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## Editorial

# The Dream of Surgery Without Complications: A Great Step, Much to Do<sup>☆</sup>



## El sueño de la cirugía sin complicaciones: Un gran paso, mucho por hacer

Surgical site infections (SSI) are one of the most relevant adverse effects associated with surgery. The problem is global, although it is more frequent in low-income countries, where it seems that up to one-third of surgically treated patients present SSI.<sup>1</sup> In countries with higher incomes, SSI also has important healthcare, economic and ethical repercussions. Studies done in our setting demonstrate adjusted rates that range between 12% and 23% in colorectal surgery, 2.7% and 11.8% in hip replacement and 1.3–4% in knee replacement.<sup>2</sup>

The World Health Organization (WHO), which promotes actions to prevent the adverse effects of medical care (*Clean care is safer care*<sup>3</sup>), has embarked on an ambitious project involving a large group of citizen representatives, clinicians and methodologists from different countries and socio-economic levels, who have worked for 4 years in the evaluation of the evidence of the main measures for preventing SSI. The final document can be accessed freely for review in its entirety<sup>4</sup> or in a summarized version.<sup>5,6</sup> My intention is not to describe the excellent points of the document, and there are many, but to encourage reflection by uncovering the work that still remains to be done and by generating the inspiration to undertake the project of safe surgery. Time and the opinion of healthcare recipients will judge and give credibility to these recommendations

The first step was to decide the preventative measures to be studied and design the questions that should be answered. The methodological sequence continued with the search for evidence, selection of studies, critical reading and extraction of the data of the main outcomes to be included in a program that would create the different meta-analyses (REVMAN<sup>7</sup>). Finally, the quality of the evidence was evaluated with the *Grading of Recommendation Assessment, Development and Evaluation (GRADE)*<sup>8</sup> approach, which classifies the evidence as very low, low, moderate or high-quality, based on which the group creating the guidelines has made a strong or weak recom-

mendation, or has refrained from recommending a certain measure.

A total of 25 generic measures have been analyzed, generating 35 questions. From the surgeon's point of view, there is a prevalence of preoperative actions (20), followed by intra- (8) and postoperative (5) measures. The members of the committee have made some kind of recommendation in 28 of the 35 evaluations carried out, the most relevant of which we discuss below.

Three recommendations have to do with the reduction of the patients' skin flora. The committee recommended cutaneous antisepsis by applying a solution of alcoholic chlorhexidine (R: strong/C: low-moderate).<sup>1</sup>

The guidelines make special mention of the contraindications and the prevention of the rare but very important adverse effects, mainly intraoperative fire. Thus, it is very important that the alcoholic antiseptic solution be applied appropriately, avoiding soaking the adjacent surfaces and the hair of the patient. The message is clear: the application of an alcohol antiseptic must be precise in quantity and extension, while the drying time (no less than 3 min in hair-free skin areas) is sacred.

If the decision is made to remove the hair pre-operatively, this should be done with electric clippers to avoid scratches and nicks. There is not enough evidence to determine the ideal range of hair removal and surgery. What is new is that the document recommends only removing hair when absolutely necessary (R: strong/C: moderate). However, this latter recommendation is based on indirect evidence (clipped/not clipped vs shaved). In addition, it is necessary to clarify the interaction of this measure with the recommendation of the use of the alcoholic solutions, given that the drying times of these solutions are longer in the presence of hair.

In patients who are carriers for nasal *Staphylococcus aureus*, decolonization is recommended with nasal topical mupirocin.

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<sup>1</sup> R: Degree of recommendation; C: Quality of the evidence.

This recommendation is especially directed at patients who require orthopedic surgery with joint prostheses and candidates for cardiac surgery (R: strong/C: moderate). Although the evidence concludes that the topical treatment of colonized patients improves the rates of postoperative staphylococcal infection, it is unclear whether the measure within a complex and frequent care process (sampling, detection, treatment and surgery) is appropriately cost-effective.

The document also discusses hand hygiene in surgery. The WHO<sup>9</sup> recommends surgical scrubbing either with a soapy solution of chlorhexidine/povidone iodine or with an alcohol solution (R: strong/C: moderate). As for the duration of hand scrubbing, the document refers the reader to current guidelines.<sup>10</sup> Thus, using 4% chlorhexidine soap, the first washing (not brushing) is recommended for 4–5 min; then 2 min are enough in the remaining surgeries, either repeating the soapy solution or an alcoholic solution (two 60 sec scrubs, with complete drying at the end), provided that, in the interval between surgeries, there has been no obvious contamination.

Among the measures aimed at reducing contamination of the surgical site by the endogenous flora of the patient, the document supports the use of oral antibiotics and mechanical preparation of the colon. Until results are published from studies comparing oral antibiotics with and without mechanical bowel preparation, it is recommended to add oral antibiotics when the colon is prepared mechanically (R: weak/C: moderate).

Also worthy of mention are the recommendations aimed at optimizing patient homeostasis in general, and the immune response in particular, such as hyperoxygenation, preservation of normothermia and perioperative normovolemia. However, the benefits of homeostatic optimization measures should be evaluated by taking into account a broader perspective of outcomes and also including the effects on other systems and organs. The recommendation of perioperative hyperoxygenation (R: strong/C: moderate) is a measure that will generate debate in different forums.<sup>11</sup> There is a perception that the application of hyperoxygenation by anesthesia services will be far from universal since it is based on an effect in an unsolid subgroup. The possible adverse effects and the limited pathophysiological evidence of the potential benefit of the increase in tissue oxygen when the hemoglobin saturation is 100%, together with other systematic reviews<sup>12</sup> with more prudent conclusions, could be the cause of the lack of consolidation of this measure.

On the opposite side of the spectrum is perioperative normothermia (R: weak/C: moderate). Paradoxically, the recommendation of preserving perioperative body temperature is weak, which may seem insufficient given the fact that its application is generalized in anesthesiology services during major procedures. The cause of this timid recommendation is, perhaps, that the group that created the guidelines did not consider that the number of patients and events from the 2 studies published were more than enough to give a more solid recommendation. To my understanding, this “disruptive” evidence does not require – nor should it wait for – more studies that corroborate the deleterious effects associated with perioperative hypothermia.

Perioperative normovolemia (R: weak/C: low) extends to the concept of volume restriction protocols. Individualized objectives are recommended to guide reanimation to avoid systemic and local hemodynamic deficit of the surgical site.

Persistent arterial hypotension can compromise the correct vascularization of intestinal anastomoses,<sup>13</sup> and, on the contrary, an excessive extracellular volume can reduce the effectiveness of the antibiotic prophylaxis due to an increased distribution volume for the antibiotic, while it may also worsen the cardiorespiratory response of the patient.

Perhaps it is surprising that, in the WHO recommendations, measures related to antibiotic prophylaxis are not given preference. While waiting for a more extensive review to be published, the document reinforces the classic concepts of performing prophylaxis before surgery and not prolonging it beyond 24 hours (R: strong/C: moderate). As an added detail, the evidence analyzed allows for the administration time to be “relaxed” (generally accepted between 30 and 60 min) up to 2 h before the initial incision (R: strong/C: moderate). This latter point can generate a discussion, given that the evidence analyzed that supports this extension of pre-incisional administration time distances itself from the basic precepts of antibiotic prophylaxis (high concentrations of antibiotics at the time of incision contamination) and is a generic recommendation for any type of surgery (with different contamination times) and antibiotic (regardless of their half-life).

Other measures with weak recommendations deserve to be commented. The guidelines are in favor of the application of perioperative glucose control, the use of plastic surgical wound protectors, triclosan-impregnated sutures, negative-pressure therapy in high-risk wounds, perioperative enteral nutrition and the irrigation of the surgical wound with a povidone-iodine solution. Meanwhile, they are against the application of wound dressings with antiseptics, the laminar flow of operating rooms, suspension of immunosuppressants before surgery, irrigation of the surgical wound with antibiotics, prolongation of antibiotic prophylaxis until the withdrawal of drain tubes and the use of skin sealants and plastic adhesives (Steri-Drape).

Due to the limited evidence found, the committee did not comment on 6 (17%) of the measures evaluated, including the use of sterile gloves (use and replacement of the double glove) and irrigation with saline solution of the surgical wound, among others. It seems logical to recommend the substitution of the external glove in procedures with the risk or confirmation of perforation or contamination. It is true that the available evidence is limited and low quality, but it is unlikely that general surgeons will stop irrigating and cleaning dirty wounds with saline solution if they decide to carry out a primary closure.

As in all consensus documents, there are intrinsic limitations that we would like to mention. First, although the method used for the analysis and gradation of the evidence reduces the possibility of bias in the recommendations, it does not exclude it. Thus, there are several stages of the study in which the subjective opinion of experts may “contaminate” the analysis. Given these threats, the best “vaccine” is a complete declaration and management of conflicts of interest. In addition, when elaborating the recommendations, the presence of all parties involved in the prevention measures is important. The opinion of first-line specialists who decide on the relevant aspects of some of the prevention measures analyzed can facilitate the decision of the panel on certain recommendations.<sup>14</sup> However, these and other difficulties that panelists face should be adequately

addressed through a structured approach to the development of the guidelines that ensures maximum transparency in terms of the selection and analysis of the evidence, as well as in the reasoning behind decision-making.<sup>15</sup>

Second, the application of these measures will undoubtedly help improve the rates of postoperative infectious complications, although simple adherence does not substitute correct decision-making criteria or the application of the optimal surgical technique. The best “package” will not improve the rate of surgical infection of heroic surgical procedures that exceed patient resistance.

And third, the quantity and quality of the application of measures in medical centers and healthcare institutions will undoubtedly lead to difficulties in making the necessary changes, especially given the involvement of users in the processes and the hierarchical decision-making system.<sup>16</sup> In any event, it seems reasonable to start from less and progress toward more, identify departments to use as a reference while combining pedagogy with enthusiasm.

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