	Water test	Single Double	Large surgery – mean duration 85.16 minutes: 86 (7.88%) perforations Small surgery - mean duration 53.75 minutes: 5 (2.35%) perforations Videolaparoscopic surgery - mean duration 90.13 minutes: 13 (5.60%) perforations
Kojima & Ohashi <sup>(29)</sup> Japan 2005 Prospective	Thoracoscopy, open thoracotomy	Thoracic	117 gloves	Water test	Not mentioned	< 120min: 11 (16.9%) > 120min: 22 (42.3%)

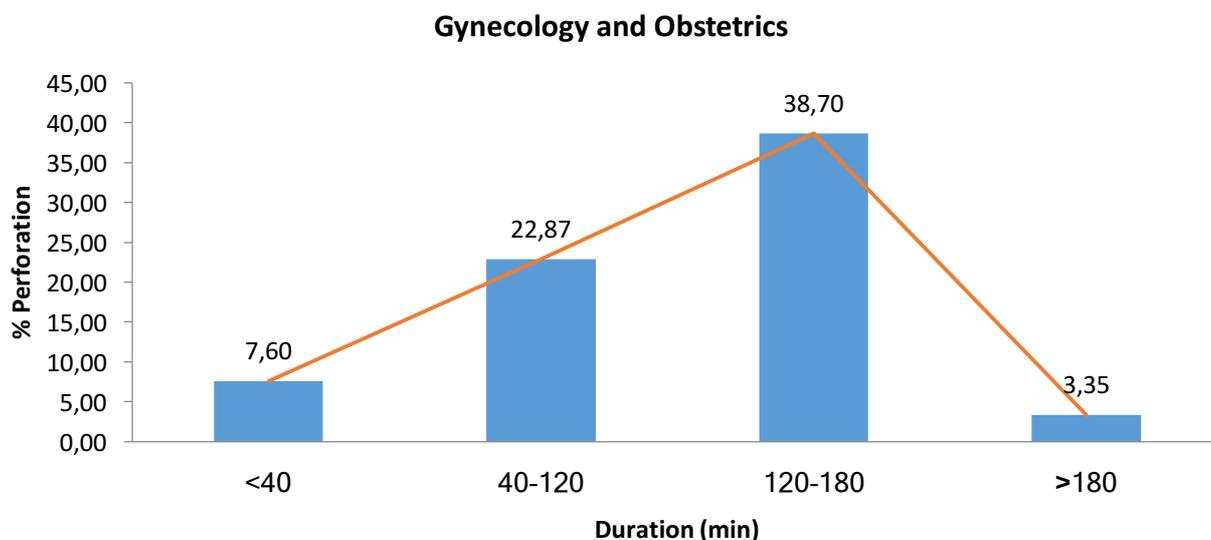
Authors/country of origin/year/ type of study	Type of Surgery	Specialty	Nº of Assessed Gloves	Perforation Test	Type of Gloving	Perforation Percentage per Time of Glove use
Guo et al. <sup>(30)</sup> China 2012 Prospective randomized	Caesarean section, cholecystectomy, gastrectomy, hernia repair, hysterectomy, laparotomy and nephrectomy	Gynecology Digestive tract Urology	218 gloves  112 singles 106 doubles	Air test and immersion in water to detect bubbles. Posterior validation with the water test	Single  Double	The mean use of perforated gloves was 69.8 minutes: 10.09% perforations
Hübner et al. <sup>(31)</sup> 2010 Prospective	Laparotomy	Digestive tract	194 gloves	Water test	Double	Mean time of gloves' use: 99.6 minutes – 10 (10.2%) external and 1 (1.04%) internal gloves
Korniewicz et al. <sup>(32)</sup> 2004 Clinical trial	Diverse procedures	Oral Plastic Dental Cardiovascular Orthopedics Urology Neurology Gynecology and obstetrics Otolaryngology Thorax Transplant General Pediatrics Ophthalmology	6386	Water test	Not mentioned	<60 minutes: rate of 0.03 perforations detected on latex gloves 120 minutes: rate $\cong$ 0.043 perforations 180 minutes: $\cong$ 0.045 perforations 300 minutes: $\cong$ 0.057 perforations 480 minutes: $\cong$ 0.09 660 minutes: $\cong$ 0.125 perforations

From the total studies, nine used latex gloves<sup>(15,18-19,21-22,24,27,29-30)</sup>, one<sup>(32)</sup> compared latex with non-latex gloves and nine mentioned the registered brand used, but not the material<sup>(7,12,17,20,23,25-26,28,31)</sup>.

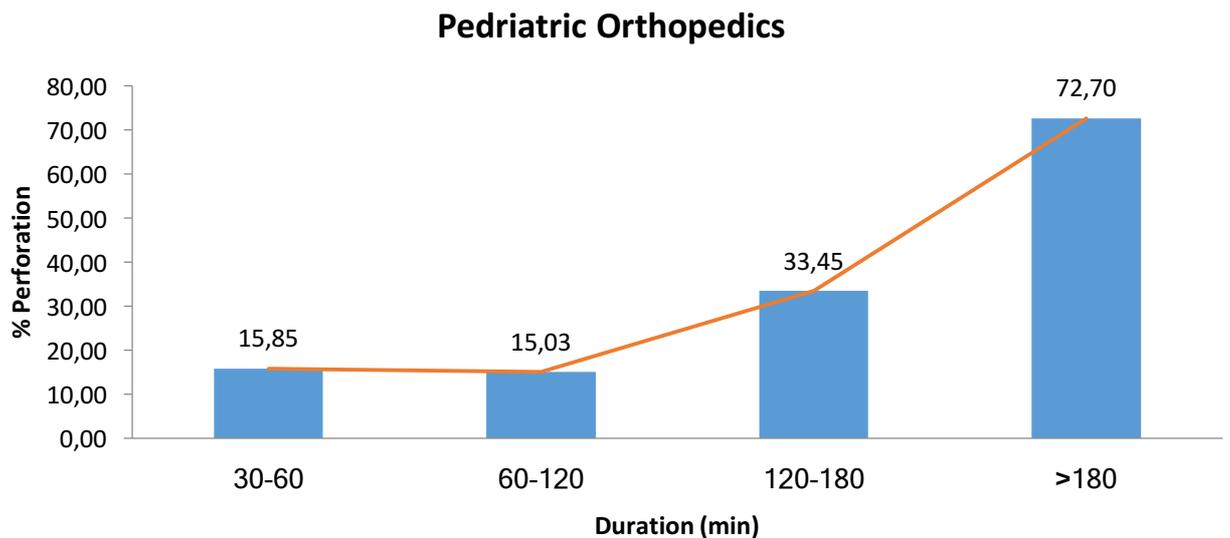
All studies conducted glove tests after its final use in the surgery and most used the test consisting in the filling the glove with water and pressure on the fingers and palms to detect leakage<sup>(7,12,18-29,31-32)</sup>, as described by the European norm EN 455-1<sup>(33)</sup>. One study conducted a test filling the glove with air and immersing it in water to detect bubbles<sup>(17)</sup> and another used both tests for validation<sup>(30)</sup>.

The participating surgical teams were composed of surgeons, assistants, and nurses that used sterile latex gloves. In general, in these teams, surgeons were the professionals who presented higher levels of perforations, and the thumb and index finger of the non-dominant hand represented the leading perforation sites<sup>(7,15,17,21-23,25,31)</sup>.

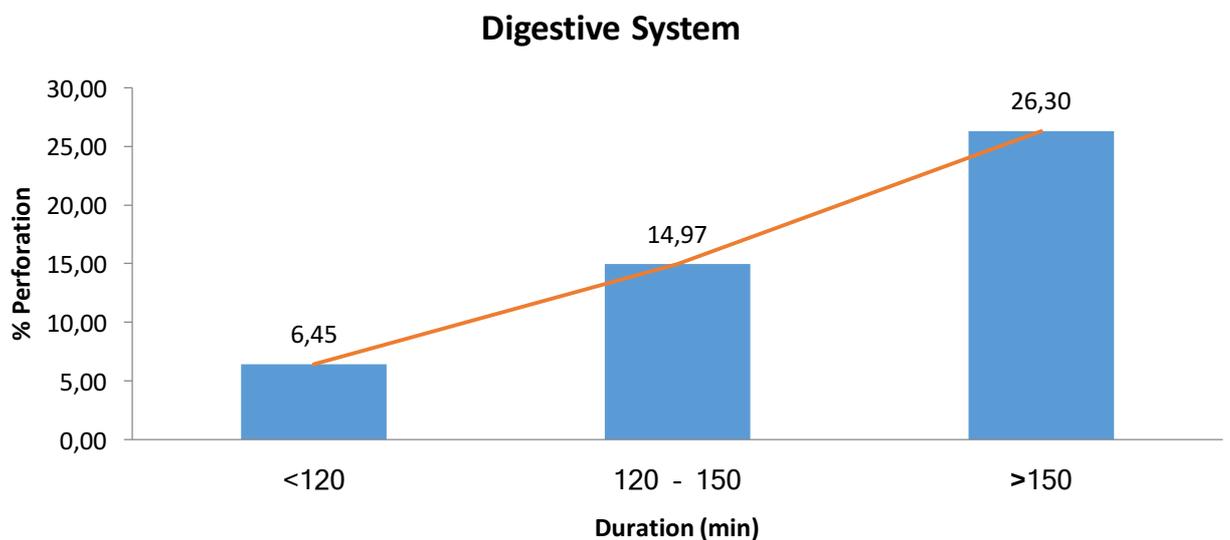
Considering such heterogeneous data, as the procedures addressed, specialties, surgery duration, the average time of glove use, we observed the need to reunite similar intervals of these studies calculating a perforation mean of each interval when there were more of one study from the same specialty. We plotted these averages in a graph: perforation X surgery time, allowing the analysis of the perforation behavior, aiming for an optimal time for a gloving change.



**Figure 1:** Estimative of the suggested time interval for changing surgical gloves in gynecology and obstetrics. N= 3<sup>(17,19,23)</sup>.



**Figure 2:** Estimative of the time interval for changing surgical gloves in pediatric orthopedics. N= 3<sup>(18,20,22)</sup>.



**Figure 3:** E Estimative of the time interval for changing surgical gloves in surgeries from surgeries in the digestive system. N= 3<sup>(7,24,31)</sup>.

Considered the graphs and tables, we suggest the change of gloves in gynecological and obstetrics, pediatric orthopedic and digestive system surgeries occur before 120 minutes, which was the time interval where there was a considerable increase in the percentage of perforations.

For the specialties that had only one study, we considered the interval time with higher perforation rate, recommending the change of gloves before this “critical” time. Thus, in thoracic surgeries, the change should occur before 120 minutes; in oral and maxillofacial surgeries before 90 minutes; and in ophthalmologic ones, before 60 minutes.

In studies with diverse specialties assessed,<sup>(12,15,28,30,32)</sup> we could observe that the increase in time was related to higher rates of glove perforations. However, it was not possible to determine the ideal time for

changing gloves, once each specialty has its specificity related to the material used, the complexity and duration of procedures conducted.

## DISCUSSION

### General aspects of the theme

Because of the relevance of surgical gloves as a measure for prevention of SSI, its use should meet the safety requirements for the user and for the patient who is being assisted. Thus, respecting the criteria to standardize its quality and effectiveness. Therefore it is necessary to follow the national and international norms that regulate its commercialization and, guarantee its safe and efficient use.

The American Society for Testing and Materials (ASTM) is responsible for the standards of recommendation and regulatory tests for the commercialization of these products in the United States. Thus, this institution requires latex and synthetic gloves for surgical procedures from manufacturers, so gloves are produced with rubber polymers, with internal and external surfaces free of talc. Also, it preconized that sterility tests, the absence of holes, dimensions and physical properties, resistance to traction, stress, final stretching, protein content, lack of residuals, the quantity of powder and degree of antigenic protein to be by their standards<sup>(6,34)</sup>.

Some of these rules described by the ASTM are precisely determined, for example, the absence of micro perforations/holes, while others accept variations within a pre-determined limit, as the physical dimension and thickness, justifying diverse gloves available in the market, depending on the manufacturer<sup>(6)</sup>.

In Brazil, the Board Resolution 55, published on November 4<sup>th</sup> of 2011, based on the ISO (International Organization for Standardization) standard 10282:2005, 11193-2:2006, and 37:2008, requires that gloves should not put patients and users at risk. Also, they should be submitted to processes to guarantee the reduction in the protein content, meeting the requirements of physical dimensions, mechanical, impermeability and microbiological tests<sup>(35)</sup>.

Although the technology to produce surgical gloves is increasingly advanced, the detection of perforations is still unavoidable<sup>(5,36-37)</sup>, and these perforations can be present before or after its use by professionals<sup>(38)</sup>.

Although most studies work with the detection of perforation after its use, there is evidence of the passage of microorganisms in 65% of surgical gloves and 40% of procedure gloves before its use, demonstrating pre-existing perforations that can result in risk for professionals and patients<sup>(38)</sup>.

### Characteristics of perforations in surgical gloves

The longer duration of the surgical procedure is related to the increase of perforation rates in gloves<sup>(6-7,12,29,32)</sup>. And the reduction of the microbial contamination rate is associated with the increase of surgical glove changes<sup>(39-40)</sup>. Therefore, this is a recommended practice during long surgeries<sup>(10)</sup>. Thus, studies using

pre-determined change protocols obtained a significant decrease in perforation rates<sup>(41-42)</sup>.

According to our findings, time recommendations for changes vary between less than 60 minutes to less than 120 minutes, depending on the specialty. The specialty diversity in a single study impaired analysis and impeded to recommend time interval for changing, as the procedures, the surgical time and the use of gloves were very heterogeneous, ratifying the importance to assess the time of glove changes per specialty, per procedure and even the professional role during surgery.

A similar review<sup>(43)</sup> that evaluated the time recommendations for glove change, there was a significant variability of data that impaired a standardization and convergence for a unique result. Only one of the assessed specialties was able to present a correlation between the time of glove use with the perforation rate.

According to the literature data, orthopedics is the specialty that should be aware of smaller time intervals for changing surgical gloves, considering that orthopedics involve a variety of sharp materials, besides bone fragments and chemical products that act as stressors to the glove integrity<sup>(6)</sup>. In the present study, we only assessed pediatric orthopedics and after analyzing the data, the suggested change time was not so short when compared to other assessed specialties.

In gynecological surgeries, we observed a decrease in the number of perforations in surgeries longer than 180 minutes. Such fact can be explained by the lower number of analyzed procedures lasting this time and consequently, lower number of gloves assessed after this period.

Besides the quality of the glove material, surgery time, surgical specialty and instruments involved, other factors contribute to the occurrence of perforations, as the role performed by the professional of the surgical team during the procedure and his technical ability<sup>(6)</sup>.

Regarding the role performed during the operation and the relationship with glove perforation, studies have demonstrated a higher number of perforation among surgeons<sup>(15,44)</sup>, more frequently on the non-dominant hand, on the index finger, followed by the thumb<sup>(6-7,12,15)</sup>. This perforation characterization results from the fact that the surgeon manipulates sharp instruments with the dominant hand favoring the occurrence of accidents on the opposite hand<sup>(6,12)</sup>. Thus, we observed the need for more studies with changing intervals recommendations per role during the surgery, as based on this, the surgeons' changing time tends to be shorter than the instrumentalist change, for example.

The time of professional experience constitutes an important variable as the risk factor for the occurrence of accidents. Less ability and skill of professionals during longer complex procedures and the manipulation of surgical instruments can formally contribute to more glove perforations<sup>(6,15)</sup>.

One of the studies<sup>(7)</sup> assessed the passage of microorganisms through those flaws, besides the perforation levels related to the time of use. This research conducted in vitro tests and under clinical conditions after laparotomy procedures. The last one consisted of the use of double gloving by the surgical team, and the internal pair was considered integral and the external with previous perforations caused by 22G needles. The inner gloves were assessed after the removal of external ones using the modified Gaschen

procedure.

There were microorganisms passing through the perforation in 4.7% of external gloves assessed. The most frequent bacteria in the inner gloves were: *Staphylococcus*, *Enterococcus*, *Klebsiella spp*, aerobic spore, *Micrococcus spp* and *E. coli*. Such finding points that when facing a perforation/tears, the levels of contamination between professionals and patients and, the transference of microorganisms to the surgical wound or organ cavity is amplified<sup>(7)</sup>.

Other measures besides the regular change of gloves are preconized in a trial to keep glove integrity, as the double gloving, overall when there is a high risk of glove perforation, as in orthopedic surgeries affected by instrumental specificity, involvement with bone fragments, implantation of prosthetics or in the handling of patients with diseases transmissible by the blood flow (hepatitis B and C, HIV) and, in cases where contamination consequences can be catastrophic<sup>(4,11)</sup>. The use of double gloving versus single gloving can reduce the incidence of perforation from 10 to one<sup>(6)</sup>.

However, some professionals question the practice of double gloving, because they feel uncomfortable with the sensation of losing fine skills and sensitivity<sup>(45)</sup>. The choice of the adequate glove size makes the procedure execution more comfortable and safe. Thus, it has been a consensus among users that the use of a larger external pair is more comfortable than its use in the internal pair<sup>(6)</sup>. So, a study described the acceptance of double gloving by 88% of participants without questioning the reduction of tactile sensitivity<sup>(46)</sup>. A more recent study with thicker gloves demonstrated a decrease in this sensitivity<sup>(47)</sup>.

Also, there is the double gloving with a glove system indicator that consists in the use of internal pairs of colorful gloves that in the presence of fluids, it visually signals where is the perforation, and it is little widespread in Brazil. This system highlights perforations and, consequently, increases the user's perception, allowing the immediate exchange of gloves, contributing to the reduction of the exposure of the professional to biological material<sup>(45,47-50)</sup>.

Other practices that are little widespread have also been used for the maintenance of the integrity of surgical gloves, as triple gloving, to use ticker surgical gloves, glove liner and cloth gloves, demonstrating a incessant search for the maintenance of the physical barrier propitiated by gloves, essential for the prevention of SSI<sup>(50)</sup>.

The limitations of our study consisted of the diversity of procedures and how the analyzed studies were conducted in relation to the number of assessed gloves, the type of gloving, the perforation assessment test and extremely variable time intervals that we found in studies. We also observed the need for more robust studies with similar variables and methods, to allow the creation of evidence-based protocols in the surgical practice.

In this context, nurses have an important role as care managers to prevent harms to patients, and they can be transforming agents in this reality in surgical rooms, contributing to the reduction in the contamination of the surgical site. Consequently, resulting in the infection prevention and control at the surgical site, as this is directly and indirectly involved in the assistance to this public.

## CONCLUSION

The integrity flaw in surgical gloves during operative procedures is a common occurrence, which allows the exposition of patients and health professionals to microorganisms that are potential causes of infection. Thus, a recommended practice to minimize the glove material wear consists in its change during extended procedures, once the increase in surgical time has been associated to perforations.

Aspects as the glove quality, type of surgical procedure, skill of the team, type and conditions of instruments can interfere in the time determination. It is suggested for a change to occur in less than 120 minutes for surgeries in the digestive system, gynecological and thoracic, and less than 90 minutes in oral and maxillofacial surgeries, and less than 60 minutes in ophthalmologic procedures.

However, more studies are needed to strengthen the evidence and to support better practices, favoring the creation of protocols with the definition of time intervals for surgical glove changes for different surgical specialties, considering its specificities, aiming for the safety of patients and professionals involved.

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