

## Surgical hand washing: A systematic review

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### SUMMARY

**Objective:** Hand antisepsis has an important place in the prevention of surgical site infections. In this review, we aimed to systematically examine the studies on the comparison between the efficiency of surgical hand washing method and the antiseptics being used.

**Methods:** Between August 2009 and September 2014, 23,450 studies which were published were screened. The databases of “EBSCO”, “Pubmed”, “Medline”, “Cochrane Library”, “Science Direct”, “Google Academic” and “ULAKBIM” were screened by using the keywords “Surgical hand washing”, “comparison of surgical hand scrubbing solutions” and “operating room”. Among the acquired studies, only 14 randomized-controlled (RC) and experimental articles were examined. These articles were given in a chronological order containing the authors, years, titles, objectives, samples, methods, findings, discussions and conclusions.

**Results:** Considering the findings that were acquired according to this systematic examination, we observed that majority of studies preferred alcohol-based washing products instead of traditional hand washing products (scrubbing with a soap or a povidone iodine), as traditional methods causes less and even no complications such as hand cracks and scrapes, saves time and, above all, it shows an antibacterial effect in a short time. Recent experimental studies suggest that scrubbing fingernails and hands with an antiseptic solution has no use in surgical decontamination; thus, it is sufficient to scrub until the hand dries and the most efficient alcohol-based hand washing product is chlorhexidine gluconate. Efficiency of antiseptics used in surgical hand washing differs according to the technique of surgical hand washing and the sample group being used.

**Conclusion:** Procurement of surgical hand antisepsis is one of the most important principles in preventing the surgical site infections. Efficiency and preference of surgical hand washing solutions is still a disputable issue. Thus, it is recommended to repeat relevant randomized-controlled and experimental studies in a different sample group.

**Keywords:** Comparison of surgical hand washing/scrubbing solutions; operating room; surgical hand washing; systematic review.

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**H**and hygiene forms the basis of antiseptic techniques aimed at reducing the incidence of nosocomial and surgical site infections.<sup>[1-3]</sup> The contaminated hands of health workers are known to result in nosocomial and surgical site infections. These infections lead to severe morbidity and mortality, prolonged hospital stay, and increased hospital costs.<sup>[1-4]</sup>

Surgical hand washing has an important place in preventing the development and transfer of nosocomial infections, and also in the development of surgical site infections.<sup>[2,4]</sup> Cleaning of hand and arms with an antiseptic solution was first initiated in the 1860s by Joseph Lister's surgical team, which used carbonic acid for hand disinfection.<sup>[5]</sup>

The aim of surgical hand washing is to clean up microorganisms, prevent their transfer or to reduce the amount of permanent flora of the hands, which would ultimately prevent surgical wound contamination from microorganisms found on the hands of the surgical team. Even a small amount of microorganism found on the hands can trigger the development of infection. This is particularly pronounced in patients with implants. The incidence of surgical site infection can markedly be reduced through appropriate hand washing procedures.<sup>[6,7]</sup>

Earlier, Mangram et al.<sup>[8]</sup> reported that in the first surgical cases scrubbing including that of nail beds was necessary in surgical hand washing, and later suggested that the hands could be washed surgically without the scrubbing procedure. Inadequate scrubbing of the hands with an appropriate antiseptic agent may lead a rapid growth of microorganisms.

The use of alcohol-based hand antiseptics was initiated towards the end of the year 2008.<sup>[6]</sup> Alcohol-based hand washing solutions have a broad spectrum of antimicrobial effect. They are also considered in the first-line of use due to their rapid effective nature and a better skin tolerance compared to soap-based hand washing solutions.<sup>[4]</sup> However, in the absence of included moisturizers, alcohol-based solutions tend to cause dryness of the skin. As a result, there are still controversies concerning the advantages and disadvantages of alcohol-based solutions.<sup>[4,6]</sup>

Although surgical hand washing has been in routine practice for many years now, no acceptable standard protocol has been clearly described as to the scrubbing procedure and the antiseptic solution to be used. Several studies have suggested that any antiseptic agent can be used together with a nail cleaner and scrubbing. However, many studies suggest that there is no need for a nail cleaner or scrubbing and that scrubbing with a good antiseptic agent would be adequate.<sup>[3,9-12]</sup> Debates con-

cerning the method and solutions used in surgical hand washing are still being carried out.

In this review, we aimed to examine randomized controlled and experimental studies concerning the comparison of the efficiency of surgical hand washing methods and the antiseptic agents used.

## Materials and methods

### Inclusion criteria

The following criteria were considered in the selection of articles:

- Availability of a plan for the method of surgical hand washing and hand washing solutions
- Publication language of either Turkish or English
- Publication within the past five years (August 2009 and December 2014)
- Accessibility to the full text
- Being a randomized controlled and experimental study

### Exclusion criteria

- Absence of a full text article
- Articles which do not examine the efficacy of the method of surgical hand washing and hand washing solutions
- Publication language not being in either English or Turkish
- Non-original studies
- Lack of reviews and out-of-scope studies investigated in case studies, guidelines, and systematic reviews were not reconsidered and excluded from the study.

### Selection of studies

In this review, 23,450 studies published between August 2009 and September 2014 were examined. The databases of "EBSCO", "Pubmed", "Medline", "Cochrane Library", "Science Direct", "Google Academic" and "ULAKBIM" were screened using the keywords such as "Surgical hand washing" "comparison of surgical hand scrubbing solutions" and "operating room" between August-September 2014. Only 14 randomized-controlled and experimental articles were examined from among the studies obtained. These articles were chronologically outlined accordingly to include authors, years, titles, objectives, samples, methods, results, discussions and conclusions. The full texts of all articles considered for investigation were examined to evaluate whether inclusion criteria were met.

## Results

**Table 1.** Analysis of studies on surgical hand washing (in a chronological order of articles).

Author/year	Title	Study design	Sample	Method	Limitations	Results	Conclusion
1 Tanner et al., 2009	Brushes and picks used on nails during the surgical scrub to reduce bacteria: a randomized trial	Randomized controlled	164 operation room personnel	To investigate if scrubbing and the use of nail cleaners were effective in bacterial reduction, during surgical hand washing. Three different methods were compared. 1. Hands were scrubbed with chlorhexidine. 2. Nails were cleaned with chlorhexidine and nail cleaner. 3. Nails were brushed using chlorhexidine. 4. Culture products were collected one hour after, using the glove-fluid method.	Every participant was permitted to take part in the study only once. Those who took part more than once and those who were sensitive to chlorhexidine, latex or any other surgical cleaning product were excluded. The study was performed every day and lasted for a period of six weeks.	No statistically significant difference was found between the three groups. Chlorhexidine was found to be more effective alone in decontamination.	The amount of bacteria was not found to be reduced by scrubbing nails with particularly chlorhexidine. Scrubbing is not necessary for surgical hand washing. The technique of scrubbing was suggested to be removed from the procedure of surgical hand washing.
2 Suchoamel et al., 2011	Ethanol in pre-surgical hand rubs: concentration and duration of application for achieving European Norm EN 12791	Randomized controlled	20 individuals	A total of 20 volunteered were divided into three randomized controlled groups. Every volunteer used each antiseptic only once. At least one week was expected to elapse for the skin flora to be renewed when an individual test was repeated. All two hands were washed for three minutes in 75%, 85% and 95% Ethanol.	Individuals below the age of 18 years, those with scratches on their hands, or those with any skin disease, those who refused to use any antiseptic solution or anybody who did not perform any of the tests one week before was excluded from sampling.	A statistically significant difference was observed between the three antiseptic solutions (75%, 85%, 95% ethanol), during the evaluation performed three hours later. Bacteria on the hands of those with gloves were found to be significantly reduced in those who used 85% ethanol, following a three-hour antiseptis.	Ethanol-based hand cleaning solutions were convenient for surgical hand washing and the use of the 95% form of the solution was more appropriate for surgical hand washing of less than three minutes.
3 Cunha et al., 2011	The efficacy of three hand aseptic techniques using chlorhexidine gluconate (CHG 2%)	Experimental cross-over study	A total of 29 individuals completed the study out of the 32 individuals who were enrolled (an allergic reaction developed in one person, while two persons were excluded from the study following inability to respect the antiseptic technique prescribed)	A total of 29 individuals were included in this study. The aim was to compare the antimicrobial effect of chlorhexidine gluconate through the use of three different hand washing techniques. The hands were washed with 2% chlorhexidine gluconate with brush, 2% chlorhexidine gluconate with sponge, and scrubbing with 2% chlorhexidine gluconate alone.	Individuals with allergic reactions, those with scratches on their hands, or those with any skin disease, and those who did not respect the antiseptic technique prescribed were excluded from sampling.	No statistically significant was found between the three methods with regards to colonies on the hands. There was no difference in the effect of scrubbing with chlorhexidine gluconate in reducing the colony size on the hands.	The scrubbing technique may not be used for surgical hand washing. Chlorhexidine gluconate may be used without any scrubbing apparatus.

**Table 1.** Analysis of studies on surgical hand washing (in a chronological order of articles). (Cont.)

Author/year	Title	Study design	Sample	Method	Limitations	Results	Conclusion	
4	Chen et al., 2012	Effect of surgical site infections with waterless and traditional hand scrubbing protocols on bacterial growth	Experimental	A total of 100 operation room personnel were randomly selected for the study.	In this study, 100 investigators were divided into equal groups. Comparison was made between traditional hand washing and alcohol-based water-free hand washing durations, and between the mode of washing and the effect of solution used. Samples for microorganisms were obtained 48 hours after surgical hand washing performed in two different ways.	None	Analysis of microorganisms was performed from the sample collected 48 hours after. About 1-9 colony plaques were demonstrated in the water-free scrubbing group whereas 1-5 colony plaques were demonstrated in the traditional soap-washing group. No statistically significant difference was found between the groups. Decontamination of microorganism was observed in nine patients who had contact with 14 individuals following the scrubbing procedure. Of these patients, one underwent amputation.	Results showed that alcohol-based water-free hand washing was more efficient and that it was as effective as traditional scrubbing of hands in terms of growth of microorganisms.
5	Olson et al., 2012	Prospective, randomized in vivo comparison of a dual-active waterless antiseptic versus two alcohol-only waterless antiseptics for surgical hand antiseptics	Prospective randomized controlled experimental study	A total of 82 individuals completed the study out of the 129 individuals who were enrolled, following the inability of others to fulfill the study inclusion criteria.	Comparison was made between the three water-free hand washing products found in the market to understand if the efficacy of adding chlorhexidine gluconate to alcohol-based products changed. Alcohol+1% chlorhexidine gluconate alcohol+ 61% ethyl alcohol alcohol+ 80% ethyl alcohol  A total of 12 measurements were performed during a period of five days. Cultures were collected using the glove-fluid method, immediately after and again six hours after washing.	Individuals below the age of 18 years, those with scratches on their hands, those allergic to latex, alcohol, detergent, soap, or any hand antiseptic, those who have used any antimicrobial agent on the hand or arms within the past week, those with any allergic condition, those using artificial nails or nail polish, those treated for any nail or nail bed condition, individuals who have visited thermal springs or similar places for treatment purposes, those who have used any hand lotion within two hours of surgical hand washing, individual with asthma, hepatitis or any such contagious disease, those who have received antibiotic treatment within one week, or pregnant women, were excluded from sampling.	A statistically significant difference was demonstrated between alcohol-based solutions containing 1% chlorhexidine gluconate and the other alcohol-based products (61% ethyl alcohol and 80% ethyl alcohol). Alcohol + 1% chlorhexidine gluconate has a higher bactericidal permanent effect.	Immediately after using three water-free surgical hand antiseptics their effects were found to be similar. However, after six hours, products containing alcohol plus chlorhexidine gluconate were reported to have a higher bactericidal permanent effect.

**Table 1.** Analysis of studies on surgical hand washing (in a chronological order of articles). (Cont.)

Author/year	Title	Study design	Sample	Method	Limitations	Results	Conclusion
6 Okgün Alcan et al., 2012	Comparison of the efficiency of nail pick and brush used for nail cleaning during surgical scrub on reducing bacterial counts	Experimental	60 nurses	<p>The study was conducted to determine whether there was any difference between 4% chlorhexidine gluconate and surgical hand washing. A total of 60 nurses were divided randomly into three equal groups.</p> <ul style="list-style-type: none"> <li>- Those who used routine hand washing methods (1) Control group</li> <li>- Those who used brushes to clean nail beds (2) Study group and</li> <li>- Those who used nail cleaners (3) Study group</li> </ul> <p>Culture samples were collected from the nails and hands before surgical scrubbing</p> <p>Culture sampling was repeated one hour after scrubbing, using the glove-fluid method.</p>	Individuals allergic to chlorhexidine gluconate, those who had any scratches on their hands, persons allergic to latex, those with any systemic allergic disease, those who developed allergic reactions during the period of data collection or those with punctured gloves within a one-hour period, were excluded from sampling.	<p>The amount of bacteria after one hour of surgical scrubbing was found to be lower in the control group compared to the study group.</p> <p>No statistically significant difference was found between the study and control groups.</p>	Nail cleaning and the use of brushes were not found to have any advantage in the decontamination of bacteria during surgical hand washing, and no difference was reported between scrubbing and normal hand washing.
7 Lai et al., 2012	Surgical Hand Antisepsis—A Pilot Study comparing Povidone Iodine Hand Scrub and Alcohol-based Chlorhexidine Gluconate Hand Rub	Experimental	20 Volunteers	<p>Twenty volunteers were divided into two groups.</p> <ol style="list-style-type: none"> <li>1. Traditional group performed scrubbing using 7.5% povidone iodine (PVP-I) for three minutes.</li> <li>2. Avagard group used 61% ethyl alcohol and 1% chlorhexidine gluconate by scrubbing for three minutes until the hands were dry.</li> </ol> <p>Colony formation was left to the Colony Forming Units (CFU) immediately before and after the procedure, and one hour after putting on gloves.</p>	Participants with infections on their upper extremity, those with any scratches or wounds, and those allergic to povidone iodine and chlorhexidine gluconate were excluded from sampling.	<p>The colony size on the hands washed with povidone iodine within one hour and immediately after the procedure was found to be significantly smaller than that observed with chlorhexidine gluconate. However, this difference was not found to be statistically significant.</p> <p>Avagard was reported in many studies to be more effective.</p>	Consistent with previous study findings, chlorhexidine containing alcohol-based hand washing solutions were found to be superior, compared to povidone iodine containing products. It can be used in the operation for surgical hand antisepsis alternatively to the traditionally used method (PVP-I).
8 Shen et al., 2013	Comparative antimicrobial efficacy of alcohol-based hand rub and conventional surgical scrub in a medical center	Prospective observational study/ Experimental	128 healthy personnel	<p>The study was conducted with 65 test subjects and 63 control individuals. Culture samples were collected from both group pre- and post-operatively to investigate the antimicrobial effects of alcohol-based hand washing solution and the conventional surgical scrubbing.</p>	Individuals who refused to provide culture samples before and after the operation were excluded from sampling.	<p>Growth of pathogenic microorganisms was reported to be low in those who used alcohol-based hand lotions for two minutes pre- and post-operatively. The antimicrobial effect of alcohol-based products has been shown to be faster than observed in conventional hand washing.</p> <p>The antiseptic effect was reported to be higher than conventional hand washing methods. No statistically significant difference was found between the two groups in respect of the occurrence of allergic reactions.</p>	<p>Alcohol-based antiseptics have been reported to be more effective than conventional hand scrubbing.</p> <p>Alcohol-based products affect bacteria faster. They can be considered as an alternative to the hand washing techniques preferred in the operation rooms due to this rapid antibacterial effect, rendering scrubbing unnecessary.</p>

**Table 1.** Analysis of studies on surgical hand washing (in a chronological order of articles). (Cont.)

Author/year	Title	Study design	Sample	Method	Limitations	Results	Conclusion
9 Mahmoud et al., 2013	Hand rubbing and scrubbing in relation to microbial count among surgical team members in a Saudi Hospital	Experimental	72 Individuals	A total of 72 individuals were divided randomly into three groups, in the study aimed at comparing the effect of povidone iodine, alcohol and conventional hand washing in reducing the flora found on the hands of the surgical staff. Group 1. 7.5% povidone iodine used for three minutes to scrub by conventional method, Group 2. 70% ethyl alcohol used to scrub for three minutes until the hands were dry, Group 3. Avagard (2% chlorhexidine gluconate +70% ethyl alcohol) used to scrub for three minutes until the hands were dry. Culture samples were obtained from every group when gloves were removed before, immediately after and three hours after scrubbing.	Those who participated in the surgical procedure in the operation room and performed surgical hand washing, those allergic to chlorhexidine gluconate or alcohol, patients with upper respiratory tract infection, those with any trauma, scratch or infection on the hand, and those who could not contribute to the study for a period of three months were excluded from sampling. Participants were instructed about dressing and hand washing procedures before the study.	No statistically significant difference was found between the three groups immediately after scrubbing. There was also no statistically significant difference after scrubbing with alcohol and Avagard; however, in those who used Avagard the reduction in colony size was reported to be statistically significant during measurements performed three hours later.	Avagard was reported to be more effective in reducing colony size on the skin when compared to 70% ethyl alcohol and 7.5% povidone iodine. Avagard was suggested as an alternative in operation rooms to the conventionally used povidone iodine (PVD-I).
10 Macias et al., 2013	Chlorhexidine is a better antiseptic than povidone iodine and sodium hypochlorite because of its substantive effect	Experimental	30 volunteers	The study was conducted in two steps. First step: evaluation according to the skin colony-forming units (CFU), Second step: investigation of the effect of 10% sodium hypochlorite or % chlorhexidine gluconate, and isopropyl alcohol. Each volunteer was tested four times.	Participants were advised not to enter swimming pools for two weeks; to use neutral shampoo and shower jells free of antiseptic effects. They were also advised not to bath within 24 hours before the experiment.	Demonstrations were made 120 times to check on the antiseptics. No difference was reported between chlorhexidine gluconate and sodium hypochlorite with regards to CFU. The two antiseptics were found to have marked different effects from the control group. Only chlorhexidine gluconate demonstrated variable effects.	Although isopropyl alcohol, sodium hypochlorite and povidone iodine and chlorhexidine gluconate did not demonstrate the similar long lasting effect. chlorhexidine gluconate has been reported to be preferable during pre-operational skin cleaning, catheter installation and surgical hand washing.
11 Suhomel et al., 2013	Glycerol significantly decreases the three hour efficacy of alcohol-based surgical hand rubs	Randomized controlled Experimental study	24 volunteers	Three cross-over examinations were made to test if all alcohol products contained glycerol or not. Every formulation of the cross-over examination was performed randomly in two groups. The first person in the first group used pure alcohol, the first person in the second group used glycerol-containing alcohol, while the second person used pure alcohol. The test continued for one week. At the end of the experiment everybody must have used every formulation once.	Individuals below the age of 18 years, those with scratches, scratch infections or wounds on their hands, those who had not used any antibacterial-containing antiseptic or antibiotic within one week, pregnant women, and those who had not performed the required tests before one week of the study were excluded from sampling.	All formulations containing 1.45% glycerol were found to significantly reduce a three-hour bactericidal effect ( $p < 0.01$ ); and alcohol was reported to be more effective alone. The three-hour bactericidal effect of pure alcohol-based formulations were found to be significantly higher the formulations containing glycerol ( $p < 0.01$ ).	This study demonstrated that addition of glycerol to alcohol-based hand washing products reduced the bactericidal effect of surgical hand washing antiseptics. Another study showed that the effect of glycerol was high.

**Table 1.** Analysis of studies on surgical hand washing (in a chronological order of articles). (Cont.)

Author/year	Title	Study design	Sample	Method	Limitations	Results	Conclusion
12 Kareem et al., 2014	Alcohol Based Hand-rub versus Traditional Hand Scrub as Surgical Hand Disinfection in a Tertiary Eye Teaching Hospital in Iraq	Experimental	50 Individuals	The study was performed in a single center for a period of four weeks. One group used the standard hand washing method by washing with water, and soap and scrubbing for five minutes, rinsing and drying. The other group used alcohol-based hand washing solution for 1.5 minutes.	None	Those using alcohol-based hand washing solutions were reported to present with a significantly reduces colony size (CFU), compared to those who used the standard hand washing method.	Alcohol-based hand washing solutions were reported to significantly reduce the colony size (CFU), compared to the standard hand washing method. Alcohol-based hand washing solutions were suggested to deserve preference over the standard hand washing method.
13 Barbadoro et al., 2014	<i>In vivo</i> comparative efficacy of three surgical hand preparation agents in reducing bacterial count	Experimental	7 Individuals	Comparison was made between alcohol-based hand washing solutions (40%; isopropyl alcohol, 25%; N-propyl alcohol, 1.74% glycerin, 1% < triethanolamine carbomer salt), chlorhexidine gluconate and povidone iodine solutions, with regards to surgical contamination. Random selection was made for the choice of fluid. Culture sample were obtained three hours after wearing sterile gloves.	Individuals with scratches, wounds and desquamations on their hands, and those allergic to antiseptics were excluded from sampling.	The best results within the three-hour period were obtained from alcohol-based products. However, bacterial growth was reported on the hands of those who scrubbed and experienced irritation with alcohol-based products.	Alcohol-based products were found to have a higher bactericidal effect; the bactericidal effect of chlorhexidine gluconate was reported to be higher than that of povidone iodine. The fact that alcohol-based hand antiseptics cause desquamation on the hands may lead to marked colonization. This reaction demonstrated by the skin of health personnel should be investigated.
14 Howard et al., 2014	New method for assessing hand disinfection shows that pre-operative alcohol/ chlorhexidine rub is as effective as a traditional surgical scrub	Randomized Controlled/ Experimental	20 Volunteer Anesthetists	The Mc Kenzie method was used in the study. The procedure was initiated using the glove-fluid method, after removing jewelry such as rings and bracelets from the hands and doing nothing else. Then after, and in a randomized controlled manner (subsequent removal of gloves), 4% watered chlorhexidine was used on one hand which stayed on for three minutes. The other hand was scrubbed for 60 seconds using 70% isopropyl alcohol/0.5% chlorhexidine solution. Bacteria samples were obtained 30 minutes later from both hands using the glove-fluid technique. Comparison was then made between the two groups.	Participants who obtained antibiotic treatment within seven days, those who had sever skin injuries and those who were sensitive to alcohol-based products were excluded from sampling.	No statistically significant difference was found in terms of the amount of bacteria. The amount of microorganism was reported to be reduced when alcohol and chlorhexidine were separately used after 30 minutes.	It has been suggested that the use of alcohol together with chlorhexidine is more effective.

## Discussion

The common goal of all surgical staff is to provide bacterial decontamination in the operation room.<sup>[13]</sup> Pre-operative washing of hands by the surgical team with an antimicrobial solution is known to play an important role in the prevention of nosocomial infections.<sup>[14]</sup>

Povidone iodine and chlorhexidine gluconate are the common solutions used in surgical hand washing. Recent RC experimental studies have demonstrated that the scrubbing technique frequently used in conventional surgical hand washing is not very necessary. Although the conventional brushing/scrubbing technique provides an effective antiseptics, it has been shown to increase complications such as cracks and scratches of the hand. As a result, scrubbing has been suggested to be unnecessary during surgical hand washing. Scrubbing and particularly the use of special apparatus to scrub nails has been shown not to reduce the amount of bacteria; hence, it has been suggested that the scrubbing technique may be removed from the surgical hand washing guidelines.<sup>[2,9,12,15]</sup>

In the study by Okgun Alcan et al.,<sup>[3]</sup> the use of nail cleaners and scrubbing did not have any advantage in bacterial decontamination during the process of surgical hand washing, and that there was no difference between scrubbing and normal hand washing. In another study where the conventional hand washing was compared with hand washing using alcohol-based solution, washing time, washing method and the effect of solution were investigated, alcohol-based hand washing was found to be as effective as the conventional scrubbing technique.<sup>[12]</sup> Another study compared the antimicrobial effect of alcohol-based hand washing and the conventional scrubbing technique and demonstrated that alcohol-based hand antiseptics were more effective than conventional scrubbing.<sup>[2]</sup> Kareem et al.<sup>[15]</sup> reported similar results in their study. Although washing with alcohol-based solution shortened the duration of washing, a smaller colony size was demonstrated on the hands of participants compared to the conventional method.

Apart from several advantages of alcohol-based hand washing products such as the rapid bactericidal effect, being easy-to-use and its less time consuming nature, they also have several disadvantages of scrubbing such as irritation of hands, development of allergic reactions and skin dryness. To reduce these unwanted effects, a study was conducted where glycerol was added to the alcohol-based products.<sup>[4]</sup> The study results demonstrated that addition of glycerol to alcohol-based products reduced

the antibacterial effects of surgical hand washing antiseptics.

The antibacterial effects of surgical hand washing antiseptics have been reported to be as important as the surgical hand washing technique itself in the reduction of surgical site infections. Many literature studies compared the effect of various antiseptics, as well as various forms of the same antiseptic. To illustrate, Suchomel et al.<sup>[11]</sup> demonstrated that 85% ethanol had a higher bactericidal effect than the others. In another study, three different methods were used with chlorhexidine gluconate (classical scrubbing, scrubbing with sponge, and scrubbing without using any apparatus) for surgical hand washing and it was reported that there was no statistically significant difference between the three methods.<sup>[10]</sup> According to results of this study, the use of brush and sponge did not increase the bactericidal effect of chlorhexidine gluconate. The authors concluded that chlorhexidine gluconate can be used in surgical hand washing without the need for any scrubbing apparatus.<sup>[10]</sup>

In another study investigating whether there was any change in the effect of adding chlorhexidine gluconate to the alcohol-based products, chlorhexidine gluconate containing products provided a longer lasting bactericidal effect.<sup>[16]</sup> Chlorhexidine gluconate was also shown to have a higher bactericidal effect, compared to povidone iodine and other alcohol-based products in many studies carried out among varying samples groups, varying time periods, and with varying techniques.<sup>[17-21]</sup>

Furthermore, recent experimental studies have demonstrated that conventional hand washing/scrubbing techniques are no longer necessary, and that the use of alcohol-based hand antiseptics would instead be more appropriate.<sup>[17-21]</sup>

In conclusion, the technique of surgical hand washing, effect of the solution used and the preference of one over the other is still a controversial issue. Therefore, there is a need for repeated RC experimental studies in a varying sample size.

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### Cerrahi el yıkama: Sistematik derleme

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**Amaç:** El antisepsisi cerrahi alan enfeksiyonlarının önlenmesinde önemli bir yere sahiptir. Bu derlemede, cerrahi el yıkama yöntemi ve kullanılan antiseptiklerin etkinliğinin karşılaştırılması ile ilgili çalışmaların sistematik olarak incelenmesi amaçlandı.

**Yöntemler:** Bu çalışmada Ağustos 2009 – Eylül 2014 tarihleri arasında yayınlanmış 23.450 çalışma incelendi. "EBS-CO", "Pubmed", "MEDLINE", "Cochrane Library", "Science Direct", "Google Akademik" "ULAKBİM" veri tabanları "Surgical hand washing" "comparison of surgical hand scrubbing solutions" ve "operating room" anahtar kelimeleri kullanılarak tarandı. Elde edilen çalışmalardan sadece randomize kontrollü (RKÇ) ve deneysel 14 makale incelemeye alındı. Bu makaleler, yazarları, yıl, başlık, amaç, örneklem, yöntem, bulgular, tartışma ve sonuçları içeren bir düzen içerisinde kronolojik sıraya göre verildi.

**Bulgular:** Bu sistematik inceleme doğrultusunda elde edilen bulgulara bakıldığında, çalışmaların çoğunda geleneksel el yıkama (sabun ya da povidon iyot ile fırçalama) yerine alkol bazlı el yıkama ürünlerinin tercih edildiği görüldü. Tercih edilme nedenlerine bakıldığında, geleneksel fırçalama yöntemine göre ellerde, çatlak, sıyrık gibi komplikasyonların daha az olduğu, hatta hiç görülmediği, zaman tasarrufu yarattığı ve kısa sürede antibakteriyel etkisinin görüldüğü bildirilmektedir. Son yıllarda yapılan deneysel çalışmalarda tırnakların ve ellerin antiseptik bir solüsyonla fırçalanmasının cerrahi dekontaminasyonda yararının olmadığı, bu nedenle el kuruyana kadar ovulmasının yeterli olduğu, alkol bazlı el yıkama ürünlerinden en etkili olanın ise, klorheksidin glukonat olduğunu belirtilmektedir. Cerrahi el yıkamada kullanılan antiseptiklerin etkinliği, cerrahi el yıkama tekniği ve kullanılan örneklem grubuna göre farklılık göstermektedir.

**Sonuç:** Cerrahi el antisepsisinin sağlanması cerrahi alan enfeksiyonların önlenmesinde en önemli ilkelerden biridir. Cerrahi el yıkama solüsyonlarının etkinliği ve birinin diğerine göre tercih edilme durumu hala tartışmalı bir konu olarak güncelliğini koruduğu görülmektedir. Bu nedenle, bu konu ile ilgili randomize kontrollü deneysel çalışmaların farklı örneklem grubunda tekrarlanmasının uygun olduğu düşünülmektedir.

**Anahtar sözcükler:** Ameliyathane; cerrahi el yıkama; cerrahi el yıkama solüsyonlarının karşılaştırılması; sistematik derleme.